

Aparna Mangadu, MPH, BS
Research Project & Presentation Portfolio

This portfolio contains abstracts and posters for research projects that I have led. Please refer to the Presentations section of my CV to see where each project has been presented. Contact me at aparnamangadu@gmail.com with any questions!

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CPRIT Summer Research Internship – UTHealth Houston

Houston, Texas

During the summer of 2019, I completed a research experience for undergraduates (REU) at UTHealth School of Public Health in Houston, Texas. Under the mentorship of Dr. Maria Fernandez, Alison Welski, and Preena Loomba, I worked on a project that would address the stigmas associated with administration of the HPV vaccine among the Hispanic population in El Paso, Texas. To do this, I designed an evidence based and user-friendly interactive website by using the Wix website builder as a base along with other coding and programming techniques. This project was completed under the Cancer Prevention & research Institute of Texas (CPRIT) program at the university and was presented at the end of summer research symposium at UTHealth and the BUILDing Scholars Fall 2019 symposium.

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Summer 2019 Abstract

Increasing HPV Vaccination Coverage Among Hispanic Women by Addressing Cultural and Social Barriers

Aparna Mangadu¹, Alison V. Welski², Preena Loomba², Maria E. Fernandez²

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While Human Papillomavirus (HPV) is one of the most common sexually transmitted infections (STIs) among Hispanic women, HPV vaccine initiation and completion rates for this population continue to be low. Hispanic women ages 19-26 within El Paso, Texas have expressed specific cultural and social barriers regarding the HPV vaccine that result in hesitation towards the vaccination process. To address these concerns, I designed an evidence based online intervention that can be accessed both through a computer and mobile phone. The entirety of this project was literature based. By using the Wix website builder as a base along with programming and coding techniques, the website was made to be interactive and simple to navigate. These elements improve self-efficacy by tailoring user experience to address specific concerns. Every section of text was set to be in plain language that is standard to the education level of the target population. The current state of this project includes the completion of the website, but it has yet to be tested. Future directions include partnering with local institutions to promote the website and implement it into their programs. Once piloted, a survey will assess the website effectiveness as well as ease of navigation. This will allow for continuous improvement of the website.

Summer 2019 Poster




Increasing HPV Vaccination Coverage Among Hispanic Women in El Paso, Texas by Addressing Cultural and Social Barriers

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CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Introduction

- Human Papillomavirus (HPV) is one of the most common sexually transmitted infections (STIs).
- Approximately 79 million Americans have HPV, and each year 14 million new people become infected¹.
- Many strains of HPV can result in malignancies, but there is a vaccine that can prevent infection with some of these strains of HPV.
- A lack of effective patient-provider communication promoting the vaccine results in low initiation and completion rates in the United States.
- Only 32.9% of the Texas population is fully vaccinated for the virus
- In the Hispanic female population of El Paso, Texas, social barriers and cultural norms stymie HPV vaccination rates⁴.
- Since individuals lack the appropriate information that addresses these concerns, they are unable to make an informed decision about receiving the vaccine⁵.

Objective

- Design an evidenced-informed online intervention addressing cultural and social barriers surrounding HPV vaccine among Hispanic women 19-26 in El Paso, Texas.

Population Specific Cultural and Social Barriers

Social Concerns About HPV Stigma:

- Women may be reluctant to get vaccinated due to the negative stigma surrounding STIs
- Women are worried about additional assumptions that are made by the community
 - i.e. promiscuity, impurity, infection

Cultural Worries and Beliefs Surrounding HPV Vaccine:

- Married women who receive the vaccine may be labeled as promiscuous
- Unwed women should not need the vaccine since they should not be sexually active
- Sexual and gender roles lead to misinformation about vaccine acceptance

Methods

Literature Review

Development

Pilot Test

Complete assessment to identify priority population and specific healthcare needs

Identify information about cultural and social barriers among Hispanic women in El Paso regarding HPV vaccine

Identify information to properly address barriers

Design a website that examines and addresses each concern/barrier

Make the website live

Develop a QR code so that the website is easily accessible

Offer access to the website at a community event as a tool to learn more about these concerns regarding the HPV vaccine

Track How many people use the website/website analytics

Administer survey at the end of website to assess the effectiveness

Website

Time Is Ticking
<https://aparnamangadu.wixsite.com/timeisticking>

Forward

Back

Home Page

About Section

Consent: Protected Health Information

Sign

Social Barriers

HPV and Sexual Activity

Community Assumptions

General Association

Commitment to Partner

Abstinence until Marriage

Confidentiality

Let's Talk

Cultural Barriers

Married

Unwed

Sexual and Gender Roles/Norms

Get Vaccinated/Resources

End of Website Survey/Questionnaire

Discussion of Website

Theory-Based Website Design Elements

- Each section addresses perceived social norms or perceived barriers (Social Norms Theory)
- Continuous use of phrase "Get Vaccinated"
 - Cue to action (Health Belief Model)
- Interactive elements (Health Promotion Model)
- Easy to navigate (Transtheoretical Model of Change)
 - Use of plain language designed for the education level of the target population
- Evaluation: Survey/Questionnaire
 - Assesses ease of navigation

Example Survey Questions: (Qualitative/Quantitative)

- Was this website helpful in addressing your specific concern(s)?
- Do you have any concerns/questions that were not addressed in the website?
- Will you be recommending this website to friends and/or family?

Future Directions

- Complete "Pilot Test" section of methods
- Submit and Receive IRB approval for the website
- Improve the overall flow of the website based on field-testing
- Promote the website through a social media outreach program
- Partner with local El Paso institutions to promote the intervention

Acknowledgements

UTHealth Innovation for Cancer Prevention Research Summer Undergraduate Fellowship (Cancer Prevention and Research Institute of Texas (CPRIT) grant # RP160015) The findings and conclusions are those of the author(s) and do not necessarily represent the official position of the funding agency. Research reported in this project was supported by The National Institutes of General Medical Sciences of the National Institutes of Health under linked award numbers RL5GM18969, TL4GM118971, and TL4GM118970. The content is solely the responsibility of the authors and does not necessarily represent the official view of the National Institutes of Health.

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Mobile format is still in the development process

Castner Range Project - UTEP

El Paso, Texas

I began my volunteer work in the Biodiversity Collections at The University of Texas of El Paso in the Spring of 2020, but it was not until the Summer of 2020 that I began work on this project. Castner Range is an area in the northeastern section of the Franklin Mountains that is composed of roughly 7000 acres of land. This site is an important vegetation hotspot; however, the most recent checklist was constructed in 2014 and focused on the Franklin Mountains as a whole as opposed to Castner Range Individually. To address this issue, I used modern georeferencing methods and historical specimens to construct a unique plant species checklist for Castner Range, Texas. The initial project was presented at the BUILDing Scholars Summer 2020 and Fall 2020 research symposium. The project was then made more complex by using ecological niche modeling to examine the effects of climate change on sensitive species. These results were presented at the Spring 2021 COURI Symposium and the Spring 2021 Department of Geological Sciences Colloquium. This project was submitted as my undergraduate thesis.

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Summer 2020 Abstract

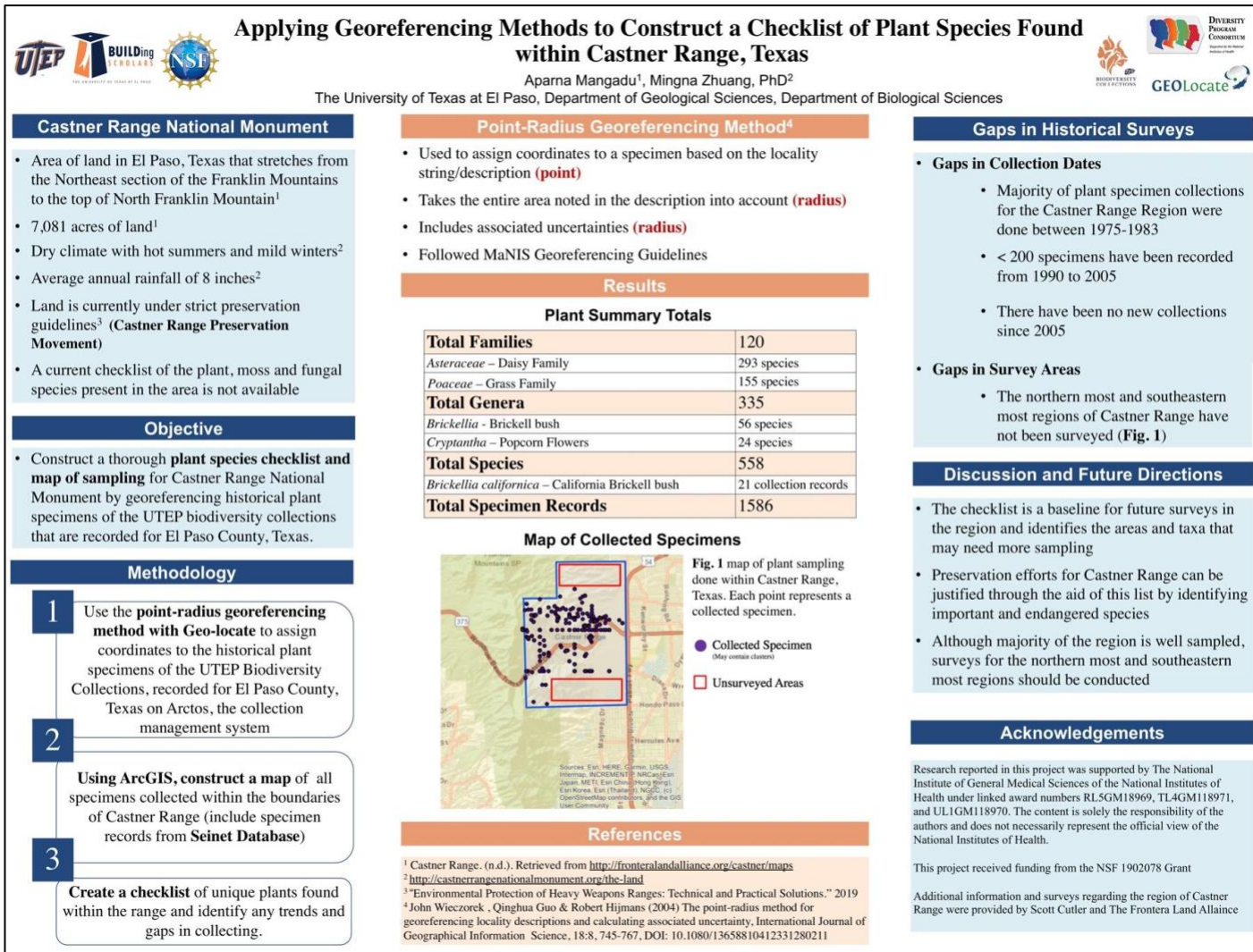
Applying Georeferencing Methods to Construct a Checklist of Plant Species Found within Castner Range, Texas

¹Aparna Mangadu, ¹Mingna Zhuang

¹The University of Texas at El Paso

Castner Range National Monument is the area of land in El Paso, Texas that stretches from the Northeast section of the Franklin Mountains to the very top of North Franklin Mountain. In total, there are 7,081 acres of land that are currently under strict preservation guidelines. The vegetation of this area has remained true to its original flora despite the weapons firing practice that took place in the area from 1926 to 1966; however, a current checklist of the plant species present in the area has not been constructed due to difficulties in present day surveying. To address this issue, I georeferenced historical plant specimens of the UTEP Biodiversity Collections, recorded for El Paso County, Texas. Using ArcGIS, I constructed a map of all specimens that were found within the boundary of Castner Range to create a checklist and identify historical collecting trends and gaps. Although the coordinates were not always exact, the uncertainty measure that is employed through this georeferencing method allowed for the range of land around the estimated location to remain small. This checklist can be applied to future studies and help justify preservation efforts regarding this area, through the identification of endangered and important species of the area. The list creates an important baseline as comparison for future surveys of the area.

Summer 2020 Poster



Spring 2021 Abstract

Constructing a Plant Species Checklist for Castner Range, Texas with the Intent of Examining Bioindicators to Study the Effects of Climate Change

¹Aparna Mangadu, ¹Mingna Zhuang

¹The University of Texas at El Paso

Castner Range National Monument is the area of land in El Paso, Texas that stretches from the Northeast section of the Franklin Mountains to the very top of North Franklin Mountain. The vegetation of the area includes a variety of desert scrub and drought resistant plants and has remained true to its original flora despite the weapons firing practice that took place in the area from 1926 to 1966. Since the native vegetation is still present, some plant species may serve as bioindicators and aid in analyzing the health of the ecosystem. An issue is that a current checklist of the plant species present in the region has not been constructed due to difficulties in present day surveying. To address this, I georeferenced historical plant specimens of the UTEP Biodiversity Collections, recorded for El Paso County, Texas and obtained georeferenced records from Seinet and GBIF. Using ArcGIS, I constructed a map of all specimens that were found within the boundary of Castner Range to create a checklist and identify historical collecting trends and gaps. The iPlants Collaborative Platform was used to confirm the scientific names before transfer to the ecological niche modeling platform. The data from this checklist along with MaxEnt will be used to model species distribution and ultimately determine which plant species are most sensitive to climate change, how they will be affected, and how severely they will be affected. With the information gathered from modeling, the overall ecosystem health for Castner Range can be estimated.

Spring 2021 Poster



Constructing a Plant Species Checklist for Castner Range, Texas and Identifying Important Species Through Species Distribution Models

Aparna Mangadu¹, Mingna Zhuang, PhD²
The University of Texas at El Paso, Department of Geological Sciences¹, Department of Biological Sciences²



Introduction

- Castner Range is an area of land in El Paso, Texas that stretches from the Northeast section of the Franklin Mountains to the top of North Franklin Mountain¹
- The most recent plant checklist is from 2014 from Dr. Richard Worthington but it focuses on the Franklin Mountains as a whole⁴
- It is home to several endemic plant species and other important vegetation communities³
- The health of an ecosystem can be partially determined by the plants present in the area, which can be sensitive to external factors such as temperature change⁵
- The identification of climate sensitive plant species will allow for the analysis of the effects of environmental change in the region⁶

Objective

Construct a thorough compilation of occurrences and a plant species checklist for Castner Range, Texas to serve as a baseline for research and determine sampling gaps in geography, taxonomy and time. Secondly, we will identify climate sensitive plant species from this list and model impacts of climate change on these species.

Methodology

Georeferencing

Use the **point-radius georeferencing method with Geo-Locate** to assign coordinates to historical plant specimens of the UTEP Biodiversity Collections, recorded for El Paso County, Texas
Georeferenced a total of 1,410 specimens

The **point radius georeferencing method** assigns coordinates based on the locality string (**point**) and includes all areas noted in the description as an uncertainty measured (**radius**)²

Mapping

Using **QGIS**, construct a map of all specimens collected within the boundaries of Castner Range (include specimen records from **Seinet Database** and **GBIF**).
A total of 1,702 occurrences were used for the map

Checklist

Create a checklist of unique plants found within the range and confirm taxonomic names with **iPlants Collaborative Platform**.

Modeling

Use **iDigBio's** resources, climate data from **WorldClim**, and **MaxEnt** to create distribution models for the Chihuahuan Desert in order to identify which plant species of Castner Range are sensitive to climate change in Castner. Models were only created for species with more than 5 occurrences.

The dataset for the Chihuahuan Desert had a total of 595,408 occurrences. The occurrences were divided for each distribution map based on the species being looked at

Results

Plant Collections in Castner Range, TX



Fig. 1 Map of plant sampling done within Castner Range, Texas. Each point represents a collection event and may contain multiple taxa.

Ecological Distribution Models of Two Example Species – Modeled for the Chihuahuan Desert

Ferocactus wislizeni Present and Future Suitable Conditions

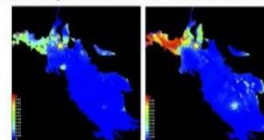


Fig. 2 Distribution models of the present (left) and future (right) (year 2050) suitable conditions for the species *Ferocactus wislizeni*. Warmer colors (green to red) indicate higher suitability.

Fraxinus Present and Future Suitable Conditions

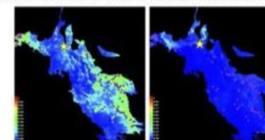


Fig. 3 Distribution models of the present (left) and future (right) (year 2050) suitable conditions for the genus *Fraxinus*. Warmer colors (green to red) indicate higher suitability.

Species Checklist

Summary

Total plant families	120
Total plant genera	343
Total unique species	625
Total specimen records	1702
New species not in previous list	136

Conservation Status

Species	Status
<i>Ferocactus wislizeni</i>	Vulnerable
<i>Fraxinus pennsylvanica</i>	Endangered

Discussion

Data Gaps and Additions

- Majority of plant specimen collections were done between 1975-1983, and there have been no collections since 2005
- The northern most and southeastern most regions have not been surveyed (Fig. 1)
- Georeferenced data filled in gaps of the previous list
 - 136 species added

Species Checklist & MaxEnt Modeling

- Important Plant Species**
 - *Ferocactus wislizeni* and *Fraxinus pennsylvanica* have high priority conservation statuses
- Significant Climate Variables and Changes in Vegetation**
 - Precipitation was a significant variable and is predicted to decrease throughout the Chihuahuan Desert
 - If precipitation continues to decrease, some species will lose habitat suitability
 - For example, *Fraxinus* loses habitat suitability everywhere except for regions in the North (includes Castner)
 - Castner Range should be conserved to protect the vegetation communities that need rainfall (i.e. *Fraxinus*)

Future Directions

- Survey unsampled areas of Castner Range
- Identify endemic and other climate sensitive plant species
- Identify the effects of other climate variables

Acknowledgements

Research reported in this project was supported by The National Institute of General Medical Sciences of the National Institutes of Health under linked award numbers RL5GM118969, TL4GM118971, and UL1GM118970. The content is solely the responsibility of the authors and does not necessarily represent the official view of the National Institutes of Health.

This project received funding from the NSF 1902078 Grant, IMLS IGSM-245733, OMS-20 Grant, and Additional information and surveys regarding the region of Castner Range were provided by Scott Cutler and The Frontera Land Alliance

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Spring 2022 Abstract

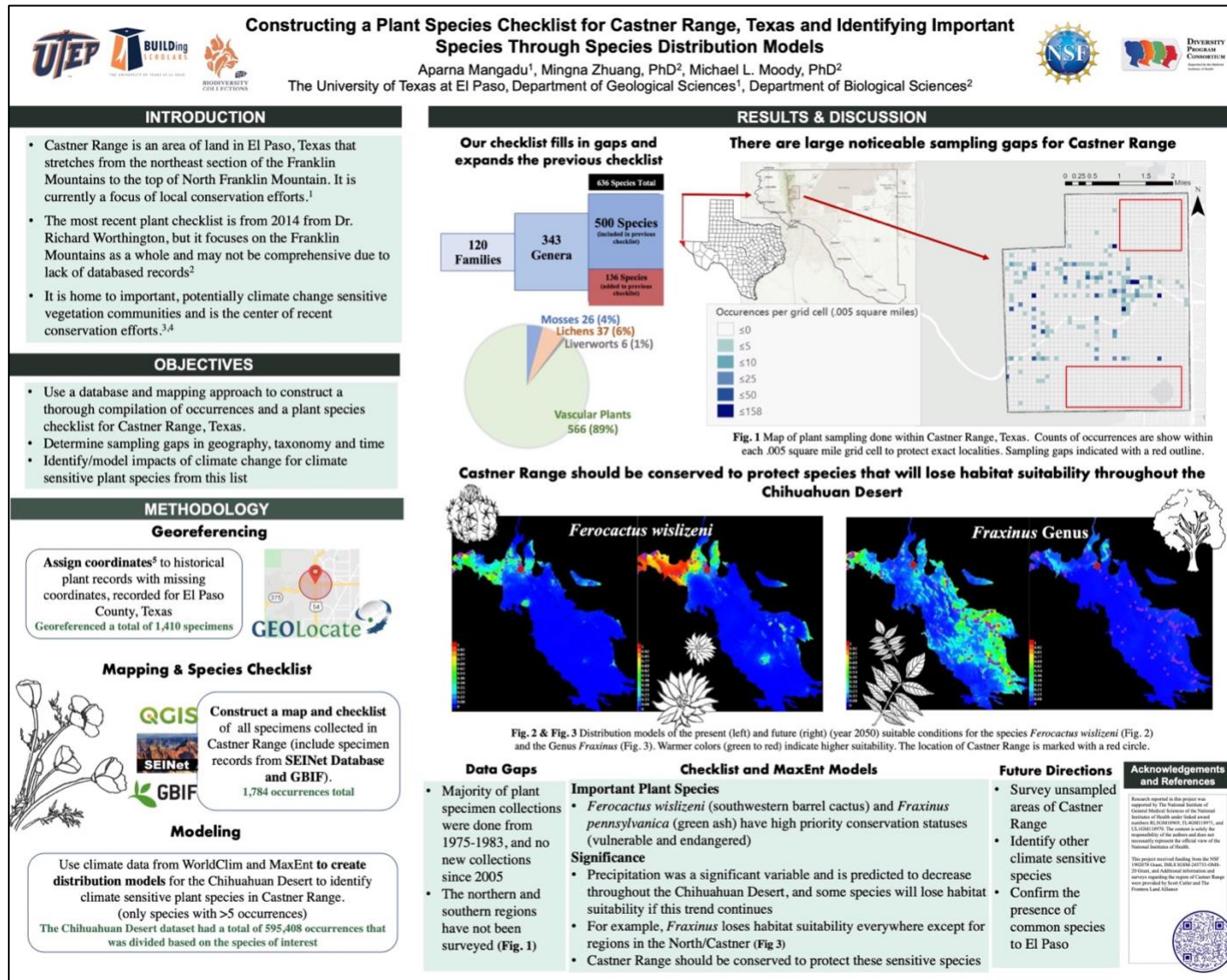
Constructing a Plant Species Checklist for Castner Range, Texas with the Intent of Examining Bioindicators to Study the Effects of Climate Change

¹Aparna Mangadu, ¹Mingna Zhuang

¹The University of Texas at El Paso

Castner Range National Monument is an area of land in El Paso, Texas that stretches from the northeast section of the Franklin Mountains to the peak of North Franklin Mountain. The vegetation of the area includes a variety of desert scrub and endemic plant species. In spite of the weapons firing practice that took place in the area from 1926 to 1966, the original flora is still intact. Additionally, Castner Range receives the heaviest amount of rainfall for the Franklin Mountains, which possibly gives rise to unique vegetation patterns. Since the native vegetation is still present, some plant species may serve as bioindicators in analyzing the health of the ecosystem. A current checklist of the plant species present in the region has not been constructed due to difficulties in present day surveying. To address this, we georeferenced historical plant specimens of the UTEP Biodiversity Collections recorded for El Paso County, Texas and compiled these records with those from SEINet and GBIF in a checklist and map of Castner Range. Using this compilation of records, we identified historical collecting trends and gaps. In total, 120 families, 343 genera, and 636 species were identified from 1784 specimen records. Using this data, we also used MaxEnt to construct species distribution models for important species, in order to assess the effects of climate change on this region.

Spring 2022 Poster



SPUR Summer Research Internship –University of Utah

Salt Lake City, Utah

During the summer 2021, I completed a research experience for undergraduates (REU) at the University of Utah in Salt Lake City, Utah. Under the mentorship of Dr. Sara E. Grineski and Roger Renteria, I completed a project that focused on using big data sources to analyze exposure to environmental hazard data. The environmental hazards that we looked at were criteria air pollutants, industrial pollutants, and lead exposure. This project was presented at the SPUR Summer Research Symposium at The University of Utah. My secondary project used big data sources to analyze lead exposure throughout school districts in Utah and its relation to intellectual disability and prevalence of autism spectrum disorder in children. We paired the public housing age data with the data from the UPDB to conduct this analysis.

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Summer 2021 Abstract – Big Data

USING BIG DATA TO ESTIMATE PRENATAL ENVIRONMENTAL EXPOSURES

Aparna Mangadu¹ (Roger Renteria², Sara E. Grineski², Timothy W. Collins³)

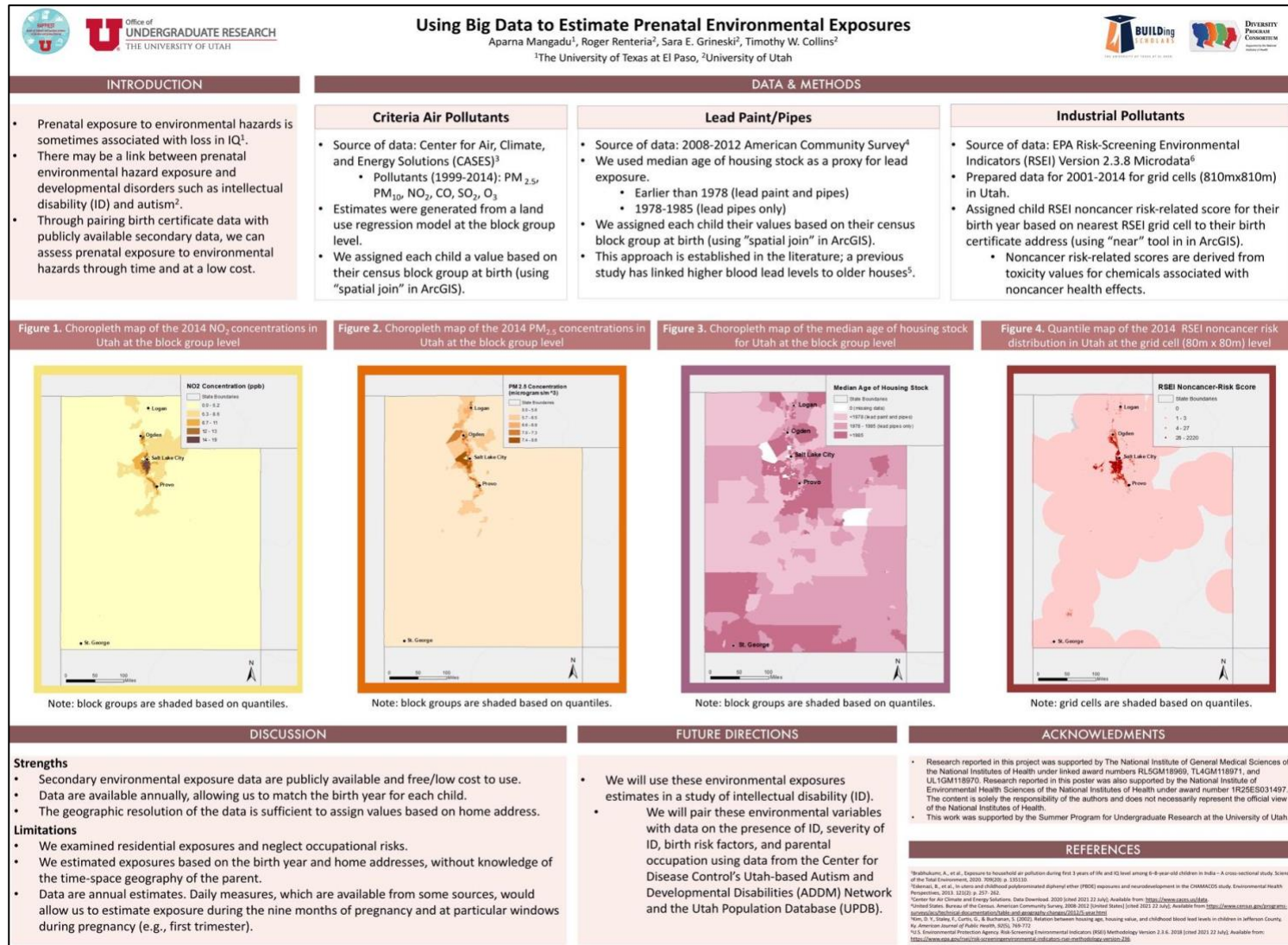
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³Department of Geography, University of Utah

Research has revealed that prenatal exposure to environmental hazards is associated with loss in IQ. Prenatal exposures may also be linked to developmental disorders such as intellectual disability and autism. Measuring prenatal exposures directly is costly, time intensive and somewhat invasive, making it hard to scale up to a population-level. Through the use of publicly available data, researchers can assess prenatal exposures to environmental hazards at a low cost. The goal of this project was to use the available data to estimate prenatal exposures for Utah children (based on birth certificate data) to criteria air pollutants, industrial pollutants, and residential lead exposures. We used data from the Center for Air, Climate, and Energy Solutions (CASES) to estimate annual criteria air pollution exposure at the census block group level. We used the US EPA's Risk-Screening Environmental Indicators (RSEI) to estimate annual non-cancer health risks in 810x810 meter grids due to industrial emissions. We used the American Community Survey (ACS) median age of housing stock block group variable to estimate exposure to lead paint and pipes (≤ 1978 , 1978-1985). Children were assigned pollution estimates pertaining to their birth year, based on their home address. Strengths of using secondary data to estimate prenatal exposures include that it is often low cost and available annually, which matches the birth year, and the geographic resolution is sufficient. Limitations include that we only examine residential exposures, neglecting occupational risks; we base lead exposure on birth year and home address, without knowledge of the time-space geography of the parent; and we use annual averages that are not specific to critical windows of pregnancy. The next step in the project is to use these data to examine associations between prenatal hazardous exposures and intellectual disability in children. Examining this association may highlight a health consequence of increased exposure and provide results that emphasize the need for better protections in vulnerable communities.

Summer 2021 Poster – Big Data



Summer 2021 Abstract – Lead Exposure

Associations between an Indicator of Perinatal Lead Exposure and Intellectual Disability in Utah Children with and without Autism Spectrum Disorder

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Individuals with intellectual disability (ID) and their families experience higher health care costs, increased stress, and poorer overall health than those without. According to the American Association of Intellectual and Developmental Disabilities, an individual has ID if they are significantly limited in both intellectual functioning (e.g., IQs under 70) and adaptive behavior (e.g., social and practical skills). Lead has well-established neurological effects following prenatal and early childhood exposure. Higher blood lead levels have been associated with living in older housing, making older housing a potential indicator of lead exposure. Few studies have examined differences in potential lead exposures between children that have ID with and without ASD. The aim of this project was to investigate if an indicator of perinatal exposure to lead is associated with children's odds of intellectual disability with and without autism spectrum disorder (ASD). Children with ID (cases) were identified by the Utah site of the Centers for Disease Control and Prevention's Autism and Developmental Disabilities Monitoring (ADDM) Network. The Utah Population Database (UPDB) was used to gather information on the cases (i.e., children with ID) and was used to identify controls (i.e., neurotypical children). Data were analyzed using multivariable generalized estimating equations. We found that the effects of the lead exposure indicator variable were significant for children who have ID and ASD as opposed to ID without ASD. Findings merit additional research looking at direct measures of lead exposure and suggest hypotheses that should be tested in future studies. Limitations of the study included that we did rely on proxy measures of exposure, focused only on Utah, and drew the address information from birth certificates, which does not include the length of residence at that address. Local lead abatement resources for families include Salt Lake County Lead Safe Housing, Utah Lead Coalition, and the Utah Blood Lead Registry.

Summer 2021 Poster – Lead Exposure



Ferguson RISE Summer Fellowship – Kennedy Krieger Institute

Baltimore, Maryland

During the summer of 2023, I participated in the Dr. James A. Ferguson RISE Program at Kennedy Krieger Institute. This experience allowed me to work with secondary quantitative data on a project investigating the link between socioeconomic status/exposure to environmental hazards and variance in social outcomes in children with CP. I presented my results at the 2023 Centers for Disease Control and Prevention Showcase and Expo in July of 2023 and the American Public Health Association 2024 Annual Meeting.

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Summer 2023 Abstract

Social Determinants and Social Outcomes: An Examination of Academic and Community Participation Outcomes in Children with Cerebral Palsy

Aparna Mangadu¹, Nicole Gorny², Paul Salib², Eric Chin²

¹The Ohio State University, ²Phelps Center for Cerebral Palsy and Neurodevelopmental Medicine

Background: Children with cerebral palsy (CP) experience significant challenges in academic and community participation due to a combination of motor, sensory, and behavioral impairments. While biomedical factors contribute to these challenges, other socioeconomic and environmental influences may play a critical role and remain underexplored. This study investigated rates of grade retention and extracurricular community participation in children with CP and their neurotypical peers and risk factors for poor outcomes amongst children with CP.

Methods: We examined nationally representative 2016-2020 National Survey of Children's Health data to investigate if children with CP experienced more grade retention and less extracurricular participation than neurotypical peers while exploring associated clinical, socioeconomic and environmental risk factors using logistic regression models.

Results: Compared to neurotypical children, we estimate that children with CP in the U.S. more frequently repeated grades (Prevalence Ratio (PR): 2.4 [95% CI: 1.6-3.6]) and participated less in organized activities (PR: 0.5 [0.3-0.6]). Within children with CP, grade retention was significantly associated with more severe CP and coexisting intellectual disability (OR: 7.2 [1.8-29] and 3.3 [1.6-7.1] per severity level, respectively), less severe coexisting autism and speech disorders (OR: 0.40 [0.2-0.8] and 0.25 [0.1-0.5] per severity level, respectively), presence of chronic pain (OR: 10 [2-55]), and increased home pesticide use (OR 4.0 [1.8-8.9] per exposure level). Low community participation was significantly associated with male sex (OR: 2.5 [1.1-5.5]).

Conclusions: Children with CP frequently experience grade retention and decreased community participation. Coexisting diagnoses impact risk of grade retention. Home pesticide exposure may serve as an additional risk factor or proxy for unmeasured socioeconomic variables, suggesting that preventable social/environmental determinants contribute to risk of grade retention in children with CP.

Summer 2023 Research Poster

Social Determinants and Social Outcomes: An Examination of Academic and Community Participation Outcomes in Children with Cerebral Palsy

Aparna Mangadu, BS¹, Nicole Gorny, MS², Paul Salib, MS², Eric Chin, MD²

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Introduction

- Cerebral Palsy (CP) is the most common physical impairment disability among children (1-4 per 1,000 live births). It impacts balance, posture, and muscle control^{1,2}.
- Previous studies have shown that many children with CP have decreased participation in everyday activities and lower overall academic performance possibly due to impairments in motor function or other cognitive/behavioral factors^{3,4}.
- Although prior research has investigated the link between maternal exposure to environmental hazards such as agricultural pesticides/maternal smoking and risk of CP^{5,6}, the possible effect of these exposures on social outcomes has not been examined.



Figure 1. Social ecological model depicting factors that affect the quality of life for children with CP. Adapted from the Bronfenbrenner Social Ecological Model, 1979

Research Question

Do socioeconomic factors and environmental exposures explain additional variance in social functioning among children with CP beyond what can be explained by demographic and diagnosis factors?

Methods

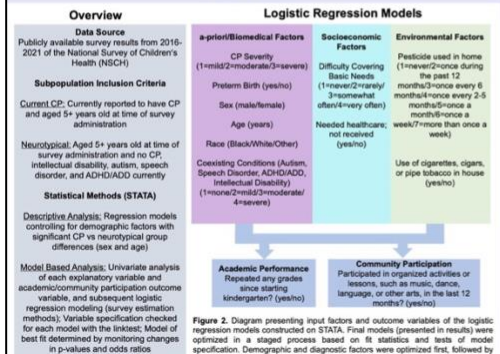


Figure 2. Diagram presenting input factors and outcome variables of the logistic regression models constructed on STATA. Final models (presented in results) were optimized in a staged process based on fit statistics and tests of model specification. Demographic and diagnosis factors were optimized first, followed by socioeconomic factors, followed by environmental factors.

Descriptive Statistics

Variable/Level	Cerebral Palsy (n = 493) Prevalence (95% CI)	Neurotypical (n = 151,089) Prevalence (95% CI)	p-value
Binary Variables			
Repeated any grades	12% (8% - 18%)	5% (5% - 5%)	<0.0001*
Participated in organized activities	23% (17% - 30%)	49% (48% - 50%)	<0.0001*
Needed healthcare not received	12% (6% - 22%)	3% (2% - 3%)	<0.0001*
Use of cigarettes, cigars, or pipe tobacco in home	21% (15% - 29%)	14% (14% - 15%)	<0.0001*
Multi-level Variables			
Difficulty covering basic needs			
Never	26% (20% - 34%)	48% (48% - 49%)	0.0185*
Rarely	36% (28% - 45%)	35% (34% - 35%)	
Somewhat often	27% (18% - 38%)	14% (13% - 14%)	
Very often	11% (6% - 18%)	3% (3% - 4%)	
Pesticide used in home			
>1/week	0.7% (2% - 2.8%)	0.7% (5% - 1%)	0.0005*
1/week	2.8% (9% - 8.4%)	1% (8% - 1.3%)	
1/month	2.8% (9% - 8.4%)	1% (8% - 1.3%)	
1/2-5 months	9.2% (5% - 16%)	9% (9% - 10%)	
1/6 months	16% (8.5% - 27.8%)	12% (11% - 12%)	
1/year	10% (6.1% - 16%)	18% (18% - 20%)	
Never	46% (35% - 57%)	47% (46% - 48%)	

Table 1. Controlling for sex and age, children with CP more frequently repeated grades, and participated less in organized activities. They more often did not receive needed healthcare and more often had difficulty covering basic needs. Children with CP were more likely to be exposed to tobacco smoke and pesticides. *Significant p-value <0.05

Results

Logistic Regression Models

Variable	Odds Ratio (95% CI)	p-value
Binary Variables		
Child's sex (reference: male)	0.98 (0.25 - 3.82)	0.976
Preterm birth (reference: no)	3.65 (0.68 - 19.65)	0.131
Healthcare needed not received (reference: no)	0.67 (0.07 - 6.71)	0.733
Ordinal/Continuous Variables		
Cerebral palsy severity (per severity level)	2.68 (0.81 - 8.94)	0.108
Coexisting autism severity (per severity level)	0.25 (0.11 - 0.58)	0.001*
Coexisting intellectual disability severity (per severity level)	3.47 (1.55 - 7.78)	0.003*
Coexisting speech disorder severity (per severity level)	0.35 (0.20 - 0.61)	<0.001*
Pesticide use in home (per application level)	3.61 (1.65 - 7.89)	0.001*
Nominal/Categorical Variables		
Child's age (reference: Aged 5-10 years)		
Aged 11 - 13 years	0.34 (0.06 - 1.96)	0.228
Aged 14 - 17 years	0.29 (0.07 - 1.18)	0.085

Table 2. Factors not included in this table did not improve model fit and were not included in the model. As intellectual disability severity increases in children with CP, they are more likely to repeat a grade (OR: 3.47). As speech disorder severity increases in children with CP, they are less likely to repeat a grade (OR: 0.35). As autism severity increases in children with CP, they are less likely to repeat a grade (OR: 0.25). As pesticide use in homes increases, a child with CP is more likely to repeat a grade (OR: 3.61). *Significant p-value <0.05

Variable	Odds Ratio (95% CI)	p-value
Binary Variables		
Child's sex (reference: male)	2.42 (1.10 - 5.53)	0.028*
Preterm birth (reference: no)	1.06 (0.48 - 2.31)	0.893
Cigarette use in the house (reference: no)	0.61 (0.19 - 2.0)	0.416
Healthcare needed not received (reference: no)	0.75 (0.21 - 2.61)	0.651
Ordinal/Continuous Variables		
Cerebral palsy severity (per severity level)	0.54 (0.30 - .96)	0.034*
Coexisting autism severity (per severity level)	1.12 (0.69 - 1.81)	0.654
Coexisting intellectual disability severity (per severity level)	0.85 (0.59 - 1.22)	0.388
Coexisting speech disorder severity (per severity level)	1.10 (0.71 - 1.72)	0.662
Difficulty covering basic needs (per application level)	0.71 (0.45 - 1.13)	0.147
Nominal/Categorical Variables		
Child's race (reference: White only)		
Black only	0.43 (0.15 - 1.28)	0.131
Other	0.99 (0.29 - 3.37)	0.994

Table 3. Factors not included in this table did not improve model fit and were not included in the model. Children with CP who are female are more likely to participate in organized activities (OR: 2.42). As cerebral palsy severity increases, children with CP are less likely to participate in organized activities (OR: 0.54). *Significant p-value <0.05

Conclusion & Implications

- This project sought to investigate associations between socioeconomic factors and environmental exposures and social outcomes among children with CP.
- Children with CP are at elevated risk of academic failure and decreased participation in organized activities—even accounting for demographic factors.
- Pesticide use in homes is associated with increased odds (OR: 3.61) of a child with CP repeating a grade—even accounting for diagnosis severity, demographic factors, and socioeconomic factors.
- This project suggests a need to further explore impacts of environmental exposures and quality of life for children with CP.

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MPH Thesis – The Ohio State University

Columbus, Ohio

From August 2022 to May 2024, I pursued my Master of Public Health Degree at The Ohio State University College of Public Health. Under the supervision of Dr. Olorunfemi Adetona, I led a project that investigated the associations between occupational exposure to persistent organic pollutants and cancer risk among structural firefighters in Ohio. I presented this project at the Environmental Health Seminar Series within the college and won a best poster award during our graduate student poster session. If you are interested in reading the full thesis, please email me at aparnamangadu@gmail.com.

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Project Abstract – MPH Thesis

Assessing Potential Smoke-Related Exposures to Persistent Organic Pollutants and Cancer Risk Among Structural Firefighters in Ohio

Aparna Mangadu¹, Olorunfemi Adetona¹, Ahmed El-Hellani¹, James Odei¹

¹The Ohio State University College of Public Health

Structural firefighting is an essential occupation and emergency response public service; however, structural firefighters are often exposed to chemical carcinogens in the form of smoke. These compounds include persistent organic pollutants such as brominated flame retardants, polychlorinated biphenyls, and organochlorine pesticides, all of which are present in household and consumer products. To characterize the relationship between the biological burden of property fire smoke constituents and cancer status among structural firefighters, we used biomarker data from serum samples to create conditional logistic regression models controlling for sex, age, metro area, and race. Initial descriptive analysis indicated that structural firefighters had significantly higher average lipid adjusted serum concentrations of PCB74, PCB99, PCB105, PCB114, PCB118, PCB138-158, PCB146, PCB153, PCB156, PCB157, PCB167, PCB170, PCB180, PCB187, PCB189, PCB184, PCB199, and B-HCCH. However, our conditional logistic regression model provided no evidence of an association between persistent organic pollutant serum concentrations and cancer risk among structural firefighters. Important limitations that may have reduced our ability to detect an association include single serum sample collection and a small participant pool. These limitations must be considered when interpreting the results of this study.

MPH Thesis Research Poster

COLLEGE OF PUBLIC HEALTH

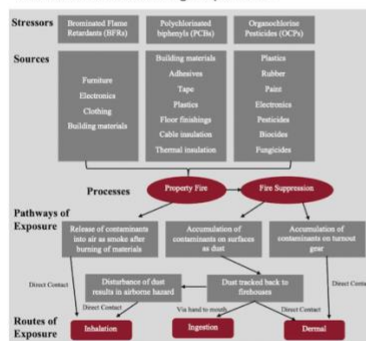
Assessing Potential Smoke-Related Exposures to Persistent Organic Pollutants and Cancer Risk Among Structural Firefighters in Ohio

Aparna Mangadu, BS, MPH(c)^{1,2}, Olorunfemi Adetona, PhD^{1,2}, James Odei, PhD^{1,3}

¹ The Ohio State University College of Public Health; ² Division of Environmental Health Sciences, ³ Division of Biostatistics

Introduction

- Structural firefighting is an essential occupation and emergency response public service
- Compared to the general population, structural firefighters are at an increased risk of being diagnosed with cancer, and cancer is the leading cause of death among firefighters¹
- Occupational exposure as a firefighter is classified as a Group 1 carcinogen – carcinogenic to humans by the IARC²
- Structural firefighters are at risk of being exposed to various chemicals that have carcinogenic potential^{3,4}



- There have been limited studies that characterize the exposure-response relationship between exposure to property fire smoke constituents and cancer risk
- There is a need for studies that focus on investigating the potential relationship between cumulative smoke exposure and cancer risk among structural firefighters

Objectives

- Assess whether the biological burden of chemicals that may indicate occupational exposure to smoke (BFRs, PCBs, and OCPs) is different between cancer and non-cancer participants
- Examine relationships between smoke exposure and cancer risk among structural firefighters using potential chemical surrogates of cumulative property fire smoke exposure

Methods

Recruitment and Sample Collection

- Firefighters were recruited through virtual dissemination of a flyer via Facebook and through visits to fire stations
- Interested firefighters were contacted and a sample collection visit was scheduled - visit to the fire station or the Clinical Research Center at The Ohio State University
- A questionnaire was administered during the visit prior to biological sample collection to collect health status, behavioral factor, and workplace factor information
- 30-35 mL of blood was drawn from each participant using collection vacutainers and taken back to the lab for processing

Serum Sample Processing & Analysis

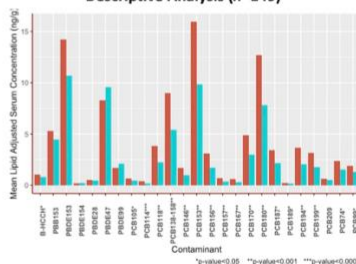
- Collection vacutainers were placed in a rack for 30 minutes at room temperature
- Samples were centrifuged for 10 minutes at 1500 G and 25°C
- Serum from each collection vacutainer was aspirated into three cryotubes using a transfer pipette and cryotubes were stored in the freezer at -80°C until analysis
- Serum samples analyzed at labs in the National Center for Environmental Health at the Centers for Disease Control and Prevention for BFRs, PCBs, and OCPs using high resolution gas chromatography isotope dilution/high resolution mass spectrometry

Statistical Analysis

- Cases: structural firefighters that have been diagnosed with cancer within the last five years at the time of participation in the study
- Controls: structural firefighters who have never been diagnosed with cancer at the time of participation in the study
- Descriptive Analysis: two-sample t-test for average lipid adjusted serum concentrations of each contaminant between cases and controls
- Cancer Risk Model: logistic regression matching cases and controls based on age (+/- 5 years), race, sex, and metro area to see if lipid adjusted serum concentrations are associated with cancer risk – 200 iterations per contaminant

Results & Discussion

Descriptive Analysis (n=149)



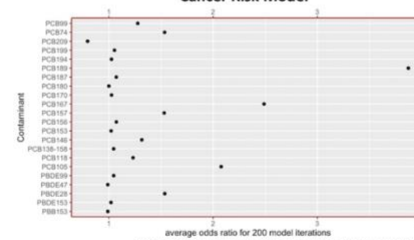
Conclusions

- On average, structural firefighters with cancer had significantly higher lipid adjusted PCB serum concentrations compared to firefighters without cancer
- Our cancer risk model provided no evidence that lipid adjusted serum concentrations of persistent organic pollutants are associated with cancer risk among structural firefighters

Strengths & Limitations

- Our results can serve as a baseline for future studies surrounding this topic
- Limited studies have attempted to quantify structural firefighter exposure to OCPs – our study adds to the current body of literature surrounding this concept
- Limitations associated with the study design – small participant pool, missing covariates in model

Cancer Risk Model



Scan this QR code to view full results

Future Directions

- By stratifying the lipid adjusted serum concentrations by percentiles, we will be able to analyze the predictor as an ordinal variable
- We plan to create a statistical model that investigates the association between workplace and behavioral factors with short lived contaminants

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Research Analyst – University of Utah

Salt Lake City, Utah

From July 2024 to present, I have been working at a Research Analyst at The University of Utah, Department of Internal Medicine, Division of Infectious Diseases. My primary objective is to coordinate research activities for R01 and R21-33 NIH-funded research grants which focus on designing and implementing a mHealth application to improve etiological prediction for pediatric diarrhea in Utah, Mali, and Bangladesh. I also assist with other projects focused on sero-surveillance methods for enteric diarrheal pathogens.

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Antibiotic Stewardship Abstract

Healthcare Providers' Perspectives on Antibiotic Stewardship: A Qualitative Study in Bangladesh

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Background: Antibiotic resistance is a significant threat to global health and is estimated to be responsible for approximately 1.27 million deaths annually. The inappropriate use of antibiotics in healthcare is a significant contributor to antibiotic resistance, especially in low resource settings. We used qualitative methods to explore Bangladesh-based clinicians' perspectives on antibiotic stewardship and the challenges that providers and healthcare facilities face in upholding stewardship principles.

Methods: We recruited 18 clinicians across 3 healthcare facilities in Bangladesh. Clinicians were eligible if they were responsible for treating emergency and outpatient pediatric diarrhea cases. In-depth interviews explored clinicians' knowledge of antibiotic stewardship, the culture of antibiotic stewardship at their clinical facility, and challenges associated with implementing antibiotic stewardship principles. Interviews were audio recorded and transcribed. Using NVivo (version 12), we used a thematic analysis approach to identify and code themes around: 1) providers' understanding of antimicrobial stewardship, 2) presence of antibiotic stewardship in clinical facilities, and 3) challenges to antibiotic stewardship.

Findings: Participants had worked in clinical practice post training for a mean of 11.3 years (range: 3 months to 23 years). When asked about familiarity with antibiotic stewardship, few had heard the specific term, but most knew the concept. Participants stated that healthcare facilities host workshops that encourage clinicians to only prescribe antibiotics when clinically necessary, limit the use of antibiotics for pediatric diarrhea, and adjust treatment based on patient history. Participants suggested a need for more educational efforts to improve providers' knowledge and practice around antibiotic stewardship. We identified four themes related to antibiotic stewardship challenges: community-level antibiotic dispensing by informal providers, staffing shortages, patient beliefs about antibiotics for symptom relief, and facility pressure to maintain patient satisfaction.

Interpretation: Healthcare providers in Bangladesh had limited knowledge of antibiotic stewardship but recognized that healthcare facilities play a role in curbing inappropriate antibiotic use. While facilities encouraged judicious antibiotic use, clinicians faced challenges in adhering to these recommendations due to dispensing practices within the informal healthcare sector and caregiver demands for antibiotics. To mitigate the growing threat of antibiotic resistance in low-resource settings like Bangladesh, healthcare facilities need to adapt a system-wide culture of antibiotic stewardship.

Antibiotic Stewardship Poster

Healthcare Providers' Perspectives on Antibiotic Stewardship: A Qualitative Study in Bangladesh



Aparna Mangadu¹, Mohammad Ashrafur Amin², Ashrafur Islam Khan², Melissa H. Watt³, Daniel T. Leung¹

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BACKGROUND

- Antibiotic resistance is a significant threat to global health, responsible for over one million deaths annually
- Inappropriate use of antibiotics in healthcare is a significant contributor to antibiotic resistance, especially in low resource settings
- We used qualitative methods to explore Bangladesh-based clinicians' perspectives on antibiotic stewardship and challenges with antibiotic stewardship practices

Participants

- Clinicians across 3 healthcare facilities in Bangladesh (n=18)
- Eligibility: Responsible for treating emergency and outpatient pediatric diarrhea cases

METHODS

Procedures

- In-depth interviews (IDIs) evaluating:
 - Knowledge** of antibiotic stewardship
 - Culture** of antibiotic stewardship at clinical facility
 - Challenges** associated with implementing antibiotic stewardship principles

Analysis

- Thematic Analysis Approach
- 1. Familiarization with raw data
- 2. Analytic memo writing
- 3. Identification of themes
- 4. Data interpretation

RESULTS

Knowledge

Familiarity with the concept of antibiotic stewardship but not the term

"Though I was not familiar with the term, what I understand is that is using antibiotics when it is required."

(Medical officer, 4 months of practice)

Culture

Informal promotion of judicious antibiotic use by facilities

"There is a lot of research on antibiotics in this hospital. We found resistance of antibiotics. That's why we are regularly informed about antibiotic resistance through seminars or meetings."

(Assistant Surgeon, 17 years in practice)

Desire for formal education on antibiotic stewardship

"You can arrange a workshop for the emergency doctors. If they become aware of antibiotic use, the load of antibiotics will be reduced."

(Assistant Professor, Pediatrics, 22 years in government job practice)

Challenges

Antibiotic dispensing by informal providers

"95% patient came here after taking one antibiotic. I don't get the opportunity to stop antibiotics. If any patient came after taking one or two doses of antibiotics, then we stop it. But if he came after taking antibiotics two or three days, then we let him taking antibiotics two days more."

(Assistant Surgeon, 17 years in practice)

Pressure to maintain patient satisfaction

"Patients expect antibiotics from the doctors. They think a doctor not being good for not prescribing any antibiotics."

(Medical officer, 4 years in practice)

Staffing shortages

"We have a lack of mid-level doctors. We have consultants who are not available all the time...The nurses working in the diarrhea ward know and understand dehydration status. They understand which patients require ORS and IV saline. However, there is confusion about antibiotic use."

(Pediatrician, 28 years in practice)

Our recent systematic review in South Asia identified similar antibiotic stewardship challenges, namely: antibiotic dispensing from the informal sector and resource constraints.

Read it here



SUMMARY

- Healthcare providers in Bangladesh had limited knowledge of antibiotic stewardship but recognized that healthcare facilities play a crucial role in curbing inappropriate antibiotic use
- While facilities encouraged judicious antibiotic use, clinicians faced challenges in adhering to these recommendations due to dispensing practices within the informal healthcare sector and caregiver demands for antibiotics
- To mitigate the growing threat of antibiotic resistance in low resource settings like Bangladesh, healthcare facilities need to adapt a system-wide culture of antibiotic stewardship

Acknowledgements

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We acknowledge and thank the study staff and the study participants who made this work possible.



Check out the other work that our lab does!

Contact: aparna.mangadu@utah.edu

Cholera Scoping Review Abstract

Longitudinal Antibody Responses to *Vibrio cholerae*: A Scoping Review

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Cholera is a critical global health threat with significant morbidity and mortality, particularly in low- and middle- income countries. Understanding long-term kinetics of antibody responses can inform interpretation of cross-sectional sero-epidemiological studies assessing disease burden. We used scoping review methodology to identify existing literature from 1980 to 2025 containing longitudinal antibody kinetics in humans following exposure to *Vibrio cholerae* and associated vaccines. 51 studies representing adults (18-65 years) and pediatric (2 months-17 years) populations from 5 high income (21 studies), 3 upper-middle income (5 studies), 5 lower-middle income (24 studies), and 1 low-income (1 study) countries were included. 16 studies followed natural cholera infection, 38 involved vaccination, and 6 were human challenge models (Controlled Human Infection Model), with some overlap. Antibody responses following natural infection were significantly higher than those induced by vaccination, particularly against the O-specific polysaccharide antigen. Younger children exhibited higher peak fold-change IgA responses than older children and adults across both infection and vaccine studies. Following vaccination, individuals from high-income countries showed higher IgA, IgG, and vibriocidal fold-change responses compared to those from lower-income settings. Limited data from challenge studies revealed slower decay of IgG compared to IgA and IgM. This review enhances our understanding of longitudinal immune responses to *V. cholerae*, highlighting variability in antibody kinetics across populations, geographic regions, and study designs, and underscores the need for tailored epidemiological approaches to address bacterial diarrheal diseases on a global scale.

Cholera Scoping Review Poster

