

Student Health Literacy & American Health Insurance

INTRODUCTION

- The landscape of American health insurance is in flux. Purchasing plans can be confusing due to the unique language and multiple levels of healthcare delivery in the United States.
- As options expand, consumers face mounting pressure to make decisions relying on accurate interpretation of complex insurance jargon and costs-benefit analyses. Lower health literacy is associated with distrust and overreliance on certain providers, as well as higher cost.
- College undergraduates represent a unique window into a population soon to enter the insurance marketplace. Many will age out of parental coverage as others obtain insurance through employment.

PURPOSE

- Assess pre-existing knowledge of health insurance
- Engage undergraduate students in a basic introduction to health insurance vernacular and systems to enhance health literacy
- Determine if an intervention focused on popular insurance models changes student confidence to make decisions about health insurance

METHODS

- Pre- and post-presentation surveys gauge student responses on a 10-point scale to measure interest and confidence managing various health insurance-related tasks.
- Questions emphasize baseline health literacy and student ability to evaluate and discuss fundamental aspects of healthcare.
- Select questions identical on both surveys follow changes in insurance knowledge as a measure of health literacy.

RESULTS

Demographic data:

- 92% of students reported receiving health insurance through parental coverage
- All students rated interest in pursuing a healthcare-related career as 9/10 or 10/10 (26% and 74%, respectively)

KEY

10-point scale: ascending (1 = lowest; 10 = highest)

Q1: Interest in understanding American health insurance

Q2: Confidence in comparing costs & evaluating health insurance plans

Q3: Comfort in purchasing an insurance plan for yourself and/or your family

Q4: Confidence in comprehending health insurance terminology when talking with a healthcare professional

Q5: Likelihood to review information or seek additional resources about insurance in the future/before selecting a health plan

Figure 1: Prior Knowledge of Health Insurance

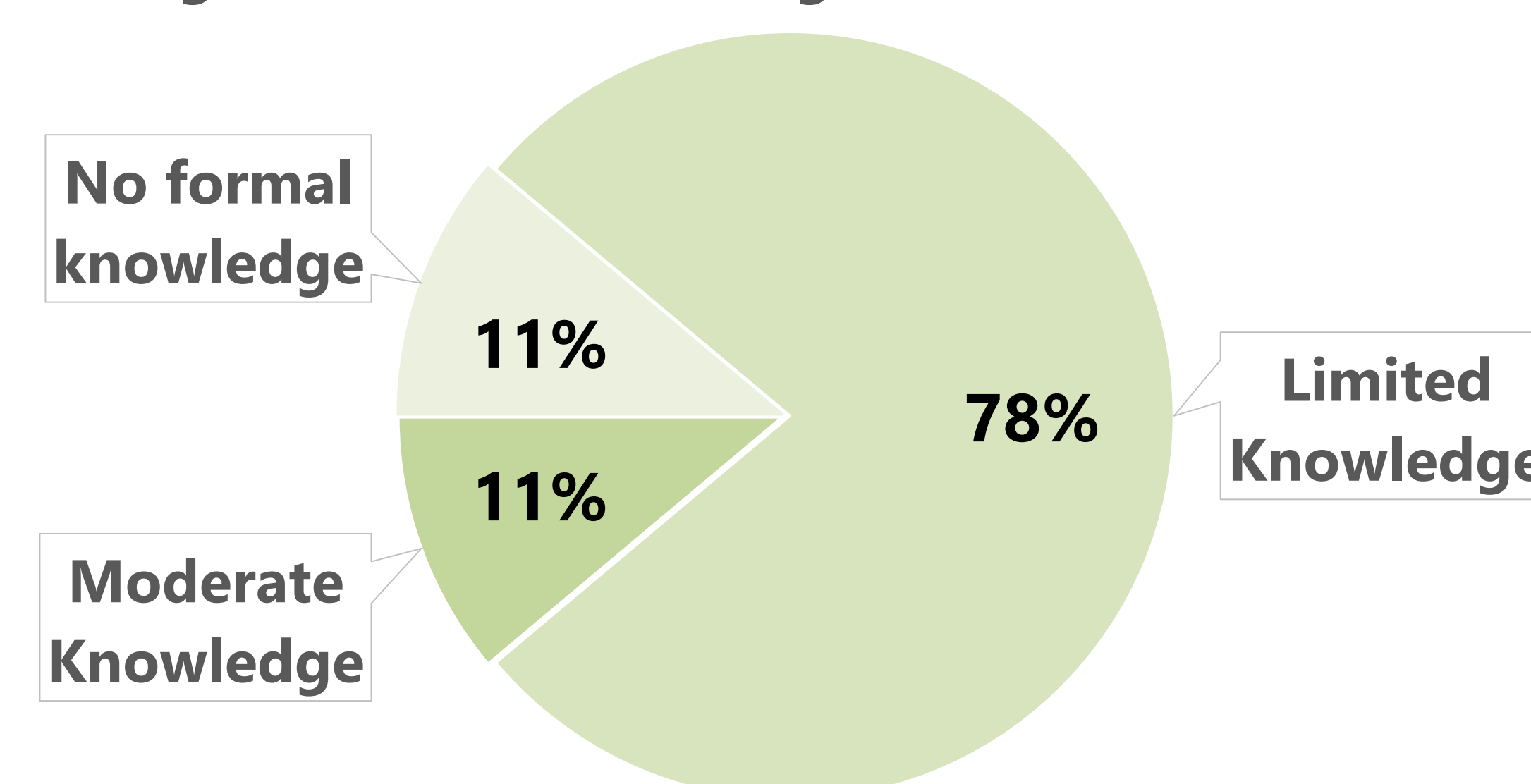


Figure 2: Average Median Score by Question

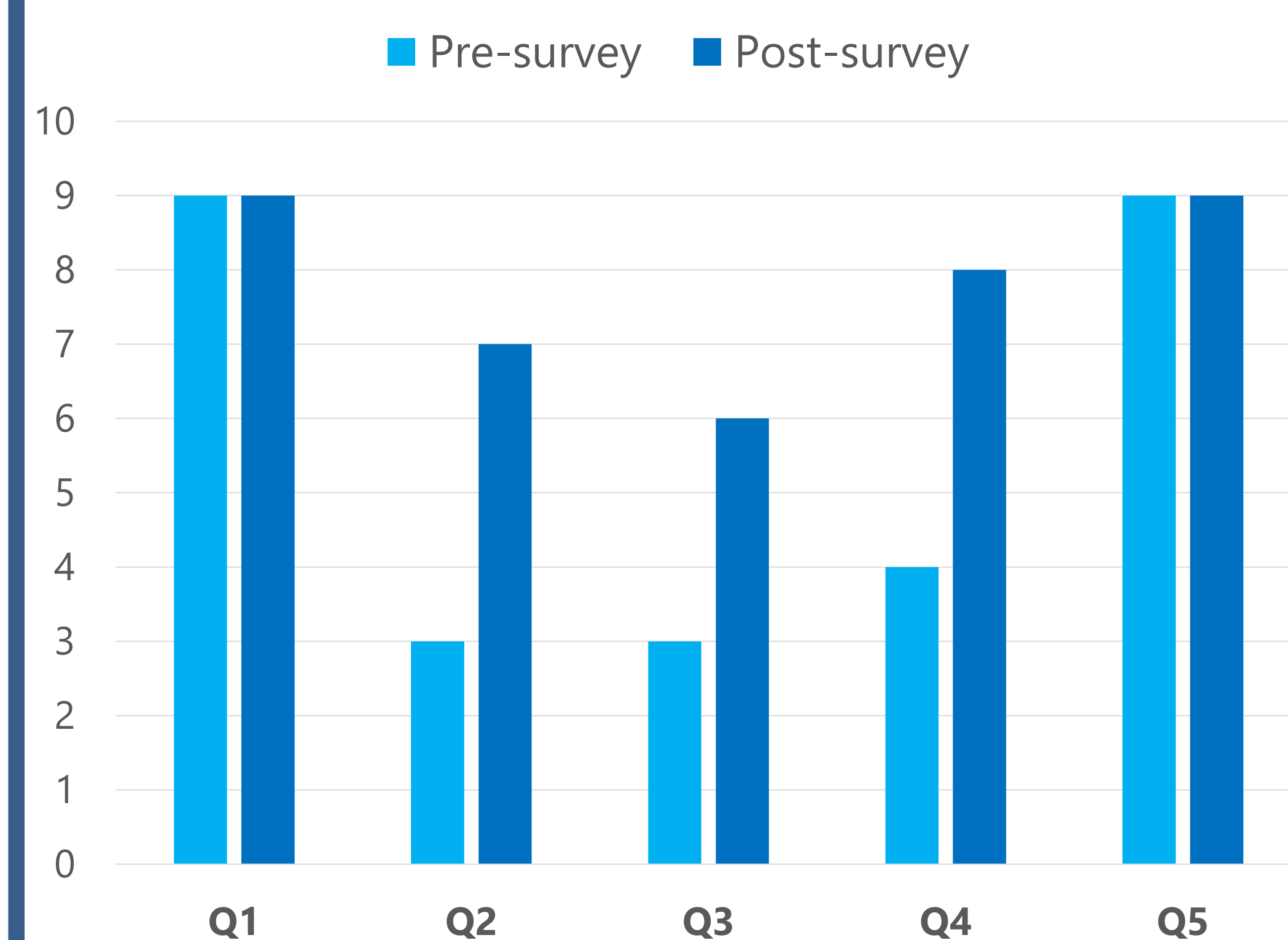


Figure 3: Average Standard Deviation Score by Question

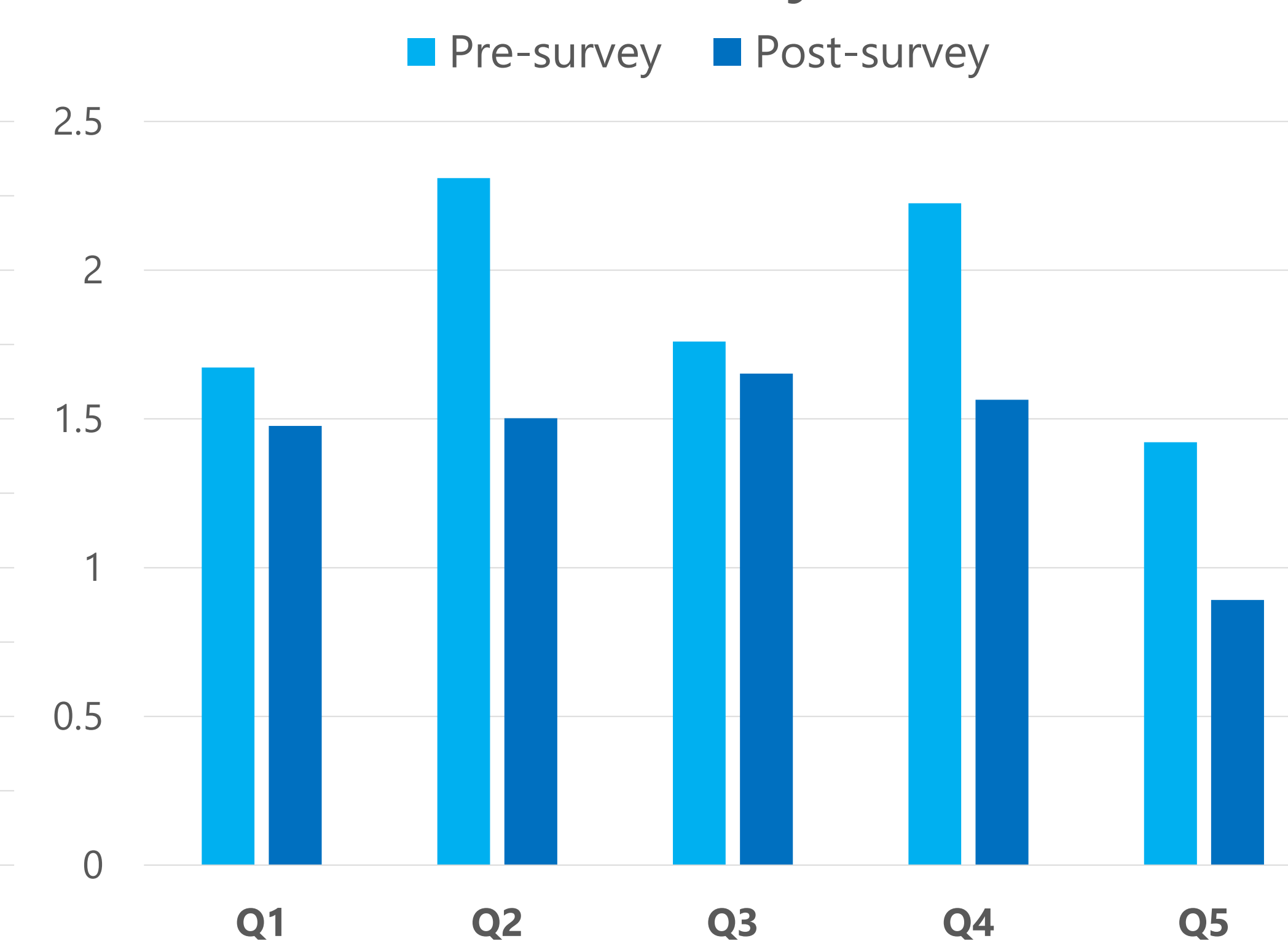


Figure 4: Q3 Matched Response Differences

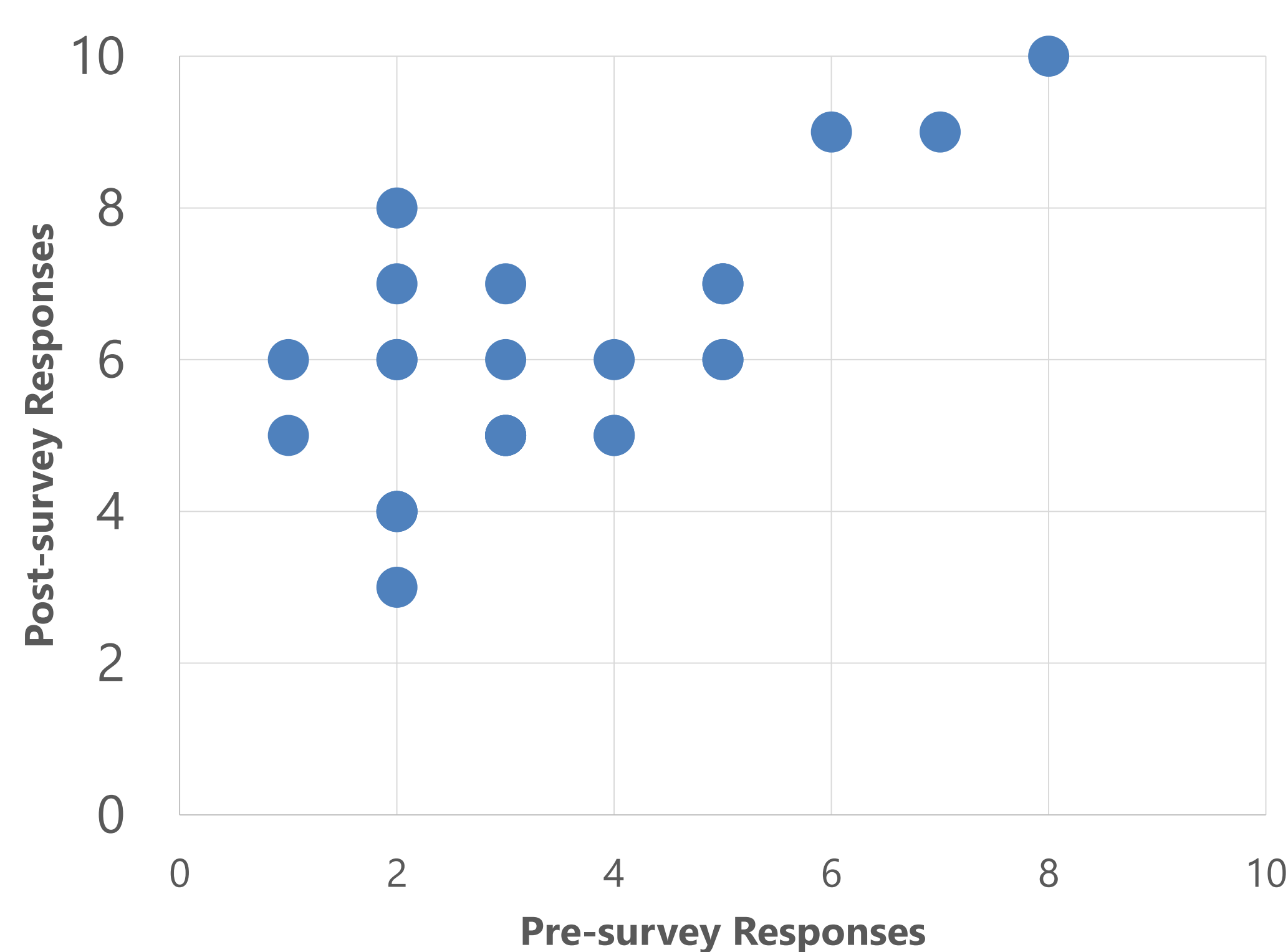
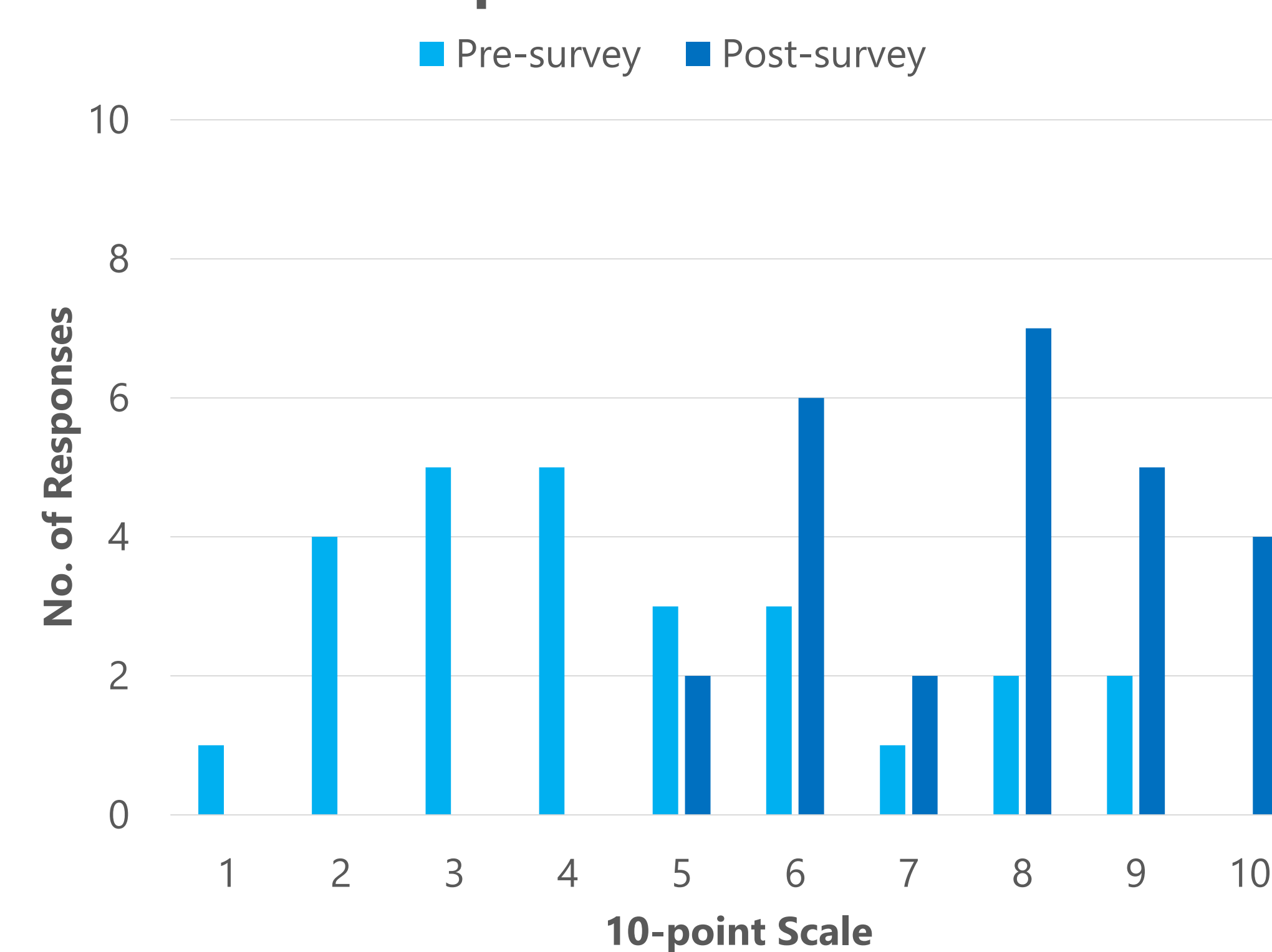


Figure 5: Q4 Responses Reported by 10-point Scale Value



CONCLUSIONS

- Although students largely reported minimal previous experience with health insurance, the majority expressed a desire to possess the ability to discuss its important facets.
- Student interest in understanding health insurance and the chance they would review additional resources before choosing an insurance plan later were high at baseline, further suggesting students already have the desire, though perhaps not the knowledge of how, to seek this information.
- The intervention produced the greatest impact on the more literal aspects of working with health insurance: students' perceived ability to make decisions when evaluating different plans and discussing them with others. Augmenting these capacities are potentially most helpful when a fundamental knowledge is most critical, such as when purchasing a plan or reviewing claims with an insurance agent.
- Students reporting lower scores on the pre-survey responses produced the largest jumps compared to post-survey data.
- Question 4 response clusters indicate many students before the presentation were not fully comfortable discussing health insurance with a healthcare provider, which may impact their input on care and its implicated costs.
- Future investigations: sample students not already highly interested in pursuing healthcare-related careers to determine to what extent it affects prior interest or desire to learn.

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Short-Term Intra-articular Hyaluronic Acid for Knee Osteoarthritis in the Primary Care Setting

Charles Gusho, MS2

INTRODUCTION

Osteoarthritis (OA) is the most common joint disorder in the United States, affecting approximately 27 million Americans (1). OA most commonly occurs in the knee, for one in two adults will develop symptoms of knee OA sometime in their lives (1). Specifically, OA of the knee is due to a decreased viscosity of synovial fluid in the joint, which normally acts as a cushion. A healthy knee joint is lubricated with 1-2 mL of synovial fluid that contains 5 to 8 mg of hyaluronic acid (HA) (2). In the arthritic knee HA is diminished, reducing the viscoelastic properties of the joint and increasing the stress on the articular surface, which causes erosion, bone spurs, and pain (2).

PURPOSE

Mild knee OA is managed with intra-articular Supartz FX despite controversial results of randomized controlled trials against placebo. US prescribing information suggests Supartz FX may provide benefit after three injections, and this study analyzes Likert-type Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores following three injections given once weekly.

METHODS

32 patients with a mean age of 66±14 years receiving intra-articular Supartz FX were reviewed in a prospective, observational study. Functional outcome data via WOMAC scores for pain, stiffness and physical function were collected at weeks 0, 1, 2 and 3 while concurrently undergoing Supartz FX therapy. Weekly percent improvements were statistically analyzed for effect size at a 95% confidence interval and compared to minimum clinically important improvement (MCII) thresholds for each WOMAC sub score and total score (3).

RESULTS

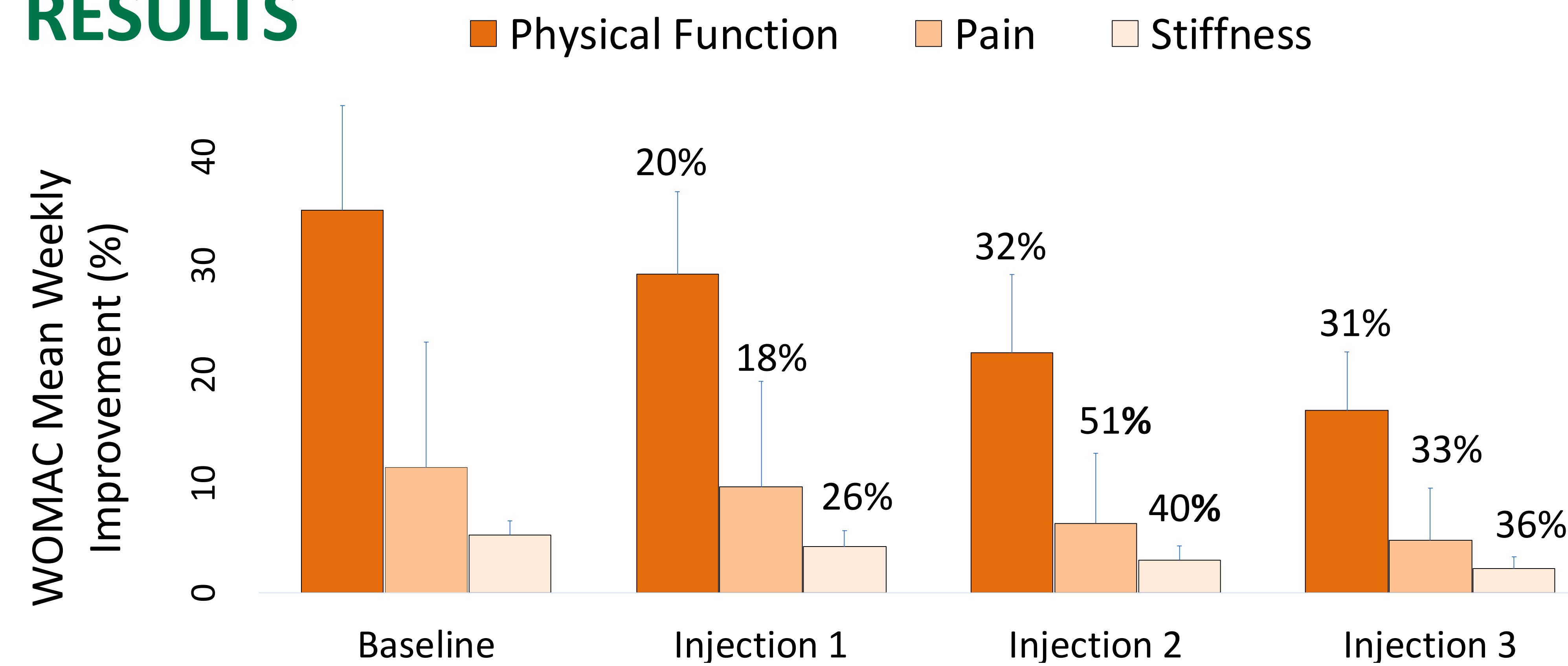


Fig 1. Effectiveness of Supartz FX injections into the knees of patients with osteoarthritis over a 3-week period. 32 patients with a mean age of 66±14 years received intra-articular injections of Supartz FX once weekly for three consecutive weeks. Mean reduction + standard error (SE) and % improvement in WOMAC scores for pain, stiffness and physical function were assessed at weekly from week 0-week 3 while concurrently undergoing Supartz FX therapy. $p < 0.05$, $n = 32$.

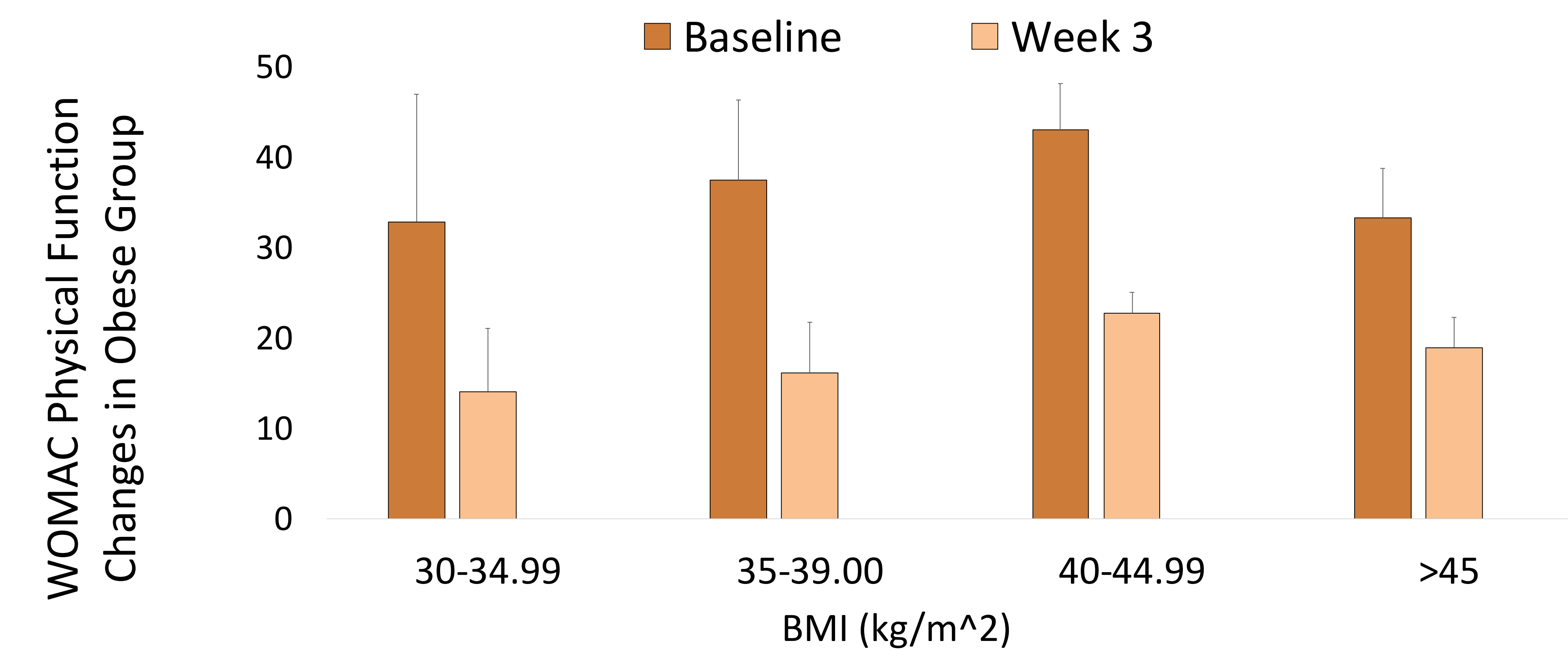


Fig 2. Mean reduction in WOMAC function scores + SE following Supartz FX injections into the knees of obese (BMI ≥ 30.00 kg/m²) patients. Physical function sub scores were compared at week 0 and at week 3 using a stratified BMI scale. Scores do not correlate completely with BMI. $n = 23$.

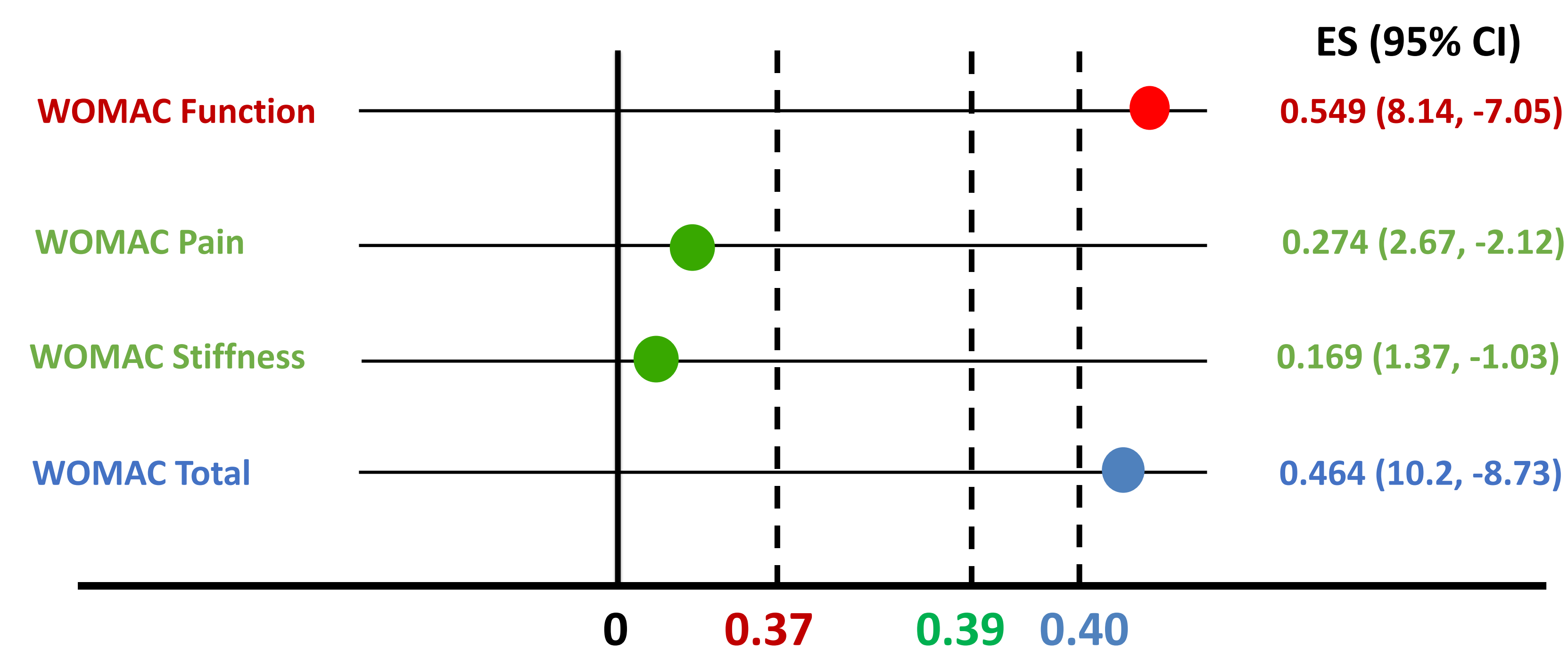


Fig 3. Confidence intervals of treatment effects for WOMAC sub scores are compared to published MCII thresholds for pain (0.39), stiffness (0.39), function (0.37) and total outcomes (0.40) (3). The MCII reflects the smallest clinical change that is considered important to patients. A “clinically significant finding” is one that is statistically significant and the lower confidence limit > MCII. The dashed lines represent the MCII for each corresponding sub score. Intervals are not drawn to scale.

CONCLUSIONS

Three repeated injections of Supartz FX at one-week intervals resulted in modest percent improvement, most significantly seen across all sub scores after the second injection (Figure 1). These data suggest two injections of Supartz FX improve pain, stiffness, and physical function when given over three weeks ($p < 0.05$). However, while mean score reductions suggest Supartz FX provides statistically significant benefit in patients when given at weekly intervals, confidence intervals of treatment effects for WOMAC sub scores fail to satisfy MCII thresholds for pain (0.39), stiffness (0.39), function (0.37) and total outcomes (0.40), meaning the changes are in fact not clinically significant (Figure 3).

The implication for use of non-surgical modalities in the treatment of osteoarthritis extends beyond symptom relief. From a community perspective, these measures can lower healthcare costs and provide patients more accessible therapeutic options. In a rural setting within which a patient may only visit his or her family physician, non-surgical options are not only more convenient, but are backed by a trusting patient-physician relationship. Therefore, while this study did not find the injections clinically significant, it contributes to a preventative-medicine database that primary care providers can employ when discussing osteoarthritis with patients. Further, it may encourage community members to become engaged in their healthcare decision-making, by knowing whether certain options are feasible standards of care.

Thank you for support from Mark Jenson and the Dousman Clinic

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An Explanation of the Methodology Used to Develop a Systematic Implementation Plan for "Stop the Bleed" in Wisconsin

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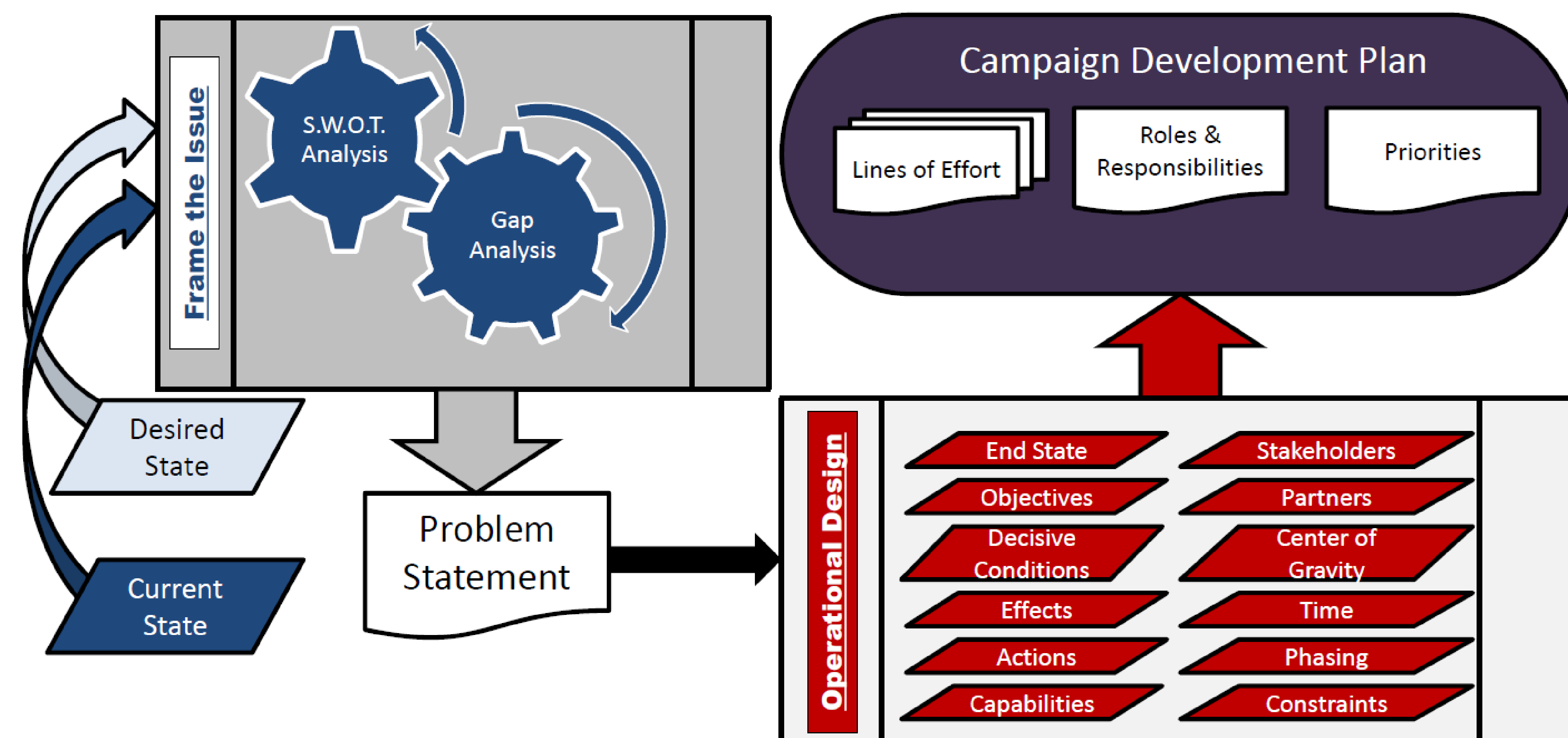
BACKGROUND:

Developed in response to the Sandy Hook Elementary shooting, "Stop the Bleed" is a national campaign teaching all citizens how to control life-threatening hemorrhage. Although various implementation plans for the "Stop the Bleed" campaign exist, none discuss the resources necessary to implement the campaign across a large population. In Wisconsin the campaign lacked the coordination necessary for it to be adopted state-wide, resulting in an inefficient effort for the limited number of its champions. The purpose of this report is to explain the methods used in determining the resource requirements and evaluation criteria for the development of a "Stop the Bleed" implementation plan in Wisconsin.

METHODS:

An Operational Design (OD) methodology was used to develop the implementation plan. This approach involved:

- Using publicly available demographic and census data to conduct a thorough gap analysis between the desired end-state of the national Stop the Bleed campaign and the current state of Stop the Bleed within Wisconsin
- Create measurable goals and objectives
- Develop a framework of multiple lines of effort which support unified actions, effects, conditions, and objectives among all stakeholders.



RESULTS & DISCUSSION:

Results:

ESTIMATED POPULATIONS	RESOURCE REQUIREMENTS					
	INSTRUCTORS	TRAINING KITS		PUBLIC ACCESS BLEEDING CONTROL KITS		
		Quantity	Quantity	Estimated Cost	Quantity	Estimated Cost
Over Age 9-years	4,959,926	12,400	1,240	\$ 1,178,000	280,865	\$ 19,379,685
Grades K-12	974,984	1,496	150	\$ 142,500	48,749	\$ 3,363,681
Law Enforcement & Support	18,519	157	10	\$ 9,500	12,586	\$ 868,434

The table above shows the resource requirements to accomplish the following clearly defined goals:

- ZERO preventable deaths from hemorrhage;
- Approximately 4.9 million Wisconsin citizens aged 9 years and older are skilled in basic hemorrhage-control techniques;
- Approximately 329,614 bleeding control kits are distributed throughout primary school classrooms, public spaces, event spaces, ambulances, and in law enforcement vehicles.

The OD methodology also produced three lines of effort:

- Equipping and Educating (Center of Gravity)
- Partnering and Policy (Supporting Effort)
- Information Operations (Supporting Effort)

Discussion: The goals above can be obtained through a unity of effort across all stakeholders and have the potential to demonstrate a real public health impact by following a few initial recommendations:

- Train Law Enforcement (TCC-LEFR is preferred over STB);
- Train 21-34 year old males (i.e., minorities, hunters, CCW);
- Track preventable deaths vs number trained and kits distributed;
- Form partnerships to reduce barriers to access.

"Stop the Bleed" training should remain a decentralized, grass roots program led by local champions.

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BACKGROUND

- Refugees have many trepidations regarding medical visits.
- We envision that medical trainees could contribute to familiarizing the refugee learners with our healthcare system and working with refugees will enhance skills of the medical trainees.
- Together, we are in the process of designing a 12-month health literacy curriculum.

OBJECTIVE

- Focus on forming a longitudinal partnership between Medical College of Wisconsin students and residents and an organization in our community, the International Learning Center Program (ILCP)
- Jointly design a health literacy curriculum tailored to the ILCP learners.

METHODS

Small focus groups

- Understand level of experience with healthcare
- Topic ideas

Simple quizzes

- Understand topics refugees wish to learn
- Knowledge retention

RESULTS

- 10 sessions complete, data collected at 8 sessions

Session name:	Notes on pre/post quiz:	Refugee learner comments, "I learned today":
Primary vs Emergency Care	All respondents reported increased understanding on post-quiz.	Learned the term facial droop and stroke. Hospital/clinic urgent care. Specialty doctor/family doctor/Walgreens/Walmart. Family doctor, EM. hospital, clinic, family doctor, primary care. When to go to hospital.
Health History and Symptoms	8/10 answered correctly on presurvey, potentially noting good understanding of topic	Kinds of symptoms. Nausea. How to go see to doctor, to say a symptoms, how to have to drink a medicines. I learned medicines. I learned shots. how to go see to doctor. Infection, sore throat, fever, back pain, chest pain, dizzy, headache, vomiting, nausea, high blood pressure. Parts of body. Symptoms of disease. Body parts.
Children's Health		No survey responses.
Dental Care	3/10 respondents reported increased knowledge of how to find dentist that takes their insurance.	Today we learned about how to find the dentist and how to floss. How to take care of teeth or mouth, how to call dentist. Healthy teeth. What a dentist is, flossing. Brush my teeth twice a day.
Mental Health		I understand more about mental health and [what] to do if I have a concern. My doctor check[s] mental health. About suicide and mental health – if you have depression, talk to your doctor. I can talk to my doctor
Routine Health Maintenance		I learned that cigarettes are bad. I want to know more about eating healthy. I learned no smoking. I learned blood draws, kidney, and stethoscope.
Sexual Health		No survey responses.
Diabetes	3/4 reported increase in understanding	No survey written responses.
Cold vs Flu	5/7 learners reported improved knowledge on post-quiz	No survey written responses.
Healthy Living	8/8 learners responded correctly to pre and post knowledge questions, possibly demonstrating good knowledge of topic.	I have learned soda and juice are not healthy for our body. Exercise. I understand how to prepare myself to be healthy. Healthy foods. Eat vegetable. Dairy.

DISCUSSION

- Learners reported increased knowledge on post-quiz in 4 sessions
- 2 sessions showed good baseline understanding
- Comments help clarify lessons learned in sessions
- Through post-quiz questions, we identified topics refugee learners want to know more about

Refugee learners want to know more about:

Backache (8). More language. I like to learn more about [treating] disease. Heart disease. Heart attack. I want to learn blood pressure (low). How to make children healthy. Insurance and medication costs. Why mental health [problems] are caused. **Stomachache (4).** See more videos. **Headache (3).** **Sleep (2).** TB. Cancer. Vision.

CONCLUSION

- Our partnership can be a model for tailoring health literacy experience to a community's requests and interests
- Medical trainees can be effective educators in the community
- Goal to further refine, simplify quizzes and adapt to English literacy
- Plan to continually adapt to refugee learner requests and introduce new topics accordingly
- Materials can be used for similar endeavors in other communities

Efficacy of the GRIT Rubric for Educators

Erin Duffy, MS2

INTRODUCTION

- Lifetime prevalence of mental illness for 13-18 year olds is 49.5% (22.2% being severe)
- Trauma Sensitive School Requirements have recently been established to provide Grief Training, which has been associated with increased resilience in bereaved participants
- Duckworth defines grit as “perseverance and passion for long-term goals”
- Grit is a better predictor of success than IQ or GPA alone
- Students who have more grit have demonstrated better coping strategies

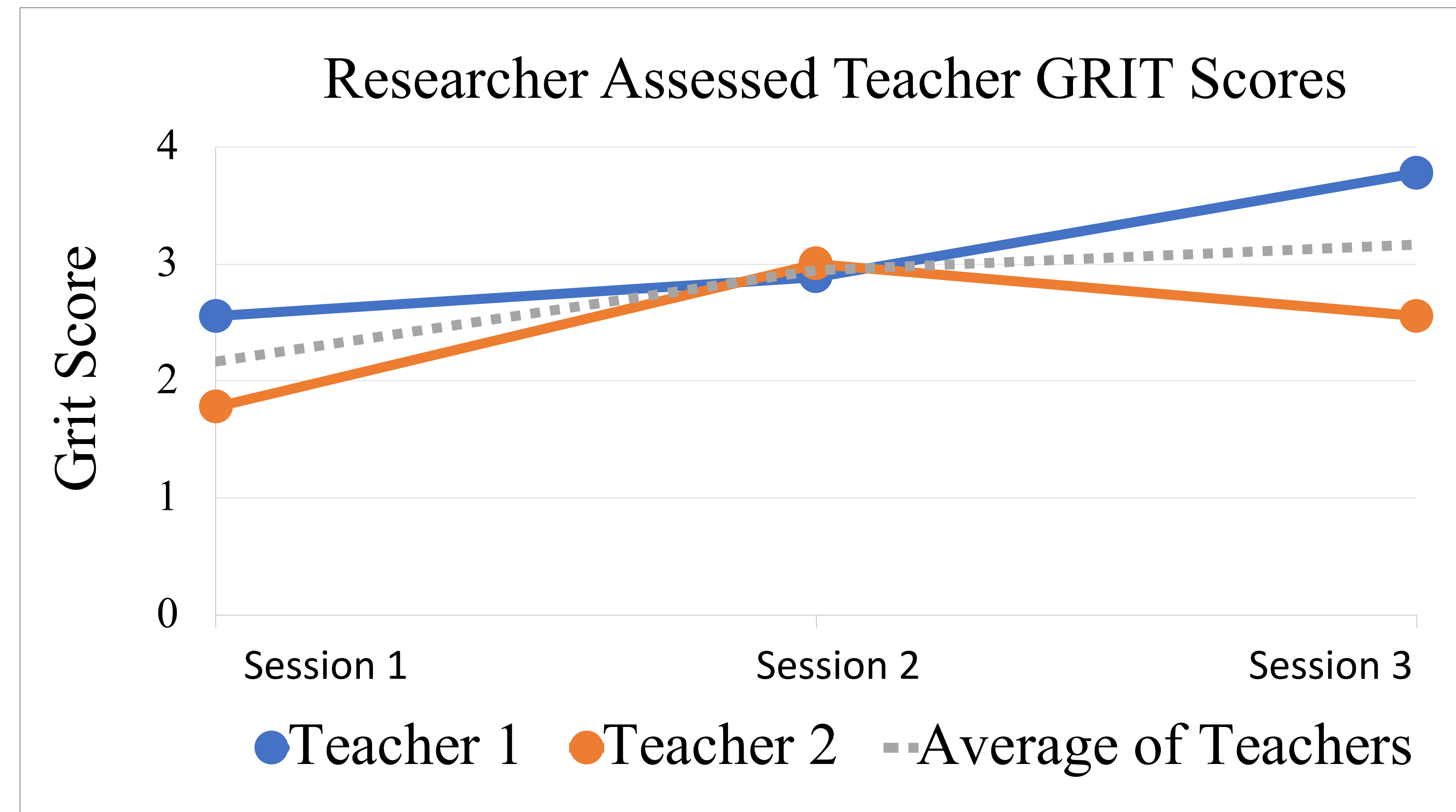
PURPOSE

- Provide a learning opportunity for educators to foster grit in the classroom and improve the chances for long-term success of students
- Have students self-assess grit levels before and after grit training for teachers

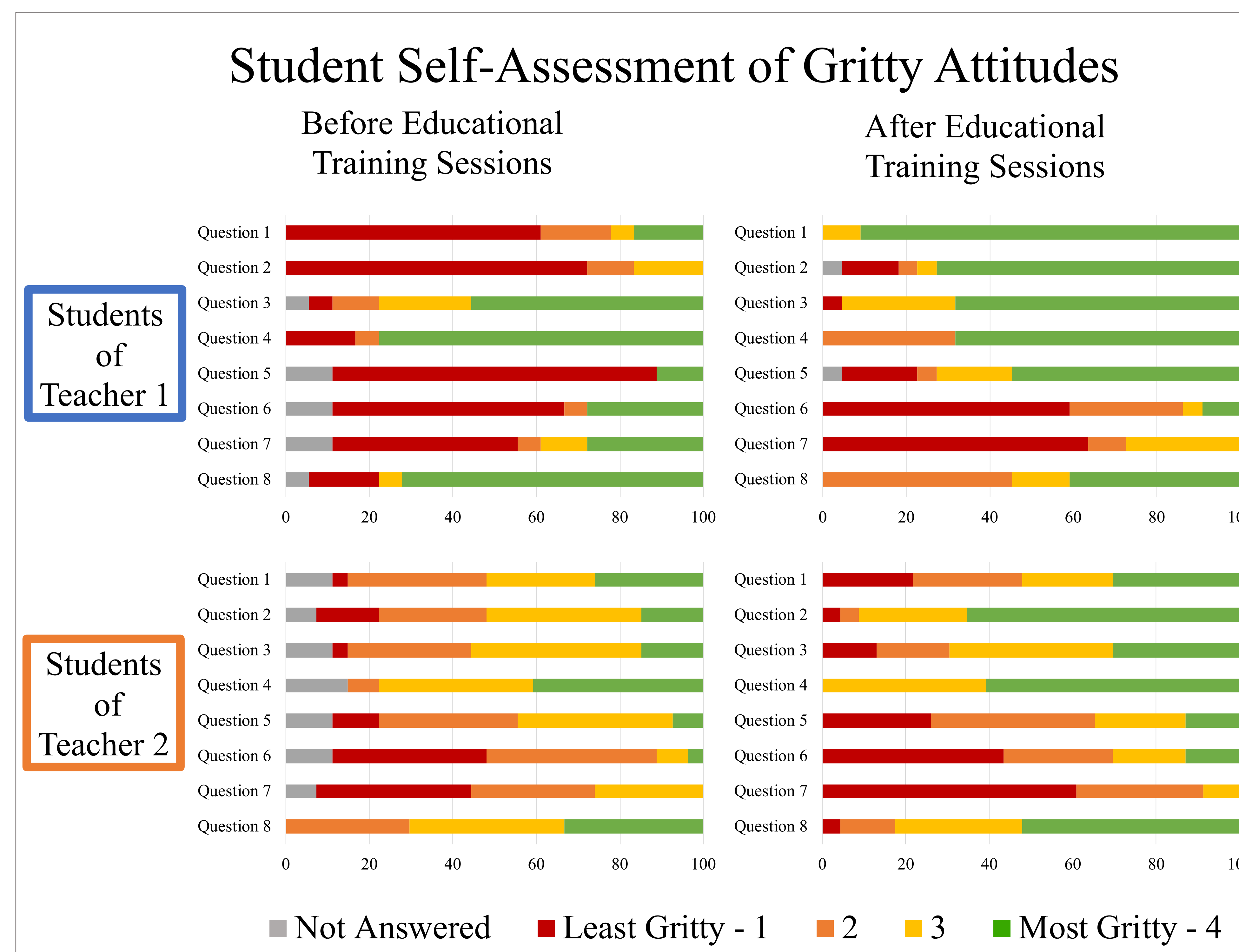
METHODS

- Updated the previously used GRIT (Generating Resilience through Integrative Teaching) rubric to allow for more objective grading of teachers
- Observed, interviewed and scored two Northeast WI Teachers using the GRIT rubric
- Provided constructive feedback to teachers after each training session
- Collected student self-assessment surveys of their level of “grittiness”

RESULTS



- Improvements seen in researcher assessed GRIT level of teacher – indicating the teacher has created a classroom environment more likely to instill grit in students



- Improvements seen in student self-reported grit levels – as demonstrated by increase in size of green bars

CONCLUSIONS

- Educators felt that the GRIT Rubric feedback was valuable in giving them ideas for promoting success in the classroom
- Educators encountered some difficulties when trying to appropriate time not only for lesson planning according to curriculum requirements, but also for incorporating newly learned grit concepts within those plans
- Student’s self-assessment survey grittiness levels correlated with improvement in their teacher’s GRIT rubric scores
- This study could be improved by including more teachers and students of more similar grade levels
- Further research may include instructional presentations for teachers on methods to instill grit within their students through their words, lesson plans, and classroom environment

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Assessing Parental Engagement in a School Nutrition Education Program

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Abstract

“Doctors as Teachers” developed the program Food Doctors in which medical students provide nutritional education to socioeconomically underserved elementary students in Milwaukee. Food Doctors has partnered with two local elementary schools to deliver an established evidence-based nutrition education curriculum to their 3rd grade students. This program successfully teaches students about nutrition, but the practical impact on nutrition behaviors at home has not been studied. Research shows strong parental impact on their child’s nutritional habits and the importance of parental involvement in nutrition education programs. Therefore, the objective of this project was to assess parental awareness of Food Doctors, views on nutrition education, and nutritional behaviors as reported by parents and students who participated in Food Doctors. This aim was accomplished by surveying parents and student participants after completion of the Food Doctors program. Students completed a short survey asking if they told their parents about the program and their nutrition related behaviors at home. Parents were also asked to complete a survey assessing their awareness of the program, views of nutrition education, interest in receiving Food Doctors materials, and nutrition related behaviors at home. Additionally, parents received a lesson summary for reference. About half of parents reported awareness of Food Doctors, while 73% of students reported telling their parents about the program. Moreover, results showed discrepancies between the parents and student self-reported health behaviors. In conclusion, we will devise and discuss methods to best engage parents in health education programs based on their communication preferences and analysis of survey results.

Methods

After the final lesson, students were asked to complete a short survey that includes one question regarding parent communication about the program and a 3 question Likert scale to assess the student perspective on nutrition related behaviors at home [Figure 1]. At home, parents were asked to fill out a survey consisting of 3 questions assessing parent awareness of our program, views of nutrition education, interest in receiving Food Doctors materials, plus a 6 question Likert scale to assess nutrition behaviors at home [Figure 1]. We also provided the Food Doctors lesson summary for the families to keep as a reference [Figure 2]. All surveys were anonymous.

Student Survey – Likert Questions

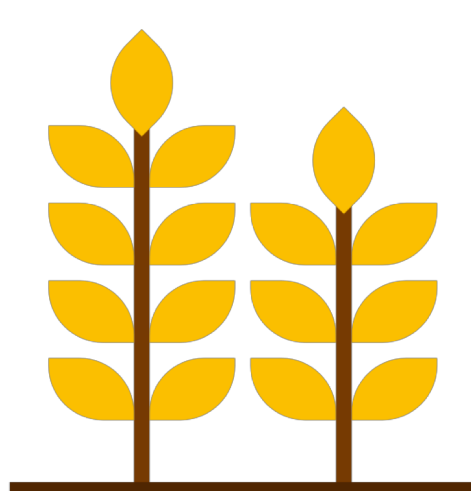
- 1) We eat fresh fruits and/or vegetables almost every day.
- 2) We eat out almost every day.
- 3) We drink soda/pop almost every day.

Parent Survey – Likert Questions

- 1) We eat fresh fruits and/or vegetables almost every day.
- 2) I do not buy healthy food because it is too expensive.
- 3) We eat out almost every day.
- 4) We drink soda/pop almost every day.
- 5) I know the difference between healthy and unhealthy foods and drinks.
- 6) Learning about nutrition is important.

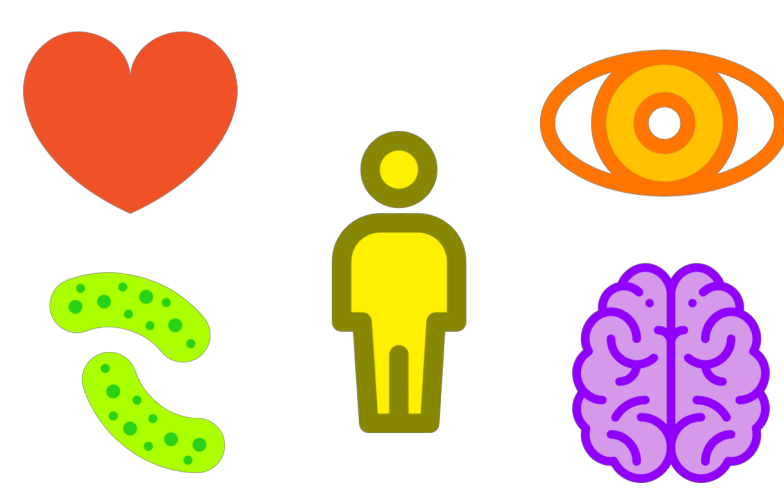
FIGURE 1

Lesson 1: Help Your Heart



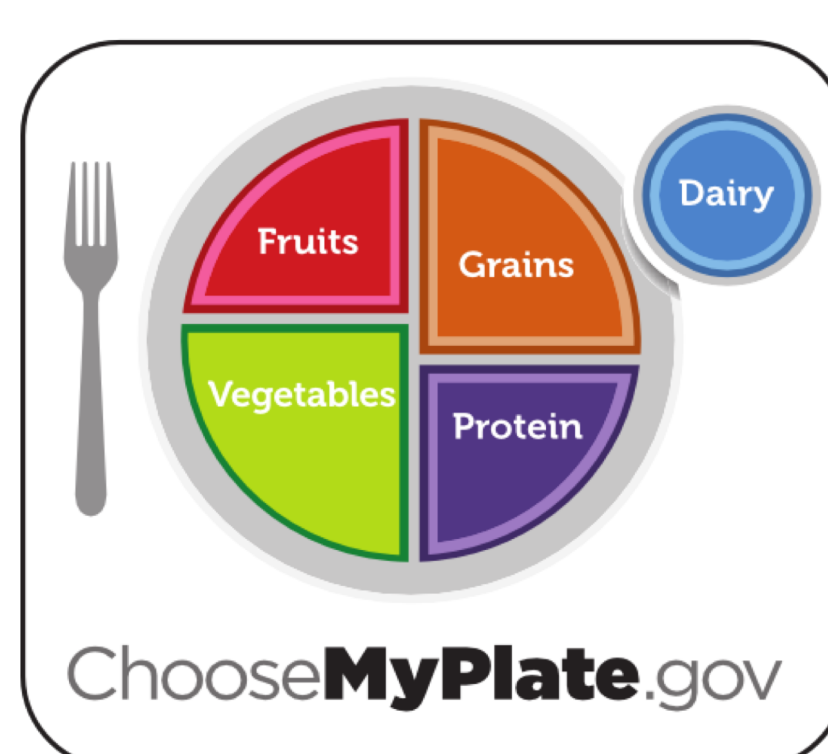
Enriched grains vs Whole grains
Whole grains contain fiber, which helps protect your heart and support overall health.

Lesson 2: Eat the Rainbow



Did you know that each color of fruit or vegetable helps support a specific part of your body?

Lesson 3: MyPlate & Drinks



Drink 8 cups of water every day.

FIGURE 2

Background

Providing parents with nutrition information has been shown to have multiple benefits including healthier meals being prepared at home, children eating healthier foods, and parents requesting healthy recipes [1]. Food Doctors teaches children how to make healthy eating choices, but parental support is needed in order for these decisions to be implemented [2]. Changing eating habits for the better is more effective when education is aimed at a family behavior versus individuals. This education is also helpful for improving parent eating patterns plus diet and disease prevention knowledge [3]. Due to this strong parental impact on children eating patterns, it is important to effectively engage parents and assess their interest in nutrition education, while taking into consideration socioemotional factors that impact eating patterns [4]. These studies indicate the strong parental impact on children eating habits and the importance of parental involvement in nutrition education for their children.

Results

Survey results showed that parental awareness of Food Doctors differed by school. St. Marcus reported 60% of parents were told about the program compared to 33% at the Milwaukee Academy of Science (MAS) [Figure 3]. Importantly, the survey response rate from parents at St. Marcus was 80% (40/50), while the response rate from parents at MAS was 24% (18/74).

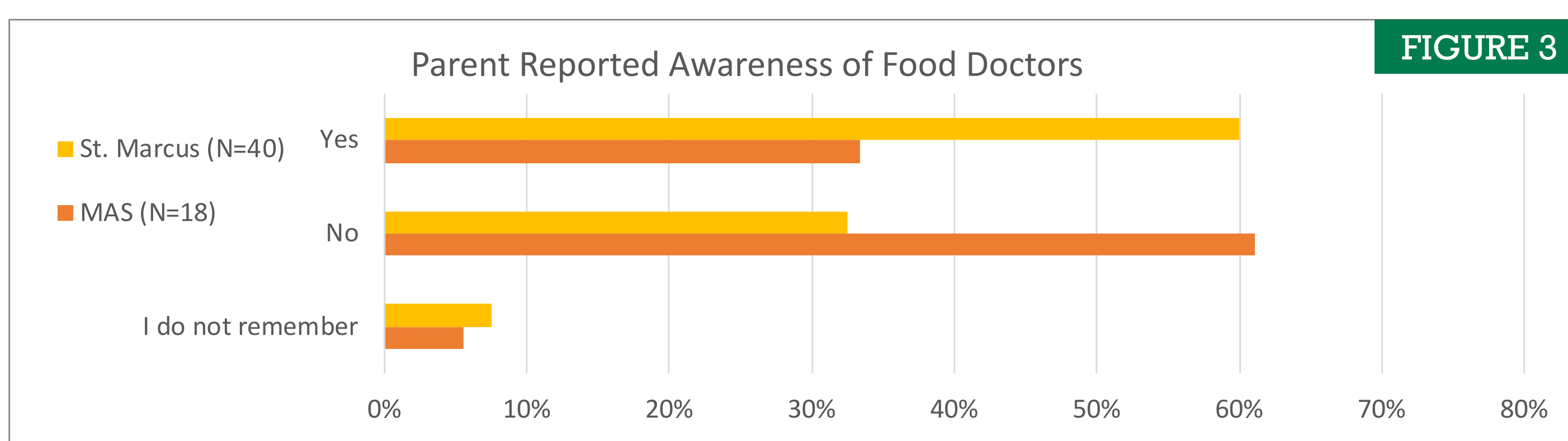


FIGURE 3

Awareness of Food Doctors in parents was also assessed by surveying students on whether they had told their parents about the program. Results show that the majority of students, at both St. Marcus and MAS, report telling their parents about the program. Both schools showed very similar percentages in ‘Yes’- around 70%, ‘No’- around 18%, and ‘I don’t remember’- around 9% [Figure 4].

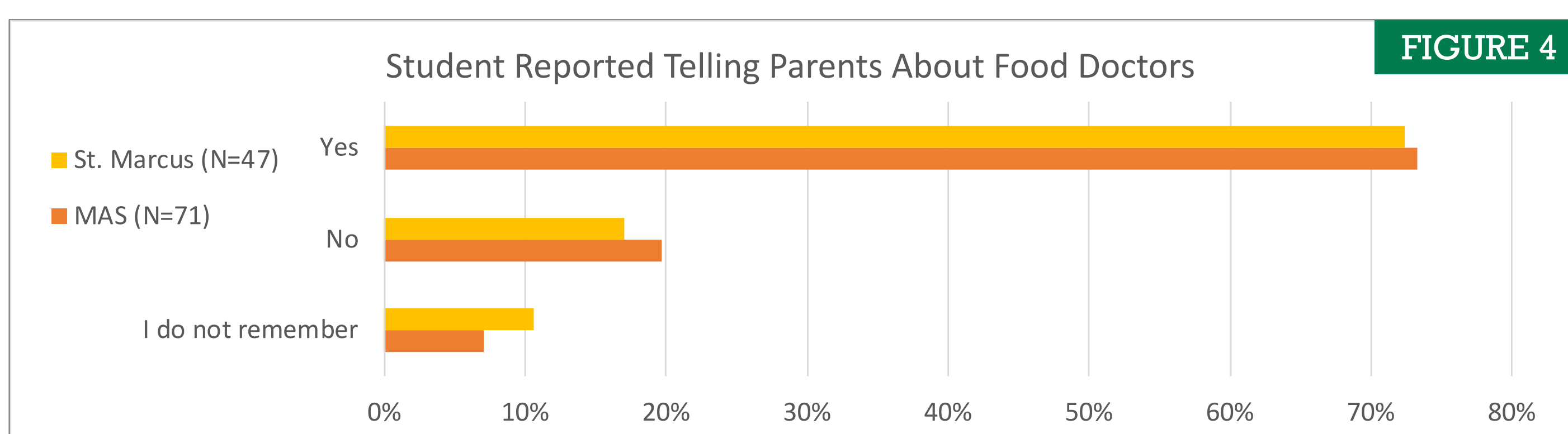


FIGURE 4

Figure 5 shows that parents in both schools preferred handouts as their primary means of receiving nutrition education. Importantly, most parents chose some form of communication to receive nutrition information, leaving a small percentage of parents from MAS who indicated they are not interested in receiving Food Doctors materials.

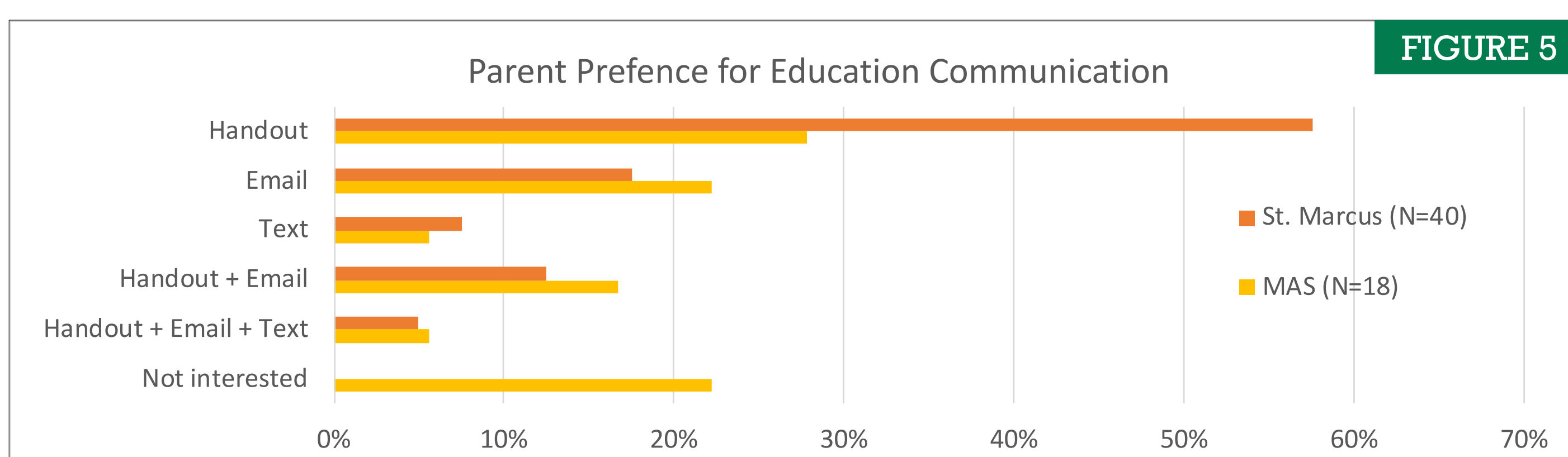


FIGURE 5

Conclusions & Future Directions

There may be discrepancies in parental awareness of Food Doctors depending on if we ask students or parents. It is also dependent on the established means of communication that our partner schools have already set up with their parents. Developing a reliable model for bidirectional communication with parents seems to be the first step in effective parental engagement. Most parents interested in receiving nutrition education materials prefer a handout or email. Unfortunately, our survey results were skewed by a low survey response rate from parents at MAS, likely due to bad weather during the time of administration.

Moving forward, our plan is to rewrite survey questions to better compare student and parent reported nutritional behaviors. We also want to have discussions with parents and school administrators to learn how we can establish a bidirectional communication model that will motivate active engagement and inspire impactful collaboration.

Results from the Likert questions regarding nutrition behaviors indicated that for each statement, parents from either school answered very similarly, with not much variability. Overall, parents agreed with statements 1, 5, 6 and disagreed with 2, 3, 4 [Figure 6].

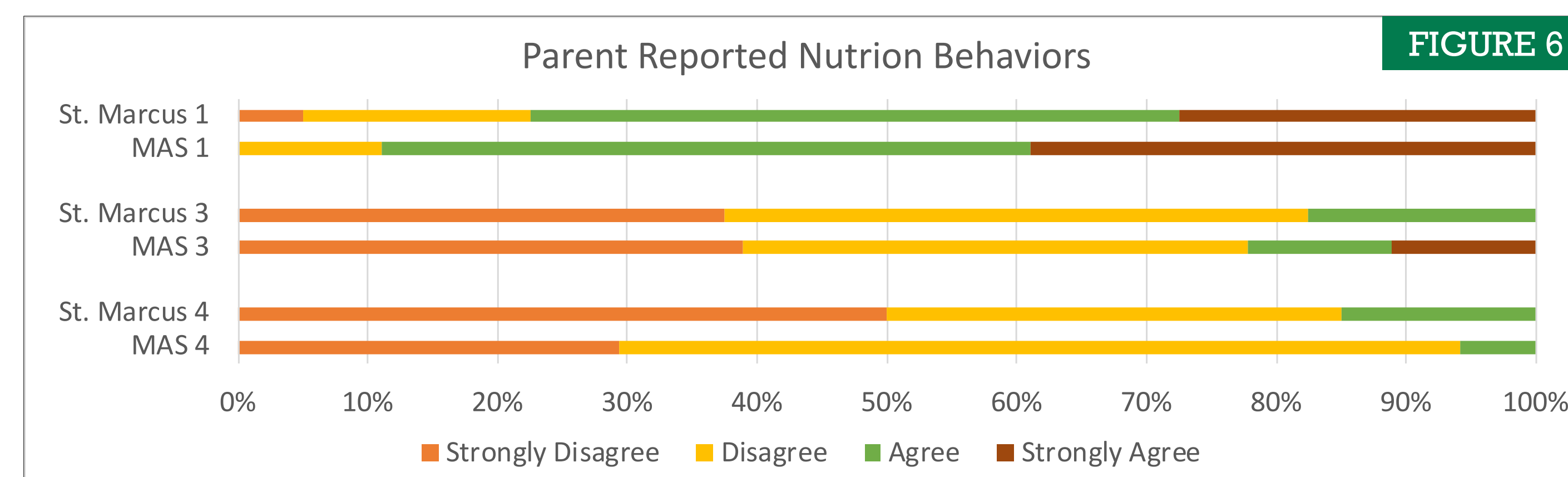


FIGURE 6

Students in both schools, both reported a majority response of ‘Most of the time’ or ‘Sometimes’ regarding statement 1. In regards to statement 2, St. Marcus students had a majority of 60% report ‘Sometimes’ compared to MAS. For statement 3, both schools students had a majority of responses tending toward ‘Sometimes’ and ‘Never’ [Figure 7].

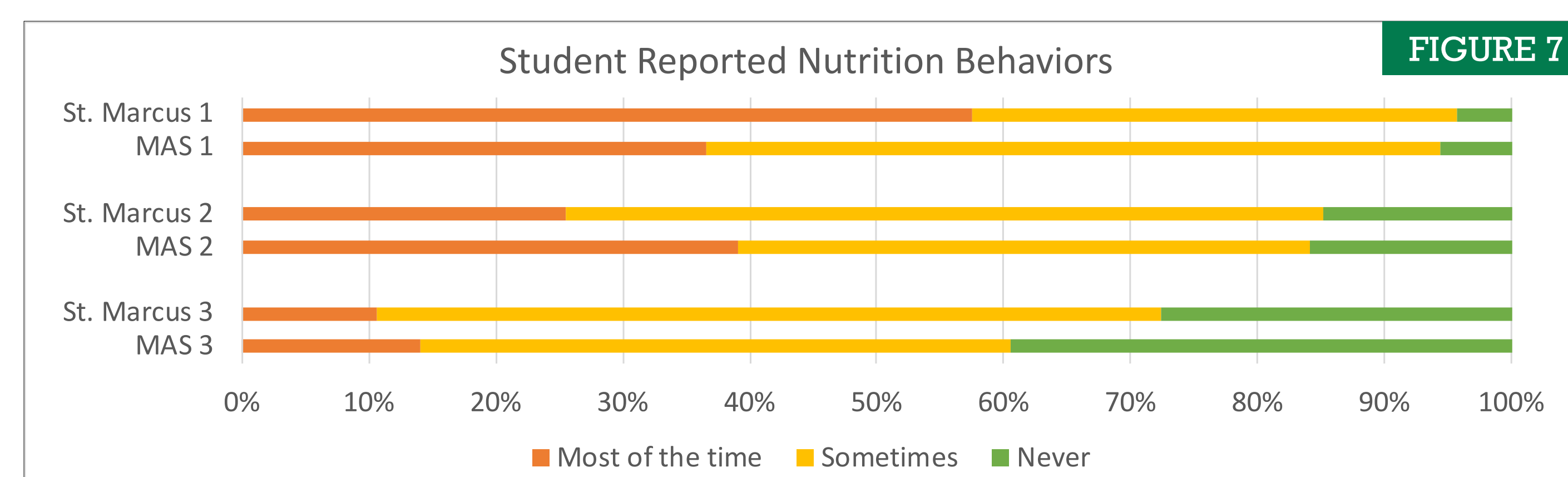


FIGURE 7

References & Acknowledgements

Special thanks to Wasif Osmani and Kevin Cory for their help and support. The Food Doctors Team: Jacob Schreiner, Eric Bobel, Paul Otto, and Kelsey Lamb. Many thanks to our community partners: Milwaukee Academy of Science and St. Marcus Lutheran School.

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BACKGROUND

- ACGME states that "residents are expected to demonstrate sensitivity and responsiveness to a diverse patient population."
- Between 2001-2015, 12,000 refugees from 50 different countries arrived in Wisconsin; 65% in Milwaukee County.
- There is a demonstrated community need for physicians to provide culturally sensitive, effective care to refugees in Milwaukee.

OBJECTIVE

- To understand trainees' confidence in caring for refugees and address a gap in medical education

METHODS

- Curriculum Night Design:**
 - Power point presentation about the refugee resettlement process and medical aspects pertinent to refugee health
 - Physician guest lecturer
 - Panel discussion
- Survey Design:**
 - Questions adapted from the Cross Cultural Care Survey (Weissman, et al.)
 - Four repeated questions pre and post survey in addition to background questions
 - Paired data with self-generated identifier

RESULTS

- <5% of trainees report receiving adequate class time on refugee and immigrant specific medical issues
- 19% report they are usually confident in providing culturally sensitive care to refugees

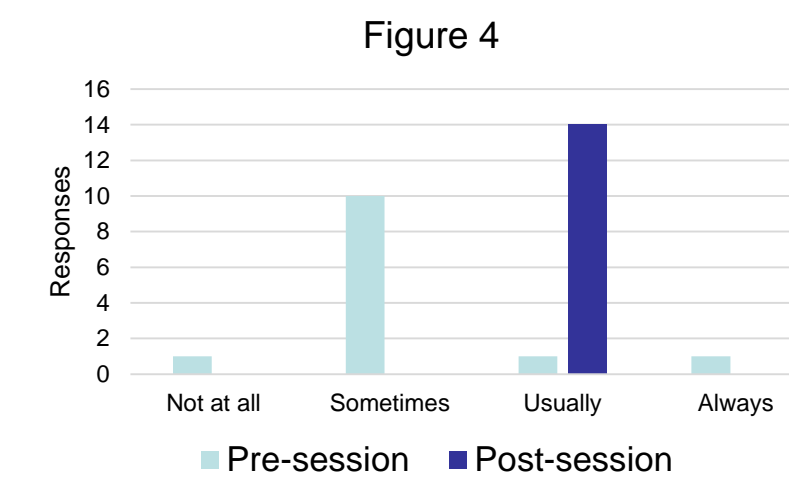
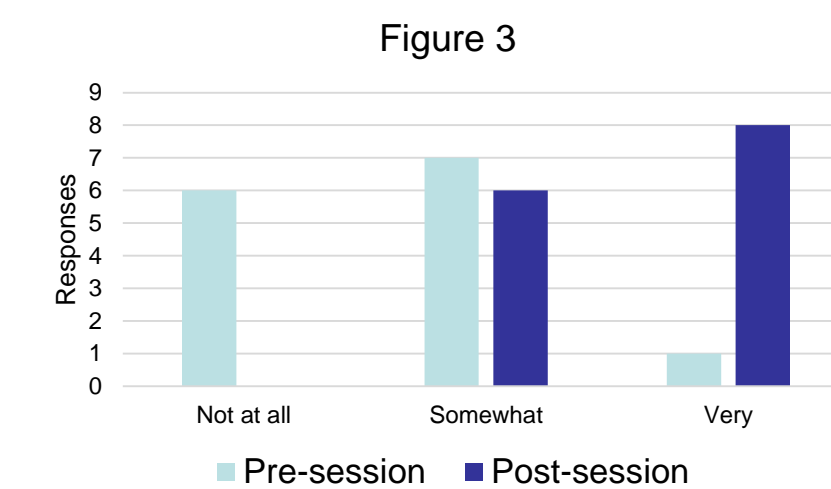
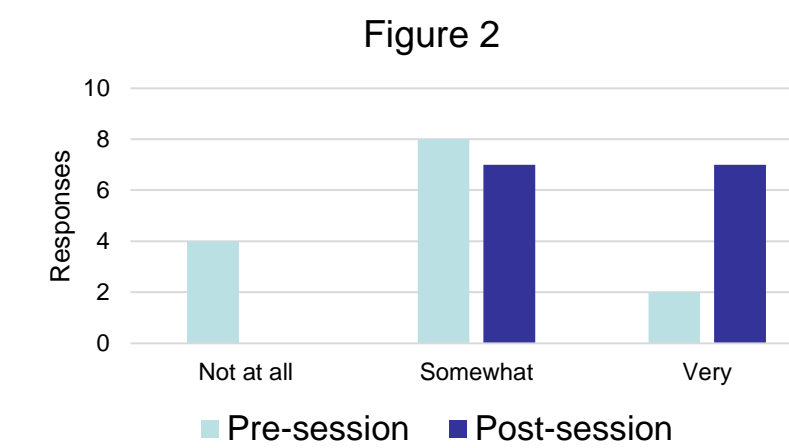
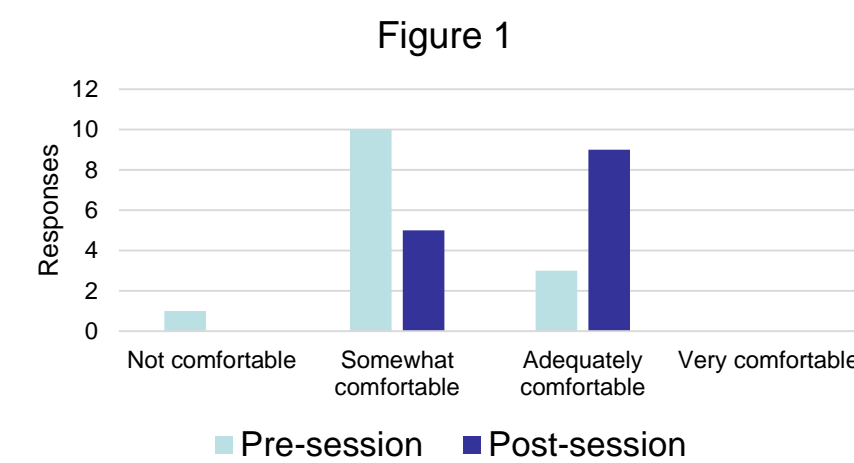


Figure 1: "I feel comfortable providing medical care to patients who speak a language other than English"

Figure 2: "I am aware of the process of refugee resettlement in the United States"

Figure 3: "I am aware of the medical intake procedure refugees must undergo upon resettling in the United States"

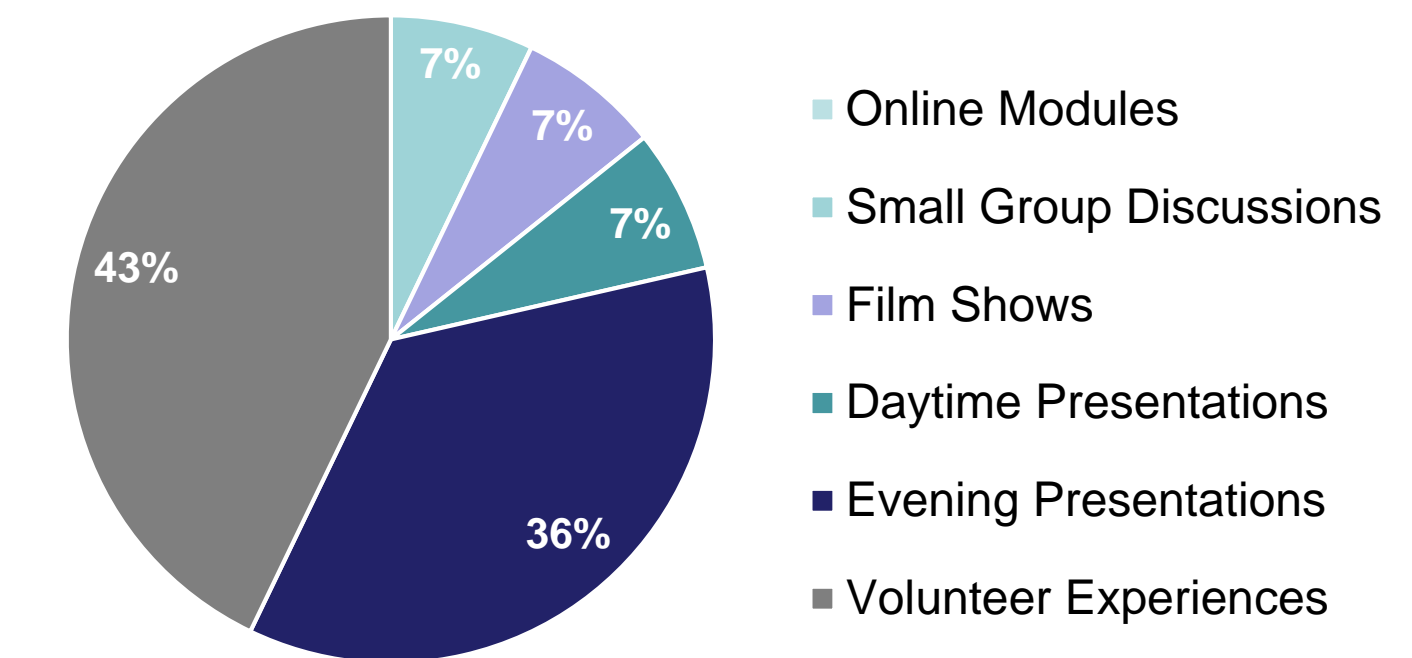
Figure 4: "I feel confident in my ability of provide culturally sensitive care to refugees"

Wilcoxon signed-rank test showed increases in trainees':

- Comfort providing medical care to non-English speaking patients (p=.023)
- Awareness of the process of refugee resettlement in the US (p=.025)
- Awareness of the medical intake procedure refugees undergo upon resettling in the US (p<.01)
- Confidence in providing culturally sensitive care to refugees (p<.01)

- Modalities often employed in medical education, such as online modules and small group discussions, received the smallest number of votes

First Choice Preferences for Extra-Curricular Activities Designed to Deepen the Individual's Understanding of Refugee Health Concerns



CONCLUSION

- Conventional medical education does not provide refugee focused health information
- Population specific curriculums like the one presented improve understanding and comfort
- Seminars can help to address barriers providers face in serving specific populations

DISCUSSION

- Small sample size with selection bias risk
- Adapted survey with limited validity
- Further research needed to evaluate scope of content

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Navigating Complexity in University-Community Partnerships

Eleanor Barr, Laura Hermanns, Dulmini Jayawardana
Master of Sustainable Peacebuilding, UW-Milwaukee

Introduction

This project examines the role of urban-serving university-community partnerships in addressing complex social problems. The findings are rooted in the experiences and research of the three authors, who use Milwaukee, Wisconsin, USA as a case-study.

The landscape is complex for this type of work, with partners navigating the challenges of an institutional colonial legacy of white supremacy and exclusion, uneven power dynamics, organizational tensions, value clashes, competition for funding, mistrust among partners, and the pressured expectations of stakeholders. Many university-community partnerships are successful, creating tangible benefits for involved parties. Some are less successful and fall into vicious cycles which may perpetuate the exact social problems they seek to remedy. Most struggle to address the underlying root causes of social conditions due to inadequacies in complexity-aware program interventions and minimal attention to structural factors that can enhance overall system health.

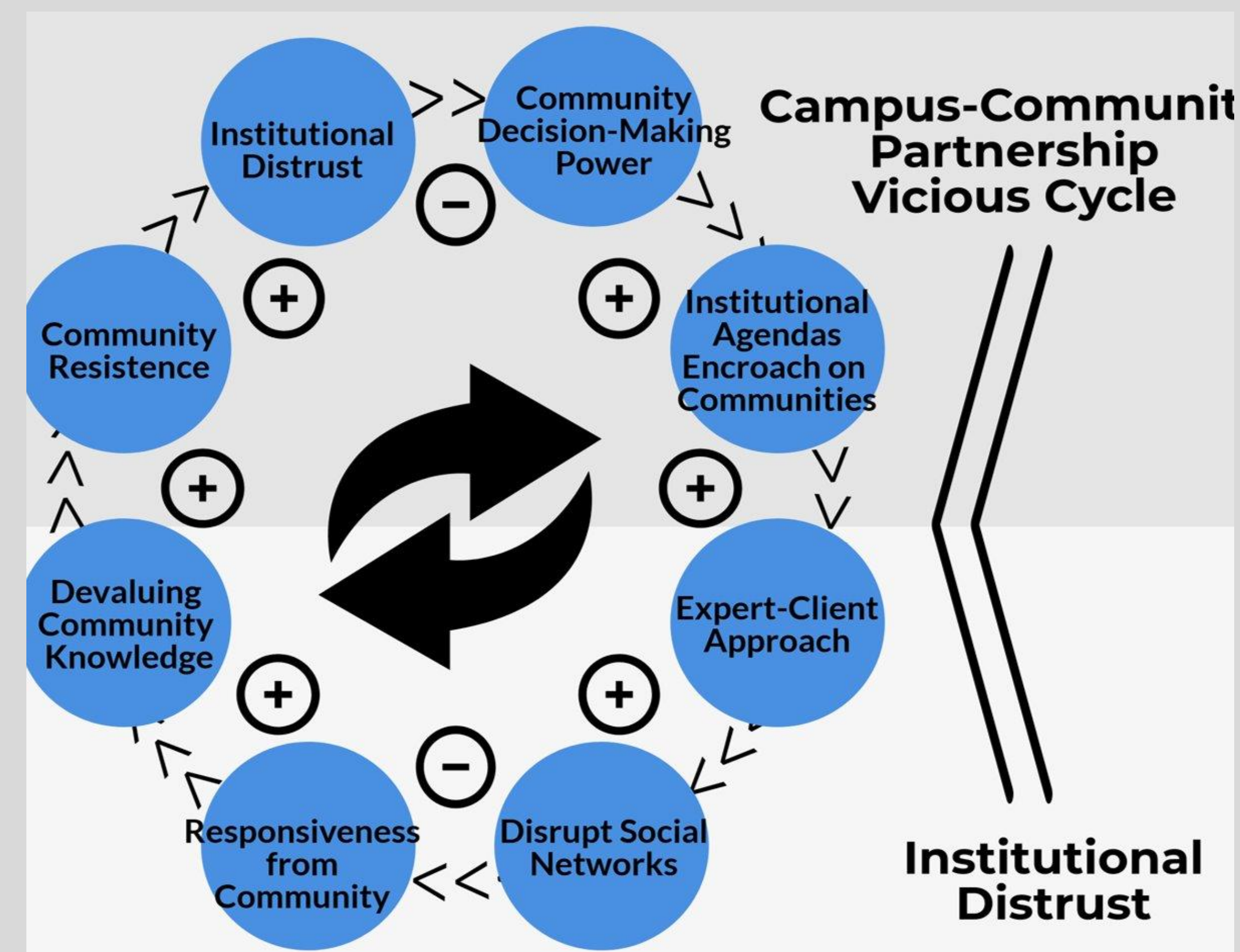
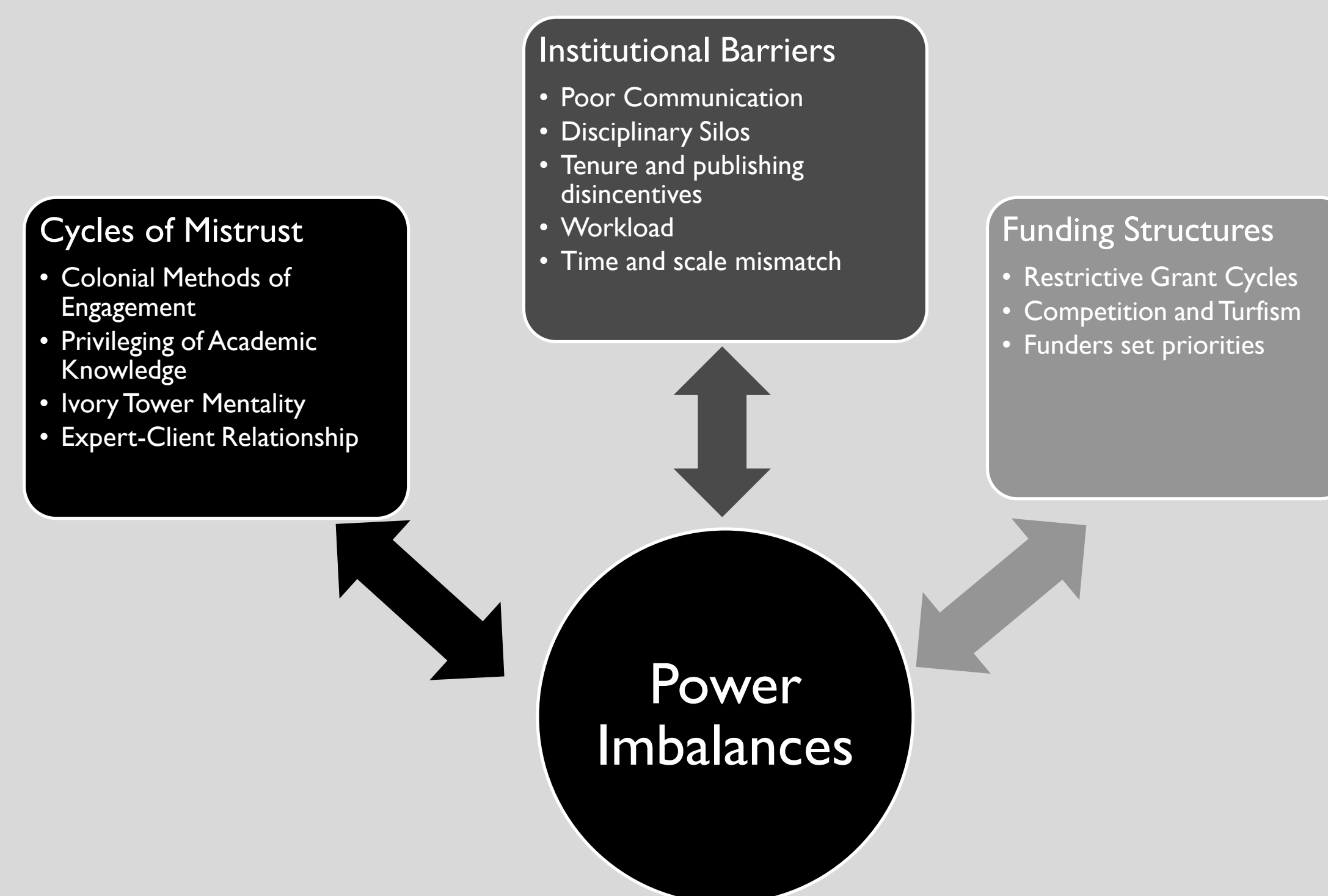
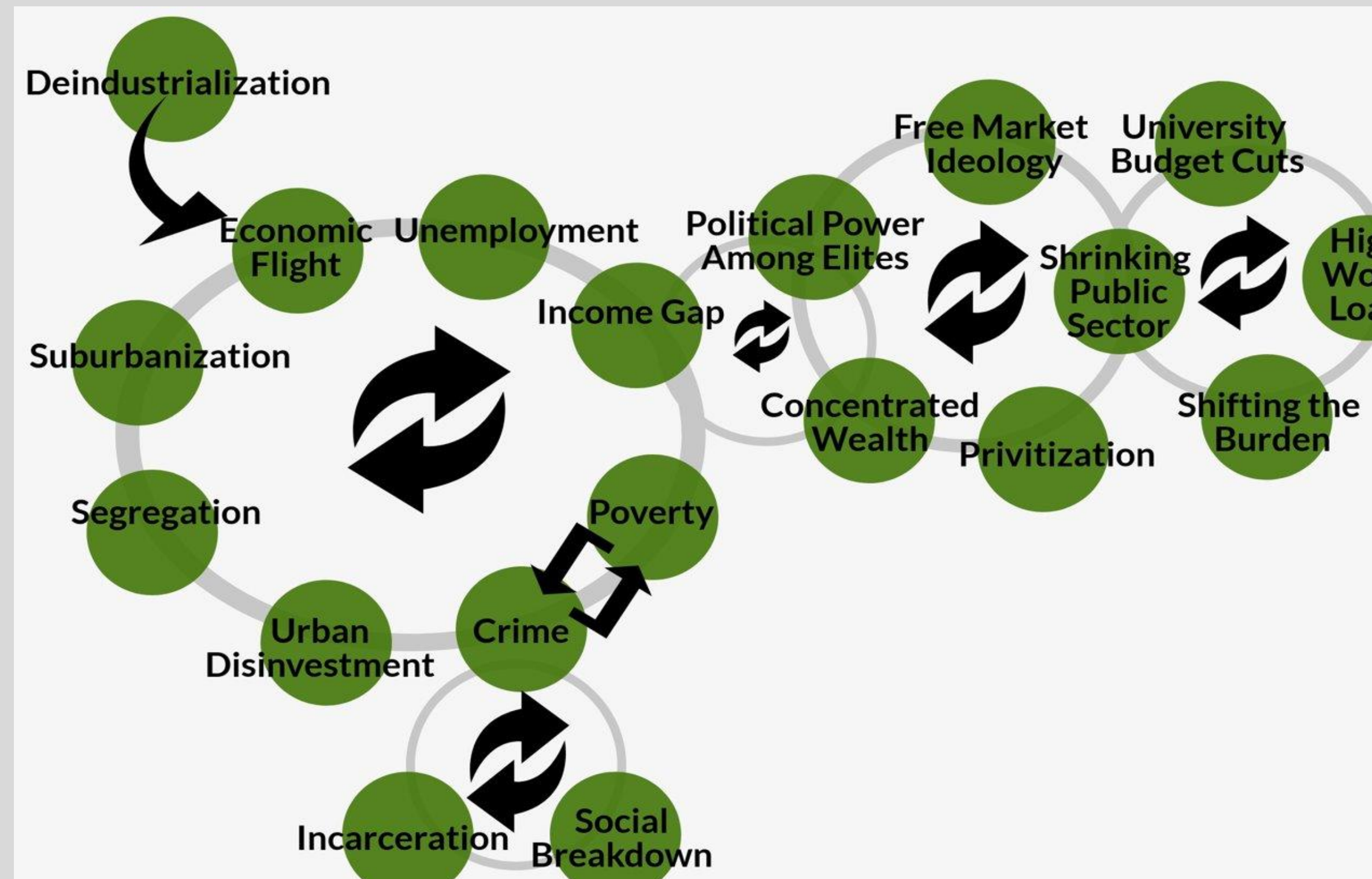
Methods



Framing questions

- What factors enable or inhibit equitable university-community partnerships?
- In what ways do university-community partnerships perpetuate or challenge systems of inequality?

Context



Gap: Restrictive Funding Structures

- Restrictive Grant Cycles
- Competition and Turfism
- Funders set priorities

Lever: Improve Funding Processes

- Equitable evaluation practices and trust-based collaborative grant-making
- Build relationships with local and national funders and state agencies
- Increase support of BIPOC-led organizations

Gap: Cycles of Mistrust

- Colonial Methods of Engagement
- Privileging of Academic Knowledge
- Ivory Tower Mentality
- Expert-Client Relationship

Lever: Building Trust and Accountability

- Examine personal and institutional biases
- Elevate community participation and experiential knowledge
- Planning for shared governance and long-term engagement
- Focus on building social capital

Gap: Institutional Challenges

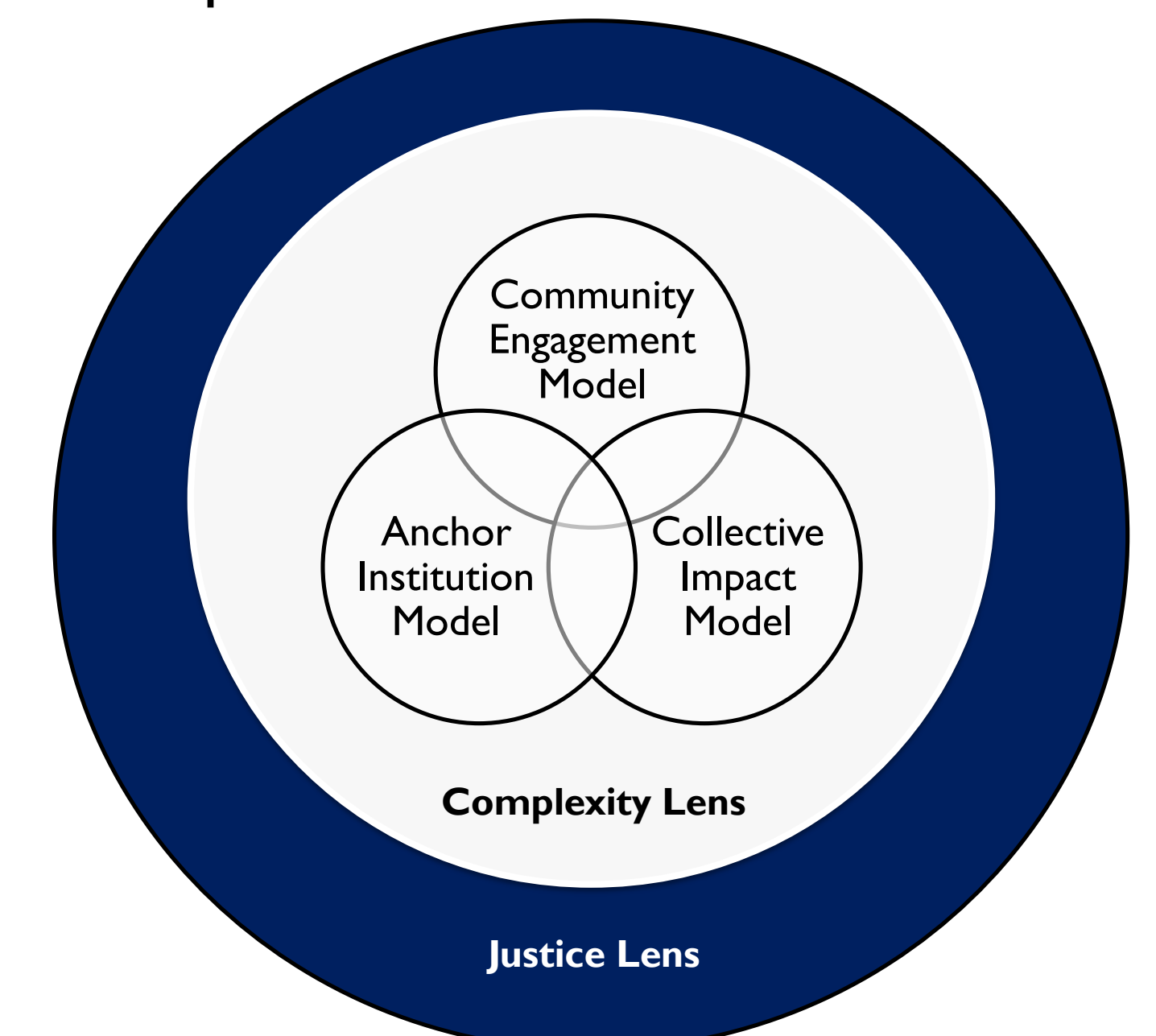
- Poor Communication
- Disciplinary Silos
- Tenure and publishing disincentives
- Workload

Lever: Support Interdisciplinarity and Communication

- Reward faculty for community engaged scholarship
- Invest in inter-campus and inter-organizational communication
- Standards for community engagement across disciplines

Conclusions

Supporting positive change in this system is best served by viewing partnerships through a complexity and justice lens. This mindset is essential for grappling with the historical legacy of higher education in the US, the realities of social inequalities, and the hard work required of relationship-building and partnership. Using this lens also points to the need for multifaceted interventions at multiple scales to leverage change across the system. Each university-community partnership is unique, but engaging in methods to shift power, move toward interdisciplinarity, improve communication, and understand funding structures can improve the overall health of the partnership landscape.



Complexity Lens

- Addresses paradoxes and the duality of collaboration and conflict
- Engages with uncertainty and ambiguity
- Focus on relationships
- Balance top-down and bottom-up orientations
- Allows difference to exist in shared space. Multiple perspectives and lenses honored. Supports a less reactionary approach to problems. Typically does not lead to "band-aid" fixes.

Justice Lens

- Contrary to a charity mentality, where resources and surplus are "given" without acknowledgement of the context that allowed disproportionate wealth-accumulation to root.
- Mutual resources are shared among members of a community
- Supports reconciliation with hurt communities.
- Addresses cycles of mistrust and power imbalances.
- Broadens scope to incorporate the context of inequality

School Based Mental Health Care Positively Impacts Academics for Children In Marginalized Communities

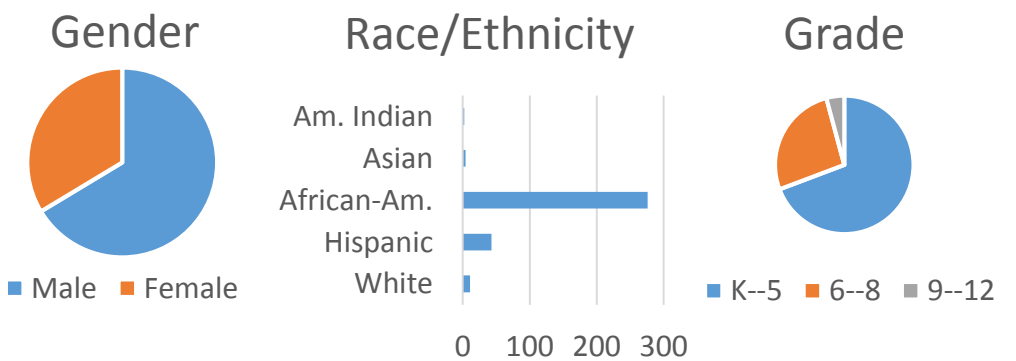


Why school-based mental health services?

- ❑ 20% of U.S. children have a mental illness and close to 2/3's of these do not receive care for it. These numbers are worse for disadvantaged kids.
- ❑ Health disparities contribute to achievement gaps between middle-income and low-income children.
- ❑ Barriers to accessing mental health care are greater in marginalized communities: cost/insurance, scheduling, transportation, shortage of providers in the area.
- ❑ School-based mental health services reduce such barriers and level the playing field in terms of well-being and achievement.

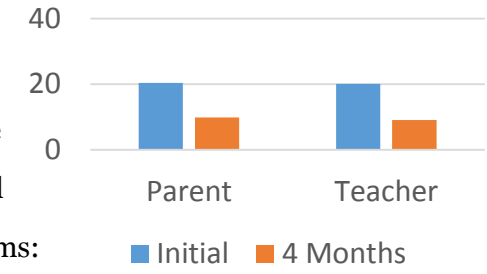
Outcome Study:

We followed **349 children** within the **22 partnership schools** across academic years **2015-2016 and 2016-2017** and gathered data on their *emotional functioning, attendance and disciplinary referrals, as well as academic outcomes*. Within this number was a group of 131 children we used as a comparison (control) group; they were referred for SCPMH therapy, but parents did not give permission to start services at school. **The breakdown:**

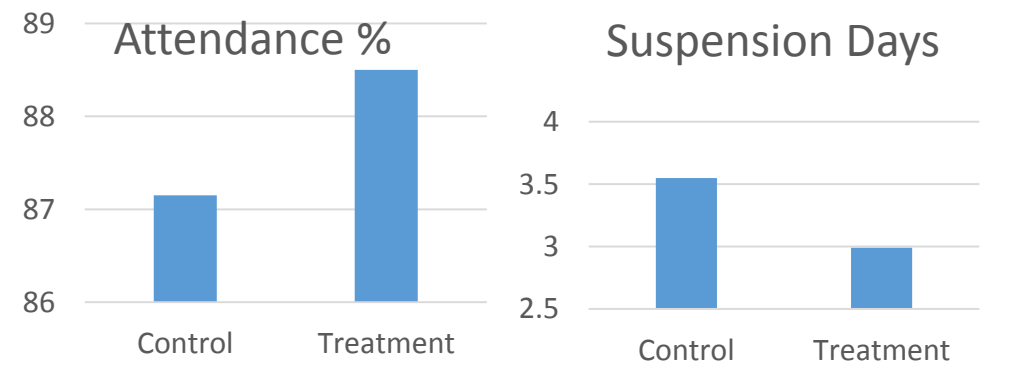


Students in the Treatment Group did show improved mental health.

On the Strengths and Difficulties Questionnaire (SDQ), a decreased score indicates improvements in rated mental health and fewer mental health symptoms:



Students in the Treatment Group had a more positive trend in school-related behavior problems.



Students in the Treatment Group showed significant improvement in academic achievement.

Wisconsin uses the STAR Assessment test to evaluate the progress of students over the course of the year. Students were categorized into improvement or no improvement conditions based on STAR Assessment test results over the two year period:

- Students in the SCPMH Treatment Group were significantly more likely to show improvement on the STAR Math Assessment test than students in the SCPMH Control Group.

Introduction

- Hypertension (HTN) is a major risk factor for myocardial infarction and stroke, as well as other disease states
- HTN occurs more frequently in underserved populations and commonly remains underdiagnosed and/or undertreated, as it is usually asymptomatic
- Patients may not seek medical care for treatment of HTN

We tested the feasibility and compliance of a novel strategy for assessment of blood pressure (BP) within a Hispanic community in Milwaukee.

Community Partner

- The United Community Center (UCC) seeks to provide programming to Hispanic individuals of all ages
- Programming in education, cultural arts, recreation, community development and health/human services

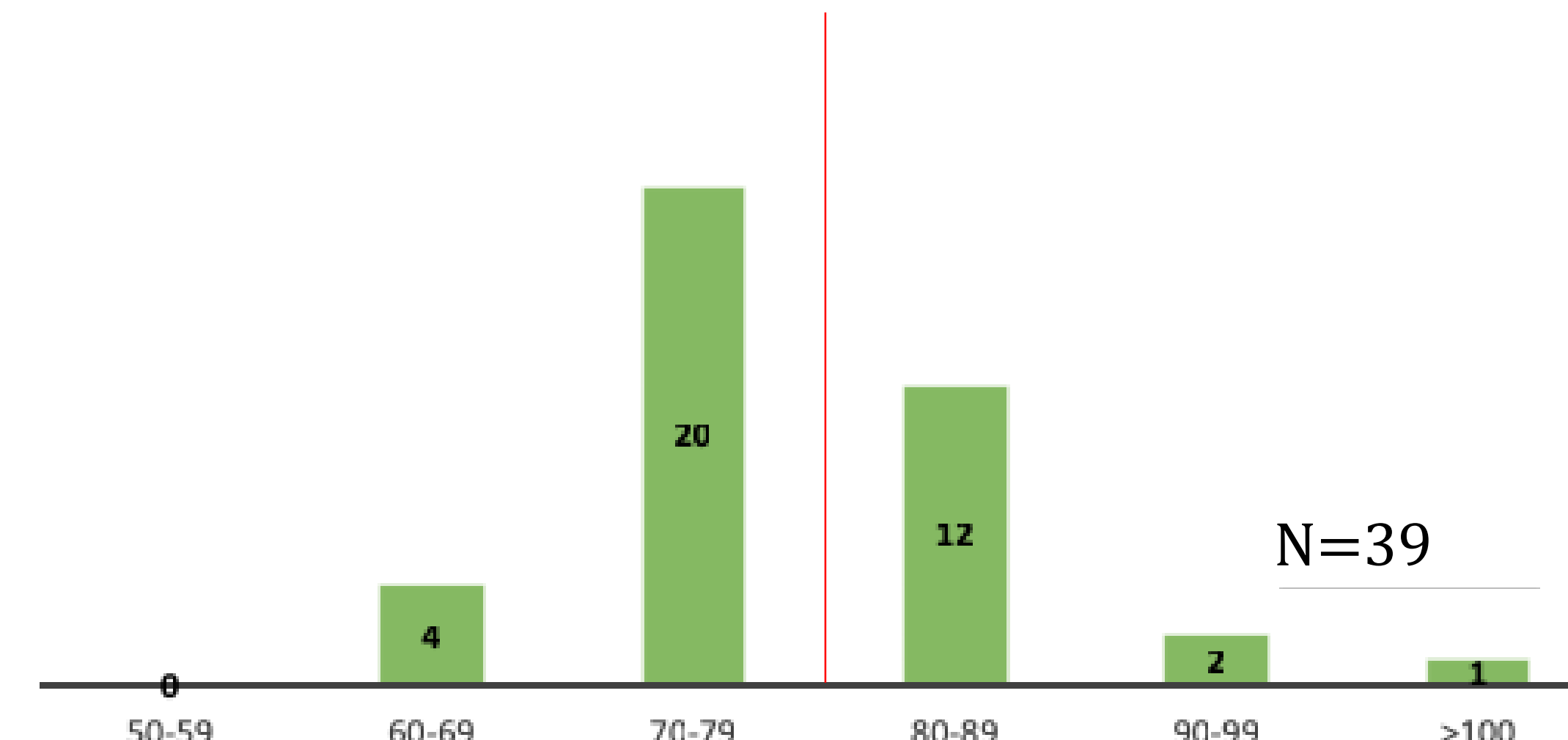
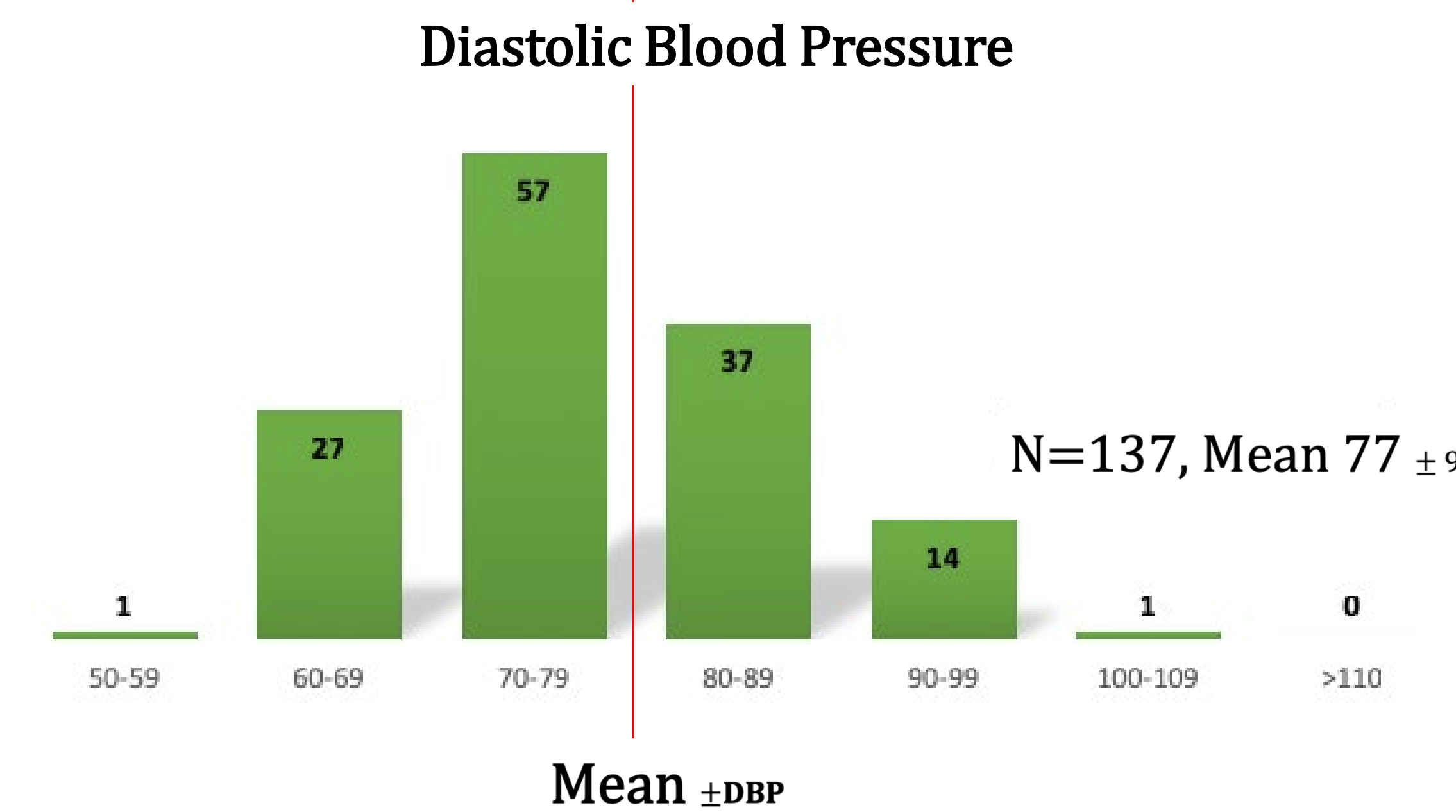
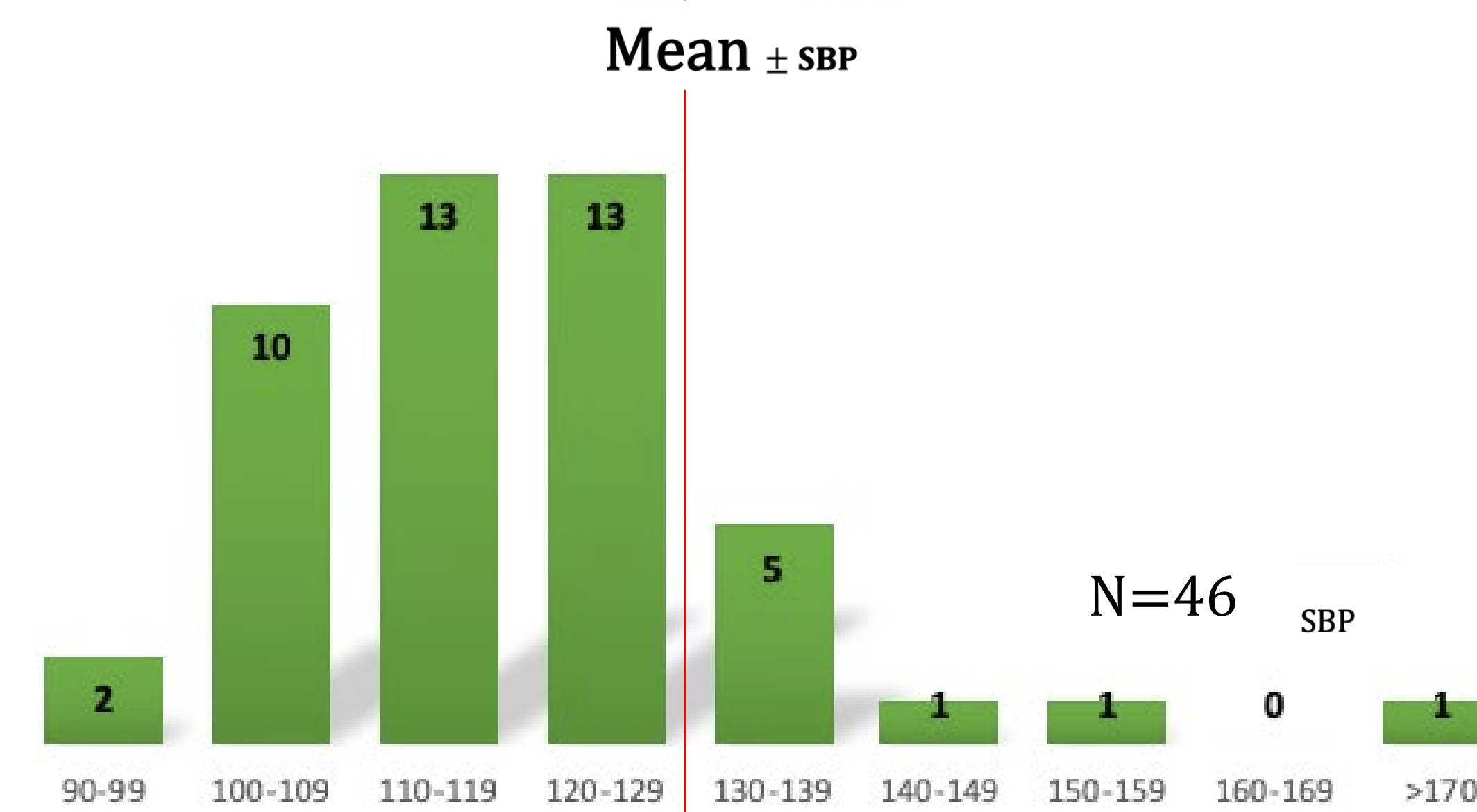
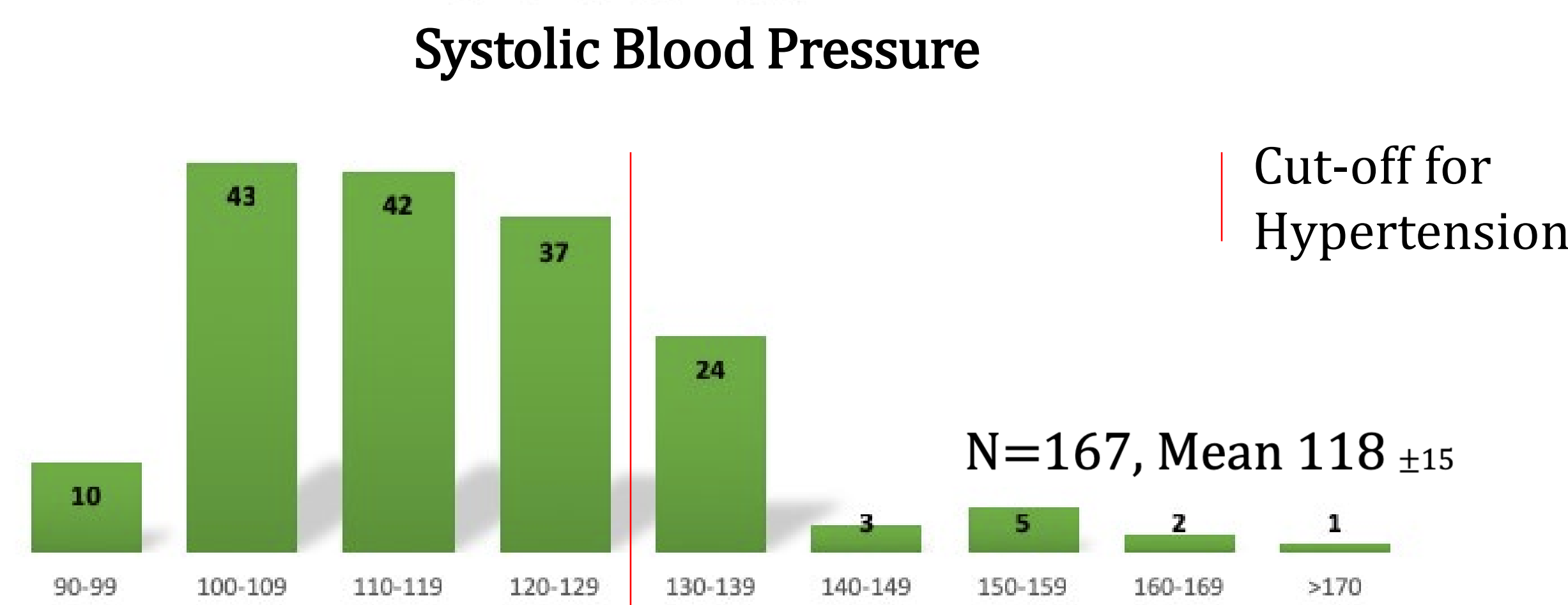
more information at: unitedcc.org

Methods

- 20 high school students were recruited through our community partnership
- Students were educated (by Cardiologists) about HTN and proper technique for measuring BP
- Each student was issued an automated BP cuff and were encouraged to measure BPs of willing participants
- Students were instructed to measure BPs at least 3 times for at least 3 individuals over a 3-month period
- 15 students completed these measurements

Results

# of Participants	46	Mean SBP	118	Mean Female SBP	119
# of Participants with HTN	5	Mean DBP	77	Mean Male SBP	121
# of Participants with DM	1	Mean HR	74	Mean Mexico SBP	120
Average Age	38	Mean SBP Age > 30	120	Mean USA SBP	111
M:F	1 : 1.5	Mean SBP Age > 40	121	Mean PR SBP	121



- Students approached 46 individuals, and 100% agreed to participate
- Mean age of participants was 38 years: 30 were women; 16 were men
- Systolic BP (SBP) among participants was 118 \pm 15 (mean \pm SD) mm Hg, and diastolic BP was 77 \pm 9 mm Hg
- 11% of participants (n=5) had a previous diagnosis of HTN
- 74% of participants (n=34) reported seeing a doctor within the past year
- 100% of students reported an improved understanding of HTN and voiced that participation in this program fostered interest in pursuing study or a career pertaining to healthcare delivery

When were participants last seen by a doctor? Diagnosis of High Blood Pressure



Discussion

This pilot project demonstrates the feasibility and positive impact of this community-based program, which successfully recruited minority participants for BP screening and engendered knowledge and interest in medicine among high school students who are underrepresented in medical fields.

Thank You!

Thank you to Dr. Gutterman for institutional support from a grant through Northwestern Mutual, and also to the United Community Center, in order to complete this program.

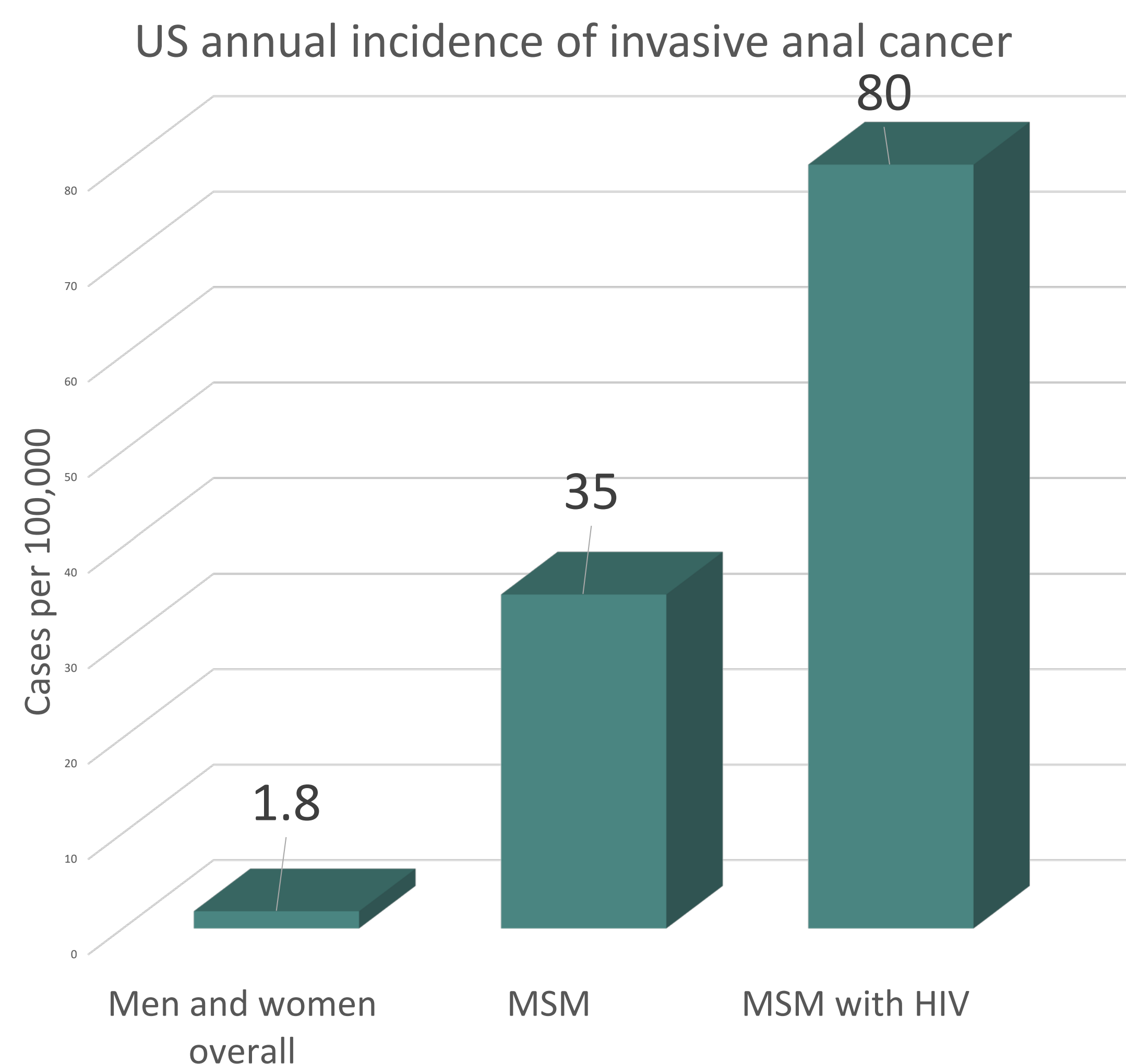
PROTOCOL OF THE PREVENT ANAL CANCER STUDY OF SELF-SWABBING AND NOVEL BIOMARKERS

Christopher O. Ajala MD, MPH;¹ Timothy J. Ridolfi MD;² Sarah Lundeen RN, MSN, APNP;² Elizabeth Y. Chiao MD, MPH;³ Maria E. Fernandez PhD;⁴ Vanessa Schick PhD;⁴ Anna R. Giuliano PhD;⁵ Eric L. Brown PhD;⁴ Michael Swartz PhD;⁴ Alan G. Nyitray PhD¹

¹Clinical Cancer Center and Center for AIDS Intervention Research, Medical College of Wisconsin, Milwaukee, Wisconsin; ²Department of Surgery, Division of Colorectal Surgery, Medical College of Wisconsin, Milwaukee, Wisconsin; ³Department of Medicine – Infectious Disease, Baylor College of Medicine, Houston, Texas; ⁴The University of Texas Health Science Center at Houston School of Public Health, Houston, Texas; ⁵Moffitt Cancer Center and Research Institute, Tampa, Florida

BACKGROUND

- Anal cancer is a rare disease (2 cases/100,000 persons annually) caused by persistent human papillomavirus infection (HPV).
- However, among men who have sex with men (MSM), who are HIV-negative and MSM who are HIV-positive, the annual incidence is estimated at 35/100,000 and 137/100,000, respectively.
- There are no uniform anal cancer screening recommendations to identify persons at increased risk of anal cancer.
- Also, since men, in general, have poor compliance with preventive screening recommendations, it may be helpful to assess methods of screening, like self-swabbing, that could reduce barriers to screening protocols developed for men and transwomen.
- Evolving screening recommendations may involve molecular and/or cytological markers.



OBJECTIVES

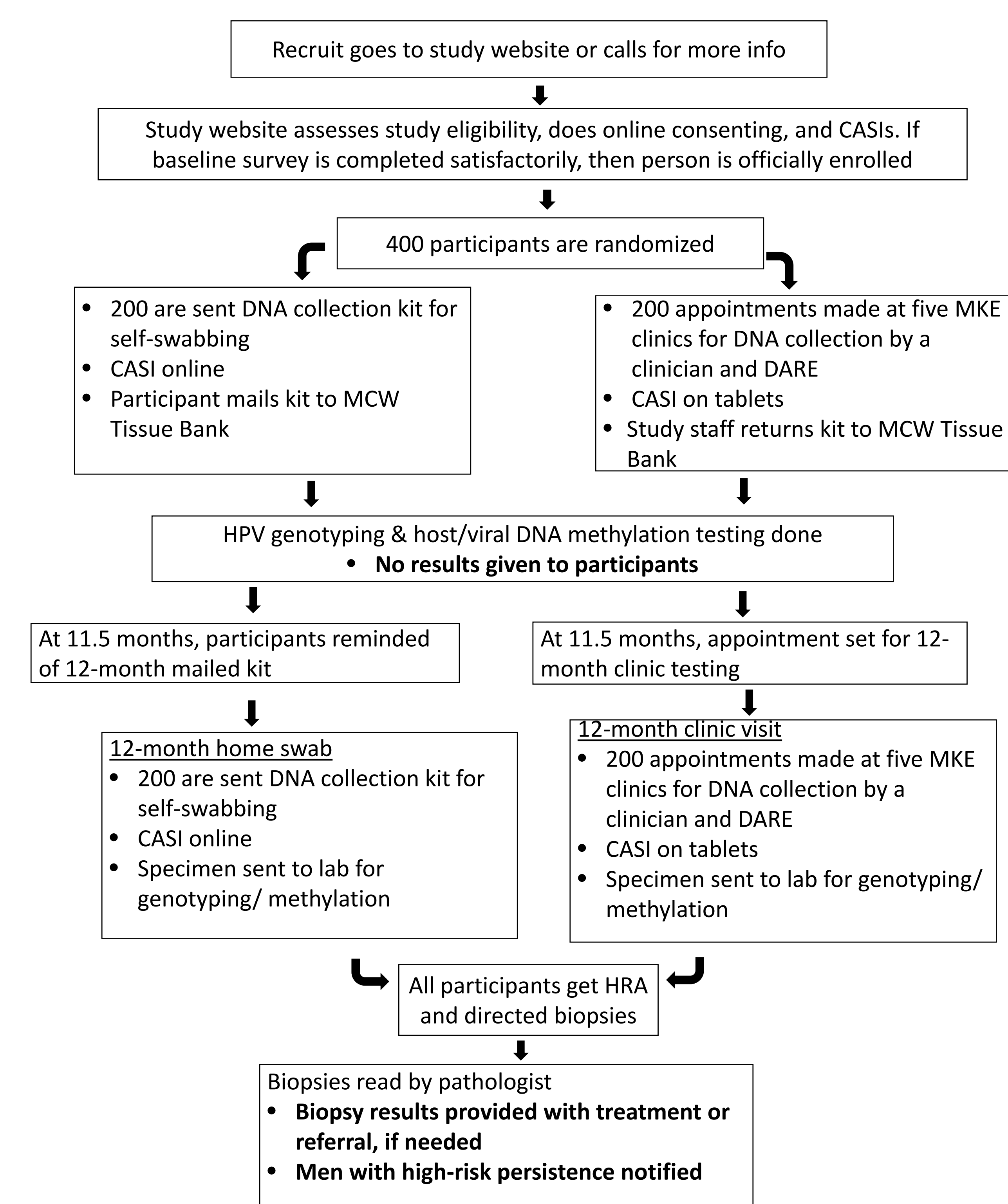
- To test compliance with home-based versus clinic-based swabbing among 400 Milwaukee MSM and transwomen and to assess the utility of HPV persistence and host/viral DNA methylation as triage biomarkers.**

METHODS

- MSM and transwomen will be recruited between 2019 and 2021 (n = 400).
- Participants will be aged 25 years or older and acknowledge sex with men
 - No prior diagnosis of anal cancer
 - No anal Pap test in the last 12 months and recall of the result
 - No plans to relocate in the next 12 months
- Anal canal exfoliated cell specimens will be obtained from participating persons by self-swab or by clinician swab at 0 and 12 months.
- Specimens will be assessed for 12-month persistent HPV infection and host/HPV DNA methylation.
- All participants will undergo high-resolution anoscopy (HRA).
- Demographic and experiential data will be collected from study participants using computer-assisted self-interviews (CASI) at several time points.

METHODS

- Study activities flow chart



CONCLUSION

- Study findings may increase knowledge about anal cancer screening among MSM and contribute to reduced morbidity and mortality from anal cancer.

Please address questions to
Christopher Ajala: cajala@mcw.edu

BACKGROUND

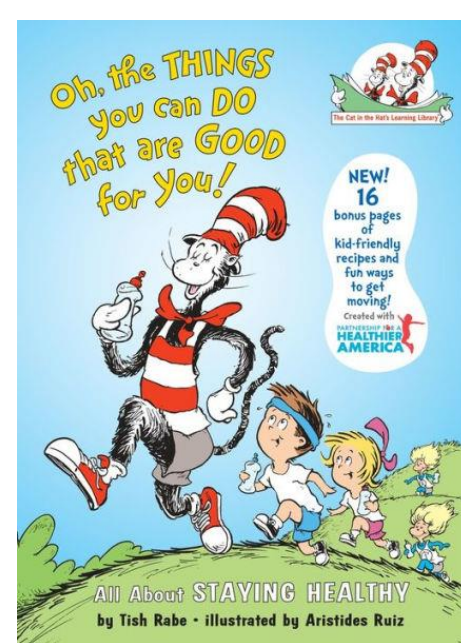
- Triple P stands for Positive Parenting Program
- Evidence-based program that provides strategies to address behavioral problems in children 0-12 years old
- Success in suburban communities of greater Milwaukee area
- Challenges implementing program in Milwaukee
- Lack of childcare possible contributing barrier
- Opportunity for pediatric residents to develop health curriculum for children

OBJECTIVE

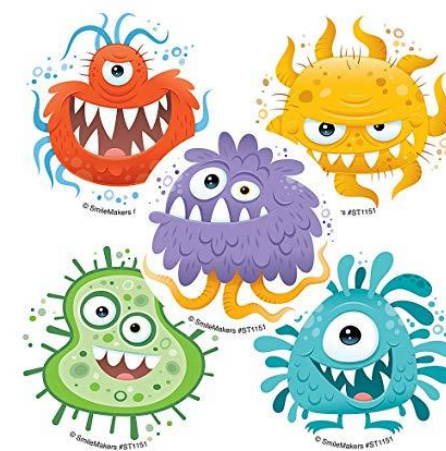
- To provide age-appropriate health activities for children of Triple P participants

METHODS

- Identified a strong community partner COA Early Childhood Education Center
- Based curriculum and activities on Wisconsin Department of Instruction guidelines for health education
- Prioritized activities that “develop age-appropriate cognitive understanding of health promotion concepts to improve health behaviors”
- Activities for age 5-12
- 5 main health stations
- Healthy snacks provided
- Infant childcare provided by community partner staff



- Alphabet Exercises**
 - Children invited to come up with physical exercises for each letter of the alphabet
 - Helps to foster speech and language skills
 - Allows children to engage in creative physical exercise
- Glitter Germs**
 - Glitter used to signify germs
 - Kids give each other high fives to show transfer of germs
 - Wash away glitter “germs” to illustrate hand hygiene
- Teddy Bear Clinic**
 - Developed in the 1980s to increase familiarity with medical concepts, tools, and common procedures
 - Decreases children’s ratings of expected pain from medical stimuli
 - Decreases reported distress and increases overall satisfaction with the medical team
 - Topics included blood pressure, pulses, otoscope exams, and fracture splinting



- Organ Identification**
 - Outline of a person with cutouts of various body organs
 - Kids guessed organs and attached to correct anatomical position
 - Discussed role and function of each organ
 - Provides proper anatomical terms to enhance body image, self-confidence, and openness
- MyPlate Nutrition**
 - Discussed MyPlate components: fruits, vegetables, grains, protein, and dairy
 - Had kids sort different foods into the appropriate components on a large MyPlate template
 - Allowed kids to color in their own MyPlate template with their favorite foods in the appropriate location

CONCLUSIONS

- 17 parents participated in the pilot Triple P program at COA Youth and Family Center
- 12 children participated in the health education program
- General reception positive from parent and children participants
- Parents and community partner have requested more sessions for the future
- Providing child care facilitated having a large turn out of parent participants
- There are creative opportunities for pediatric residents to provide health education outside of a clinical setting

DISCUSSION

- Further evaluation needed to determine other barriers to participation in Triple P
- Need to evaluate role of providing child care and health activities in decision to participate in Triple P



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LENA Start Marathon County: A Community Project to Close Achievement Gaps Before They Start

Corina Norrbom MD, Amy Prunuske PhD, Nicole Tank

Background

LENA START™

Marathon County

Exposure to language during early childhood is important in brain development and can be used to predict future literacy skills and school success. Parents and caregivers are key in creating optimal early language learning environments. A local workforce shortage inspired community action and investment in parents and young children. LENA Start is a parent group model that utilizes LENA's "talk pedometer" to support interventions that improve early language exposure.

Objectives

- Advance language development and early literacy skills in children before age 3
- Improve the quantity of talk and quality of parent-child interactions
- Promote parent engagement in the community and in early-childhood education programs
- Support employees as parents, thereby attracting and retaining productive workers locally

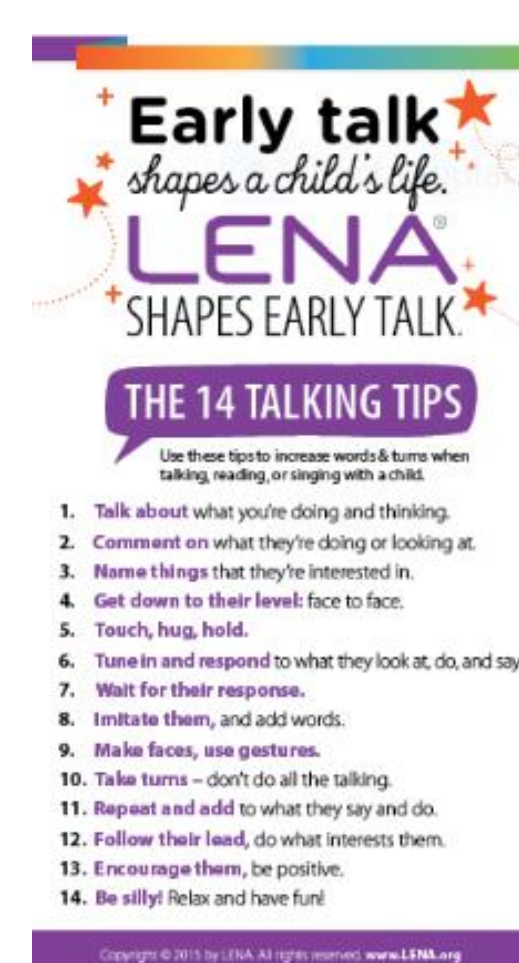


Methods

4 community partners emerged to implement LENA Start Marathon County. Grants and private donations were raised to fund an initial 2-year implementation. LENA Foundation conducted webinar and on-site training over the course of 3 months. Community partners and site partners meet weekly.

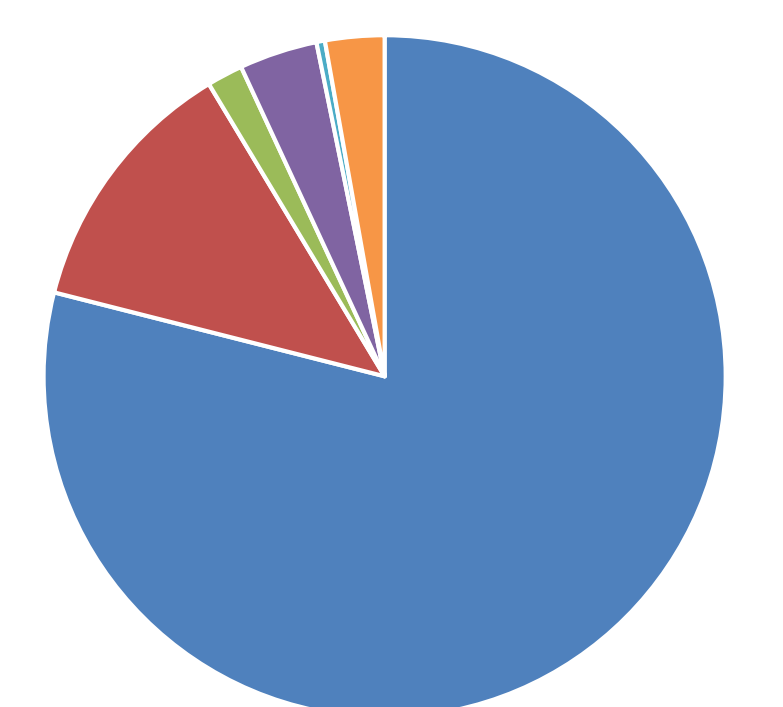


The LENA Start parent group model is utilized. Cohorts of parents attend weekly one-hour sessions for 13 weeks with trained facilitators. Each week families complete a day-long recording with their child. Adult word count, conversational turns, and electronic/TV sound is measured using LENA (Language ENvironment Analysis) technology. Reading minutes are self-reported. Parents receive a feedback report and learn evidence-based Talking Tips. They learn about a new strategy, observe the strategy, reflect on how they would use the strategy, practice and review. Sessions incorporate group learning as well as individual coaching. The program is free of charge and includes meals, childcare, and a free book each week. This protocol was approved by the MCW IRB PRO00029308.



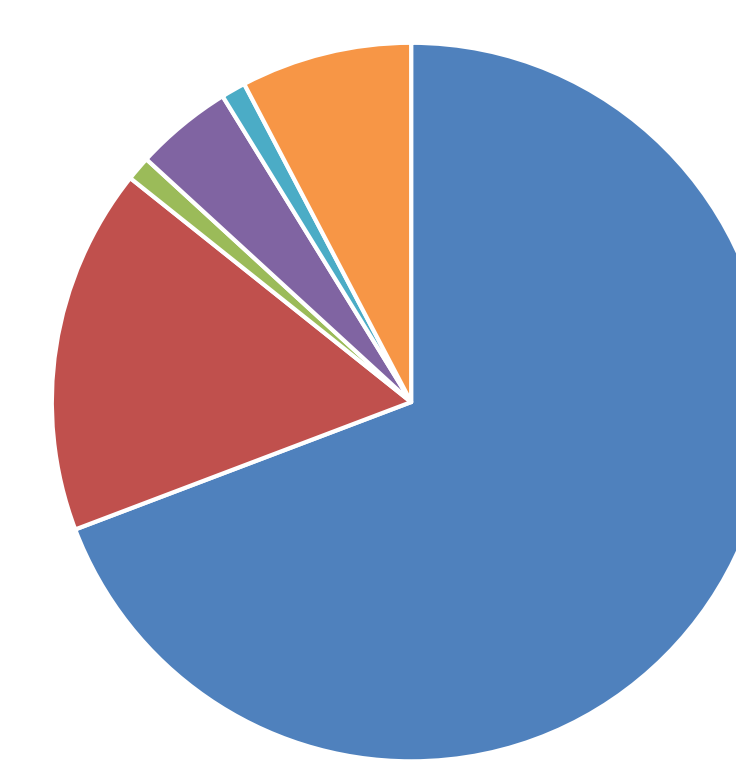
Results

City of Wausau Total Population
Source: US Census Bureau, 2015



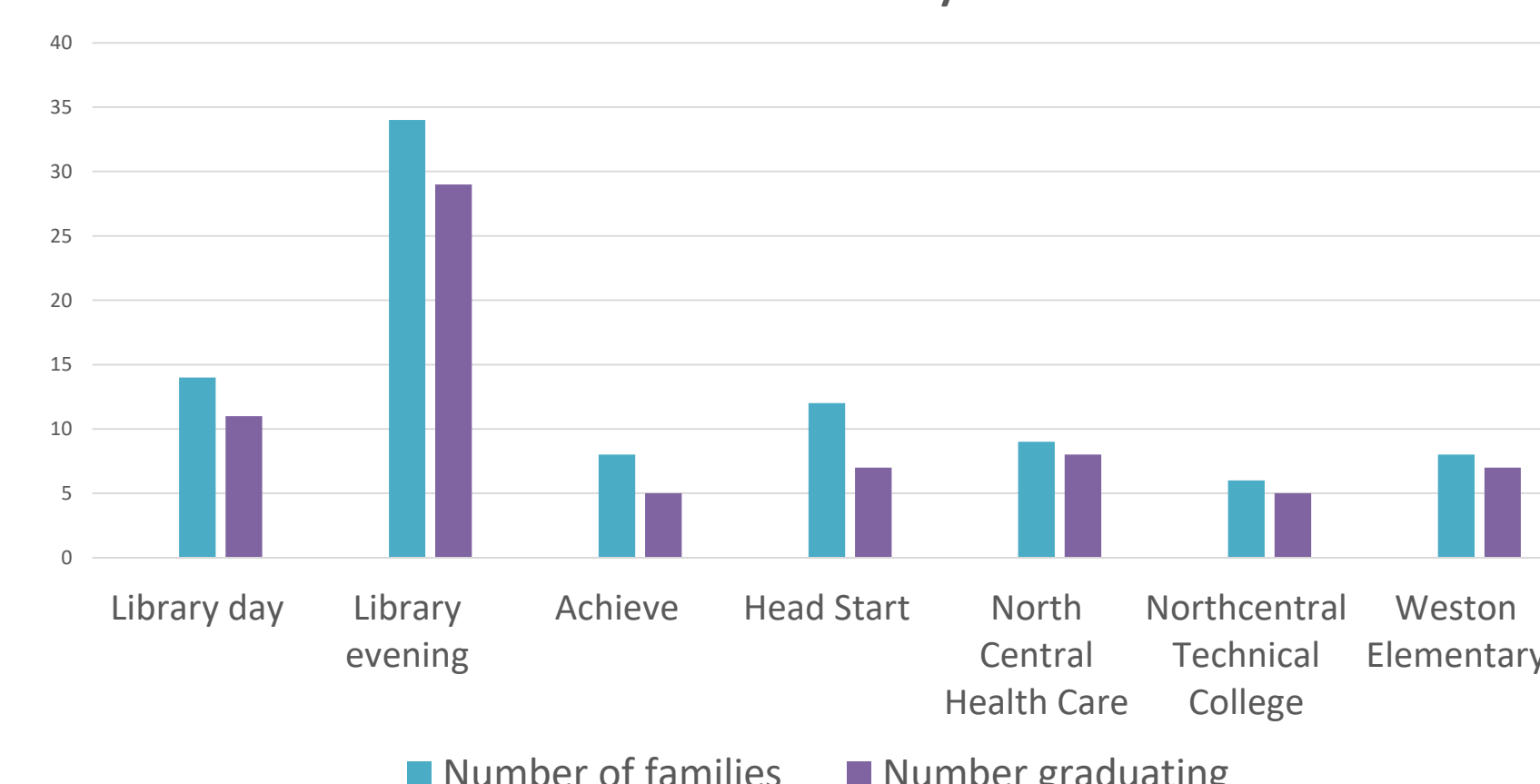
- White
- Asian
- Black/African American
- Hispanic/Latino
- Native American/American Indian
- Two or More

Participant Ethnicity



- White
- Asian
- Black/African American
- Hispanic/Latino
- Native American/American Indian
- Two or More

Graduations by site



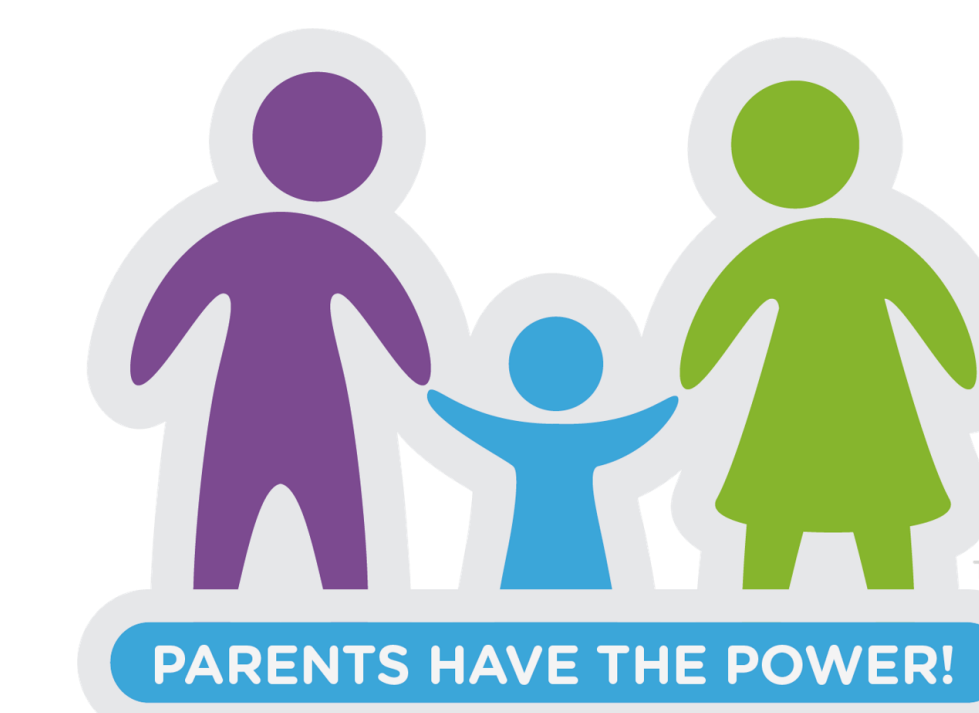
Site	Graduation rate	Family Income <\$25,000	First child
Library day	78.57%	28.57%	64.29%
Library evening	85.29%	20.59%	58.82%
Achieve	62.50%	0.00%	50.00%
Head Start	58.33%	42.00%	46.15%
North Central Health Care	88.89%	22.00%	42.86%
Northcentral Technical College	83.33%	0.00%	60.00%
Weston Elementary	87.50%	0.00%	50.00%
All sites	79.12%	19.80%	54.94%

Prior to the program, many parents were not aware of the critical importance of early language and parent interactions. Parents express interest in learning even more about early childhood brain science.

"I personally had reading and math problems when I was in school, so if I can do something to offset that for my child, I want to."

"One of the things I loved was being at the library, so we would get a book each week but also pick out some books from the library, and our son could help pick them out, too."

"The information my wife and I have taken from the program has been invaluable and has really changed and strengthened the bond in our family."



Conclusions & Future Directions

Pilot year results are promising in terms of parent and child benefits and in the development of an expanding public-private community partnership to try to close achievement gaps by supporting parents and their young children through language. Further quantification of data will follow as the number of participant families increases.

Acknowledgements

Funding has been provided by generous anonymous donors, BA and Esther Greenheck Foundation, Marathon County Public Library Foundation, Dudley Foundation, The Caroline S Mark Fund of the Community Foundation of North Central Wisconsin, Northcentral Technical College, Marathon County, Thrivent Financial, Achieve Center, Library Friends, CoVantage Cares Foundation, Marathon County Health Department, Aspirus Community Benefits, and Ascension Community Benefits. We thank site hosts North Central Health Care, Northcentral Technical College, Barrington Center Head Start, and DC Everest School District. We appreciate in-kind support provided by Marathon County Special Education, Townline Market, Lucky Deli, Downtown Grocery, and Politos Pizza. We would like to acknowledge our amazing team: Taylor Weinfurter, Ben Kromholtz, Ralph Illick, Erica Hoffman, Madyson Main, Boly Vang, Jessa Reif, Laura Lawler, Deborah Smith, Mitch Fuller, Joe Novak, Polina Orlova, Carol Wesley, Katie Brueggen, Rachel Alwin. Thank you to our medical student and Wausau West High School Key Club childcare volunteers.

PATCH (Providers and Teens Communicating for Health) Program: Successes and Challenges of Implementation in Central Wisconsin

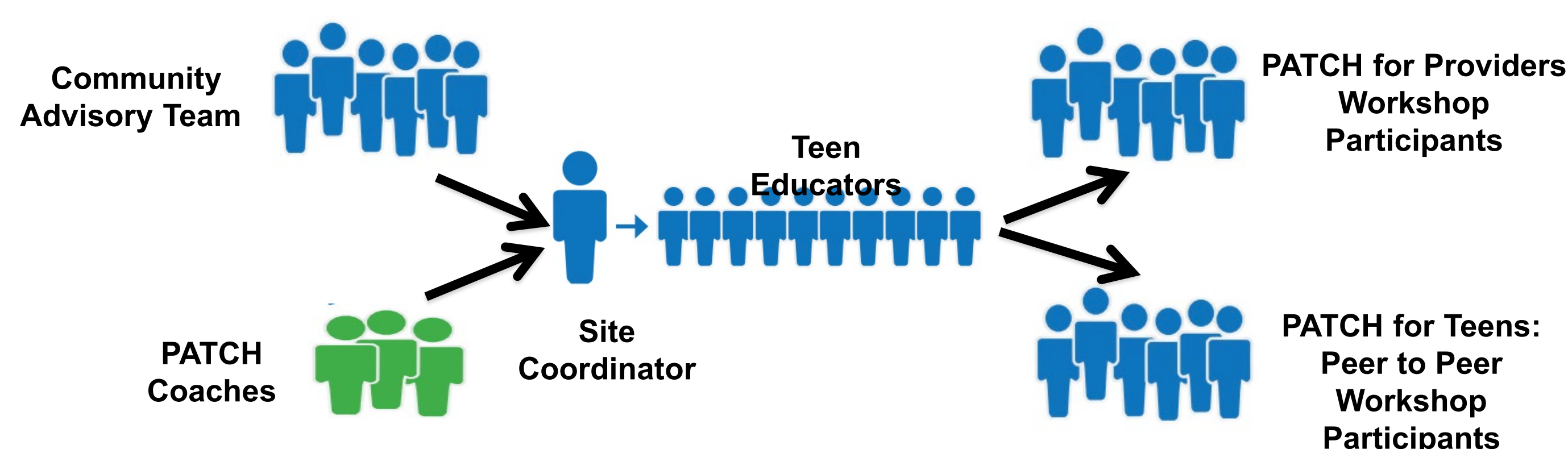
Elizabeth Wendt, MPH, M2¹, Nicole Thill, MPH², Kimberly Pufahl³, Corina Norrbom, MD¹, Amy Prunuske, PhD¹
 Medical College of Wisconsin – Central Wisconsin¹, North Central Wisconsin Area Health Education Center², The Women’s Community, Inc.³

Introduction

Adolescents demonstrate a need for access to sexual health, mental health, and substance use counseling, but many report never having discussed these sensitive health topics with a healthcare provider¹. Healthcare providers are a reliable source of knowledge, but there is a critical gap in communication with adolescent patients². The PATCH (Providers and Teens Communicating for Health) Program aims to bridge communication gaps between adolescent patients and healthcare providers by facilitating open and honest conversations about sensitive health topics.

Methods

Figure 1: The PATCH Site Architecture illustrates the holistic and collaborative approach to program implementation.



Teen Educators, a diverse group of students from Central Wisconsin high schools, are hired to lead two types of workshops - one targeting peers and the other healthcare providers – to increase utilization of healthcare resources by young people and improve communication in the provider’s office. PATCH is based on activities developed by the National Institute for Reproductive Health including skits, small and large group discussions, and worksheets. The curriculum was first implemented in Madison, WI, in 2010, and effectiveness was demonstrated in a 2015 publication³. It was adapted and implemented in Central Wisconsin in 2018. Program activities and analysis are approved under MCW IRB # PRO00031805.

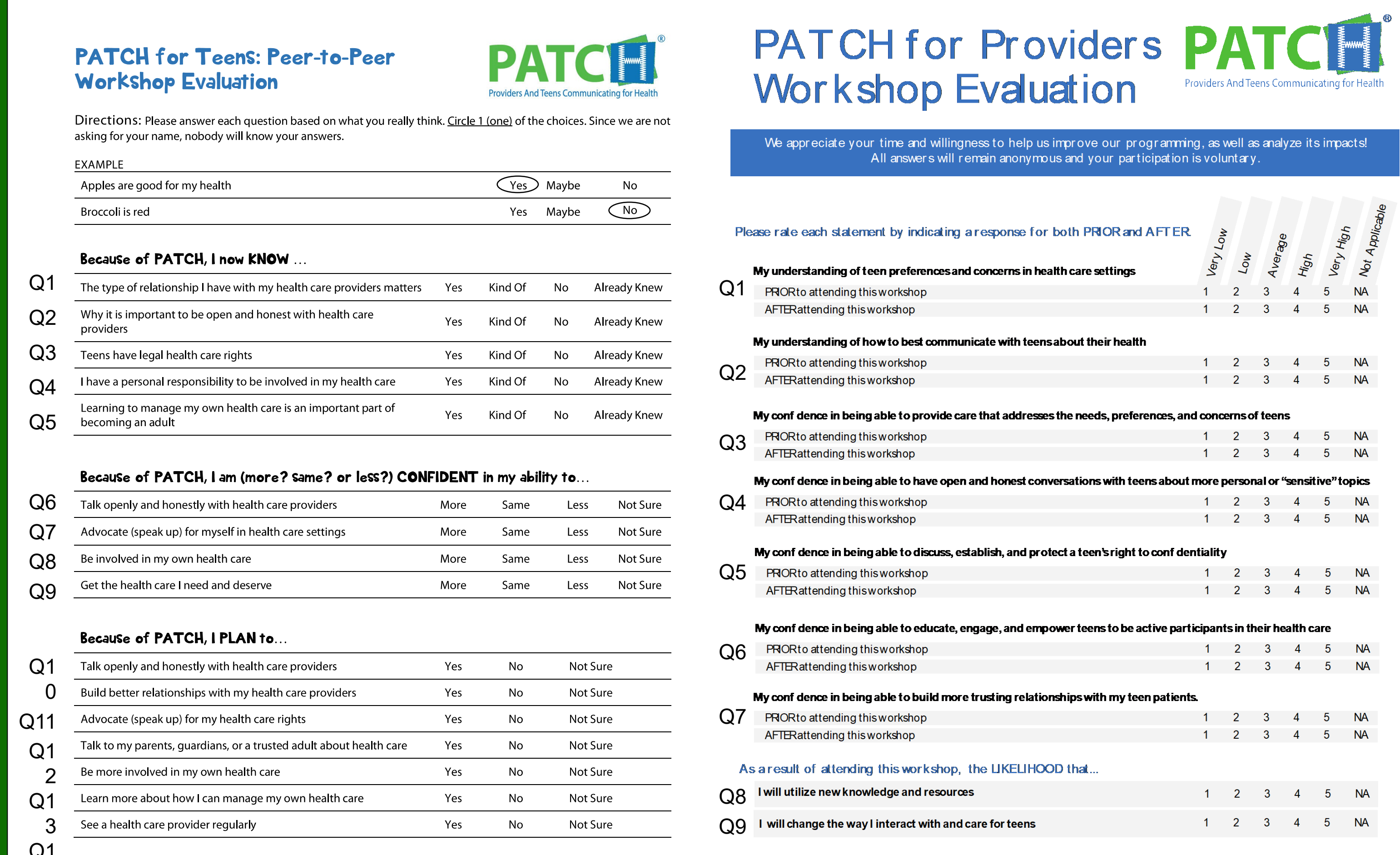
1. PATCH for Providers Workshop

- Participants will understand adolescents’ concerns, attitudes, and preferences in healthcare settings.
- Participants will explore ways to provide high-quality, youth-friendly health care services.
- Participants will acquire confidence and skills to communicate effectively and build relationships with teens.

2. PATCH for Teens: Peer to Peer Workshop

- Participants will understand the importance of learning to manage their own healthcare.
- Participants will explore steps they can take to make sure they’re getting the care they need and deserve.
- Participants will gain new skills to help them advocate for their own health and well-being.

Figure 2: Peer to Peer and Provider workshop evaluations. Questions correspond to tables in Results section.

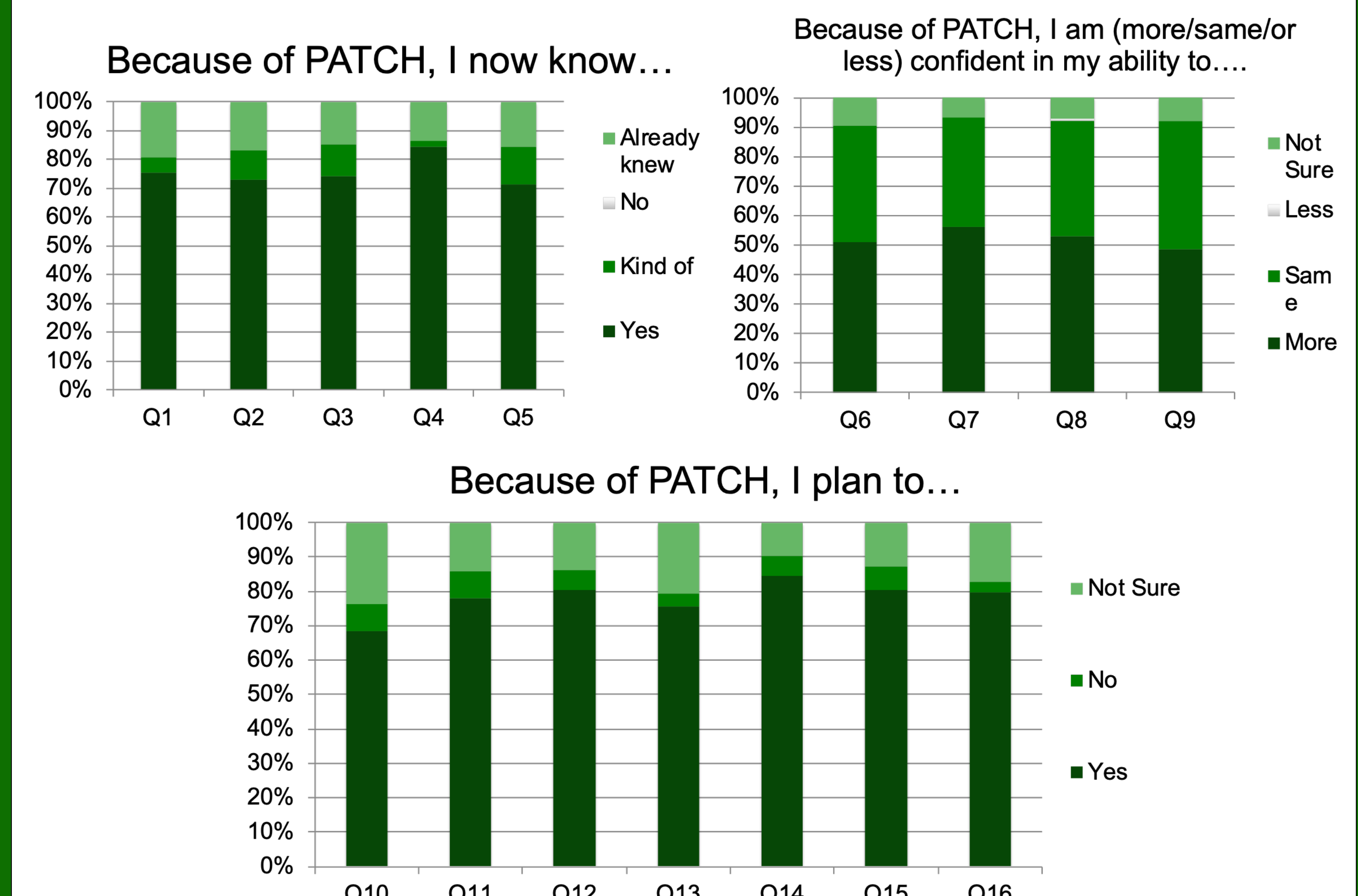


PATCH Central Wisconsin implemented seven peer to peer and two provider workshops. After each workshop, evaluations were administered to all participants. A total of 74 providers participated in a workshop and 22 evaluations were returned for analysis. A total of 235 teens participated in a workshop and 94 evaluations were returned for analysis.

Results

PATCH for Teens: Peer to Peer Workshop

Figures 2-4: Teen participant responses to corresponding questions in evaluations above.



PATCH for Providers Workshop

Table 1: Provider participant demographics

Characteristics	
Type of Provider	
Student	18
Practicing Provider	3

Question	Avg	Stdev	T Value
1 - Pre	3.14	0.69	0.021
1- Post	4.50	0.58	
2 - Pre	3.27	0.69	0.022
2-Post	4.59	0.49	
3-Pre	3.25	0.70	0.022
3-Post	4.57	0.49	
4-Pre	3.27	0.86	0.036
4-Post	4.36	0.57	
5-Pre	3.09	0.90	0.024
5-Post	4.55	0.66	
6-Pre	3.23	0.95	0.030
6-Post	4.55	0.58	
7-Pre	3.19	0.73	0.032
7-Post	4.29	0.63	
8	4.52	0.66	
9	4.39	0.71	

Table 2: Provider participant responses to corresponding questions in evaluations to the left.

Conclusions

- Teen participants demonstrated increased:
- Understanding of the importance of patient/provider communication
 - Self-efficacy.
 - Confidence in talking to providers about sensitive health topics.
- Provider participants demonstrated increased:
- Knowledge of adolescent concerns and preferences
 - Understanding of best-practices to ensure honest conversations about health history.
 - Knowledge of minors’ rights in Wisconsin.



Figure 5: Ongoing monitoring, evaluation, and expansion are conducted by the PATCH Central Wisconsin Community Advisory Team with members from MCW – Central WI, North Central and Northern Highlands Area Health Education Centers, Wausau School District, Boy Scouts of America, and The Women’s Community, Inc.

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Development and Distribution of School-Based Concussion Curriculum for Wisconsin Schools

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Introduction

- There is increased awareness of the impact of concussion on students given the high prevalence and the potential for lifelong complications.
- Standard treatment has been avoidance of all mental stimulation, which recent literature suggest may cause harm
- Experts have created Return to Learn (RTL) guidelines which provide guidance for students to return to the classroom after a concussion.
- Many educational online resources are available about RTL including CDC's "Heads Up," and "Get Schooled On Concussions."
- Few schools are aware of these free resources

Objective

To increase awareness about RTL in Wisconsin Public Schools to ensure the best possible post-concussion care for students.

Needs Assessment

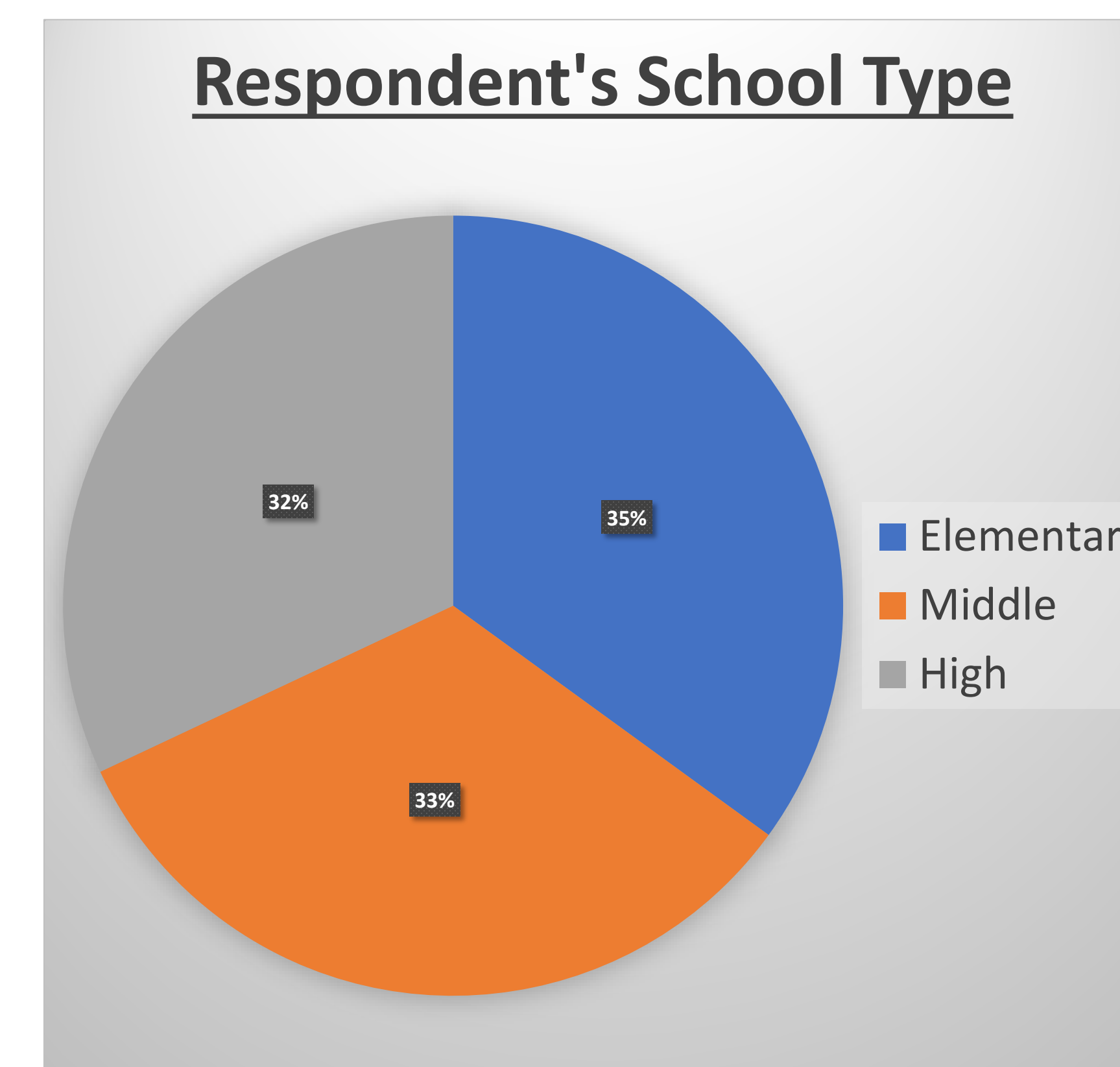
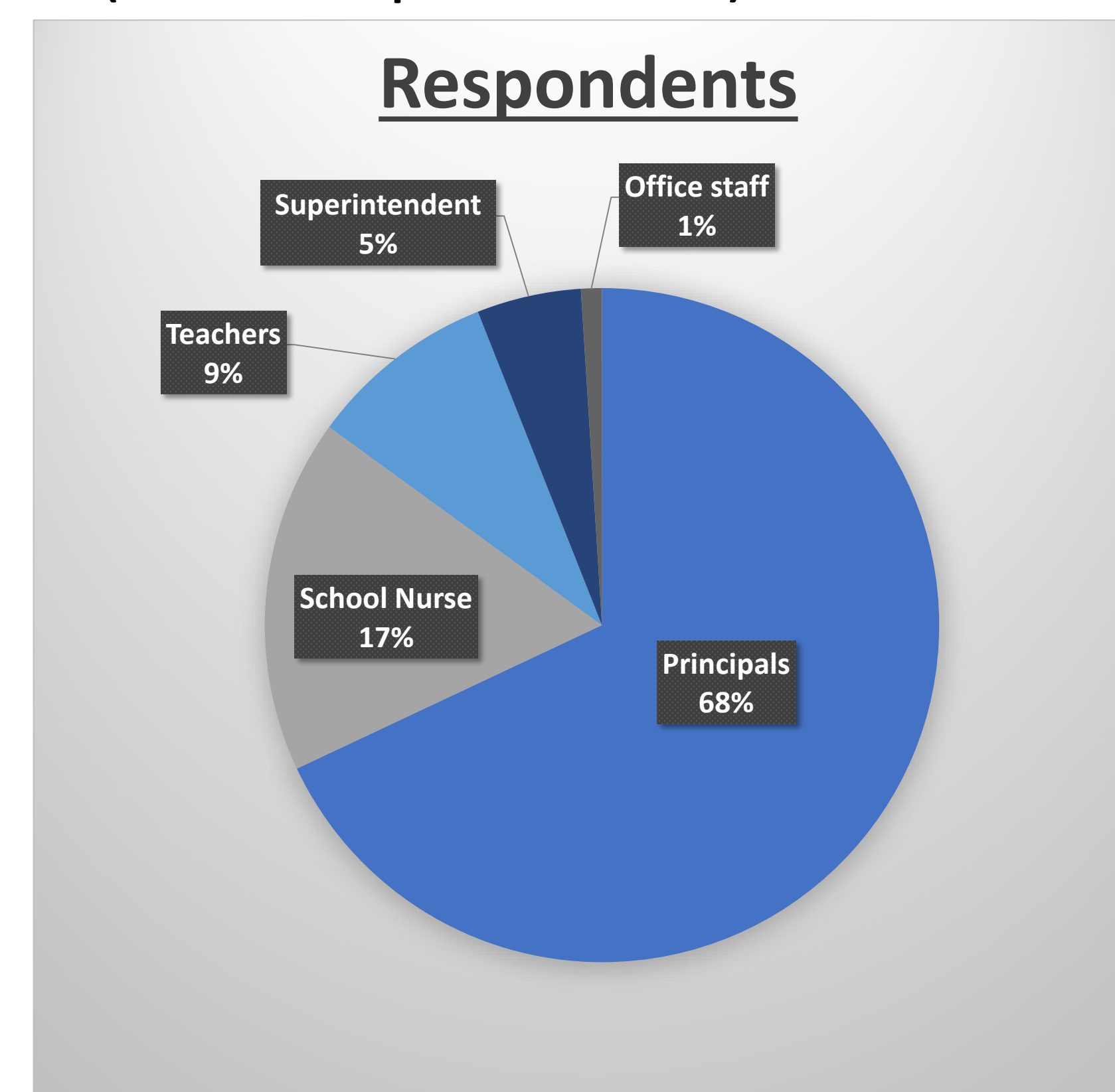
- Local public schools from Children's Hospital of Wisconsin's direct catchment area participated in a phone survey for needs assessment:
 - Current concussion management
 - Interest in concussion resources
 - What specific information is needed

Intervention

- Reviewed many available RTL educational resources (Head's Up, PACE, REAP, and Get Schooled on Concussion)
- RTL curriculum was developed using "Get Schooled On Concussions" as the primary resource.
- Curriculum summarized RTL recommendations in a single document that is easily distributable and readable.
- Curriculum emailed to 2,132 Wisconsin public schools, grades K-12.

Results

- Of the 2,132 schools which were sent RTL information, 67 responded (3.1% response rate)



- 66% of respondents reported that <10 students at their school(s) per year suffer from concussions
- 53% said concussions have a significant impact on learning in their classrooms
- 100% of schools surveyed were interested in receiving information about concussion management
- 100% of respondents found the information provide helpful
- 62.7% planned on implementing changes because of the document

Results (feedback)

- *"Information would be helpful in particular when student involved is not an athlete"*
- *"Getting specific information on limitations for a set time period from the students doctor is the best way to prevent confusion with health care and school administration/coaches."*
- *"I do think it would be helpful if there were more education statewide for providers to be directly communicating with schools about post concussion care and return to learn recommendations."*

Conclusions

- There is a need for concussion information in Wisconsin schools
- Email is not the preferred method of distributing information, given the low response rate
- When information is effectively given, schools are willing to make changes to improve concussion management in the classroom
- More work needs to be done to effectively distribute information to schools

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Special thanks to Matt Kamer, M3 for his work in conducting the initial phone survey to CHW's catchment schools.

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INTRODUCTION

Currently, there exists a large gap in medical education with regards to treating those with intellectual and developmental disabilities (IDDs). Given the higher rates of morbidity and mortality of these individuals when compared to the general population, this group faces more barriers in accessing appropriate and necessary healthcare¹. Medical advances have increased the life expectancy of those with IDD's 200% over the last 80 years; however, despite this remarkable improvement, individuals with IDD's still experience significant disparities in the quality of healthcare they receive². While there are multiple factors contributing to this, one of the most commonly cited is the lack of physician training. Some organizations are working to implement more direct cognitive disability content into the medical curriculum³, but the process remains slow and will not keep up with the growing needs of the IDD population. Noting this discrepancy between healthcare needs of individuals with IDD's and the lack of medical education in regards to this population, MCW students formed the Friends for Special Needs (FFSN) student organization to implement additional programming. FFSN focuses on building community-academic partnerships in order to increase awareness among MCW medical students about individuals with IDD's. The first partnership that was formed was in collaboration with the Down Syndrome Association of Wisconsin (DSAW). MCW students have various opportunities to work directly with DSAW self-advocates (community members with IDD's) by engaging in events organized by DSAW, in addition to annual clinical skills nights hosted by FFSN at MCW. The main DSAW events that MCW students are involved with are the annual DSAW walk and bimonthly Young Leaders Program sessions. The DSAW walk is a large, statewide public event which seeks to promote awareness and inclusion for those with Down Syndrome. The bi-monthly Young Leaders Program focuses on building confidence and social skills among self-advocates over the age of 16. The clinical skills event created and hosted by FFSN exposed DSAW self-advocates to different medical skills by giving them a chance to practice with medical equipment, and sought to increase their comfort working with medical professionals. This event also allowed MCW medical students to practice working with individuals with IDD's in a clinical setting. Ultimately, these events provided opportunities for both medical students and individuals with Down Syndrome to work together while gaining a more informed perspective about the medical field and its role in providing sensitive care to those with IDD's.

A newer partnership has been initiated between FFSN and the Autism Society of Southeastern Wisconsin (ASSEW). Similar to the partnership with DSAW, this collaboration promotes increasing awareness and comfortability between both medical students and individuals with IDD's, specifically those with autism. The main event with ASSEW was a socialization and self-development Game Night where medical students engaged with self-advocates by playing board games in small groups.

FFSN seeks to increase comfortability, education, and socialization between medical students and individuals with IDD's through community partnerships with DSAW and ASSEW. Direct community engagement with these groups allows for increased medical student knowledge about individuals with IDD's, which ultimately leads to improved medical care for this population.



Figure 1: A DSAW self-advocate listening to heart sounds at the 2018 DSAW workshop



Figure 2: A DSAW self-advocate listening to lung sounds at the 2018 DSAW workshop



Figure 3: MCW and DSAW members in attendance at the DSAW workshop in 2018

In addition to the workshops, medical students regularly volunteer at the Young Leaders Program, hosted by DSAW. This is an ongoing bimonthly event that DSAW organizes to aid in the development of work ethic, communication skills, and nutrition and problem solving, among many other topics⁴. At Young Leaders, medical students act as mentors and leaders for the self-advocates as they go through different skills training activities. 2-4 medical students attend each session along with approximately 10 self-advocates. Additionally, MCW students regularly volunteer at the DSAW Walk for Down Syndrome Awareness and MedFest, a health screening event through the Special Olympics.

The partnership with ASSEW culminated in a game night for individuals with Autism and MCW students. During this event, medical students and self-advocates had around 2 hours to participate in game playing and socializing over dinner. 21 teenage community members and 15 medical students attended the game night.



Figure 4: ASSEW members and a medical student playing Sorry at the ASSEW game night



Figure 5: ASSEW members and a medical student playing Risk at the ASSEW game night

FFSN distributed surveys for both self-advocates and medical students to assess the effectiveness of our various programs. The surveys for the self-advocates were based around determining comfortability and effectiveness of their interactions with medical students. The surveys directed towards the medical students were based around how these events had increased comfort levels in working with individuals with IDD's and how they have enhanced the overall medical education.

METHODS

FFSN has been working with DSAW since 2017, and ASSEW since the fall of 2018. In terms of our collaboration with DSAW, the major event that we co-sponsored was the clinical skills workshop in which medical students formed groups with self-advocates from DSAW and their parents. Since 2017, two such clinical skills workshops have been held with a total attendance of 33 medical students, 13 self-advocates from the ages of 18-33, and 11 parent representatives. These workshops included two separate portions, the first of which was the clinical skills component. In this portion, the students and advocates participated in practicing the basic components of a physical including heart rate, blood pressure, and musculoskeletal function. Both advocates and students participated in the clinical skills practicing. In the second portion of the workshop, the students presented a review of different forms of health-care providers, including the more prevalent specialists with whom self-advocates are likely to interact. Medical students, self-advocates, and parents were involved in the educational portion of the workshop.

RESULTS

Feedback was obtained from both members of DSAW and MCW students regarding the community partnership between the two organizations. DSAW members were asked questions regarding individual comfortability with medicine along with their general thoughts on the partnership with MCW.

DSAW self-advocate feedback on the partnership with MCW

- "I understand the relationship with doctors more"
- "I have been going to the doctor for 4 years, and was finally able to check myself in"
- "I was able to make new friends"
- "Young Leaders is more enjoyable and lively when the medical students are there with us"



Figure 6: MCW and DSAW members in attendance at the DSAW workshop in 2017

MCW student feedback on involvement with FFSN

MCW Students were also asked about their experiences with FFSN via an online survey. When asked if FFSN has helped medical students grow in confidence in working with individuals with IDD's, 8/9 (89%) either agreed or strongly agreed that it did. When asked if FFSN has helped medical students grow in their knowledge of disorders like Autism and Down Syndrome, 7/9 (78%) either agreed or strongly agreed that it did. When asked if FFSN experiences are beneficial to the overall medical education, 100% of respondents agreed that they were beneficial.

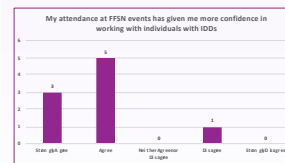


Figure 7: Medical student responses regarding if FFSN has improved confidence in working with individuals with IDD's

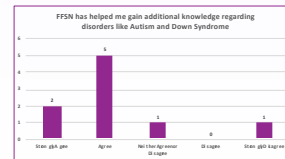


Figure 8: Medical student responses regarding if FFSN has helped students grow in knowledge of disorders like Autism/Down Syndrome

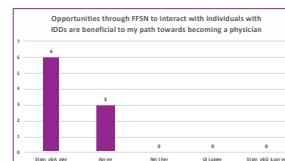


Figure 9: Medical student responses regarding if FFSN is beneficial to medical education

DISCUSSION

The Friends for Special Needs (FFSN) Student organization was founded on the aims of increasing the exposure of medical students to those with IDD's they could be better cared for by Medical College of Wisconsin's future physicians, and to increase the comfort of those with IDD's with the doctor patient relationship. These goals were best carried out through community-academic partnerships with The Down Syndrome Association of Wisconsin (DSAW, initiated in 2017) and Autism Society of Southeastern Wisconsin (ASSEW, initiated in 2018).

Overall, the self-advocates from DSAW described having positive experiences working with the medical students because they felt comfortable speaking with them and could relate to them as individuals. This is an indication that there are opportunities for the self-advocates to have meaningful interactions with the medical students within this partnership, and shows that the collaboration is reciprocal. Stringer et al.⁵ showed that a major barrier in the physician patient relationship with those with IDD's is how the physician approaches the patient's vulnerability. The programming put on by FFSN, specifically the learning and skills night, worked to address this by teaching the self-advocates to perform skills on the medical students that typically physicians would perform on them. This, in conjunction with discussing the general roles of different types of physicians and directly reviewing the self-advocate's concerns resulted in those with IDD's feeling more confident and comfortable in this setting. Medical students participation in Young Leaders also seemed to foster this relationship building as well, aligning with the aim of satisfaction and contentment of those with IDD's with the physician-patient relationship.

Medical students also found benefit in the sessions described above. The literature is abundant with information surrounding the need for IDD programming in medical education; however, little is being done to implement it². According to the Association of American Medical Colleges, integrating disability training into medical school curriculum results in decreased stigmatization, improved quality of care for people with disabilities, and additional opportunities for medical students to learn of the complexities of medical care⁶. FFSN feels this is an essential part of medical training, as future physicians will come across those with IDD's regardless of their specialty of choice. Medical students who participated in the FFSN programming felt they gained knowledge about the similarities and differences of people with Autism and Down Syndrome. They generally felt more confident in working with individuals with IDD's in a medical setting and 100% of surveyed students believed that it was beneficial to their overall medical education.

CONCLUSIONS

The introduction of the FFSN student organization at MCW provided an avenue for engagement between medical students and individuals with IDD's, which was previously noted as lacking in the standard medical school curriculum. FFSN has developed partnerships with both DSAW and ASSEW to both engage medical students with the IDD community and help individuals with IDD's become more comfortable with medicine. Events hosted by FFSN in collaboration with DSAW and ASSEW have shown favorable attendance and enjoyment from both medical students and the members of DSAW and ASSEW. The percentage of positive responses to survey questions from both self-advocates and medical students leaves FFSN hopeful that the programming can continue to expand. FFSN hopes to continue to survey students on what they feel is lacking in their education surrounding the IDD community and further adjust programming to increase attendance with the same level of both community member and student satisfaction.

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Community-Based Participatory Research: Stress Self-Management and Parents of Adult Children with Autism Spectrum Disorder

Susan A. Bonis, Ph.D. R.N., University of Wisconsin-Milwaukee; Emily Levine, B.A., Autism Society of Southeastern Wisconsin
Julie Quigley, M.A. Autism Society of Southeastern Wisconsin; Kathleen Hahn, Parent



Problem

1:59 children in the U.S. are diagnosed with autism spectrum disorder (ASD) (CDC, 2018). Their parents measure higher levels of stress than other groups of parents. This stress has primarily been attributed to their child's challenging behaviors.¹ Little is known about what these challenges are, how they vary, and how they affect parents as the child transitions to adulthood and independence.

1. (Bitsika & Sharpley, 2009; Totiska, Hastings, Emerson, Berridge & Lancaster, 2011; Reed & Osborne, 2013).

Purpose

Describe risk factors of stress self-management for parents of adult children with autism spectrum disorder (ASD) using the Individual and Family Self-Management Theory

Method

Method: Community-based participatory research (CBPR). Key principle in CBPR: Members of the community are actively involved with the project

Advisory Group - 3 parents of adult children were involved – 2 of the parents are administrators of the Autism Society of Southeastern Wisconsin

- Development of initial survey study
- Development of current research question
- Development of focus group discussion guide
- Transition to individual and phone interviews
- Theme confirmation

Data Collection: 2 FG participants; 21 individual interviews; 1 phone interview

- Parents committed to participate in FG – cancelled due to behavioral and child related issues
- Parent advisory group suggested individual interviews with a phone interview option
- Extension of study was requested and granted, resulting in 22 interviews

Analysis: Thematic analysis was used to identify patterns and themes in the transcribed interviews. Themes were organized according to the contextual risk and protective factors of the Individual and Family Self-Management Theory (Ryan & Sawin, 2014). Themes were reported to and supported by the parent advisory group.

Sample

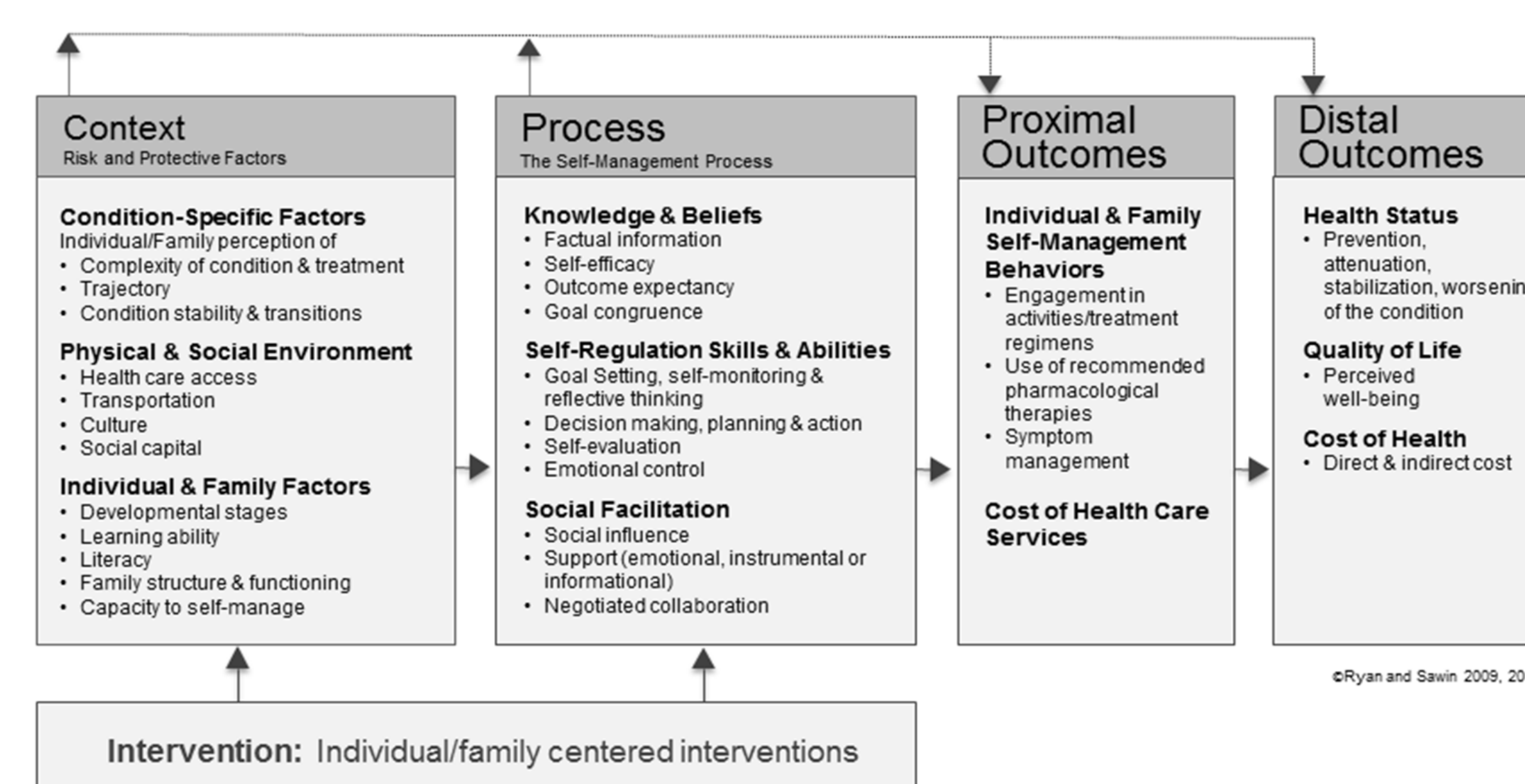
24 parents

- Ethnically, educationally, socioeconomically diverse
- 22 mothers; 2 fathers
- Fathers participated in the interviews with their wives
- Age range of adult children 18-34

Setting: The ASD community – focus groups and interviews were conducted in the community at a location of the participant's choosing or by phone

Conceptual Framework

Individual and Family Self-Management Theory



Conclusion

Parents across all ethnic, educational, and socioeconomic backgrounds experienced difficulty accessing diagnosis and services for their adult child with ASD.

Results

Condition Specific Factors

Violence (complexity of condition)

- Children have meltdowns – adults have violent episodes
- Chapter 51 - Referral to homeless shelter from court judge
- Adult children missing and out of contact
- Suicide ideation, practice and attempts

Transition (trajectory)

- Transition from IDEA to ADA
- Break in healthcare - transition from pediatrics to adult
- Adult child responsible to seek diagnosis
- Adult child responsible for own decision-making
- Parents not allowed access to Information for decision-making
- Parents not allowed access for Insurance options
- Guardianship challenges and choices

Physical and Social Environment

Diagnosis (Healthcare Access)

- 18/24 received informal ASD diagnosis from K-12, not from HCP
- Child's needs met in the school system on an as-needed basis
- Transition to adulthood, ASD diagnosis needed to access services
- Accessing services was challenging - stigmatization & disrespect
- Parents lacking access to medical information

Socialization

- Peer acceptance is challenging – no longer worth the effort
- Bullying/incivility
- Isolation in parents home

Individual and Family Factors

Expectations

- Blame for behaviors is placed on diagnosis rather than child
- Children and adult children live up-down to parental expectations

Independent living

- Group living denied - social-communication and behavioral issues
- Support needed for executive functioning
- Sensory issues

Education

- College support - Stress and anxiety in college setting
- Social situation is challenging – bullying and incivility
- Support and ADA accommodations needed – child's responsibility
- Sensory adaptation
- Motivation challenges

Employment

- Stress and anxiety in work setting
- Workplace relations are challenging – bullying and incivility
- Sensory adaptations needed
- Underemployed/unemployed – lose job ~ every 3 years



For More Information

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Funding & Acknowledgements

STTI/Midwest Nursing Research Society Research Grant

A special thank you to the Autism Society of Southeastern Wisconsin and the families who participated in this study

INTRODUCTION

- The MCW School of Pharmacy created a partnership with Next Door Foundation, an early childhood education center in an underserved neighborhood of Milwaukee, WI, with the goal of increasing community members' access to health care and impacting chronic disease outcomes.
- Pharmacists have the training and ability to perform physical assessment; and educate patients on the prevention and treatment of many disease states by using community engagement principles.

OBJECTIVES

- Develop a community-based, pharmacist-led community health screening program in an underserved area of Milwaukee.
- Increase health care access and awareness of common chronic diseases in the target community.

METHODS

- Analysis of multiple secondary data at state, county, city and zip code level were conducted followed by a 6-9 month period of community engagement activities to identify an underserved population and potential community partners in Milwaukee.
- The investigators engaged Next Door leadership, staff, community navigators and community members to determine the health needs and health screening services that would most benefit the community.
- Community listening sessions using one-on-one and small group meetings, surveys, health fairs, and review of existing literature were utilized to assess the health needs, barriers, and facilitators to quality care in the community.
- Community health screening and health education of participants for four leading chronic conditions: obesity, diabetes, high cholesterol, and high blood pressure were developed based on the health needs assessment data.
- Referral partnerships were developed with free and low-cost clinics within the community for participants needing further care after point-of care screenings.
- Operational testing was conducted for 4 weeks to refine the processes and ensure delivery of high quality services.
- Community engagement is ongoing to strengthen community-academic ties, build capacity, and leverage various community health resources to help reduce health disparities and improve overall health outcomes.

RESULTS

- Three contiguous zip codes (53206, 53209, and 53210) were identified from eleven low to medium-low social economic status (SES) Milwaukee zip codes, based on higher chronic disease burden and adverse social determinants of health (SDH) (see Fig. 1 and Table 1).

Figure 1: SES Groups and Zip codes, Milwaukee, WI

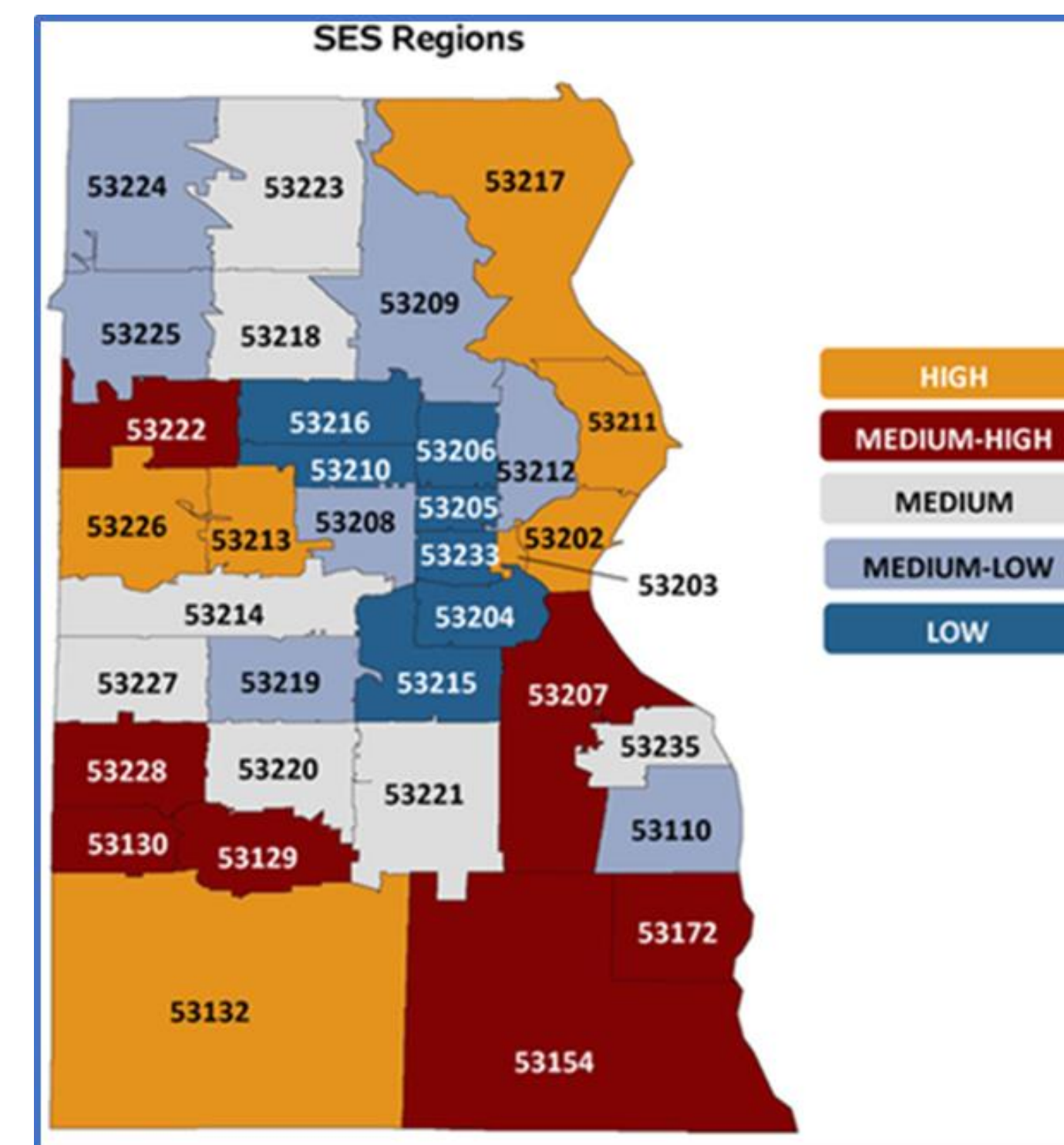


Table 1: SDH Rate for Milwaukee SES Groups VS State and US level

Characteristics	Milwaukee SES Groups			WI	U.S.	53206	53209	53210
	Lower	Middle	Higher					
Gender (%)								
Male	48.4	47.8	48.0	49.6	49.2	46.1	45.3	46.0
Female	51.6	52.2	52.0	50.4	50.8	53.9	54.7	54.0
Race								
White	30.9	67.3	79.6	86.2	72.4	1.6	25.2	18.8
Black	29.7	22.2	12.7	12.7	12.6	98.0	69.7	75.0
Poverty (FPL) (%)				10.8	13.5	42.2	28.2	30.2
Education								
<Than High school	30.9	15.6	7.6	12.9	17.1	38.1	25.4	26.3
High School	29.7	33.7	18.4	33.5	27.7	30.9	35.1	43.0
Some College	20.9	24.4	20.6	21.9	22.5	29.0	37.0	28.2
Assoc. Degree	5.1	6.8	5.9	7.7	6.5			
College	9.1	13.6	29.5	16.4	16.8	2.0	2.5	2.5
Graduate	4.2	5.7	18.1	7.6	9.4			
Ave House hold size	2.7	2.3	2.1	2.2	2.4	2.96 (7)		2.71
Housing by Renters (%)	61.7	44.8	46.4	31.9	34.9	64.3	49.1	58.6
Household Income (\$)								
Median	29,066	45,405	55,935	52,048	49,566	22,141	33,395	34,516
Mean	38,356	53,836	74,836	64,034	66,816	32,074	45,469	47,018

- Health access, poverty, hypertension, hyperlipidemia, diabetes, obesity, food insecurity, and obesity were identified as major concerns in target neighborhoods (Figures 2 and 3), which the community controlled with scarce resources (Figure 4).

Figure 2: Question 1. What health-related issues is your community experiencing?

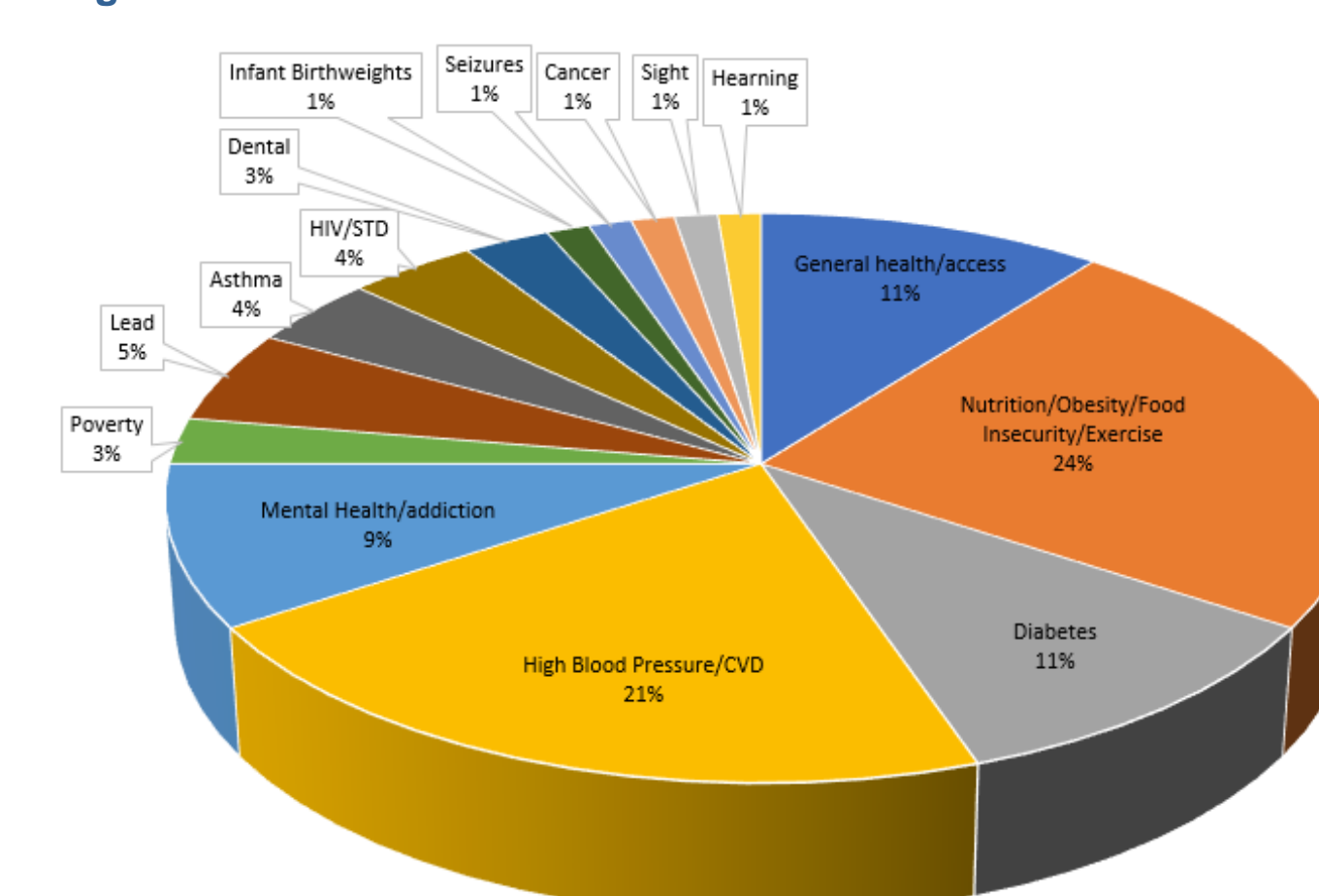


Figure 3: Q3 Which of the health issues are the most important?

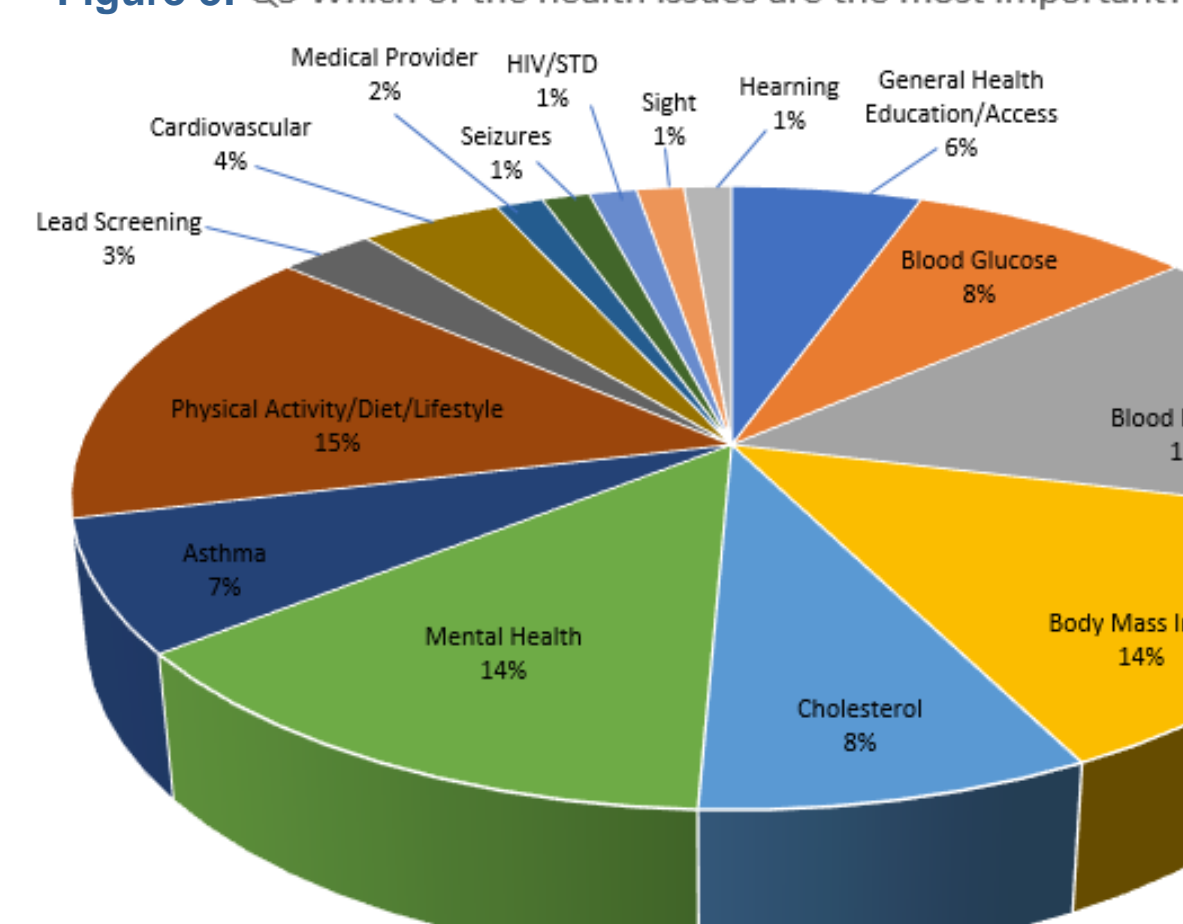
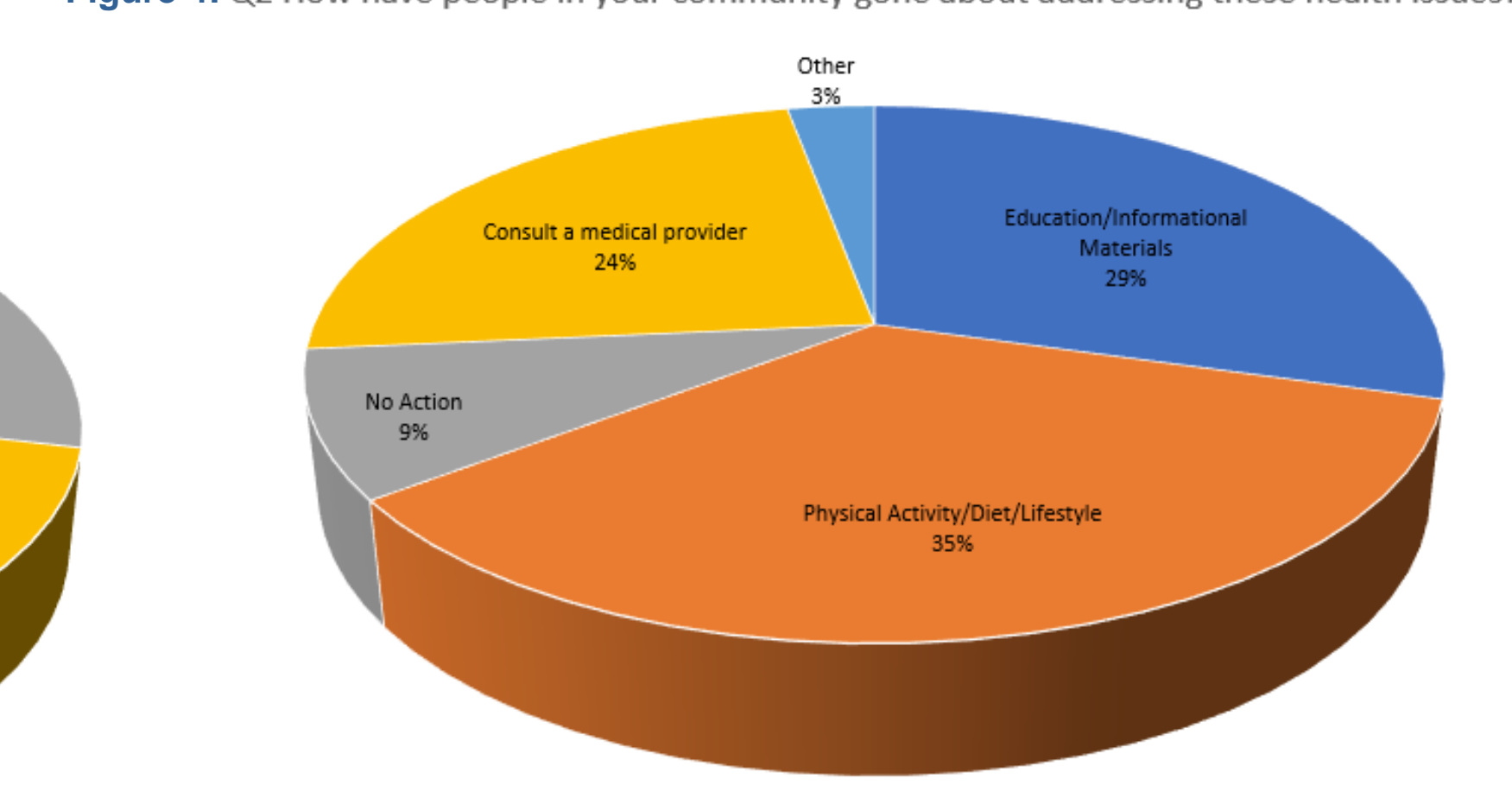


Figure 4: Q2 How have people in your community gone about addressing these health issues?




- Four initial screening protocols for CLIA waived point-of-care (POC) tests were developed based on community identified needs and current practice guidelines:

✓ Blood Pressure ✓ Blood Glucose ✓ Body Mass Index (BMI) ✓ Cholesterol

- Community health screening services were launched at Next Door in March 2019. Operational testing and participant satisfaction surveys results are shown in Table 2 and Figure 5.

Table 2: Post Client Encounter Satisfaction Survey



Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I will recommend the screening service to my friends...	0	0	0	10	90
I will return to the screening service	0	0	0	10	90
I know what I need to do after the visit	0	0	0	10	90
The conditions screened for (blood pressure, body...)	0	0	0	10	90
The information I received was helpful to me	0	0	0	10	90
I understood what the pharmacist was doing and why	0	0	0	10	90
The pharmacist made me feel comfortable	0	0	0	10	90
I understood the consent forms	0	0	0	10	90
The screening service was easy to find in the building	0	0	0	10	90
The building was easy to find	0	0	0	10	90



RESULTS

Table 3: Community Based Organization Partnerships

Next Door Family Services	MCW Saturday Clinic for the Uninsured
Free Clinic Collaborative	Bread of Healing Clinic
Greater Milwaukee Foundation (MCW Flourishing Lives)	Progressive Community Health Centers
MCW Center for Advancing Population Science	Columbia St Mary's Family Health
Outreach Community Health Center	YMCA

Table 4: Preliminary Community Health Screening Data

Number of Unique Clients	Number of Visits	Blood Glucose	Blood Pressure	Body Mass Index	Cholesterol
19	20	14	19	16	13

CONCLUSION

- Four leading CVD and chronic diseases including hypertension, hyperlipidemia, diabetes and obesity were identified as a major concern in target neighborhoods based on community engagement activities and surveys.
- Pharmacists can work to impact the health of a community in ways other than traditional dispensing roles through screening, education, and referral networks.
- Leveraging secondary data, current practice guideline data and proactive community engagement is imperative in the development, implementation of a culturally and linguistically appropriate community health screening program.
- Over the next several years, long-term economic, humanistic and clinical outcomes of the participants will be assessed.

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ACKNOWLEDGEMENTS

- This project is made possible by a generous gift from John and Maggie Raymond to the Community Health and Service Learning Fund.
- The authors would like to recognize the guidance and support of George E. MacKinnon III, Ph.D., M.S., R.Ph., Founding Dean of the MCW School of Pharmacy, in the inception, planning, and implementation of this project.

Mistrust, the Obstruction of Medicine: Repairing the Breach between Medical Research and the African-American Community in Milwaukee

Abdul-Ghaffaar Clark¹, Mikel Holt², Deborah Thomas³, Clarence Thomas³, Anne Mathias⁴, Ryan Spellecy⁵

1 Medical College of Wisconsin, 2 Black Research Organization, 3 House of Grace Ministry, 4 MCW Cancer Center, 5 MCW Center for Bioethics & Medical Humanities

Introduction

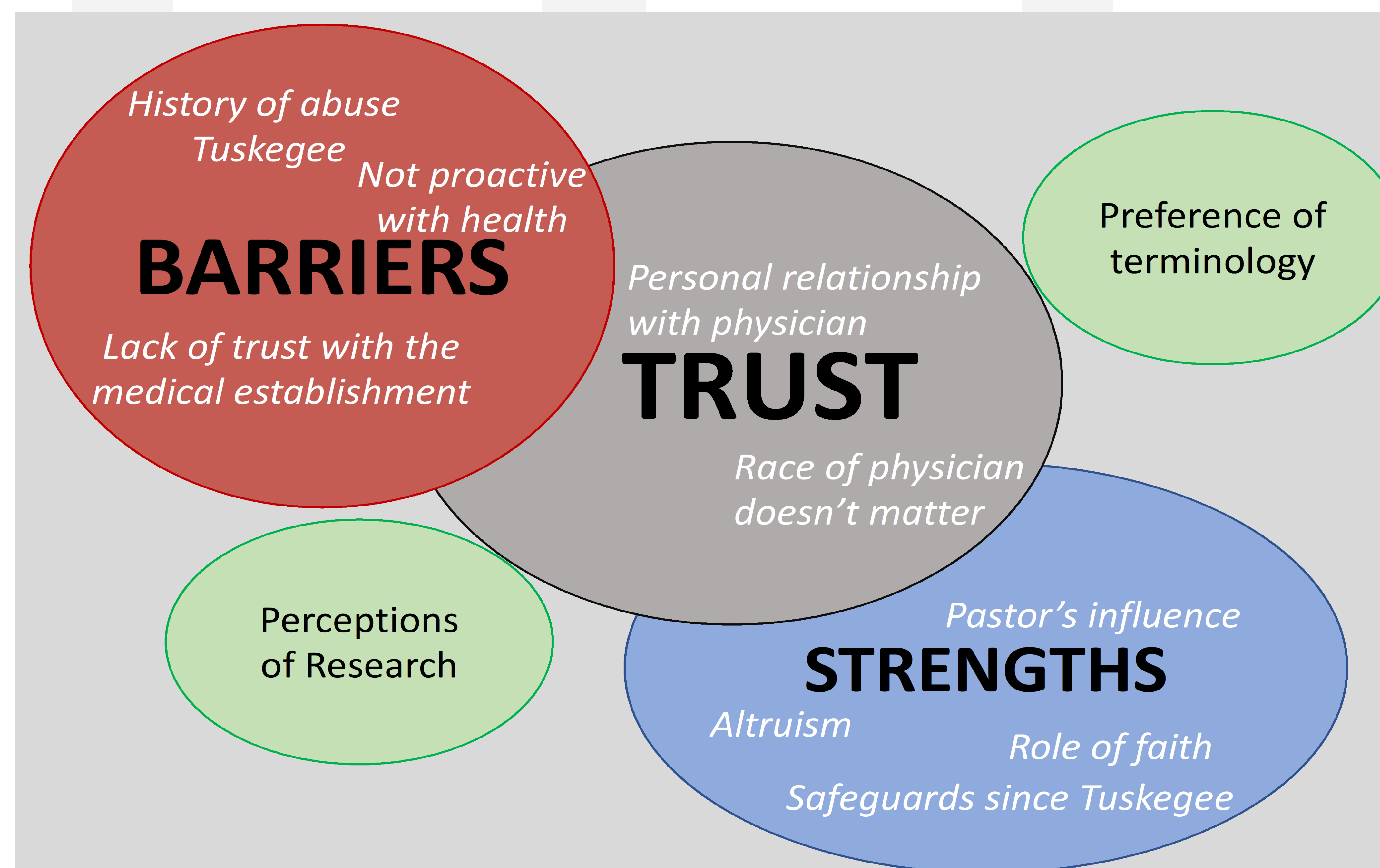
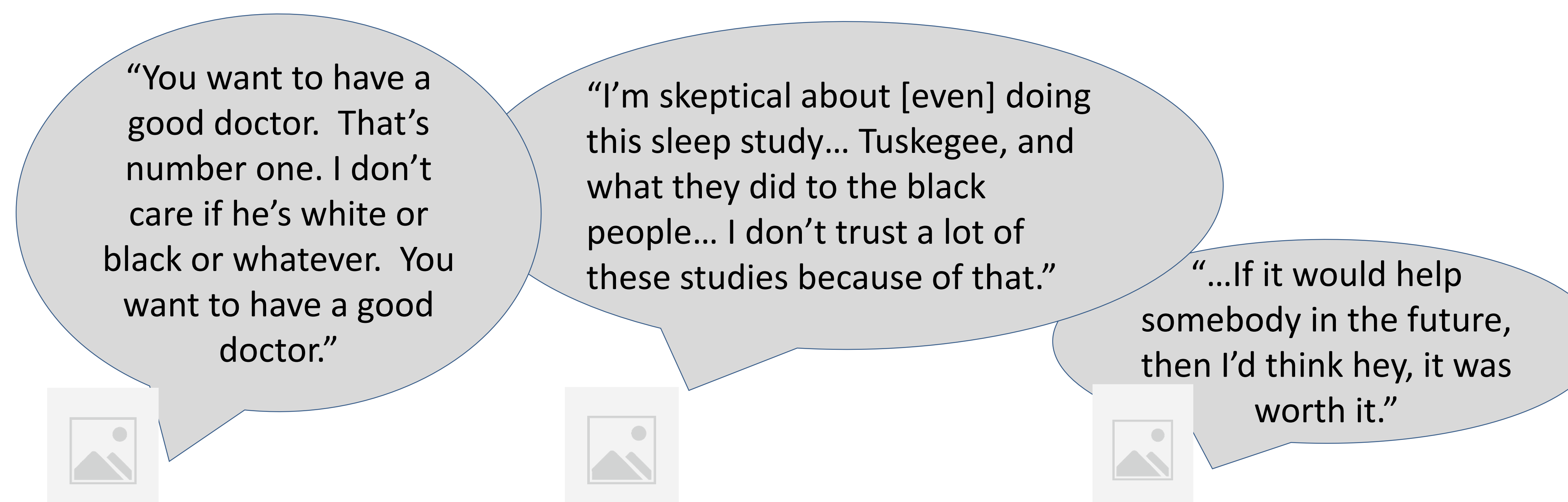
It is well known that participation rates in cancer clinical trials among African-Americans both nationally (Team, Gohagan, Prorok, Hayes, & Kramer, 2000) and in Milwaukee are unacceptably low. While the reasons for this have been documented in other regions, (Blocker et al., 2006; Robinson, Ashley, & Haynes, 1996) in Milwaukee they are currently unknown. Until the reasons for low participation among African-Americans in Milwaukee are known, attempts to increase participation will be uninformed and unsuccessful, as they will not address the root causes and - in turn - will fail to ameliorate cancer care inequalities that stem from a lack of research, as in prostate cancer among African-American males.

Study Aims

- **AIM 1:** Document the perceptions of the African-American Community in Milwaukee regarding cancer clinical trials, including reasons against participating in said trials.
- **AIM 2:** Document the factors or strengths in the African-American Community in Milwaukee that would positively influence their willingness to participate in cancer clinical trials.

Methods

- We conducted 3 focus groups with a goal of 8 subjects each, recruited via our network of churches.
- Audio recordings were transcribed and coded with two coders reconciling any disagreements between them.
- The coded transcripts were brought to the rest of the team for further reconciliation.
- The themes of the barriers and strengths of the community were thus identified, as well as any other salient themes.



Results

The transcripts revealed several themes, which were independently expressed by members of among different focus groups. The following findings were reported as either barriers to participation in clinical trials or strengths that would positively influence participation:

- ❖ Lack of trust of medical research was described as a barrier, due to the history of abuse, especially relating to the “Tuskegee Study of Untreated Syphilis in the Negro Male,” by the U.S. Public Health Service.
- ❖ The influence of faith as well as the Pastor’s recommendation may increase participation in clinical trials.
- ❖ The majority of participants expressed that race of physician does not effect trust, although a minority expressed a preference for an African-American physician.
- ❖ African-Americans not being proactive with their health was described as a barrier.
- ❖ The lack of background medical knowledge to understand goals of clinical trials and the lack of understanding of informed consent were described as barriers.
- ❖ A strength promoting participation was an eagerness to help the next generation of all people or to help increase medical treatment specific to African-Americans.

Discussion

- ❖ Historic mistrust of the healthcare establishment is a barrier to research participation, but sincere, genuine personal relationships with physicians can generate trust. Trust may be gained on a personal level between patient and provider, which has the potential to foster trust in the medical establishment overall.
- ❖ Faith and leaders of religious communities may be strong allies in change.
- ❖ Continuous community engagement providing cancer awareness is openly desired. This increased presence and availability is necessary to generate trust and may also encourage community members to take a more proactive role in their healthcare.

Future Directions

- ❖ After we disseminate our findings to the local community, as well as local and national academic settings, we intend to leverage this qualitative research project to inform an intervention that can be tested through an NCI R21 grant - to design, build, and deliver effective interventions that remove barriers to clinical trial participation.
- ❖ One of our overarching goals is to increase participation in cancer clinical trials in an effort to better provide cancer treatment services to local communities.
- ❖ Another goal of our efforts is for our findings to serve as a resource for the implementation of other such programs in other communities nationwide.

Acknowledgments

- ❖ Community stakeholders - Pastors United Milwaukee
- ❖ Funding and support by MCW Cancer Center

MCW ENGINEERING LAB

The MCW Engineering Lab team designs, fabricates, and maintains medical research equipment. These research instruments are wide ranging and include systems such as an economical off-gel for protein separation (fig. 1), a negative airway measurement system (fig. 2), an implantable electrical stimulator (fig.3), and a patient-specific 3D basilar aneurysm model (fig. 4).

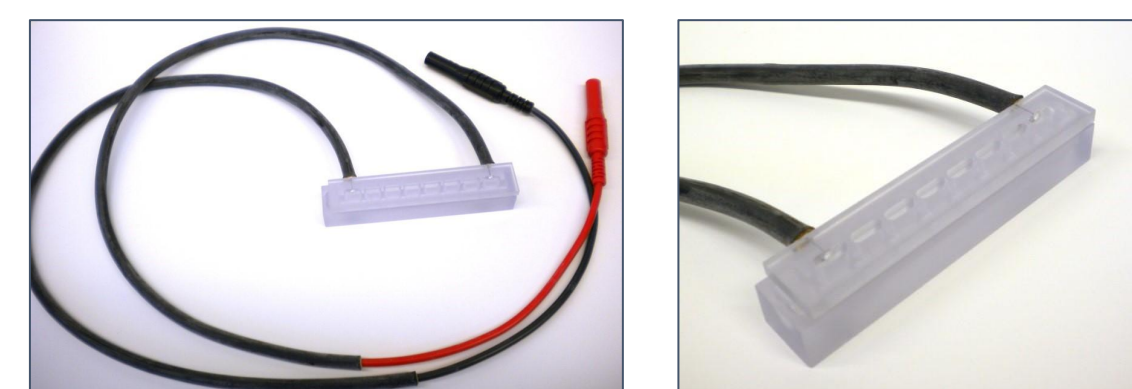
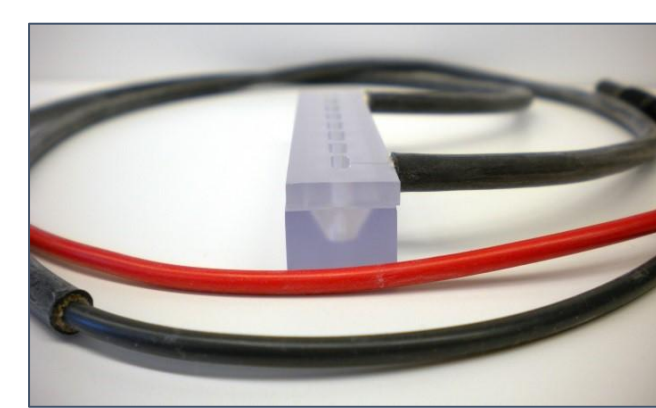


Figure 1: Protein separation off-gel system designed to separate proteins by isoelectric point

Figure 2: Negative pressure airway system for modeling the collapsibility of the human airway in sleep apnea

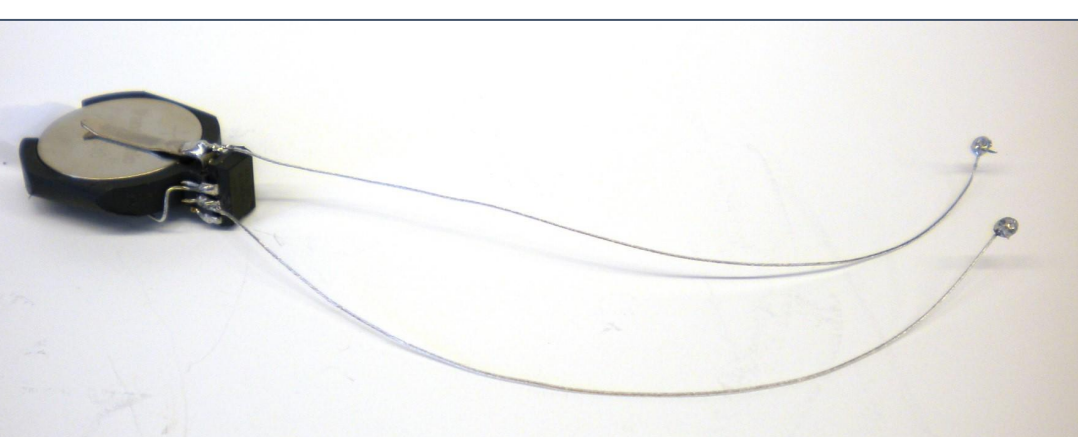


Figure 3: Implantable muscle stimulator for the study of angiogenesis or new blood vessel growth

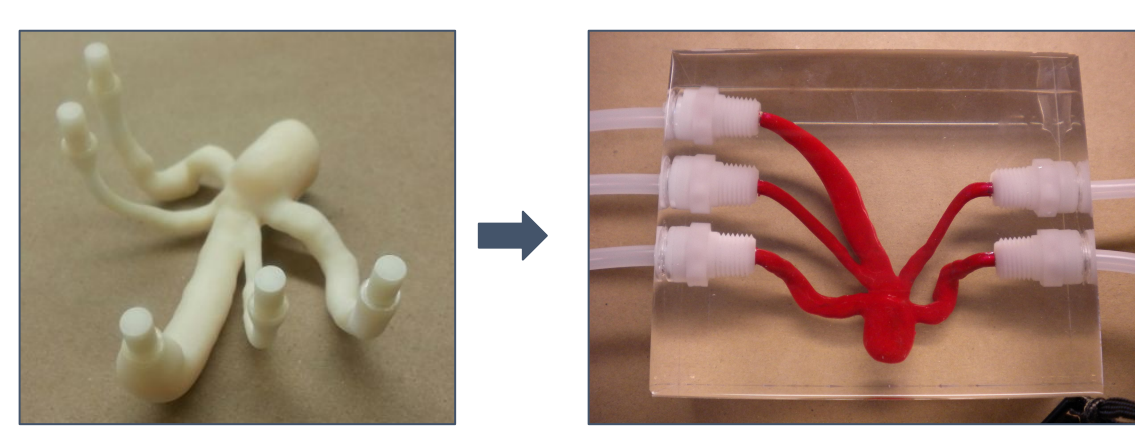


Figure 4: Patient-specific 3D basilar aneurysm model printed from clinical CT data (3D printed models are used to develop computational fluid dynamics (CFD) simulation flow models)

In addition, the MCW Engineering Lab machines custom devices, develops novel prototypes, produces 3D models for teaching and clinical applications, and designs and implements computerized data acquisition systems in support of MCW's research effort.

INTRODUCTION

For many patients with arthritis, treating pain is important to help them live a more fulfilling life. An important step to developing effective analgesic treatments is to use a method to quantify arthritic pain in experimental animal models that accurately represents human arthritic pain. A force forceps system was designed and fabricated to provide a method of testing that produces quantifiable data in the assessment of pain. The force forceps were modeled after the existing system from *Two Variables that can be used as Pain Indices in Experimental Animal Models of Arthritis*¹.

PROJECT GOAL:

The goal of this project was to design, fabricate, and test a force forceps system that is capable of converting an output voltage from a bridge circuit to grams of force as a method to quantify arthritic knee pain in rats.

METHODS & RESULTS

The force forceps system consisted of two strain gages physically attached to opposite sides of the forceps and electrically wired to a bridge circuit. The bridge circuit also contained two 350Ω resistors on the opposite side of the strain gages. The DMD-465 signal conditioner (Omega Engineering) is then used to amplify the signal and a multimeter (Fluke model 26III) is used to measure the change in voltage.

To calibrate the instrument, a series of calibration weights were hung from each of the strain gages. Three trials per side per weight were run and the results were graphed (fig. 6 and fig. 7).

A constant linear increase was seen on side A while a constant linear decrease was seen on side B. This combination produces a larger difference in resistance which results in a larger, more accurate output voltage.

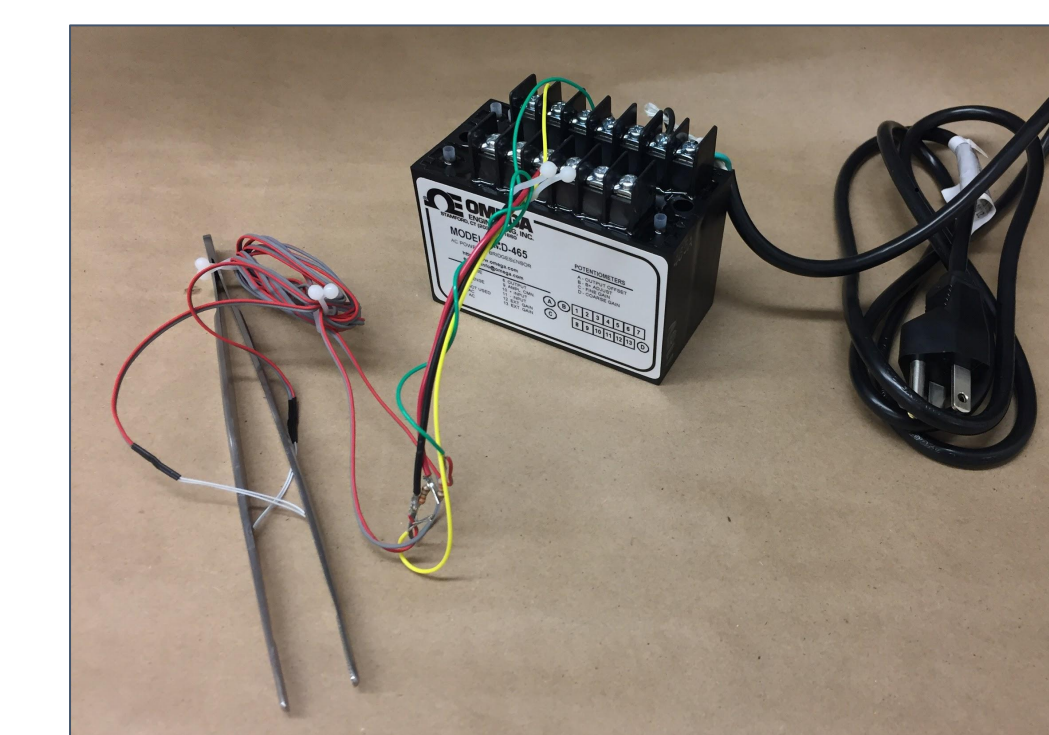
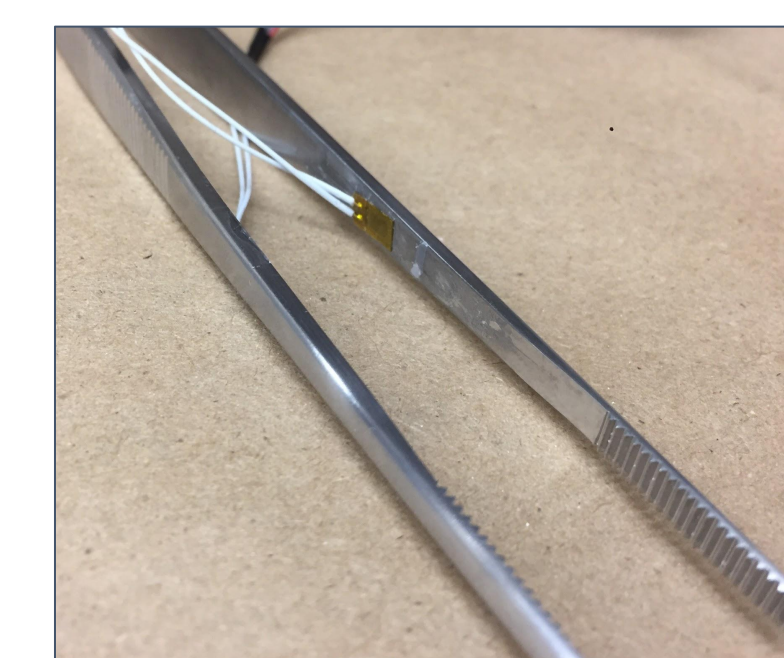


Figure 5: Force forceps system

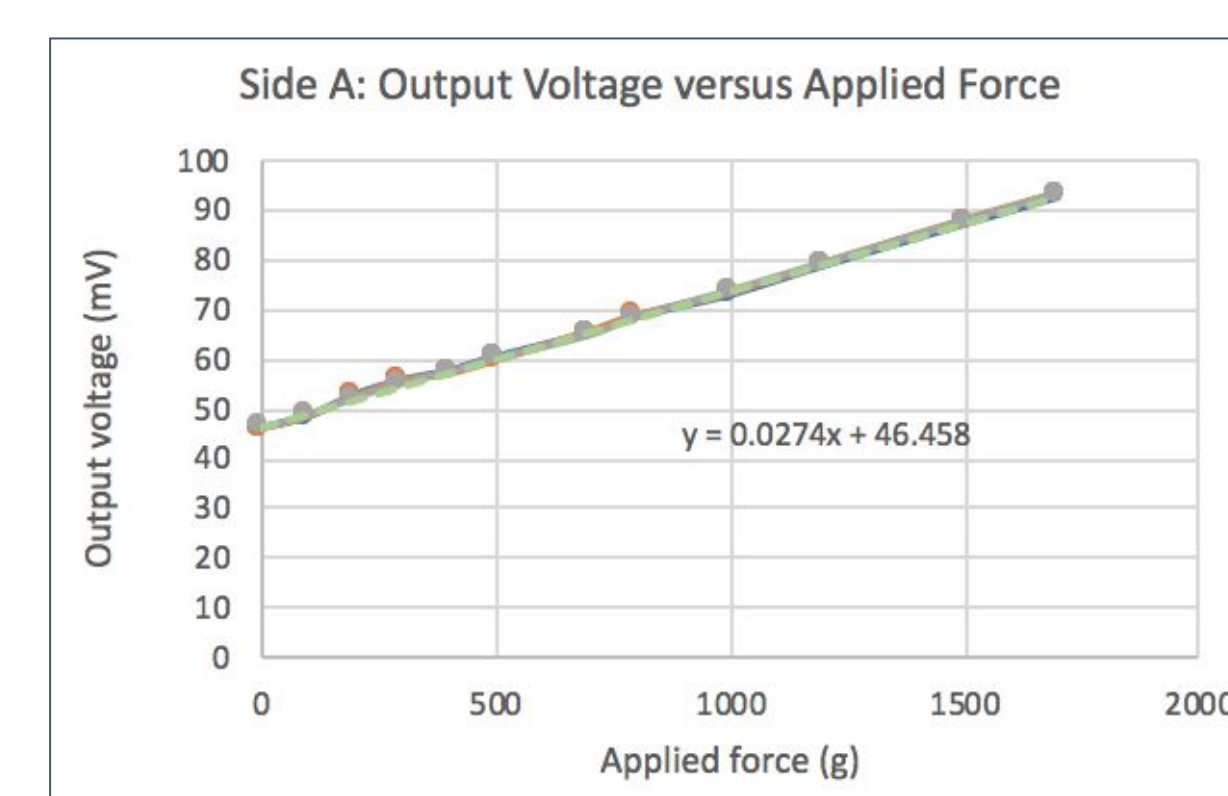


Figure 6: Graph of the results from testing on side A

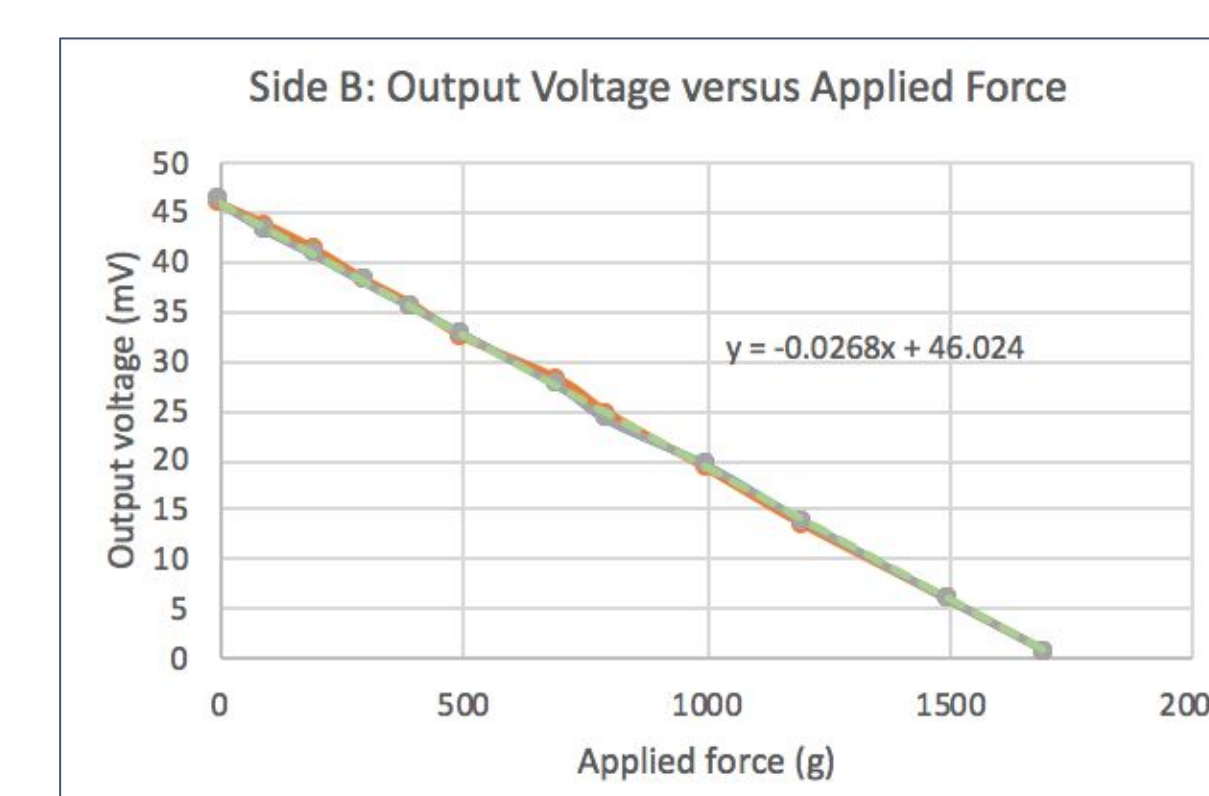


Figure 7: Graph of the results from testing on side B

CURRENT STATUS

The force forceps system has been fabricated, calibrated, and tested for reproducibility. It is able to produce a predictable output in the range from 0-1,750 g of force.

The resulting system will provide a method to quantify the assessment of pain for researchers who are currently studying arthritic knee pain in the rat model.

FUTURE DIRECTIONS

- The wiring and all electrical components will be installed in a housing to make the system safe for the user and prevent damage to system components.
- A power switch will be added to allow the user to turn the system on or off.
- A portable case will be designed and fabricated to enclose and protect the force forceps system.
- Measurement and calibration instructions will be written for the end user.
- The system will be sent to the Hogan Lab for additional testing.
- A fabrication report will be generated.

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¹Cho Yu, Yun & Koo, Sungtae & Hoon Kim, Chang & Lyu, Yeoungsu & J Grady, James & Mo Chung, Jin. (2002). Two variables that can be used as pain indices in experimental animal models of arthritis. *Journal of Neuroscience Methods*. 115(1), 107-113. doi: 10.1016/S0165-0270(02)00011-0.

Acknowledgements:

Support for SUPREMES has been provided by the Department of Biomedical Engineering at the Medical College of Wisconsin and Marquette University, as well as the Children's Hospital of Wisconsin Foundation and the Children's Research Institute award (CRI 17-327 BRH). I would like to thank Dr. Quinn Hogan's lab for the opportunity to work on the force forceps system and Bonnie P. Freudinger, ME for her mentorship and guidance.

ABSTRACT

Amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease, is a neurodegenerative disorder affecting approximately 30,000 Americans. In ALS, motor neurons in the brain and spinal cord degenerate, causing progressive paralysis and death within 3-5 years. While two therapies are approved for the treatment of ALS, neither is a cure. Therefore, much work is still needed to be done in order to understand the disease progression and identify drugable targets. However, since most cases occur without a family history, what triggers disease development is unclear, which has made modeling ALS in the lab challenging. Through MCW's SUPREMES high school outreach program, I am assisting with research in the Ebert Lab using induced pluripotent stem cells (iPSCs) to model ALS. iPSCs are made by genetically manipulating patient blood cells to revert them to a primitive state. Once reprogrammed, we can use various compounds to produce any cell type, including the motor neurons affected by ALS. In the present study, we generated iPSCs and then motor neurons from identical twins, one with ALS and the other in good health. We then sought to identify any differences between the twins' motor neurons in their survival, morphology, and molecular processes that might explain the development of ALS. While we found no differences in survival or morphology, we found that the affected motor neurons have decreased expression of proteins important for maintaining molecular health and preventing cellular toxicity. We are now investigating how this change contributes to motor neuron loss and disease pathology.

METHODS

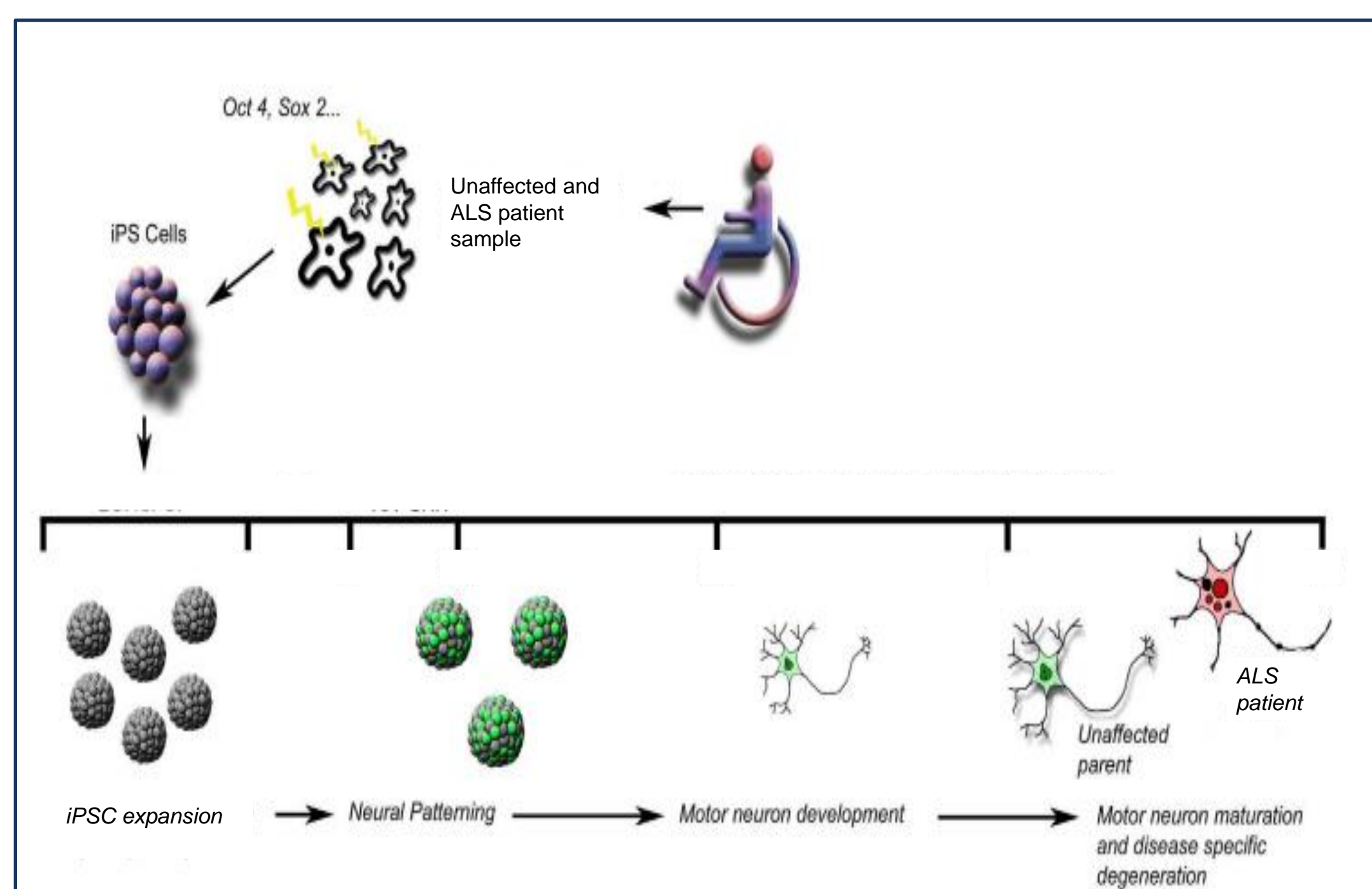


Figure 1. iPSCs were generated from peripheral blood mononuclear cells collected from identical twins discordant for ALS. Once reprogrammed, iPSCs can be differentiated into all cell types of the body by mimicking natural developmental cues. For this study, the iPSCs were differentiated into motor neurons, the affected cell type in ALS.

RESULTS

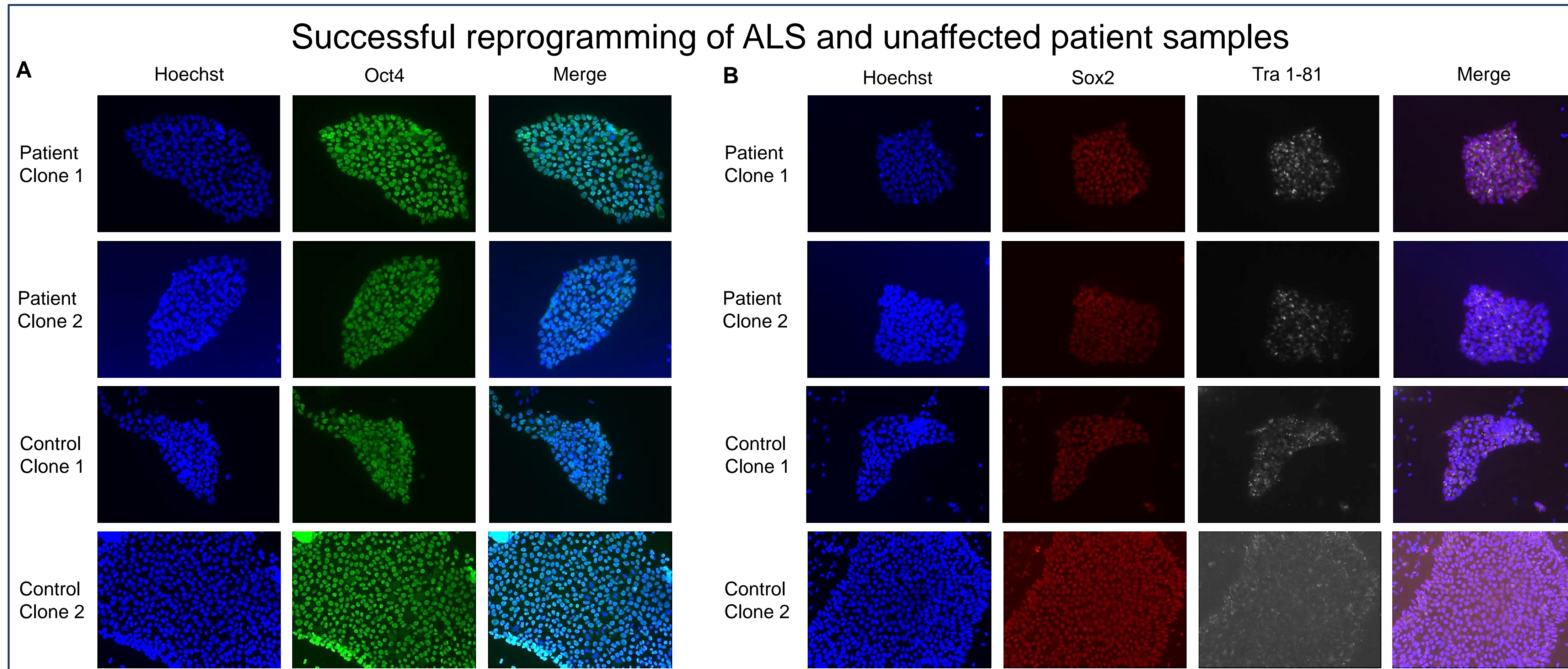


Figure 2. To confirm that iPSCs were reprogrammed, putative colonies were stained with Oct4 (A) and Sox2 and Tra 1-81 (B), proteins that are expressed in pluripotent cells. The nuclei are stained with Hoechst dye to indicate cellular location.

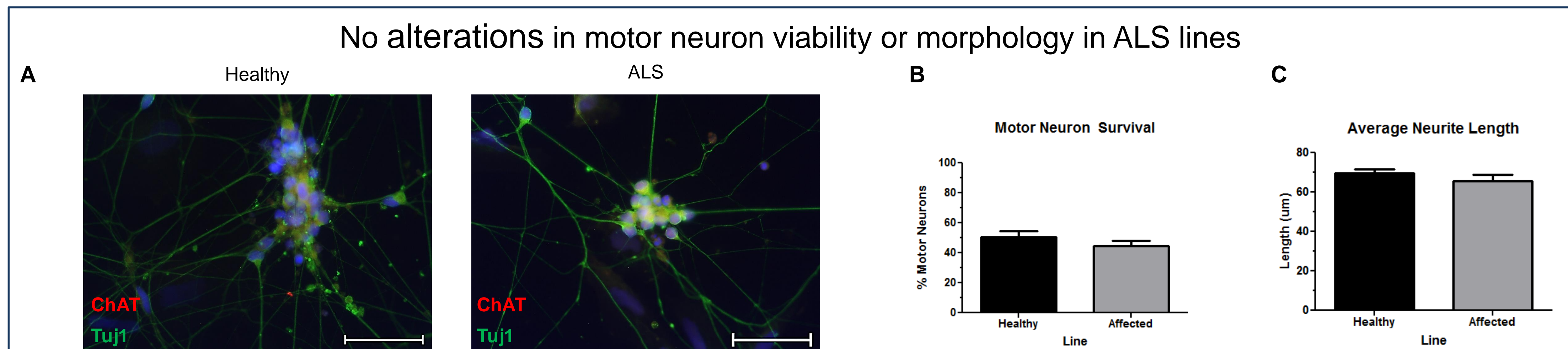


Figure 3. (A) Motor neuron cultures were stained for Tuj1 (green), a pan-neuronal marker, and ChAT (red) and Islet1 (white), both specifically expressed by motor neurons. (B) Viability was assessed by counting the number of ChAT+ cells and dividing by the total number of cells (Hoechst+). (C) Morphological changes were determined by measuring the length of the neuron projections.

ALS motor neurons show evidence of decreased molecular health

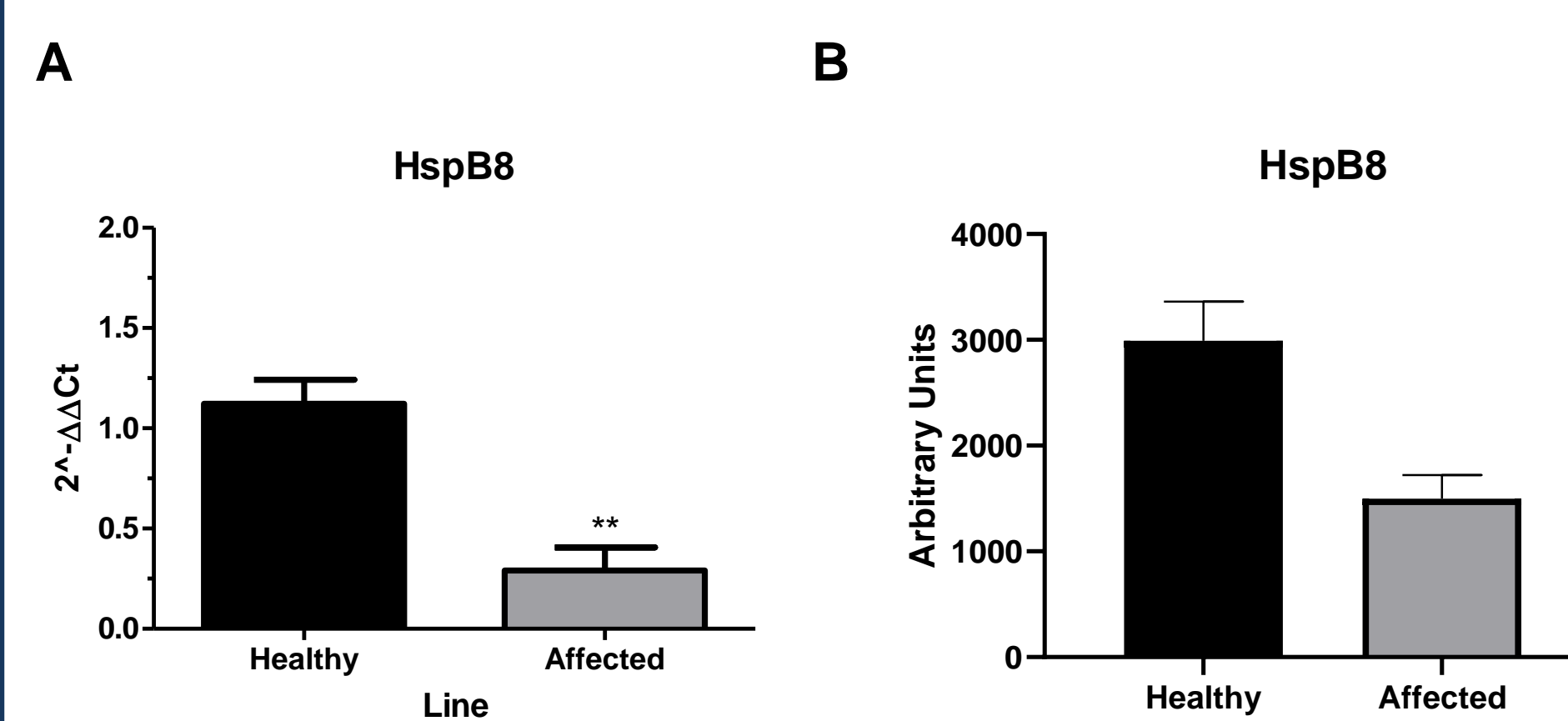


Figure 4. Expression level of HspB8 transcript (A) and protein (B) by qPCR and western blot, respectively. Heat shock proteins normally function to prevent protein aggregation, which is a common feature in ALS motor neurons.

SUMMARY

We have shown that blood cells collected from identical twins discordant for ALS were successfully reprogrammed into iPSCs. These iPSCs were then differentiated into motor neurons that have equivalent viabilities and morphologies. However, we have found that the affected motor neurons have decreased expression of HspB8, an important chaperone protein that has previously been implicated in ALS and other motor disorders. We are now investigating how this reduction in HspB8 levels contributes to motor neuron death and disease pathology.

FUNDING/ACKNOWLEDGMENTS

- Quadracci Memorial Fund
- Phoebe Lewis Regenerative Medicine Fund
- Jeschke Endowed Medical Student Summer Research Program Scholarship Fund
- National Institute on Aging Training Grant T35AG029793 (Meurer)
- SUPREMES Program

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INTRODUCTION

Human cytomegalovirus (HCMV) is the leading cause of viral-mediated birth defects in the United States with the most common being hearing impairment. Nitric oxide (NO) is a free radical produced by immune cells in response to infection by inducible nitric oxide synthase (NOS2). Preliminary data from our lab suggest that NO reduces viral DNA synthesis and virion production starting at 24 hours post infection (hpi). However, these data were obtained by serum starving the cells to synchronize the cell cycle for infection and using a high multiplicity of infection (MOI) in which all the cells in the dish were infected. Here, we sought to determine if a low MOI and growth arrested cells would yield similar results observed during high MOIs. Similar to past results, we found that viral DNA levels are reduced during high MOI. We also found that infectious virion production was reduced in DETA/NO treated groups during low MOI. We hypothesize that NO inhibits HCMV DNA replication only at high MOIs, and inhibits virion production at both high and low MOIs.

BACKGROUND

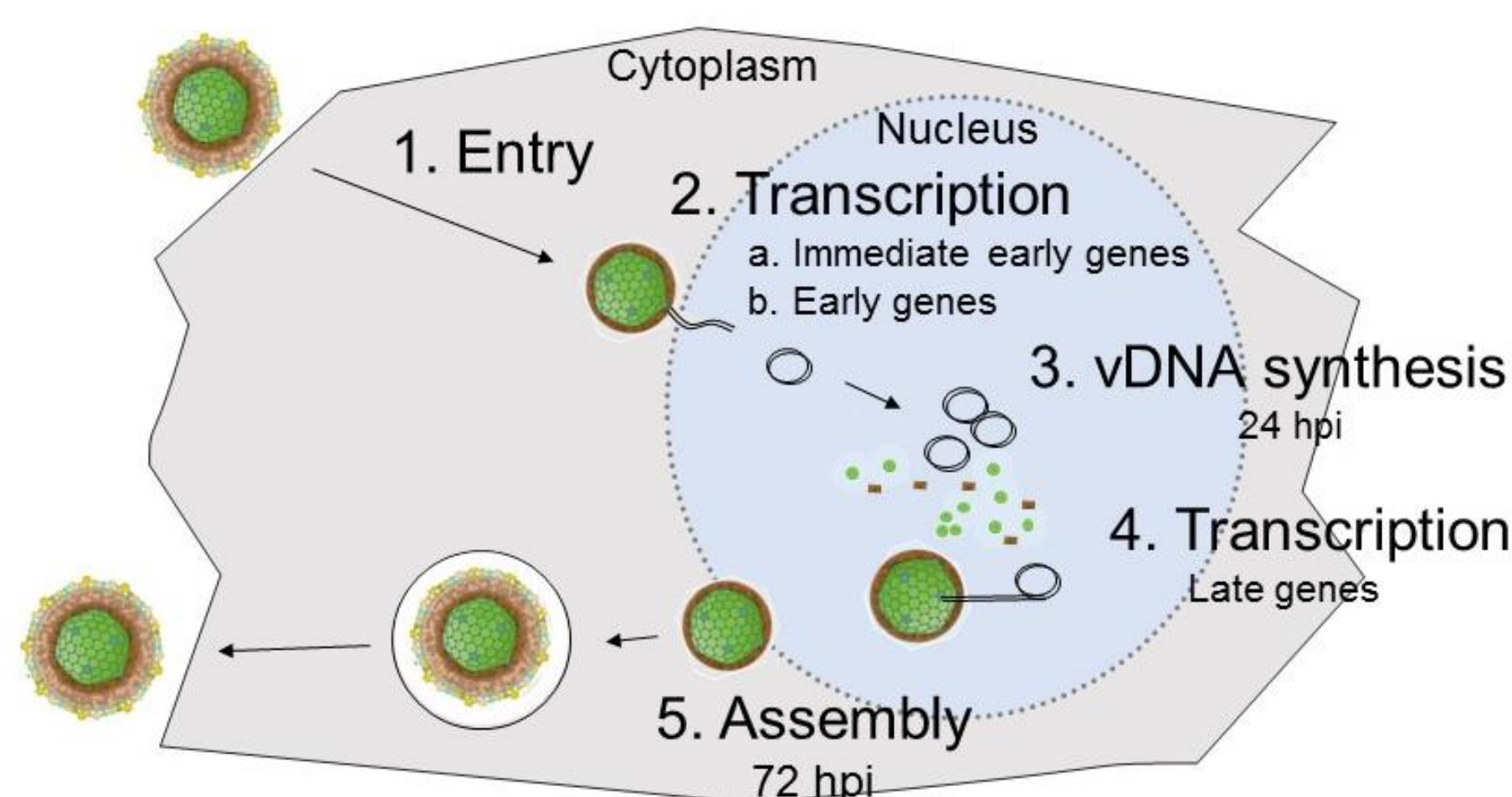


Figure 1. Diagram of HCMV replication cycle. Viral particles enter the cell and inject viral DNA into the nucleus through the nuclear pore complex (1). Immediate early gene and early gene expression (2) result in the disruption of cellular transcriptional repressors allowing for the onset of viral DNA synthesis around 24 hpi (3). Late gene expression is dependent on viral DNA synthesis and is required to form the virion and facilitate nucleocapsid exit via nuclear lamina breakdown (4). Virion assembly occurs at approximately 72-96 hpi (5), and viral particles begin cellular exit.

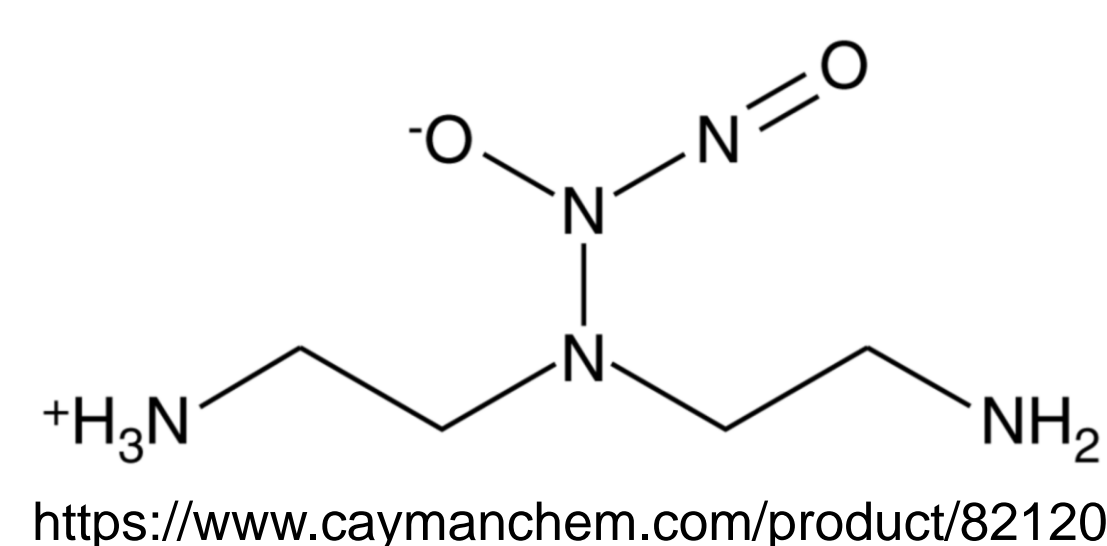


Figure 2. Diethylenetriamine NONOate (DETA/NO). Nitric oxide donor used in our experiments. NO spontaneously dissociates in a pH and temperature dependent manner.

RESULTS

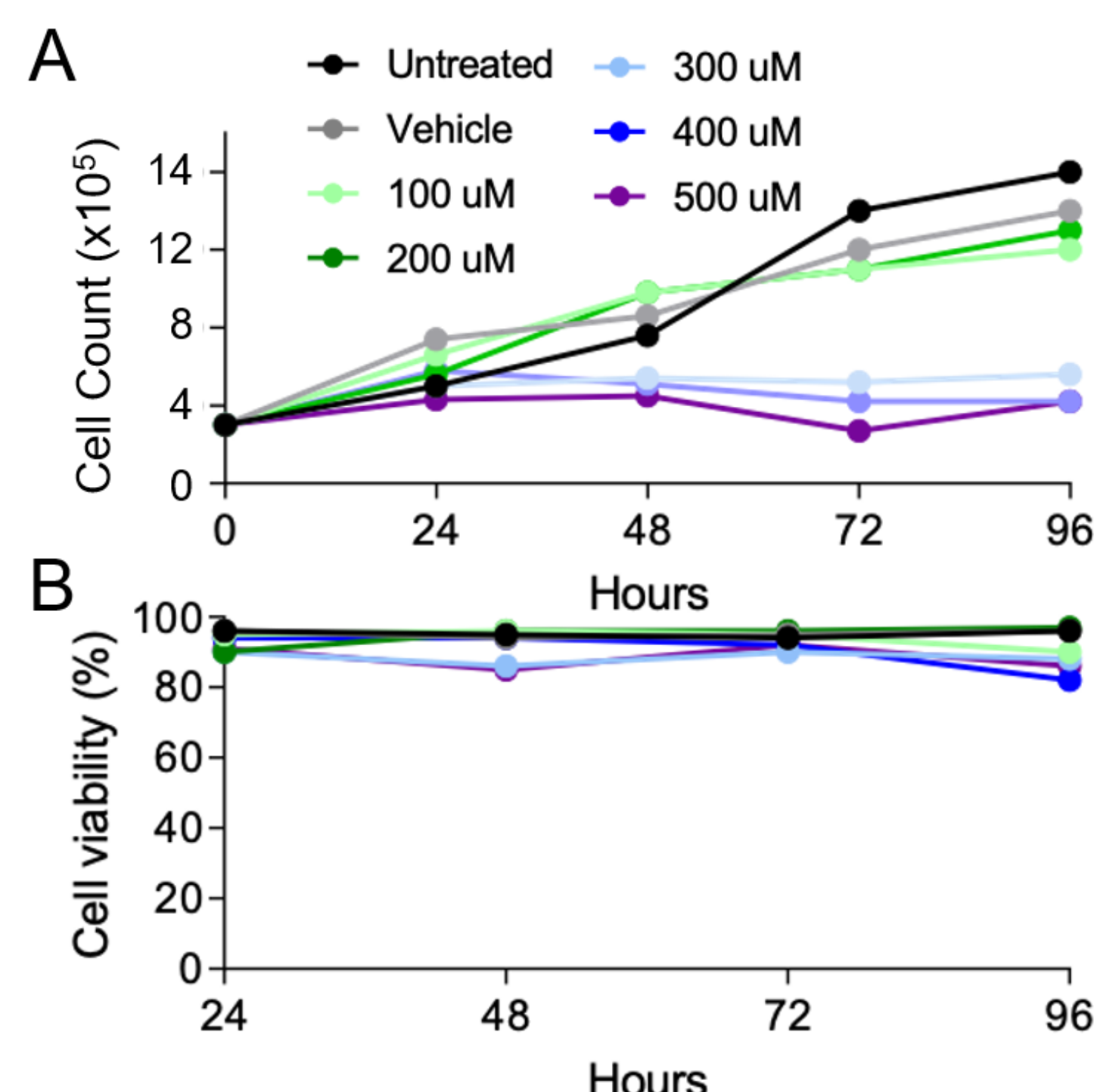


Figure 3. Cell Viability Assay. (A) MRC5 fibroblasts were plated in a 6 well plate. The cells were left untreated, treated with vehicle, or varying concentrations of DETA/NO as indicated in the figure. The treatments were changed every 24 hours. Cells were counted at 24, 48, 72, and 96 hpi using an automated cell counter. (B) Cells were assessed for viability using trypan blue exclusion assay.

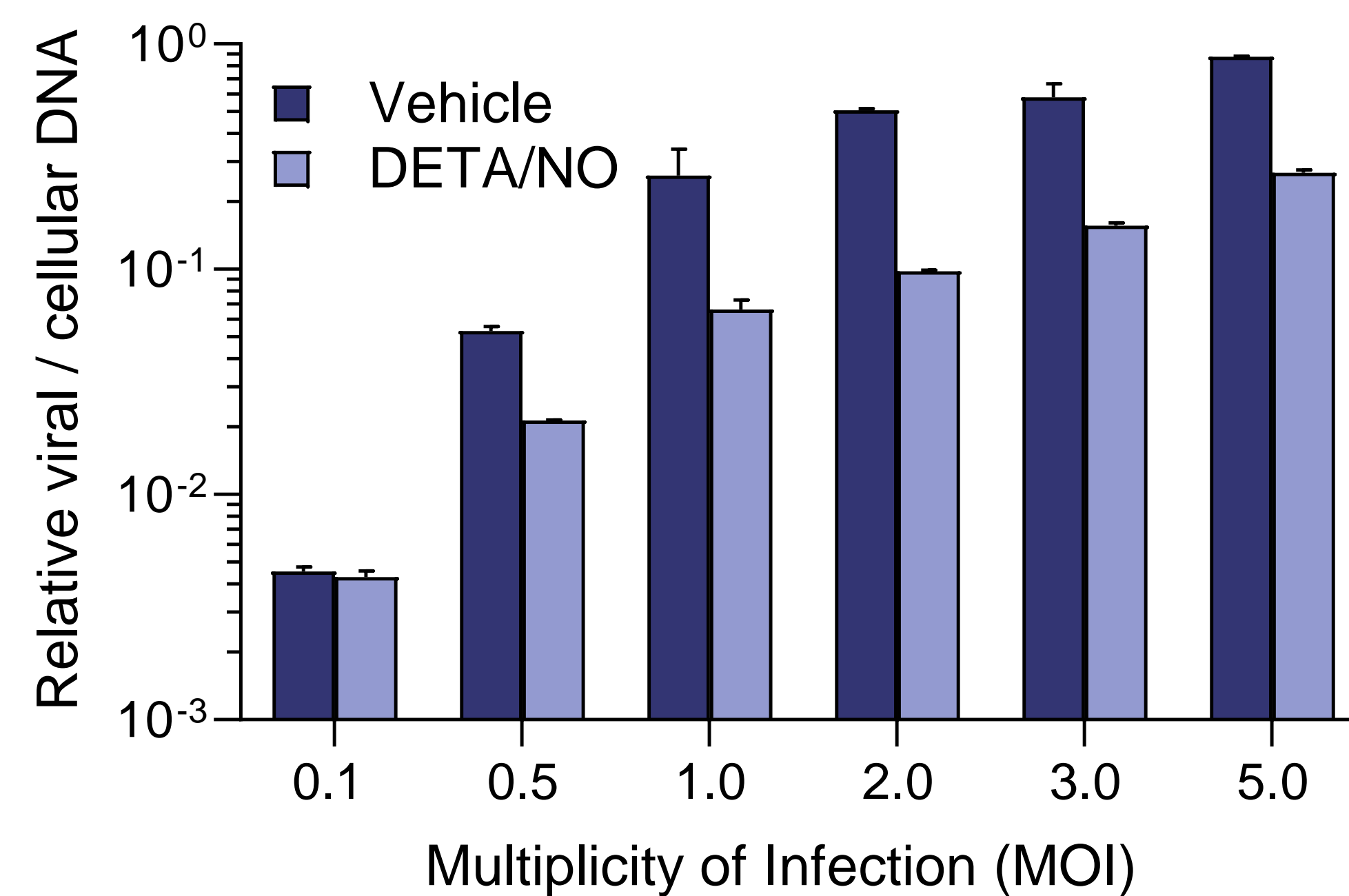


Figure 4. Viral DNA levels are decreased in infections with MOI greater than 0.1 during nitric oxide treatment. MRC5 fibroblasts were plated and allowed to grow to confluency. Cells were infected with various multiplicities of infection (MOI) and treated with 500 μ M DETA/NO or vehicle at 2 hpi. Whole cell lysates were collected at 24 hpi, and DNA was isolated. Relative viral/cellular DNA levels were assessed using quantitative PCR (qPCR) with primers to UL123 and p53. Data represent two technical replicates.

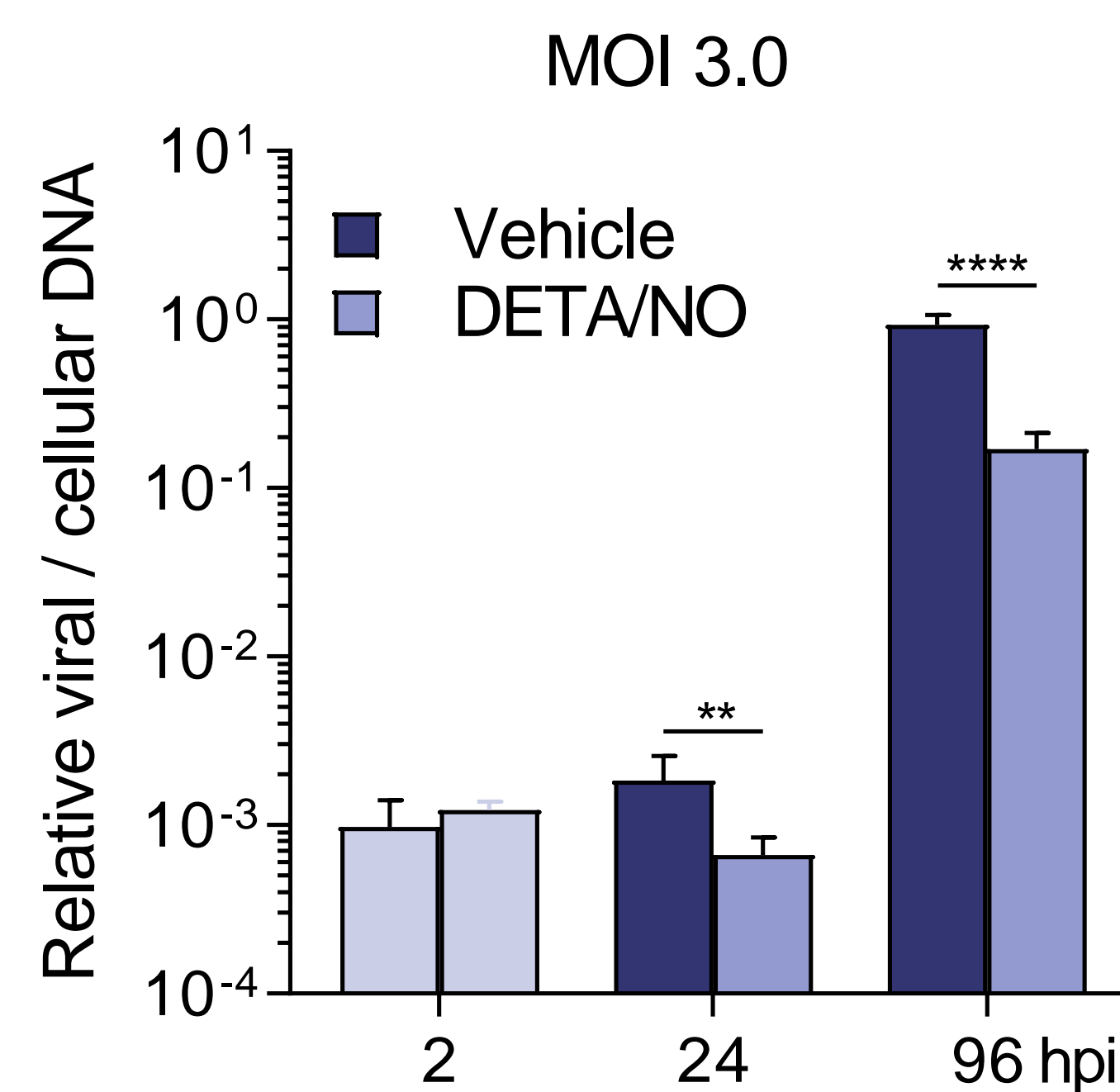


Figure 5. Viral DNA levels are decreased at 96 hours during nitric oxide treatment. MRC5 fibroblasts were plated as described in Figure 4 and infected with a MOI of 3 IU/cell. Cells were treated with vehicle or 500 μ M DETA/NO at 2 hpi and every 24 hrs. Whole cell lysates were collected at the timepoints indicated and DNA was isolated. Relative viral/cellular DNA levels were assessed as indicated in Figure 4. Data represent three biological replicates and two technical replicates.

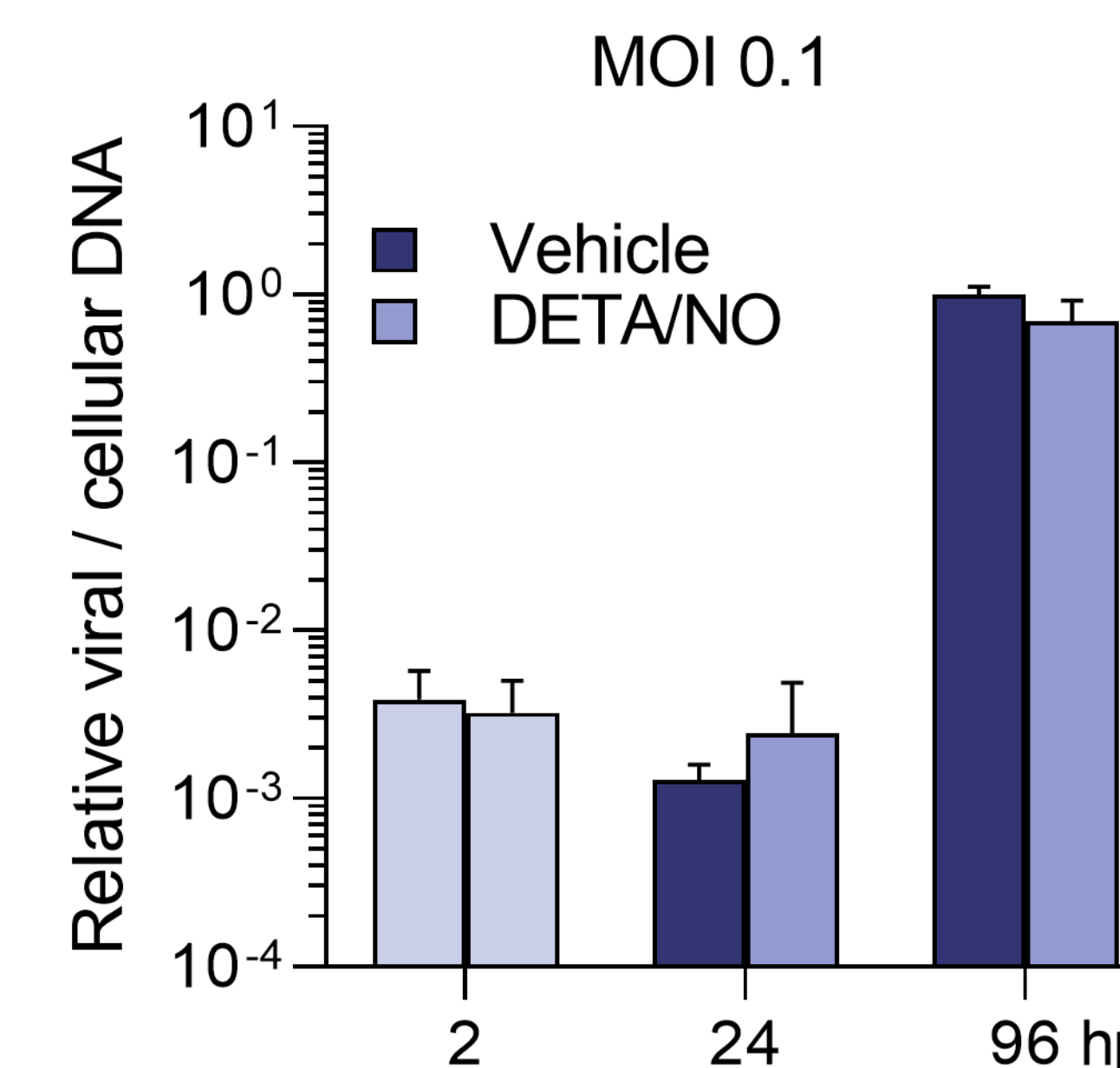


Figure 6. Viral DNA levels are not decreased in a low MOI during nitric oxide treatment. MRC5 fibroblasts were plated as described in Figure 4 and infected with a MOI of 0.1 IU/cell. Cells were treated as described in Figure 5. Whole cell lysates were collected at the timepoints indicated and DNA was isolated. Relative viral/cellular DNA levels were assessed as indicated in Figure 4. Data represent three biological replicates and two technical replicates.

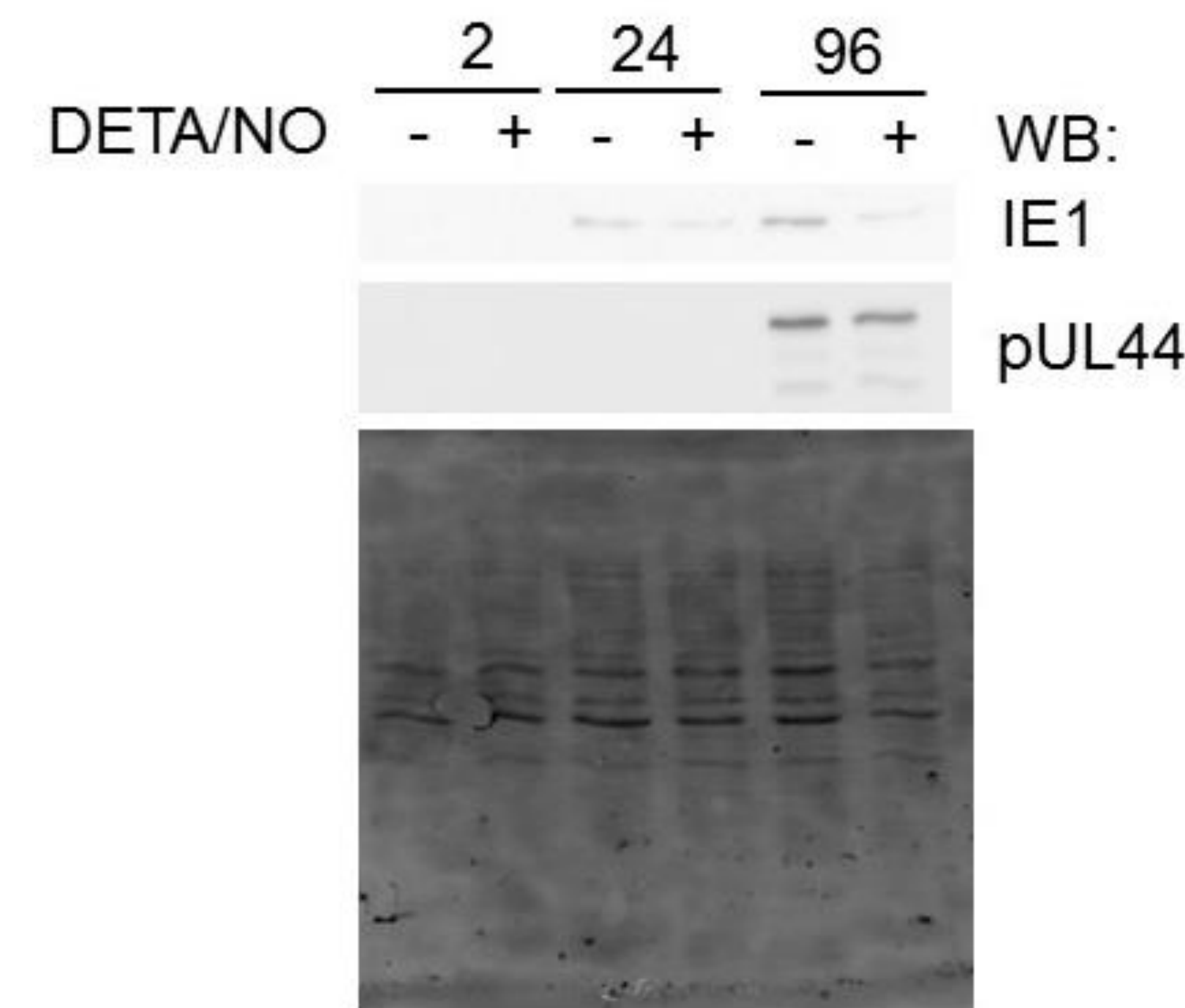


Figure 8. Immediate early viral protein levels are not reduced during nitric oxide treatment. MRC5 fibroblasts were plated, infected, and treated as described in Figure 6. Whole cell lysates were collected at the timepoints indicated, 20 μ g of total protein was loaded, and Western blot analysis was performed with the indicated antibodies.

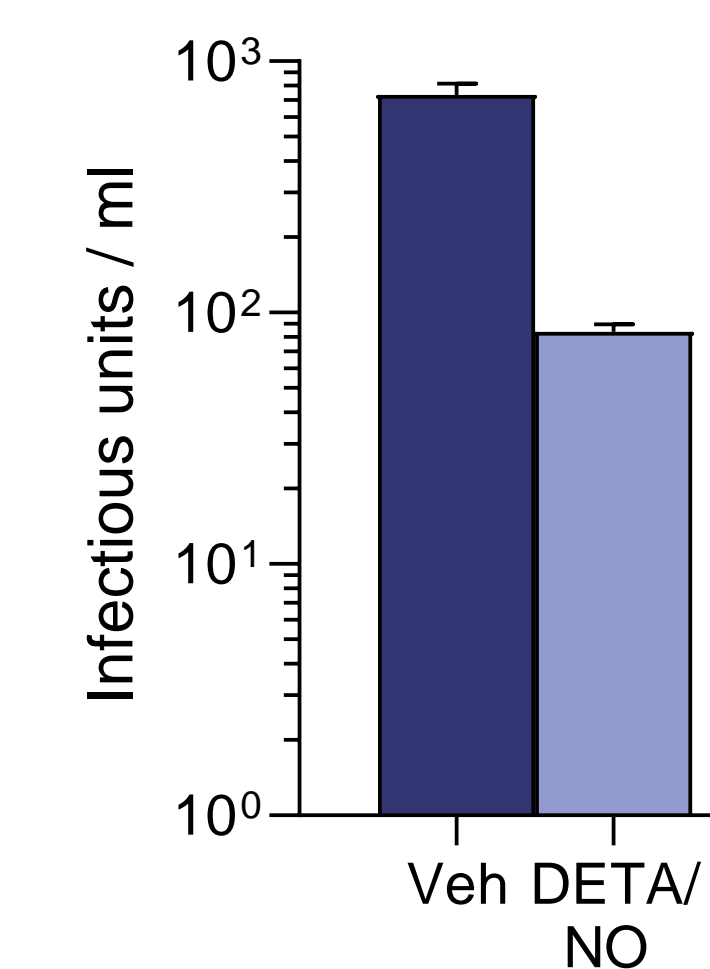


Figure 9. HCMV titers are reduced in a low MOI during nitric oxide treatment. MRC5 fibroblasts were plated, infected, and treated as described in Figure 6. Viral media was collected from cells at 96hpi, and viral titers were quantified using an infectious units assay. Data represent one biological replicate and two technical replicates.

CONCLUSIONS

1. DETA/NO appears to decrease viral DNA levels at 24 hpi using growth arrested cells during a high MOI.
2. Viral DNA levels are not affected by DETA/NO treatment during low MOI.
3. There is no visible difference in the GFP spread during DETA/NO treatment in a low MOI.
4. Infectious titers are reduced by one-log during DETA/NO treatment when compared to vehicle.
5. We hypothesize that nitric oxide inhibits HCMV DNA replication only at high MOIs, and inhibits virion production at both high and low MOIs.

ACKNOWLEDGEMENTS

I would like to thank the awesome people in the Terhune Lab. They were tremendous help to me, and I could not have completed this project without them. Support for SUPREMES has been provided by the Department of Biomedical Engineering at the Medical College of Wisconsin and Marquette University, as well as a Children's Hospital of Wisconsin Foundation and the Children's Research Institute award (CRI 17-327 BRH).

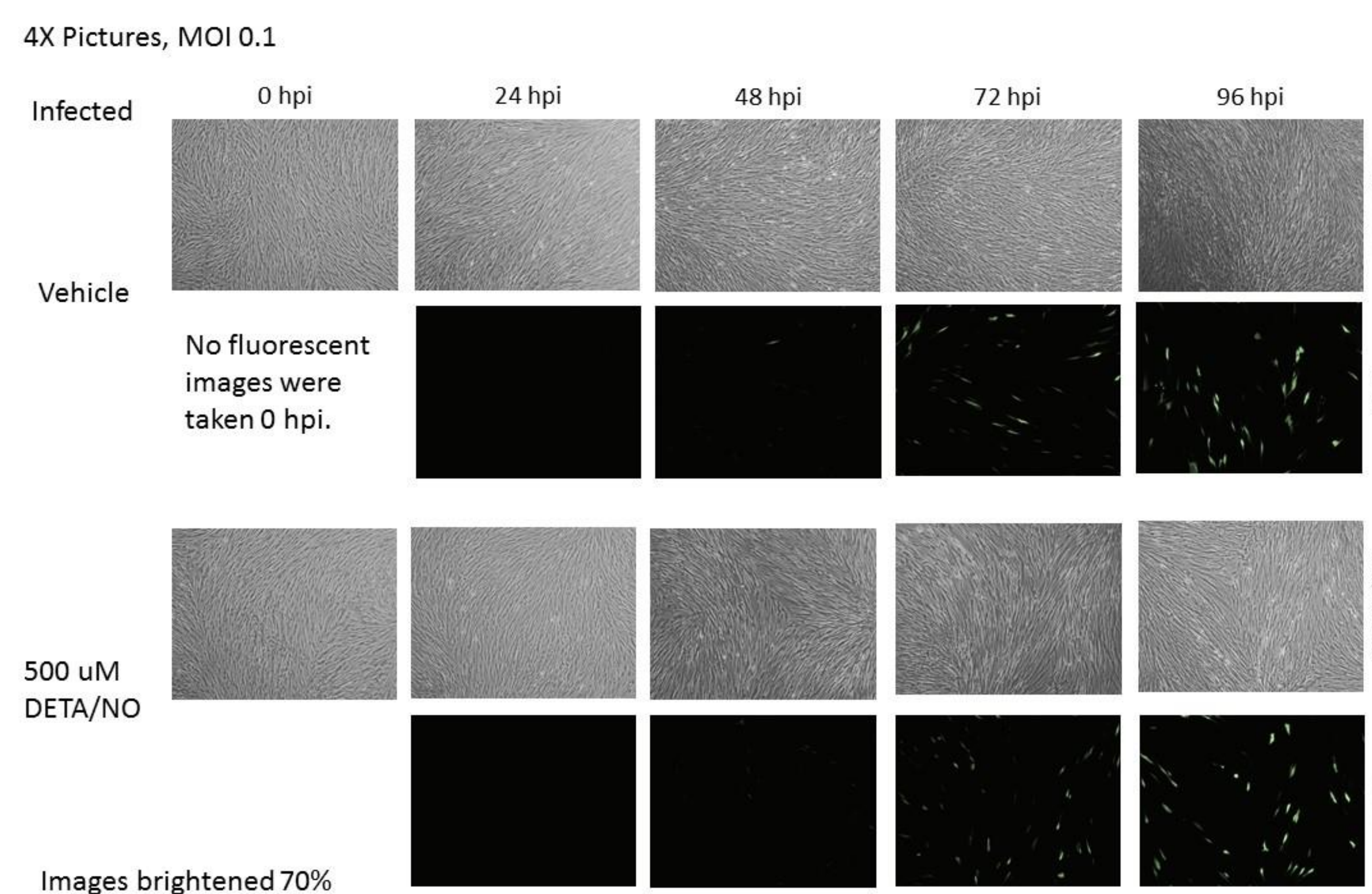


Figure 7. Brightfield and fluorescent images of low MOI time course. MRC5 fibroblasts were plated as described in Figure 4 and infected with an MOI of 0.1 IU/cell. Cells were treated as described in Figure 5. Brightfield and fluorescent images were taken at the indicated timepoints. GFP-positive cells indicate infection.

Specific Aim

We want to know how food deserts can affect cancer rates in the Milwaukee area. Understanding how the two are related we can work to increase the accessibility of food for residents in these areas. We can test this by interviewing cancer patients about their food stories during and after cancer diagnosis. We can use the stories that we collect to find out what the needs of cancer patients are in regards to their food consumption during cancer treatment.

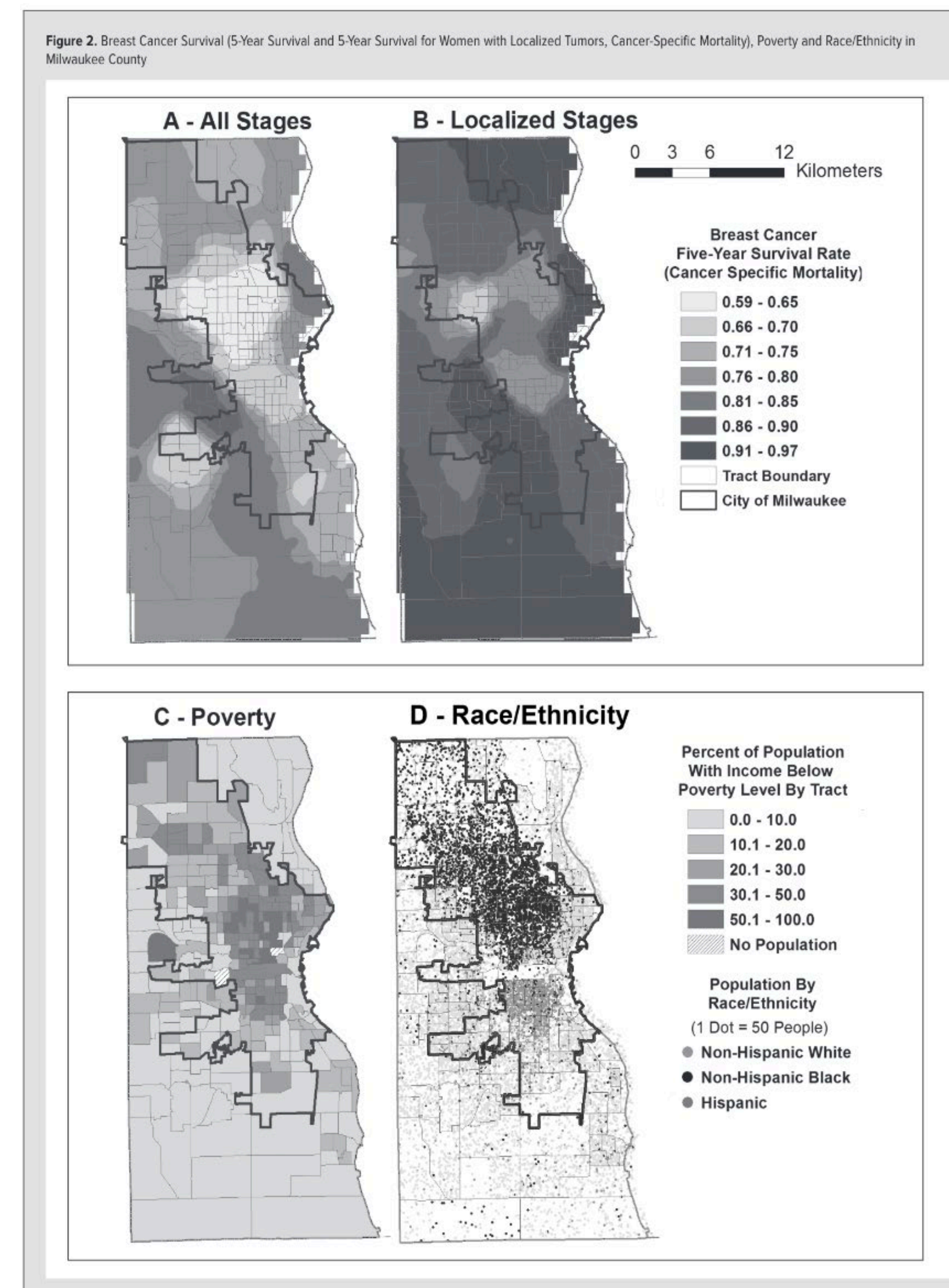
Collection of Stories

During a two hour session, the patient will be asked to share a story of a time during his/her cancer treatment surrounding their food experience. After they share their story, the interviewer will continue to ask further questions that arise during the story about family and cultural influences. A question on what an ideal food story would look like to the patient will finish the interview. There will be two interviewers per patient interview to avoid bias and to make sure that all necessary information is captured.

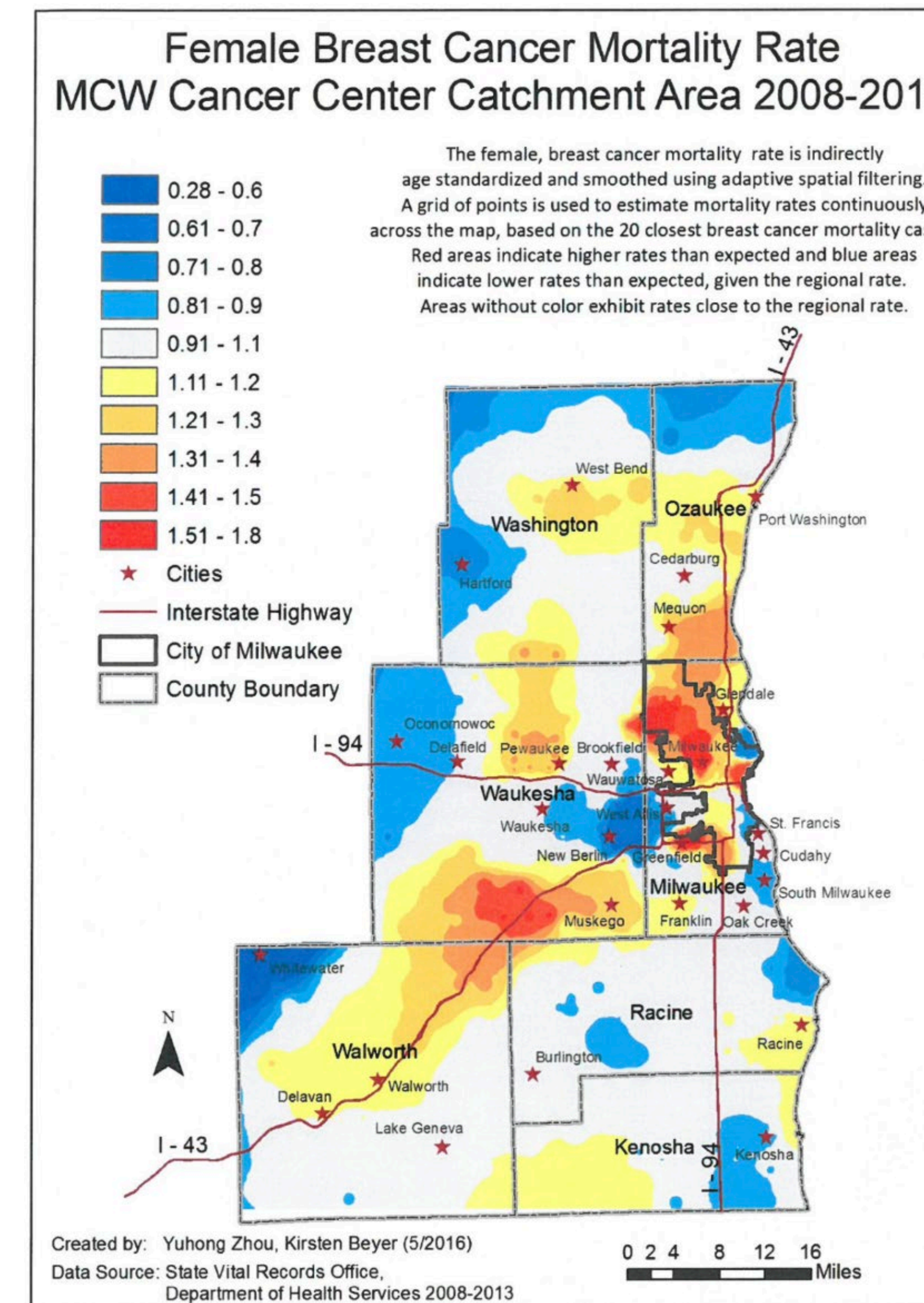
What did your pre-cancer food scenario look like?
 What would you like your food story to look like?
 How has your food story changed since diagnosis?
 How does culture affect your story?
 What help in the food space would you like during your cancer treatment?
 Are you the primary person doing the household cooking? Were other family members able to help?

Recruiting Patients

Any patient who lives in Milwaukee County with the following zip codes: 53295, 53293, 53290, 53288, 53278, 53274, 53268, 53267, 53259, 53237, 53234, 53263, 53228, 53233, 53224, 53203, 53205, 53220, 53216, 53227, 53222, 53226, 53219, 53215, 53213, 53211, 53210, 53207, 53208, 53218, 53212, 53204, 53209, 53221, 53223, 53214, 53202, 53206, 53201; and has a diagnosis of breast cancer, or a history of breast cancer, that gives consent to an interview is able to be in our study. We will recruit patients by sending out flyers to health and cancer clinics at Froedtert and the Medical College of Wisconsin and having a consent form attached explaining the experiment and any benefits or consequences of participation in the experiment. Any patient that signs and returns the consent form to us will be included in our experiment.



Four maps of Milwaukee area showing poverty, race/ethnicity, and cancer localized stages and all stages. Box A. is all stages of breast cancer, Box B is localized stages, Box C is poverty, and Box D is race/ethnicity. Beyer, K. et. al. 2016



Female Breast Cancer Mortality Rates in Milwaukee County around the MCW Cancer Center Catchment Area. Beyer, K. 2016

Food Deserts in Milwaukee

Food deserts are areas in the United States that have low densities of grocery stores, high densities of fast food restaurants and low fruit and vegetable availability. According to *BMC Public Health*, these areas can also be considered obesogenic environments: areas with high levels of nutrient-deficient, high calorie, but affordable food which promotes food consumption and low physical activity. The *Center for Disease Control and Prevention (CDC)* describes that food deserts arise from the lack of grocery stores in impoverished neighborhoods, areas with high shoplifting and neighborhood crime rates, and the growth of large chain supermarkets in suburbs where the population is more affluent. Food deserts can be linked to low-income areas due to the populations' lack of resources to access food outside of their area. This lies as an issue in the city of Milwaukee. According to the Encyclopedia of Milwaukee, when looking at the city the southern and western parts of the city have been connected to higher socioeconomic status. Because of this, when looking at the two figures above, it is shown that in the southern and western parts of Milwaukee, there are smaller mortality rates. Having this knowledge allows us to look at the connections among food deserts and cancer within the cancer maps of Milwaukee county.

Analysis and Benefits

To analyze the stories we receive, we will assess the answers to the questions asked in addition to the patient's body language while telling the story. We will look for common trends in each story on ways the patients experience food access and use these trends to find ways in which we can resolve these underlying community obstacles. This experiment can benefit society and the respondent. Although there is research present on how food deserts correlate with breast cancer incidences, having stories of ways food has impacted patients can emphasize the need to take action on the problem.

Food Deserts and Cancer

In 2017, it was estimated that 1 38590, Americans would be diagnosed with breast cancer. Economic deficiencies in populations can lead to poor access to healthy foods, otherwise known as a food desert. In these food deserts, populations have poor diets because of the inadequate access to healthier foods. A cause of breast cancer lays in the diet of populations. Breast cancer is 1.6-2.3 times higher in females with 26% breast density, and density increases with an increase in fatty tissue. Adipose inflammation from a large BMI results in a chronic inflammatory state that contributes to obesity-related insulin-resistance. For every 11 pounds a woman gains in adulthood increases her risk for postmenopausal breast cancer by 11%. It is found that the consumption of fruits and vegetables reduce the risk of breast cancer. There are links between lower breast cancer rates and higher levels of carotenoids in the blood. These compounds decrease the proliferation of human cancer cells, reduce DNA damage and genetic mutations, and enhance immunologic system functioning. Women who engage in a healthy diet and participate in regular physical activity are 88% less likely to die from breast cancer than women who have poor diets and do not actively engage in physical activity. An additional correlation between breast cancer and diet is within Metabolic Syndrome (MetS). Breast cancer is 56% more likely in women with (MetS). Obesity and increased adiposity contribute to changes in hormone regulation that lead to overproduction of estrogen, leading to breast tissue proliferation.

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High School of Health Sciences

Socially Aware; Medically Unaware

Exploring Challenges in Transgender Health

Teague Peterson and Divyank Sharma

Chris Goetz, Tucker Keuter, Sam Polhemus, and Jacqueline Schaefer



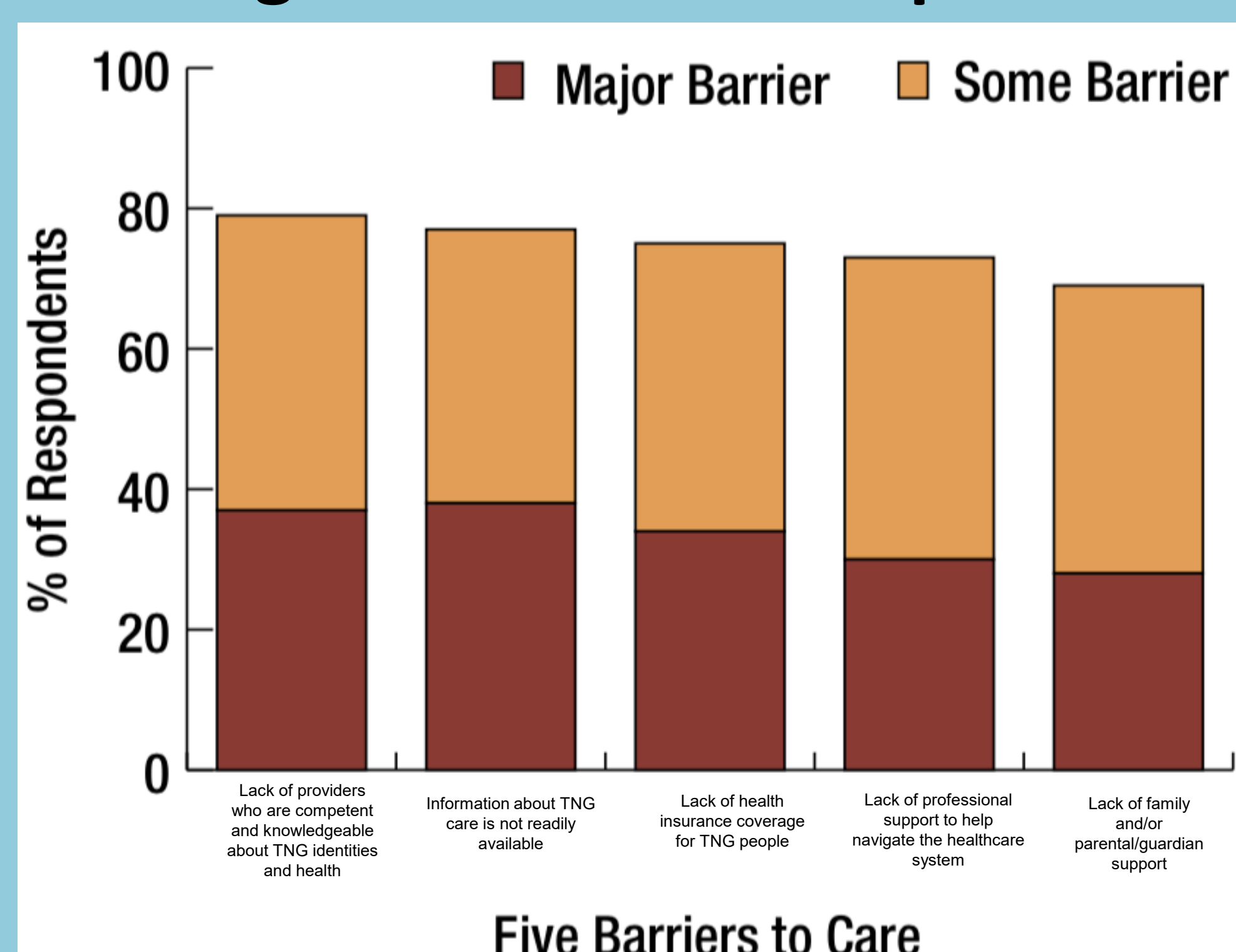
Abstract:

To interrogate issues regarding transgender inadequate care, we decided to conduct a literature review to identify whether healthcare providers (nurses) were comfortable and/or confident when providing care to transgender patients. Through our research, we have concluded that the majority of nurses are not comfortable or confident when treating transgender patients. Therefore, it is imperative to better educate our medical professionals such that they are both comfortable and confident when caring for transgender patients. Thus, we propose developing a curriculum aimed at improving transgender health education, and as a result, relations between healthcare providers and transgender patients will improve.

Introduction:

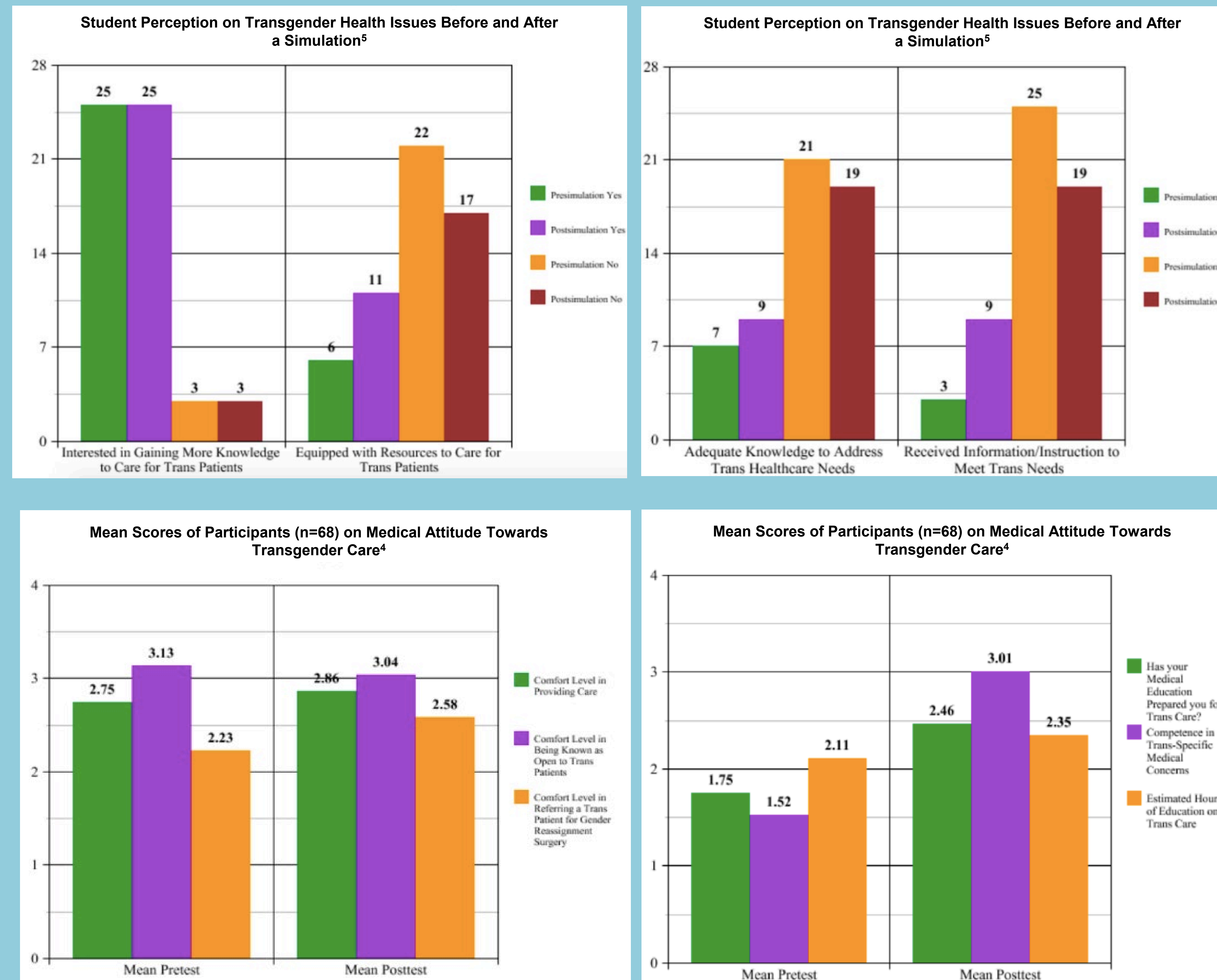
Transgender health is an area where many medical providers lack a complete understanding of how to medically address patients to increase comfort and how to provide accurate medical services. Through our study we plan to develop an efficient course as a way for providers to access information regarding transgender health and further understand medical steps and processes when providing medical care for transgender patients. Through this course that we plan to develop as a result of our study, we plan to communicate and educate medical professionals in the field of healthcare about transgender health in order to bring awareness, increase knowledge, and improve the accuracy of medical diagnosis. Through our study, we plan to develop an efficient course as a way for providers to gain cognizance regarding transgender health while understanding medical processes for providing medical care to transgender patients.

Transgender Patient Responses:



Botsford, J.C., Allen, B.J., Andert, B.D., Budge, S.L., & Rehm, J.L. (2018). Meeting the healthcare needs of transgender, nonbinary, and gender expansive/nonconforming youth in Wisconsin: A report of the 2017 Wisconsin Transgender Youth Community Needs Assessment.

Medical Student and Nurse Responses:



Curriculum Development:

Pronouns:

- Asking for preferred pronouns

Lack of education:

- Gender Dysphoria
- Hormone Therapy
- Surgery

Unsafe practices:

- Assessing and treating medical conditions more susceptible for transgender patients
- Look for self-treatment attempts made by patients
- Correctly prescribing medical treatments that are more efficient

Referrals:

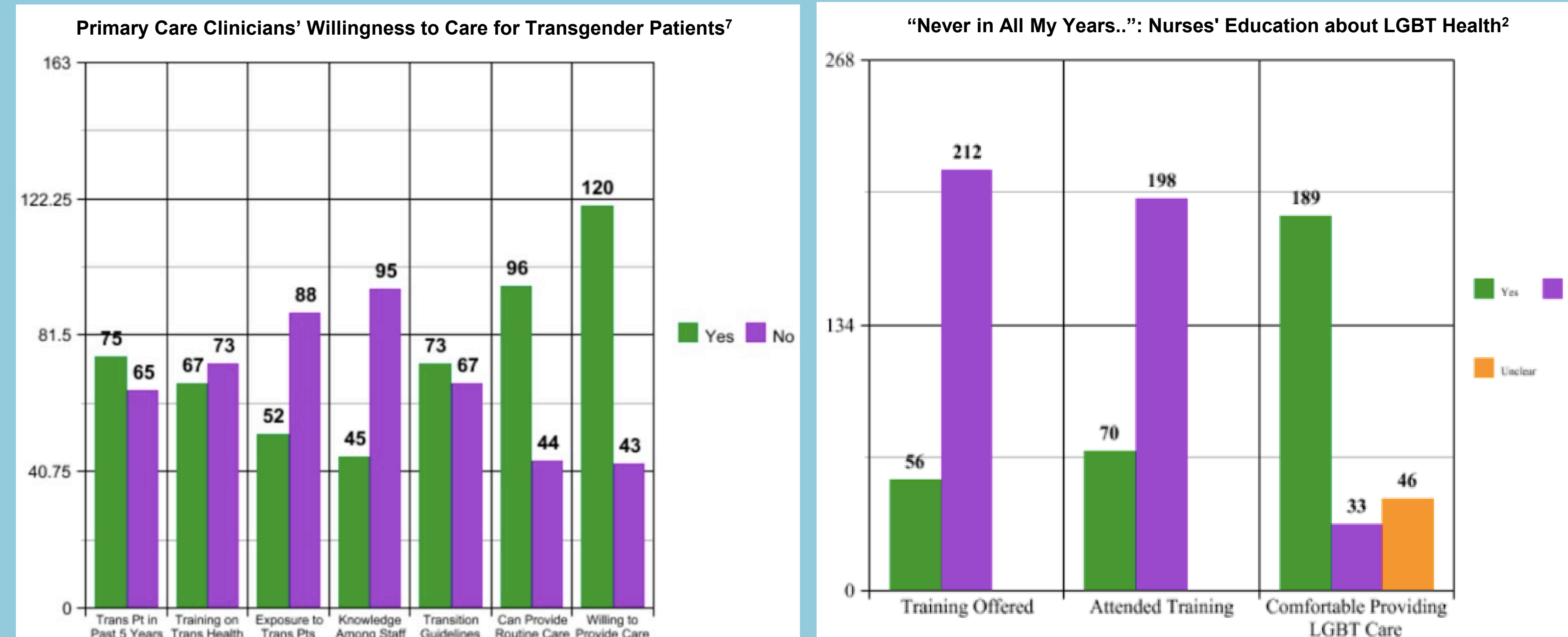
- Compile list of surgeons/endocrinologists or create protocol for finding specialists

Conclusion:

Based on evidence from several studies, both patients and nurses have noticed a visible need for further understanding and education. Access to information can be challenging for providers, and access to knowledgeable healthcare providers can be challenging for transgender patients. This curriculum is an attempt to answer this issue, and while it has not yet been proven successful, anything is better than denying these nurses knowledge and denying these patients care. Future applications include testing the significance of the curriculum developed in a medical setting. If the developed curriculum proves to show an increase in comfort and confidence for medical professionals, the next step would be to test the curriculum at a national level rather than only in Southeastern Wisconsin.

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Data compiled and illustrated above are responses from medical students (figures 1-4) and nurses (figures 5 and 6) who were surveyed on their perception regarding transgender health and ability to provide care.



Improving Students' Perceived Stress, Productivity, and Moods During Class Through the Integration of Plants Into Classrooms

Samantha Baldwin¹, Jordyn Roby², Hannah Worden¹; Mentors: Megan LaCroix³, Nisreen Mobayed³, John Tierney³

¹High School of Health Sciences, ²Milwaukee Academy of Science, ³Medical College of Wisconsin



Background

In today's day and age, the average person spends 85% of their life indoors (1). Human's interaction as a species with the natural world that they are biologically programmed to depend on has taken a backseat as urbanization rates have skyrocketed and advanced technology has continued to be improved. These trends have resulted in a very prevalent lack of integration between humans and the natural world, despite the fact that numerous studies have proven that consistent contact with nature can improve things such as blood pressure, stress, and even overall life satisfaction (2).

The belief that interacting with nature has a positive influence on human well-being has been proven in a variety of different ways. It is a well-known fact that spending time in natural spaces contributes to improvements in concentration and overall stress-relief. It is for this reason that research about the positive effects of natural elements on overall health and well-being is becoming more and more prevalent. Prior research on these effects in academic settings has been primarily done on college campuses rather than high school classrooms (3). The purpose of our study is to determine whether or not implementing plants into high school classrooms improves the students' perceived stress, productivity, and mood levels.

Experimental Methods

Our group chose one classroom from Kettle Moraine High School and one classroom in Milwaukee Academy of Science to give surveys out to the classes that were held in that room during the school day. We designed two types of surveys for the students: a pre-experimental portion and a post-experimental portion. The first section includes statements relating to the subject's perceived stress level, productivity level, and mood. These questions are designed on a five point scale according to how strongly a subject agrees or disagrees to the statements given. The post-experimental survey is designed to evaluate the subject's reported change in the areas stated above following one month of plant integration. Similar to the pre-survey, the post-survey questions are designed to be answered on a five point scale but they aim to elicit further detail on whether or not the subjects' perceived any improvement in their perceived stress levels, productivity levels, and mood levels during the experimental period. In order to ensure that we are able to compare the data accurately, we numbered the surveys to make sure that the students would get the same number during the pre and post surveys.

We also paid attention to the layouts of the classroom in order to buy an amount of plants that would make a noticeable change to the atmosphere of the room, but would not be excessive enough to become a distraction. Ultimately, we decided on five plants for the Kettle Moraine High School classroom and eight plants for the Milwaukee Academy of Science classroom.

When analyzing our data we changed the possible responses (strongly disagree, disagree, neutral, agree, strongly agree) into numerical values (-2, -1, 0, 1, 2, respectively). For each question we found the average numerical response from the preliminary survey and then compared it to the average numerical response in the post survey, and graphed the averages to show the change in response.



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- Doxey, J. S., Waliczek, T. M., & Zajicek, J. M., (2009). The impact of interior plants in university classrooms on student course performance and on student perception of the course and instructor. Retrieved from <http://hortsci.ashspubs.org/content/44/2/384.full>

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<https://i.imgur.com/y51st3x>

Figure 1

The classroom environment contributes to student's feelings of apprehensiveness.

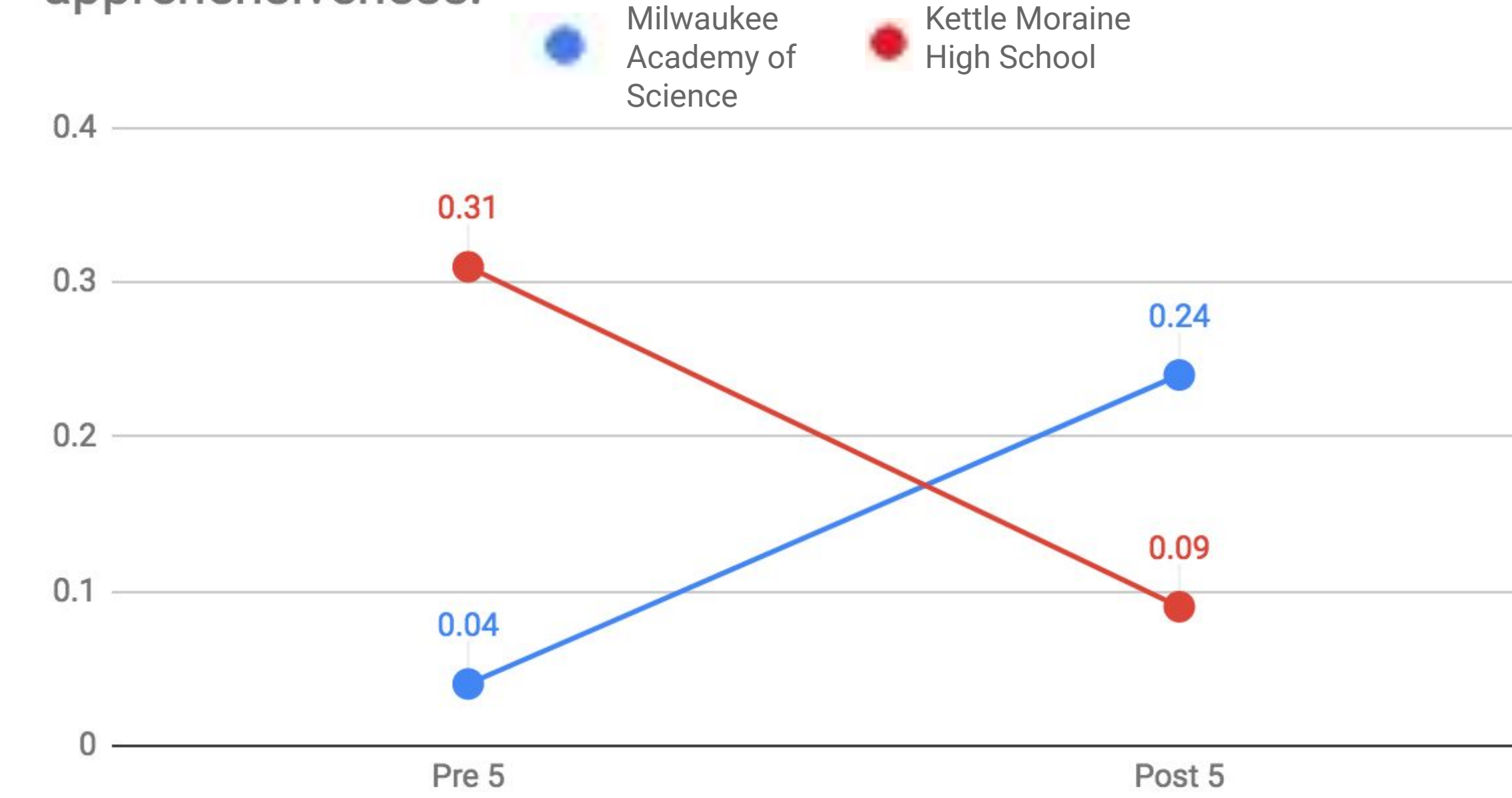


Figure 2

It is hard for students to pay attention during this class.

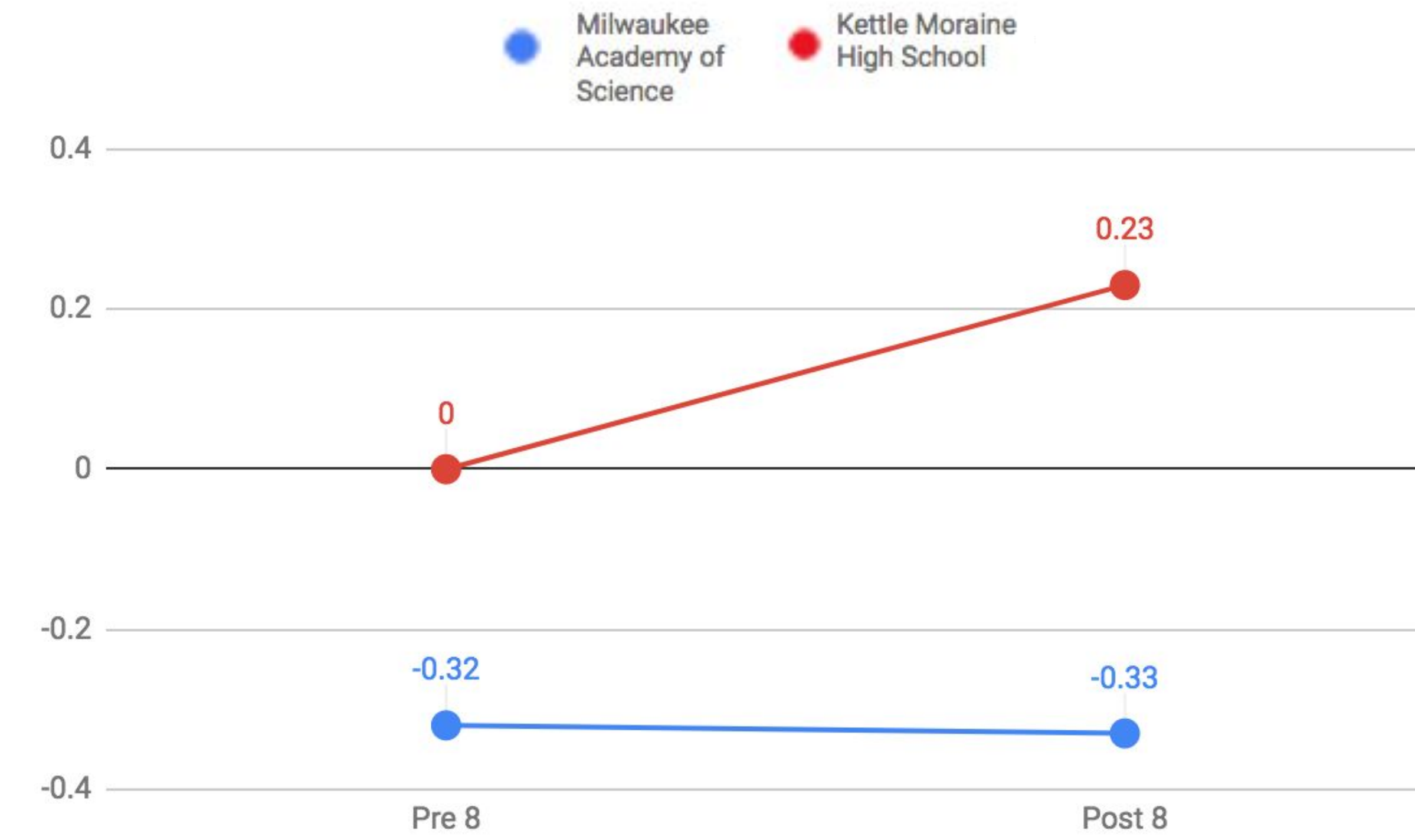
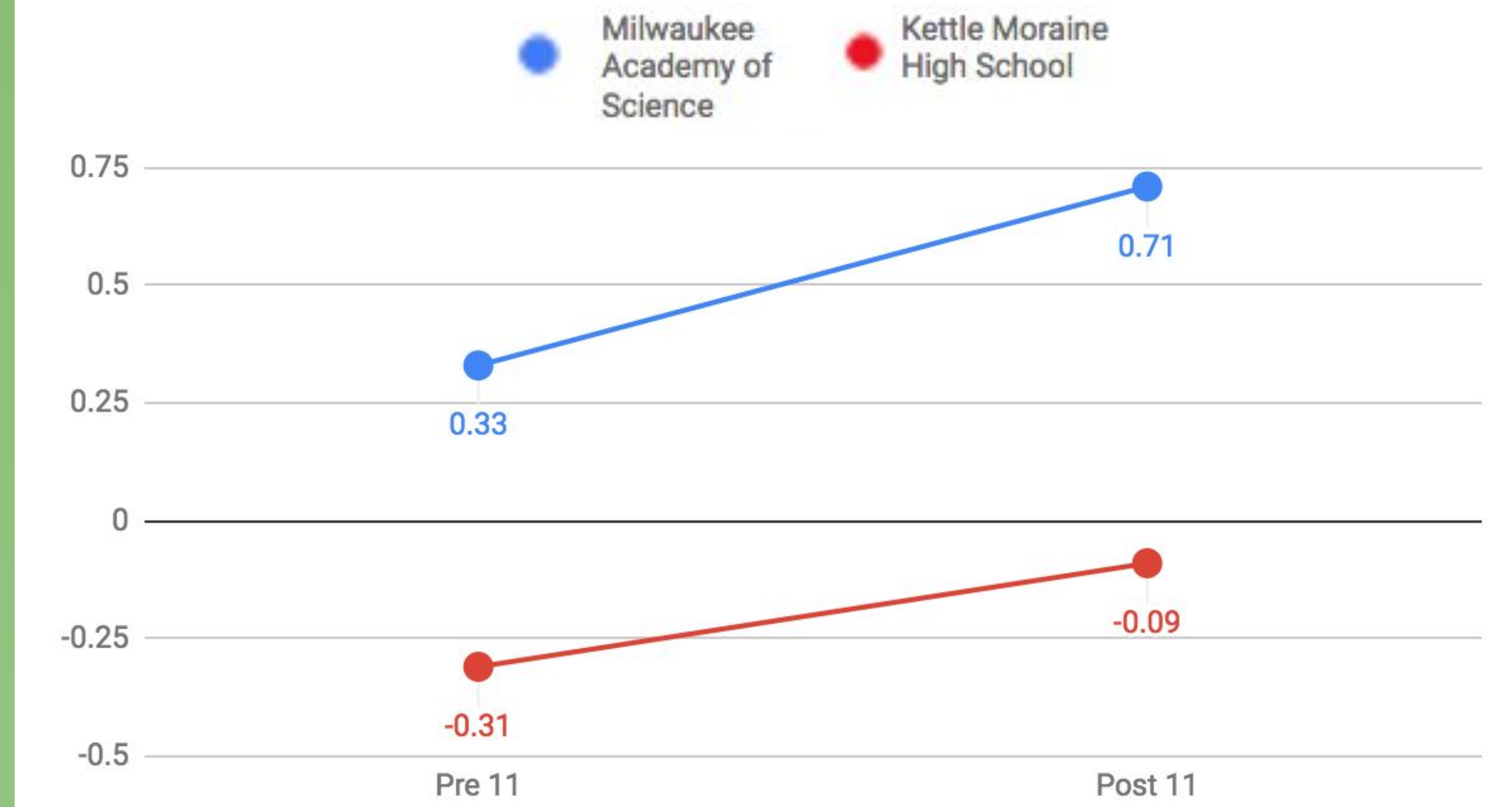


Figure 3

Students feel upbeat and optimistic about how they are progressing and learning new topics in this class.



Summary and Conclusions

Figure one shows the change in average numerical response to the statement "The classroom environment contributes to student's feelings of apprehensiveness". The classroom in Kettle Moraine High School's (KMHS) preliminary surveys had an average response of 0.31, which is slightly higher than a neutral response to the statement. Their post survey showed a negative trend to 0.09, suggesting that less people agreed with the above statement. Meanwhile, Milwaukee Academy of Science (MAS) showed a positive trend regarding this prompt--their preliminary survey response began at 0.04 and went up to 0.24, indicating that more people agreed with the statement following the experiment. The integration of plants may have had a positive effect on the students in the KMHS classroom due to the fact that their agreement with the statement decreased over the course of our study.

Figure two shows the change in average numerical response to the statement "It is hard for students to pay attention during this class". KMHS's classroom began with an average response of 0, indicating a strong neutral stance on the statement. Their post survey data showed an increase in average response at 0.23, indicating that more people agreed with this statement. MAS did not show a significant difference in response to this statement, for their preliminary average was -0.32 and their post average was -0.33. In MAS's case, most of the students tended to disagree with this statement throughout the entire study. While the plants did not seem to have an effect on MAS students' ability to pay attention during class, it is unclear whether or not KMHS's responses correlate to our experiment as responses may have been conflated with several confounding variables.

Figure three shows the change in average numerical response to the statement "Students feel upbeat and optimistic about how they are progressing and learning new topics in this class". Both KMHS and MAS showed an increase in agreement to this statement over the course of the study. KMHS's preliminary average was 0.33, indicating a slightly neutral response. Their post survey average increased to 0.71 indicating a higher level of overall agreement. MAS began lower with an average preliminary response of -0.31 indicating more of a disagreement to the statement and up-trended to -0.09, suggesting a slightly increased positive response to classroom optimism.

Figure four shows the change in average numerical response to the statement "Students find it hard to relax while in this classroom". KMHS's preliminary average was -0.08, indicating an overall neutral response to the statement. The post survey average decreased to -0.29, indicating more people disagreed with this statement post study. MAS began with an average of -0.28 and increased to -0.16, indicating that more people either agreed or felt more neutral about the statement post study.

These changes could be a result of the integration of plants into the classroom, though we are unable to definitely make that conclusion due to the fact that these statements were not worded specifically about the effect the plants had on the students, just their overall feelings about their classroom environment.

Limits and Further Research

We had several limitations within our experimental process that may have changed the results of our study. One major limitation was the minimal amount of sunlight the plants were receiving. In both of our schools, the classrooms chosen had no windows to allow natural light in. While this choice intended to give us more significant changes in responses due to the fact that the classrooms had no natural elements beforehand, it ended up being a limiting factor for some of the plants that may have required more sunlight. Three plants from Milwaukee Academy of Science and two plants from Kettle Moraine High School died over the course of our study, and we attribute this to the fact that we did not thoroughly research the specific care needs of each of the plant species we bought.

Student attendance was also a large limiting factor during our study. Because we were looking to analyze changes in responses when comparing the preliminary surveys to the post surveys, we were unable to use any student responses we got during our post survey if the student was not present for the preliminary survey. This shrunk the number of usable responses we had for analysis. The density and spacing of the plants within the classrooms also may have been a limiting factor within our study. If we did not put enough plants into each room to make a significant impact on the students, the data could show little to no change in response when comparing preliminary surveys to post surveys.

Figure 4

Students find it hard to relax while in this classroom.

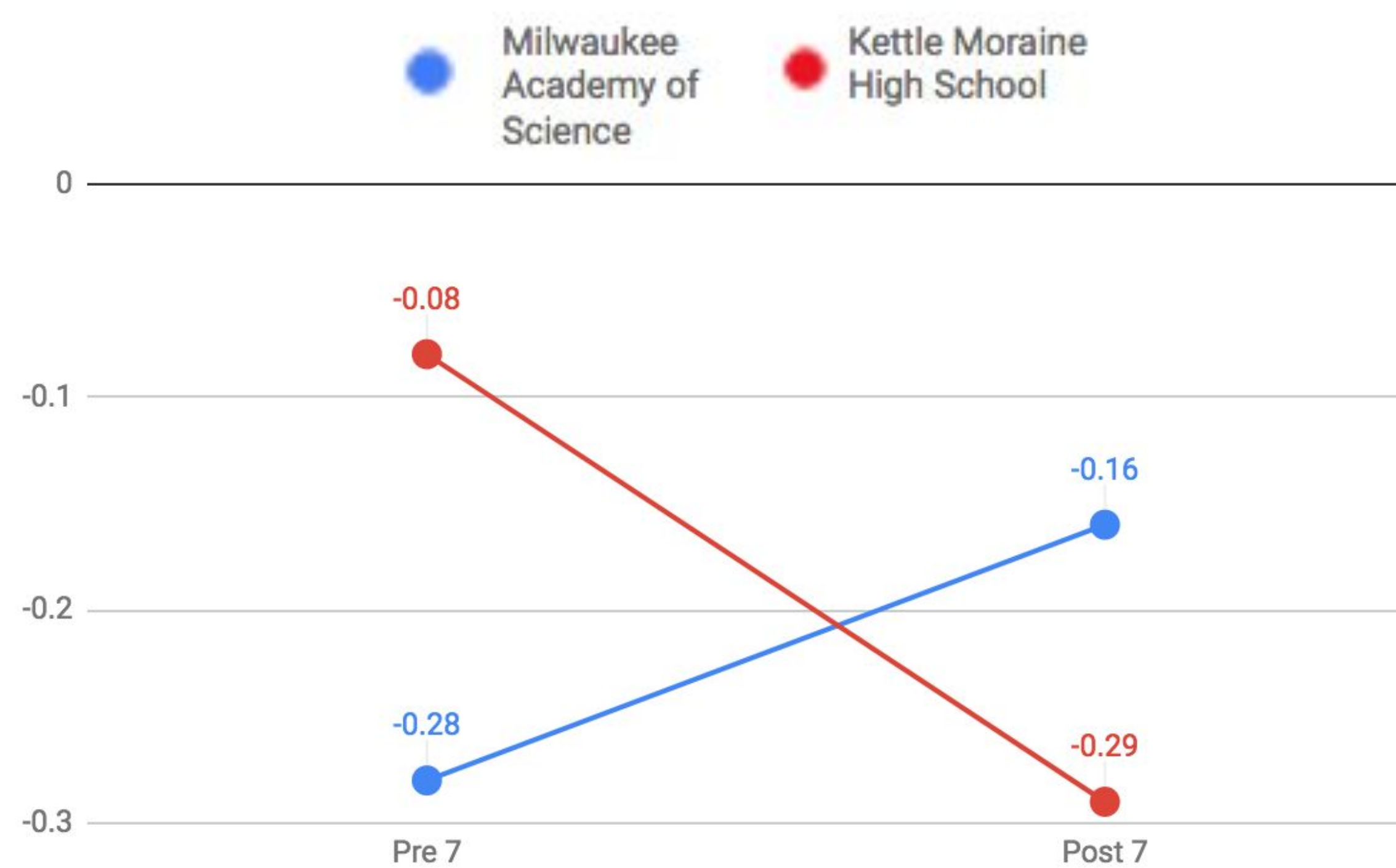


Figure 5 - Both Schools Post Survey Responses

The addition of plants to this classroom environment has enabled students to improve their level of focus in this class.

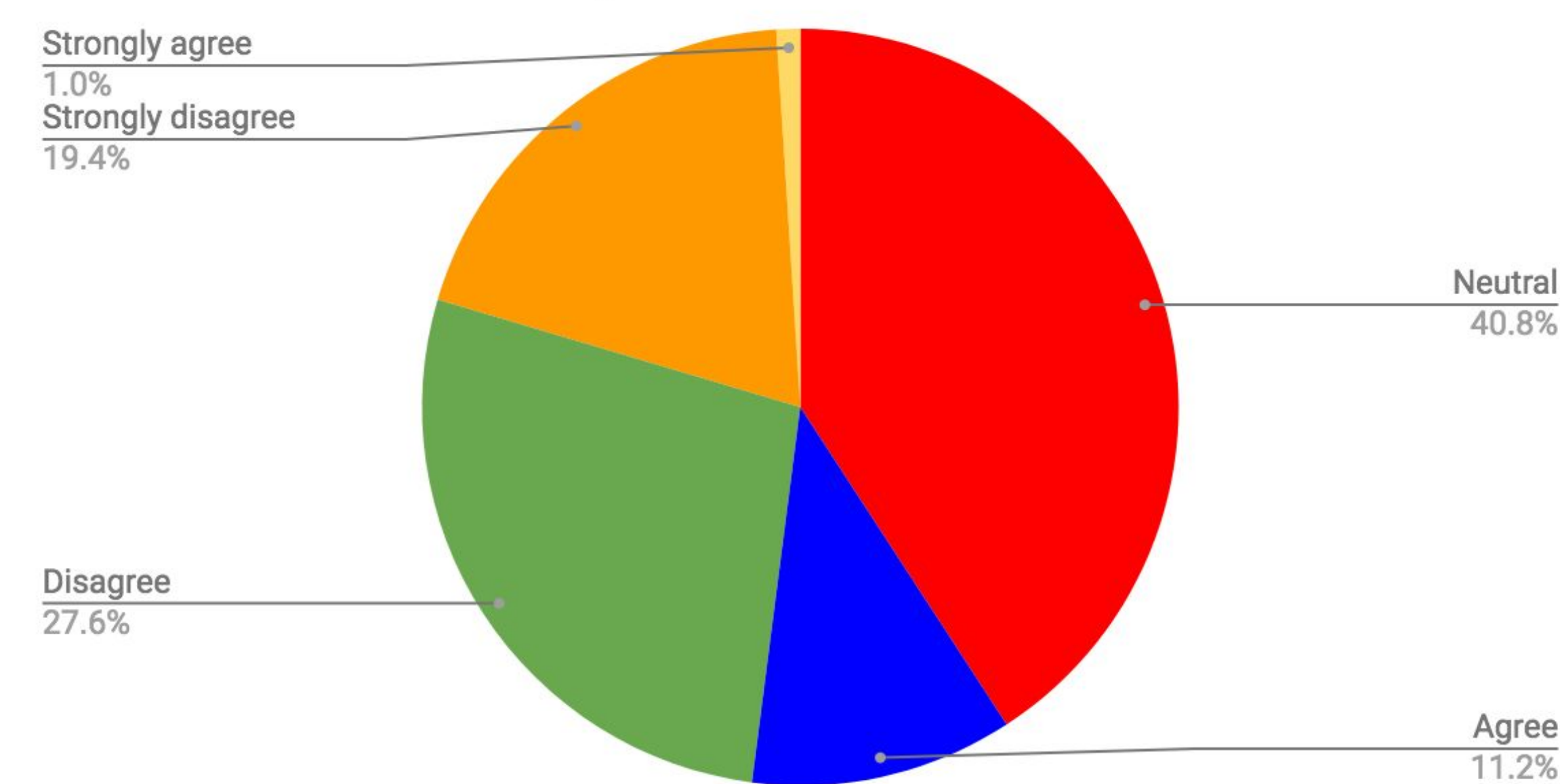


Figure five shows that the majority of students either disagreed or strongly disagreed with this statement (47.0%) while only 12.2% agreed.

Figure 6 - Both Schools Post Survey Responses

The addition of plants to this classroom environment has helped students to relax during this class.

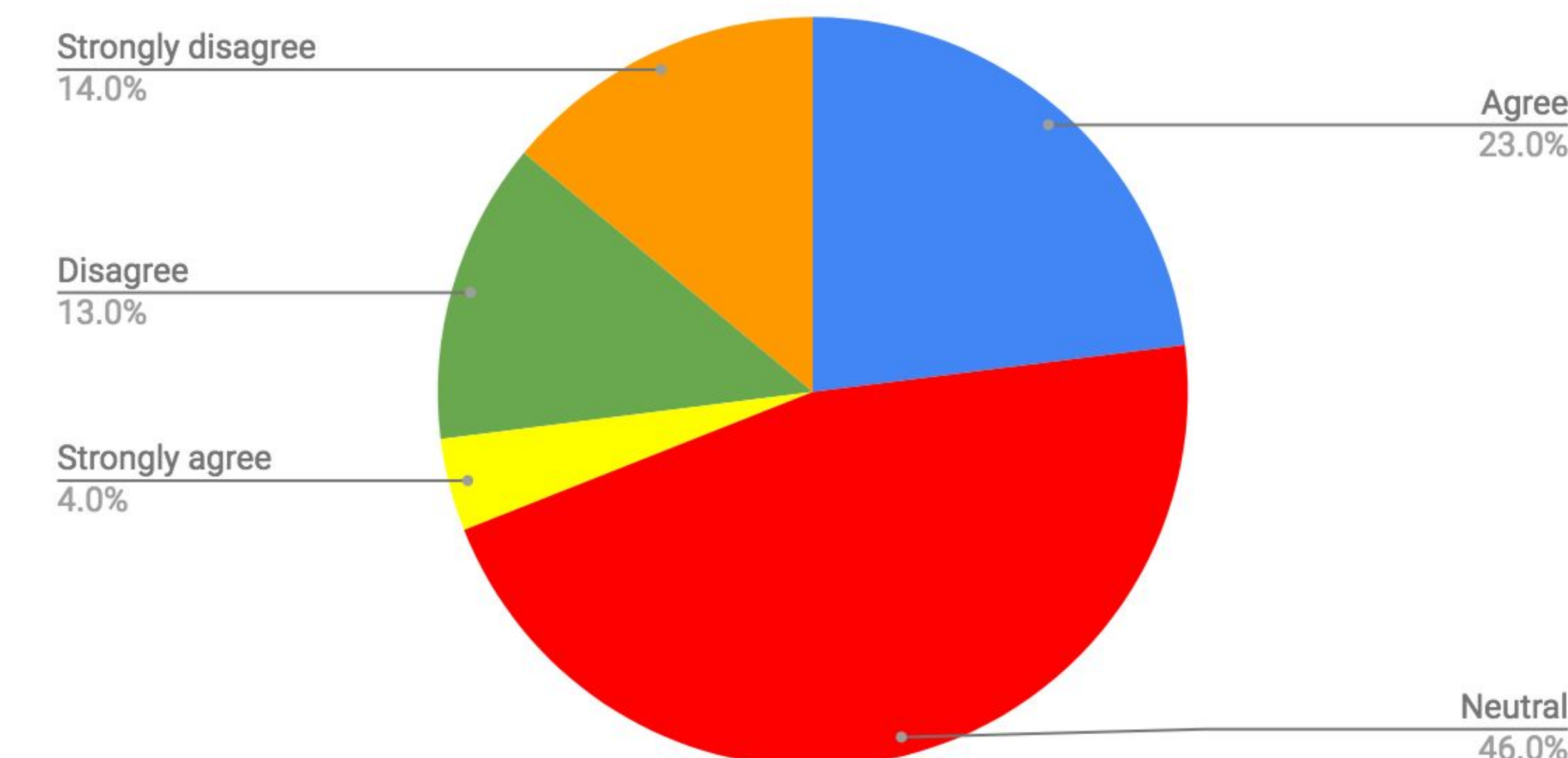


Figure six shows that an equal percentage of students agreed or strongly agreed and disagreed or strongly disagreed with this statement (27.0%). The majority of students felt neutrally about this statement (46.0%)

ABSTRACT

Spinal cord injury (SCI) is a severe condition with tremendous impact on the health and quality of life in SCI patients and caregivers. Current treatment options of SCI are still very limited. By targeting the inflammatory response after SCI we aim to reduce the secondary damage, which occurs after the acute primary injury and is caused by inflammation and other processes. Finding a method to specifically reduce harmful immune reactions could potentially lead to better functional outcome for SCI patients. The first step is to understand the composition of the tissue lesion is the use of various staining techniques. Hematoxylin and Eosin (H & E) and immunohistochemical staining allows us to detect cells such as microglia, blood derived macrophages and astrocytes. This analysis helps us to identify the overall size and shape of the lesion as well as the change in presence of various cell types. In a more severe lesion, there is expected to be an increase in the number of astrocytes, activated microglia and macrophages. These findings will increase our understanding of SCI and could give rise to a treatment that targets these inflammatory cells.

OBJECTIVE

To analyze the amount of microglia, blood derived macrophages and astrocytes in SCI and to compare lesion sizes.

METHODS

Tissue Freezing:

After a laminectomy, the spinal cord was frozen in adhesive Tek at -80°C. The block of tissue was then cut transversely to 14µm thickness using a Cryostat and placed on slides.



Hematoxylin & Eosin (H&E) Staining:

After being placed in a desiccator for 30 minutes, the slides were placed in ethyl alcohol (ETOH) for one minute. Next, they were dipped in tap water five times and placed in Harris Hematoxylin for five minutes. The slides were then rinsed with tap water and placed in a bluing solution for 40 seconds. After that, they are rinsed with tap water again for two minutes and placed in Eosin Y for one minute followed by four changes in 100% ETOH. Finally, the slides were placed in Xylazine for one minute with agitation three times.

Glial Fibrillary Acidic Protein (GFAP) Staining:

After being placed in a desiccator for 30 minutes, the slides were rinsed with PBS and placed in blocking solution for three hours. Afterwards, they were placed in a primary antibody overnight at 4°C. The next day, they were washed with PBS-T twice for 15 minutes and once with PBS. They were then put in the secondary antibody for an hour and washed three times with PBS-T and PBS as done previously.

Clarity Staining:

It is five day process to allow the intact tissue to become transparent and macromolecule permeable. The cord was then stained with 4',6-diamidino-2-phenylindole (DAPI).

RESULTS

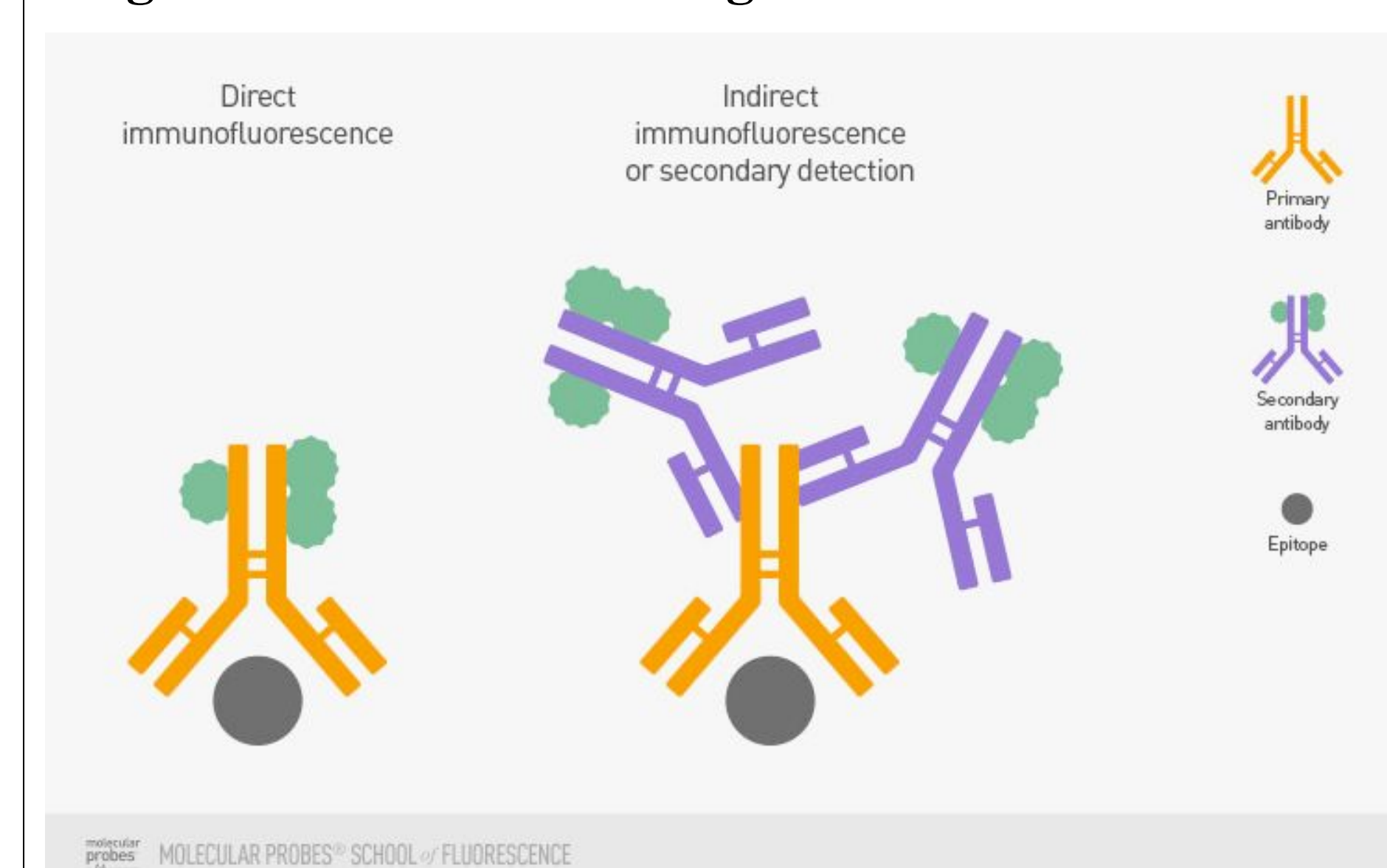
H&E Staining:

This is a basic staining used to examine the structures of tissues. The violet hematoxylin is responsible for staining nucleic acids while the eosin stains nonspecific proteins. This results in a range of pinks and purples mapping out structures within the tissues. In Figure 1A and B, the ventral and dorsal horns of the uninjured spinal cord can clearly be identified; the white and gray matter in the injured tissue are indistinguishable. There is also a visible lesion located at the epicenter of the SCI indicated by an absence of tissue.

GFAP Staining:

Being a type of immunostaining, this method utilizes antibodies to identify the GFAP, a marker protein for astrocytes. In this process, a primary antibody is used to recognize and bind directly to the antigen epitope. It is made from an animal of a different species than the specimen. This antibody does not contain fluorescence and, therefore, cannot be visualized. Next, a secondary antibody is used which attaches only to the primary. In order to prevent non-specific binding, it is derived from an animal of a species that differs from both the specimen and the primary antibody. The secondary antibody contains fluorescence which allows for visualization of the targeted antigen. Figure 2 depicts GFAP through a secondary antibody containing green fluorescence. This indicates the presence of astrocytes found in the spinal cord. Figure 2.A. demonstrates the nature of astrocytes in an uninjured spinal cord. For comparison, Figure 2B. reveals the impacted structure of a SCI through an absence of functional astrocytes.

Diagram of Immunostaining



<https://www.thermofisher.com/us/en/home/life-science/cell-analysis/cell-analysis-learning-center/molecular-probes-school-of-fluorescence/imaging-basics/labeling-your-samples/immunolabeling.html>

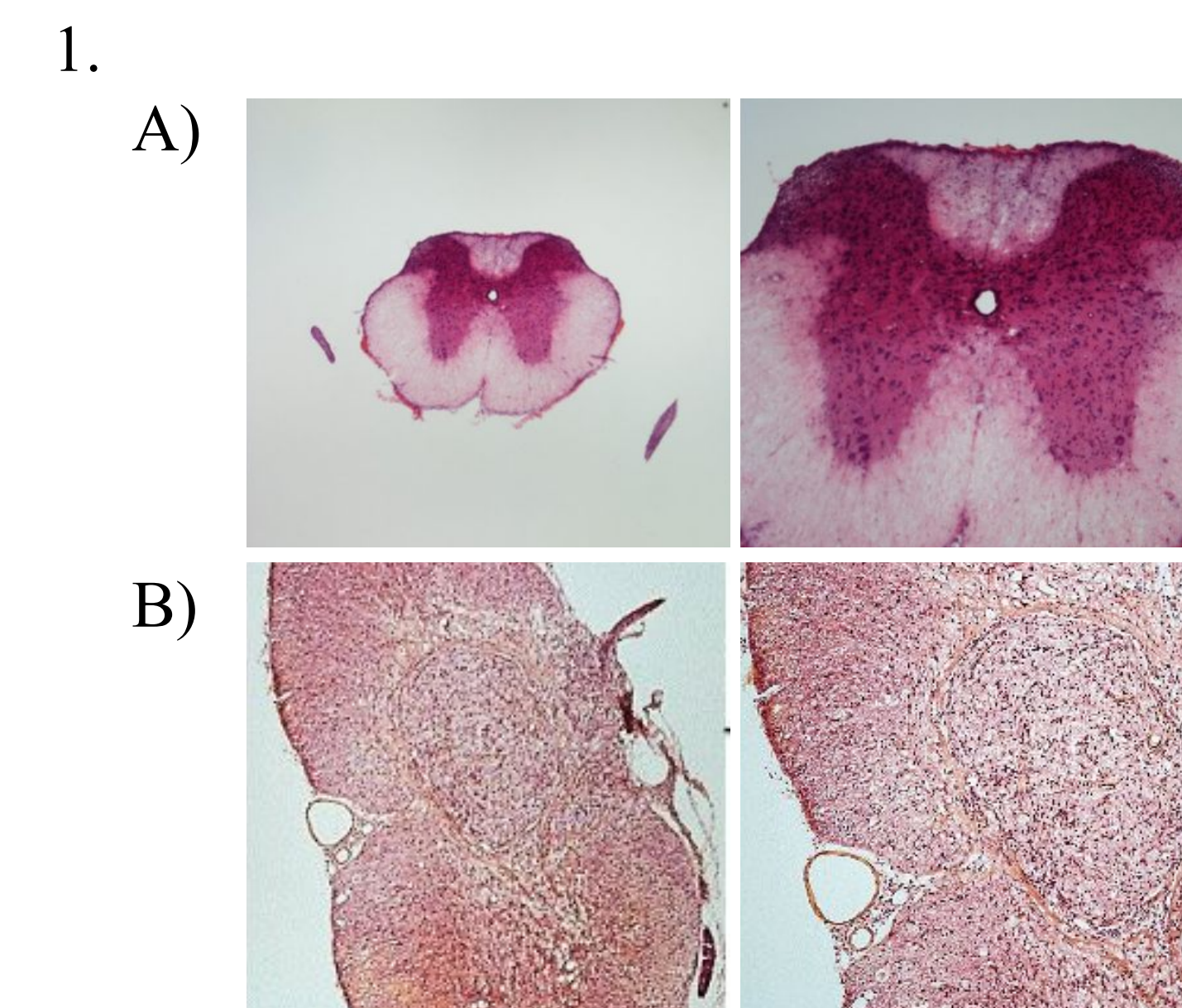


Figure 1A. A sample of H&E stained tissue that indicates the uninjured structure of the ventral and dorsal horns at 4x and magnified at 10x. **B.** A sample of injured spinal cord with the same H&E stain.

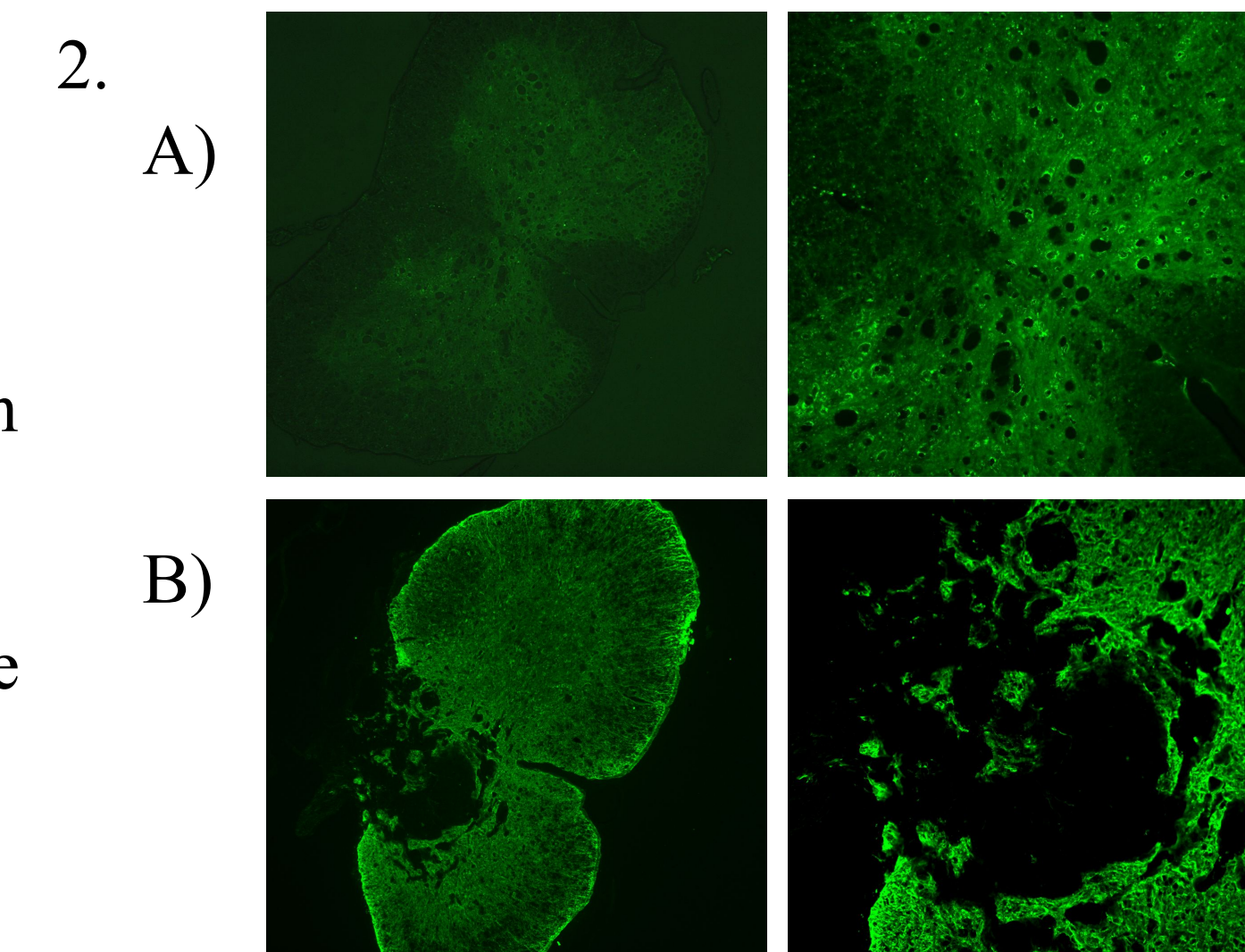


Figure 2A. A sample of uninjured spinal cord tissue exhibiting the presence of GFAP in astrocytes. **B.** The epicenter of a SCI. The absence of astrocytes is denoted by the green stain binding to GFAP.

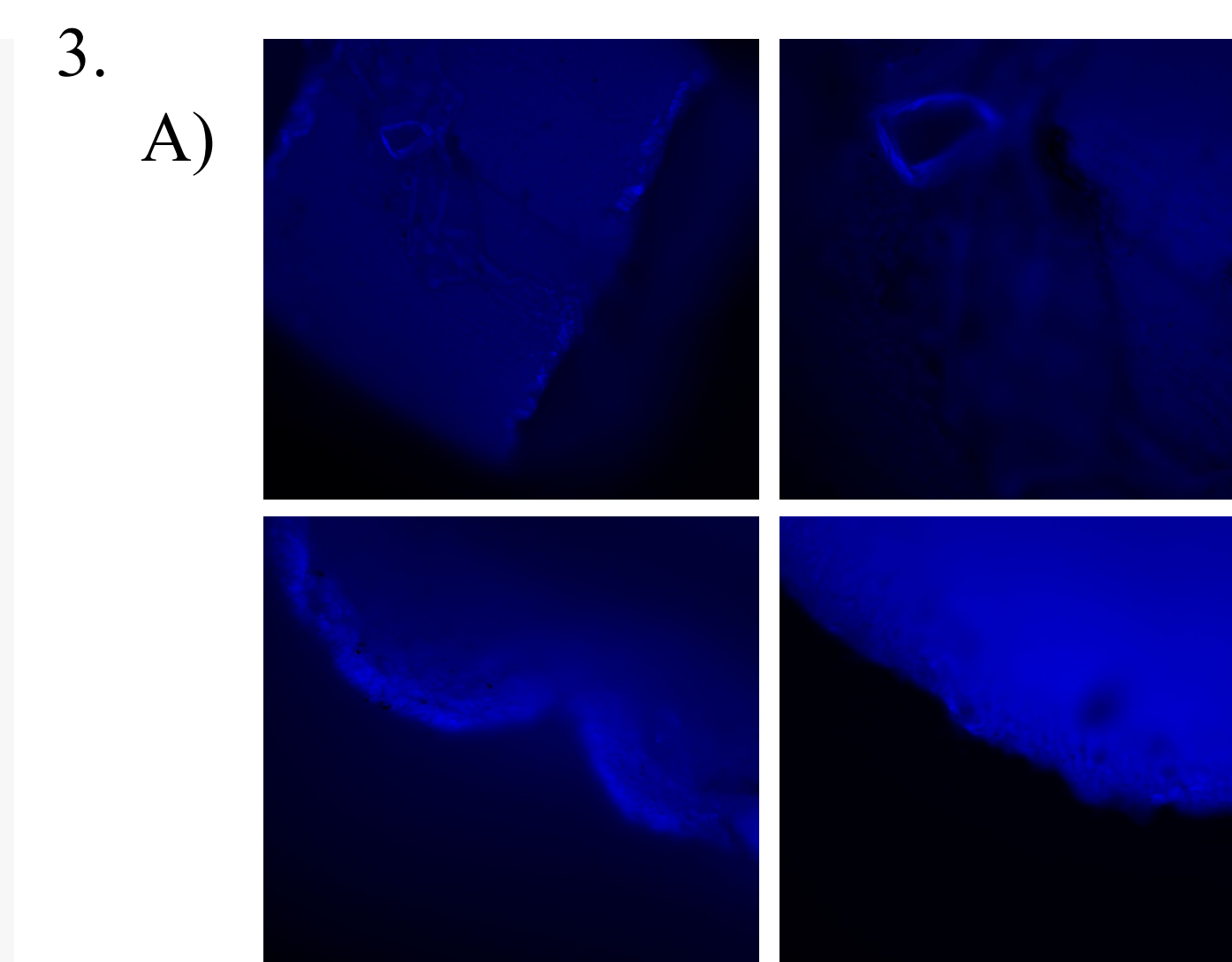


Figure 3A. Crosscut segments of spinal cords cleared with Clarity and stained with DAPI and observed at 4x and 10x.

RESULTS

CLARITY:

Is a method of clearing tissue to allow for staining and structural analysis of the full spinal cord as a three dimensional sample. The current methods of computing the lesion volume are less precise due to the fact that they cannot account for the human errors possible when freezing, cutting, and staining the tissue. Because the tissue remains intact, the stained lesion site can be more accurately measured. However, it is currently difficult to analyze the full structure because technology is not yet equipped to view a three dimensional tissue sample rather than a two dimensional slice. With a traditional microscope having been used for all three figures, the samples in Figure 3 are of lesser quality and not fully focused, indicating an uneven surface.

SUMMARY

- 1- SCI was observed to have a disturbance in the structure of the white and gray matter tissue in comparison to an uninjured, spare tissue. This resulted in the inability to identify the ventral and dorsal horns of gray matter.
- 2- An absence of astrocytes at the site of impact indicates glial damage and a prolonged inflammatory response.
- 3- CLARITY staining has the potential to provide a more accurate analysis of SCI and lesion volume. However, it is currently an underdeveloped method that requires more adequate technology.

FUTURE DIRECTIONS

Dr. Kroner's lab is currently investigating treatments to reduce the prolonged inflammation caused by SCI. Further analysis of the lesion site will lead to progressive methods of amplifying an immune response to decrease recovery time and potentially improve patients' quality of life.

The advantage of having a more detailed assay of SCI will encourage the development of advanced technology in attempts to properly visualize the three dimensional lesion.

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Acknowledgements:

Support for SUPREMES has been provided by the Department of Biomedical Engineering at the Medical College of Wisconsin and Marquette University, as well as a Children's Hospital of Wisconsin Foundation and the Children's Research Institute award (CRI 17-327 BRH). We would also like to thank Dr. Brian Hoffmann for organizing the SUPREMES program as well as Dr. Kroner and Nicolas Pelisch for working in cooperation with the program.

Endothelialization of Novel Magnetic Flow Diverters Using Magnetically-Labeled Endothelial Cells

Joseph N. Cherny, MCW; Akankshya Shradhanjali, PhD, MCW, Biomedical Engineering; Raphael Sacho, MD, MCW; Brandon J. Tefft, PhD, MCW/Marquette University, Biomedical Engineering

INTRODUCTION

Flow diverters are devices used to treat cerebral aneurysms by reducing blood flow to the aneurysms. The reduction of blood flow causes blood in the aneurysm to clot, preventing it from rupturing. The issue with flow diverters is that after they are implanted, there is a risk of blood clots forming on the device until it is completely covered with endothelial cells, and the patient must be on an antiplatelet regimen to prevent blood clots from forming on the device. The antiplatelet regimen needed to prevent clots puts a patient at risk for a variety of issues. If a patient has a preexisting condition that may cause them to bleed, such as stomach ulcers, the antiplatelet therapy can put them at risk for severe internal bleeding. Additionally, patients are put at risk by the antiplatelet therapies in the case that they may need emergency surgery. The surgery would need to be delayed to reverse the antiplatelet therapy, which could put the patient at a significant risk, and if the antiplatelet therapy is not reversed, the patient could bleed out during surgery. This project serves to determine if magnetic flow diverters can be rapidly endothelialized with super paramagnetic iron oxide nanoparticles (SPIONs) labeled endothelial cells, and to test if the process of magnetic endothelialization can be used on flow diverters with the same success as in previous studies on magnetic stents.

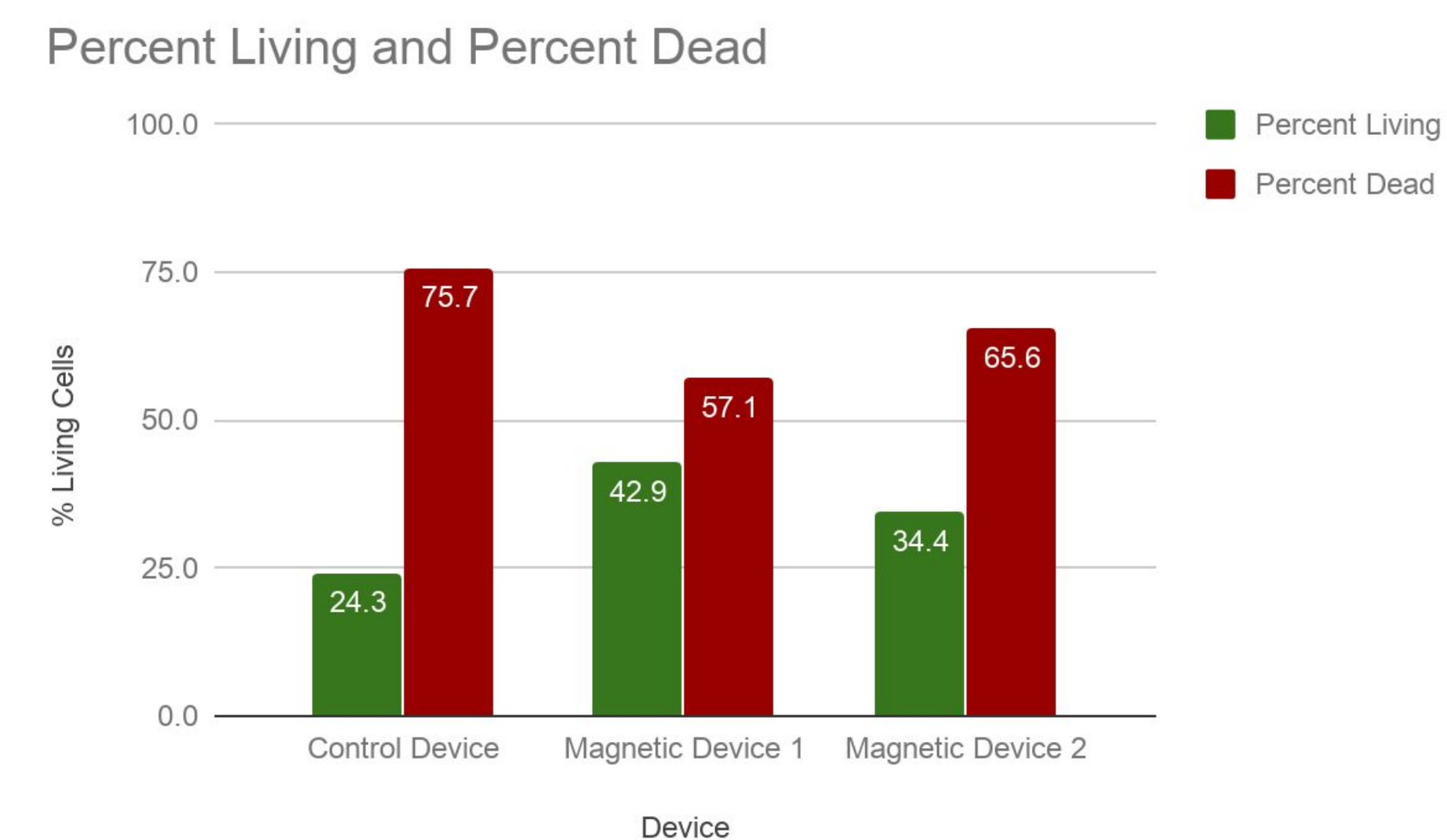
PROJECT GOAL:

The goal of this project is to determine if novel magnetic flow diverters can be rapidly endothelialized with SPIONs labeled endothelial cells. If this is successful, people who need flow diverters may no longer face the risks of being on antiplatelet therapies.

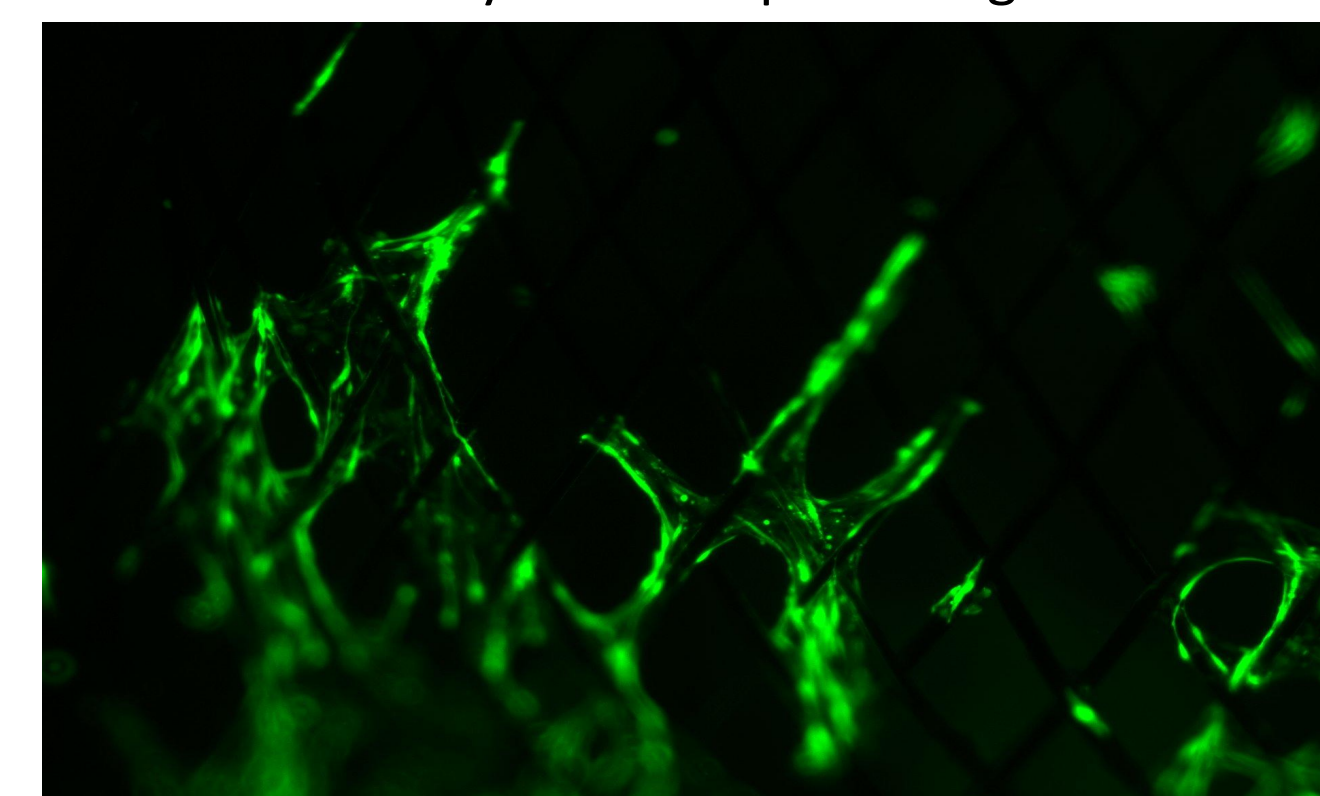
METHODS & RESULTS

Cell Viability Study

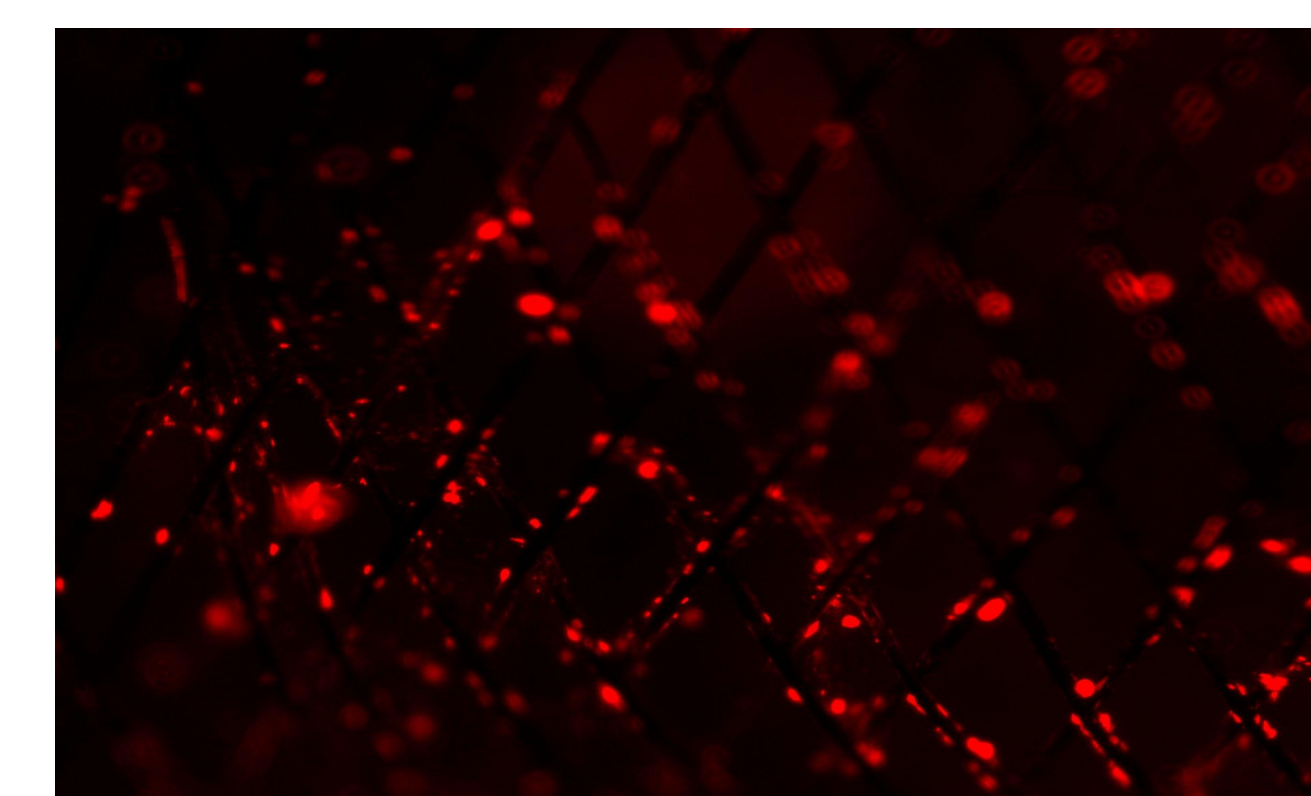
The first experiment performed was using an Invitrogen LIVE/DEAD Viability/Cytotoxicity Kit to determine the cytotoxicity of the control and experimental flow diverters. To perform this assay, working solutions of two micromolar Calcein AM and four micromolar EthD-1 were made. These solutions were vortexed separately, combined, and vortexed again. 150 microliters of the final working solution was added to each well living cells on the control device. Endothelial cells had been culturing on the flow diverters in the wells for a week before the assay was performed. The well plate was incubated for 45 minutes at room temperature and in the absence of light after the addition of the working solutions. Following incubation, fluorescent images were taken at four locations in each of the three wells. At each location, images were taken with the Texas Red fluorescence and the FITC fluorescence as well as with the bright field. The images were analyzed using the ImageJ particle counter and auto-selection feature. The results for all of the living cell counts for each location on the device were averaged, and the results for all of the dead cell counts on each device were averaged. The percent living cells and percent dead cells on each device based off of the averages can be found in the graph below.



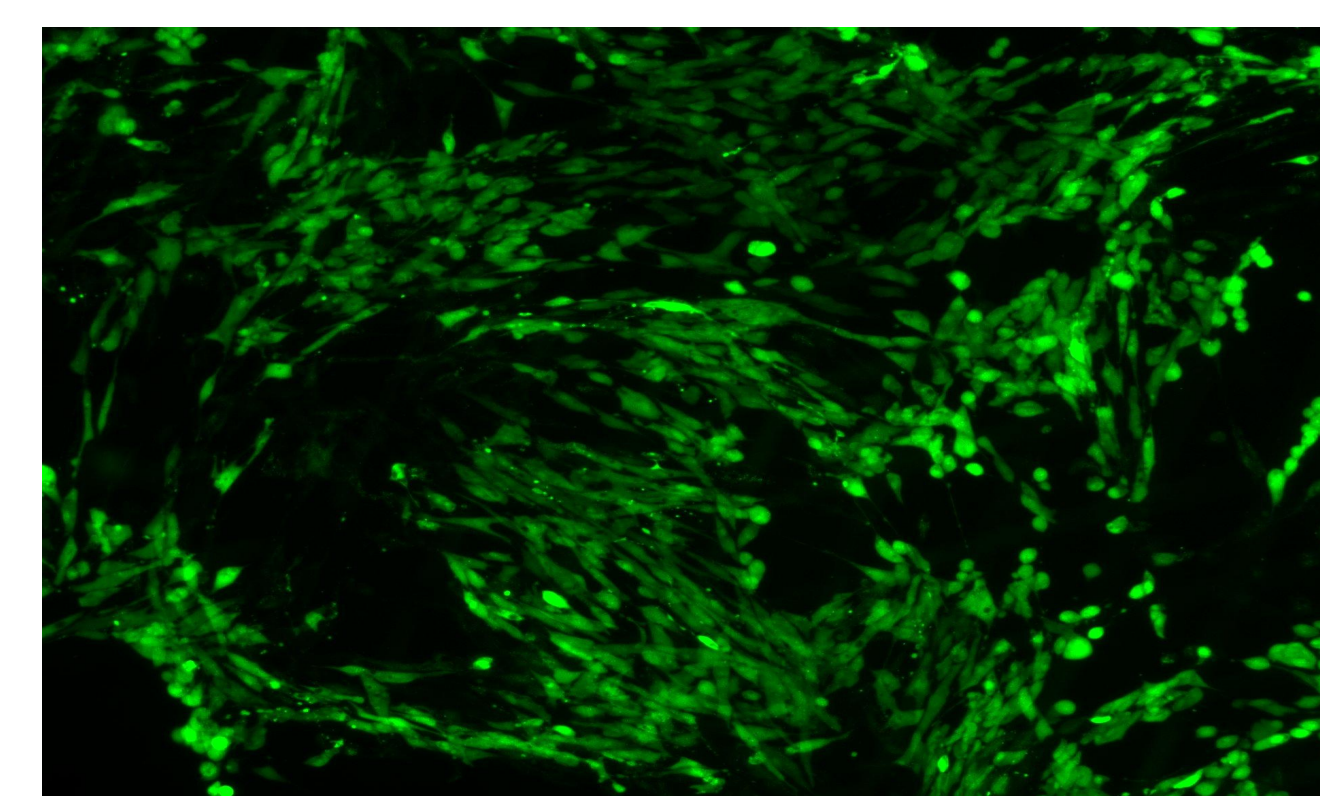
This is just a preliminary study. This graph shows that the experimental flow diverters had a higher average % of living cells than the control device, but the data in this table is not statistically significant because it is the results of only one LIVE/DEAD assay due to time constraints. The assay will be repeated again for more significant data.



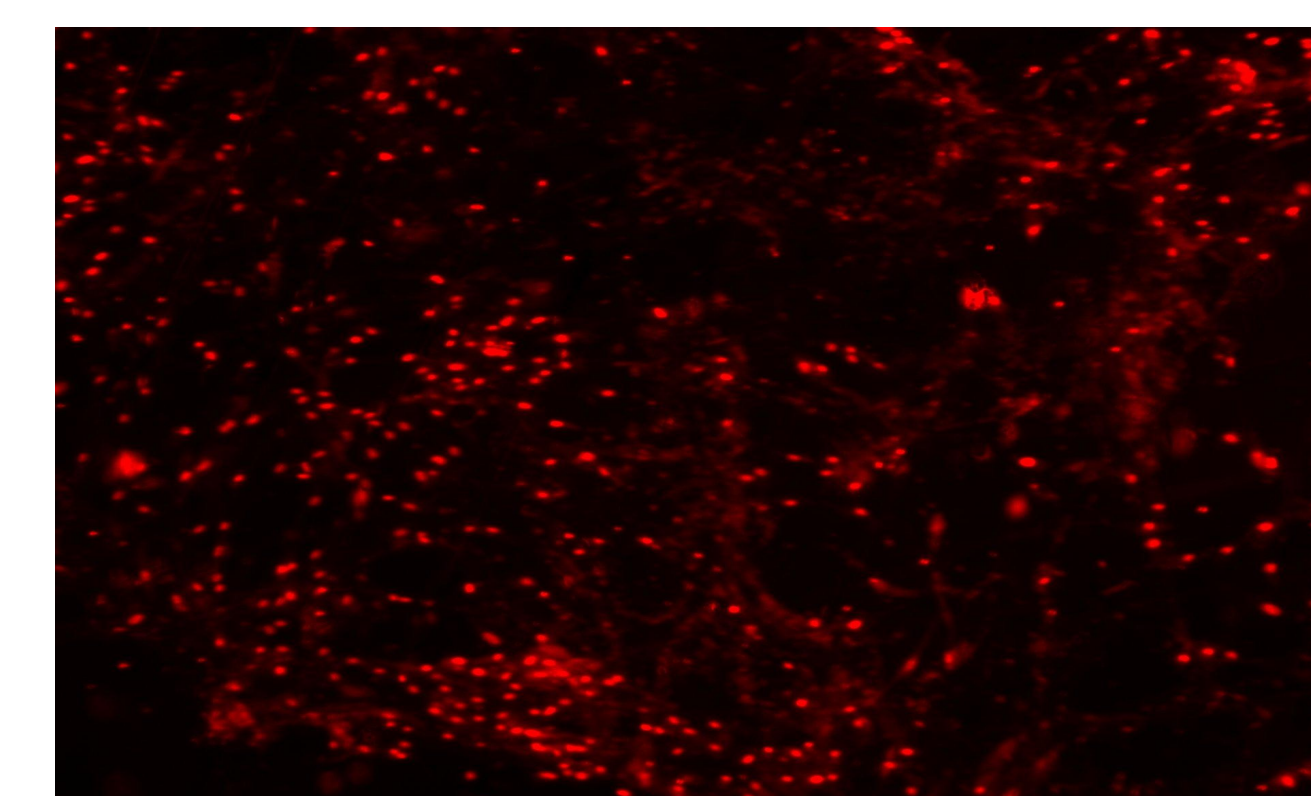
Living cells on the control device



Dead cells on the control device



Living cells on the Experimental device



Dead cells on the Experimental device

Magnetic Field Measurements

Trial Number	Control Device	Experimental Device 1	Experimental Device 2
1	0.0097	0.0206	0.0201
2	0.0081	0.0197	0.0250
3	0.0018	0.0282	0.0157

All magnetic measurements were taken using the Micromagnetics SpinMeter 3D and Micromagnetics Zero-Gauss chamber. The data in the table is measured in Gauss, and is the software-calculated total value for all of the axis combined.

CONCLUSIONS

- Based off of the preliminary results from the cell viability assay, it appears that the experimental flow diverters are more viable than the control flow diverters, meaning there is a possibility that these devices can be tested in vivo. More testing needs to be done to determine statistically significant results along with mechanical measurements and thrombogenic assays.
- The magnetic measurements allow me to conclude that the experimental flow diverters do produce an electromagnetic field stronger than that of the control devices

FUTURE DIRECTIONS

This project should be continued through a cell capture and retention study, and if that study is successful, experimenters should attempt to implant and endothelialize a magnetic flow diverter in a large animal model.

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