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# Journal of Undergraduate Research



*Volume Eighteen, Issue One  
Fall 2019*



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*The Journal of Undergraduate Research (JUR) is dedicated to providing the student body with intellectual perspectives from various academic disciplines. JUR serves as a forum for the presentation of original research, thereby encouraging the pursuit of significant scholarly endeavors.*

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# Letter from the Editors

*“The main question when reviewing a paper should be whether its conclusions are likely to be correct, not whether it would be important if it were true. Real advances are built with bricks, not straw.”*

—William G. Kaelin, 2019 Nobel Prize in Physiology or Medicine

Every semester, we are in awe of the research being done at the University of Rochester. With this issue receiving the most submissions thus far, deciding which articles to publish was a very difficult decision. At the end of the day, we based our decisions on the validity of the author’s work as, echoed in the quote above by Nobel Laureate William Kaelin, every true discovery we make contributes to a larger, grander picture.

We could not do this process without the help of the professors here who lend us their time and effort to maintain the quality of the work we publish. As always, we are greatly indebted to those who help us fulfill our mission of showcasing the extraordinary undergraduate work done here at the University of Rochester. We strive our best to serve as a platform for the incredible research being done at our institution.

In this issue, we have selected five articles spanning a broad range of disciplines, from public health to gender studies. We hope these articles spark your curiosity and encourage you pursue answers to your own questions. Whether it be on a small- or large-scale, we see every contribution as meaningful. We wish that, in a similar sense, your undergraduate pursuits act as fundamental stepping stones to bigger and brighter futures.

We hope you enjoy reading the Fall 2019 issue of the JUR and look forward to seeing your own works in the near future.

Sincerely,

*John Lozada and Arokoruba Cheetham-West*

*Co-Editors in Chief*





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# Journal of Undergraduate Research

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## Professor Interview

### Sina Ghaemmaghmi, PhD

*Associate Professor  
Director of Undergraduate Research  
University of Rochester*



*University of Rochester photo / J. Adam Fenster*

**JUR:** First, can you tell us a little bit about your professional background and how you became involved in the research that you do currently?

**Ghaemmaghmi:** I got my PhD in Biochemistry at Duke University. I guess I should go way back - in my undergraduate years, I was a Physics minor Chemistry background and I ended up doing research in a Biochemistry which got me interested in Biochemistry. I was lucky enough to publish a paper in my undergraduate which got me hooked, and I have stuck with it. I applied to graduate schools for Biochemistry, and I went to grad school at Duke University. I did 4 years of grad school, and then I did my postdoctoral fellowship at the University of California San Francisco (UCSF), and just kept at it. I was kind of too deep in at that point so just stuck with academia and applied for faculty positions at the end of my postdoc and I got a position here, at the University of Rochester.

**JUR:** Can you talk about the role that research plays in the undergraduate experience?

**Ghaemmaghmi:** Yes, I can speak to that because I am the new director of undergraduate research - which is very important to me. So, I think it's very important for undergraduates to get into research as early as possible and to stay with it as long as possible because undergraduates have an opportunity to actually try out the discipline that they are studying, see how it works in the real world, and get hands-on experience. It gives the students an opportunity to interact with faculty and establish a close relationship and form a contact, as a reference to help them move on to grad school or work, or whatever they want. It is also nice to be in a lab where there are undergraduates, graduates, and postdocs - people at different stages of their career. It creates a very nice environment. In my lab, we have a large number of undergraduates. Right now we have four, but we have had as many as eight at a time. It's really nice when an undergraduate comes into the lab because they do not have any preconceived notions, they are curious about everything - so we have to explain how things work to them and they learn how things work on their own as well. I definitely encourage all undergraduates to get involved with research.

**JUR:** How was your first personal experience with research? You said you were involved in research as an undergraduate - how did you know you wanted to get involved/how did you get involved?

**Ghaemmaghmi:** The honest answer is that my friend was doing so I said that I will try it. So it was a little bit random and to be honest, the lab I chose was not necessarily the field I thought I was interested in. They were studying about proteins and how proteins folded, which I did not know anything about. But, I got in there and my undergraduate mentor was a really good teacher. He was into it, so that got me passionate about it. Once I started doing my own experiments, getting my own results, and presenting the results, it felt very nice. That was kind of the hook that has kept me on since then.

**JUR:** What have been some of the most rewarding aspects of your work in research?

**Ghaemmaghmi:** Definitely the very first paper that I published by myself. It was my own ideas, I did the experiments and got my results, and published it on my own - which was very satisfying. The first conference I went to and presented my research. It's one thing as an undergraduate where you get told what to learn and you follow along. As a graduate student, though, you come up with your own ideas and do your own thing. So you feel a sense of ownership on the results you get. To have that and to go and present it to others, and them liking what you are presenting was a very special experience in my first conference.

As a mentor, definitely when I first started getting my own graduate students. When my first graduate student was successful and got her PhD, I felt like a cycle has been completed, which was nice.

**JUR:** Based on your early experiences, how would you suggest an undergraduate to not only get involved in research but to find a topic which is truly interesting to them?

**Ghaemmaghmi:** I mean there's nothing like e-mailing professors and just telling them... everyone has the details of their research online now, so you can just go online and see what everyone is working on. If you see something that is interesting you should reach out to the professor. Obviously you do not have to commit at that point but you should ask them if they want to sit down and discuss about their research. Then have them explain to you why it is interesting, and why they are interesting. I think often hearing someone explain why something is interesting can show you why you may be interested in yourself. A lot of students may have a little bit of an idea of what they may be interested in, but in reality they have not been exposed to that many things - so what they can con-

sider is limited. For example, a lot of students are interested in health-related research because they want to go to medical school, but no one says, “Oh I really want to study Aphids, that’s really my passion.” If you sit down with a Biology professor - say Dr. Brisson here, she has been studying Aphids and she is very dynamic and very excited about it. That may spark an interest in you, maybe you will consider doing that as well. So, definitely talking with your professors who are experts in different fields may show you what you are really interested in.

**JUR:** What are some important personal qualities you found made you a successful researcher?

**Ghaemmaghmi:** (Laughs) It’s kind of weird to call yourself successful-success is a sliding scale. I think the key to it is that you have to be interested in what you’re doing that’s the most important thing. I think that in research failure is definitely the norm and actual success is relatively rare. Most experiments fail, most grants that you write don’t get funded, most of the papers that you submit get rejected a few times before they get accepted. And if you’re just counting those [and focusing on the lack of] successes, what percentage of the time you succeeded, it really can be dispiriting. But yeah, as long as you like what you’re doing, and you’re actually interested in seeing what the results of your experiments are and you have your graduate students doing research and showing you the data and it gets both of you excited, I think that’s all the success you need and that’s enough reason to keep doing it and I think for all scientists that’s the main reason we stick with it.

**JUR:** Based on all of your experiences, do you have any advice for undergraduates in general?

**Ghaemmaghmi:** I hate giving advice. I would say to just try different things that you may not initially think you’re interested in. I think more than when I was an undergrad I think a lot of students now enter the university with a [lot] ideas of what they want. This is the path I want to go and I just want my undergrad career to get me there. And by just being closed like that, they might not be open to other disciplines, other fields, that, if they just gave it a chance, it may really attract them. So, my advice is that this period that you have to just try different things and get yourself eventually excited by all these different topics. This is it, you won’t get this chance once you start working at a job, that’s the thing you’re going to be doing. This is the period to really explore, take different classes, classes that you may or may not think you’ll like and just give yourself an opportunity to [explore a] diversity of topics.

**JUR:** Last question- in your new role with the office of undergraduate research, how do you plan to support students through their research experiences?

**Ghaemmaghmi:** I’m glad that you asked that. First and foremost, we’re a place where students can just come and get advice. If they just don’t know how to get started doing research and they just want to talk to someone and ask them “tell me everything that’s available, what should I do and how I should email professors”, you can just walk in and we have staff that we have who just talk to students and give them advice.

We have some funding opportunities. One of the major things is to provide support for summer research. We have a grant called the Discover Grant that students that want to stay over the summer and do research can apply for and get funding. We have some other funding for travel and presenting at conferences if the student has already done some research and they want to go to a conference and present it we often fund students to go. Some students when they first came to the university they got a RIG - Research and Innovation Grant which allows them to do research with that money. We also help and provide support for students to find their research opportunity here to use their RIG funding.

**JUR:** That’s all the questions we had planned. Is there anything else you want to add about your new position or anything else?

**Ghaemmaghmi:** Yeah. My vision is that I really want every single student - undergrad - at this university to experience research. And we define research very broadly. I think- some people when they think of research they think of just STEM and labs. But in our office we consider research to be for the entire university including the humanities and the social sciences and there are opportunities in those areas for undergrads who actually work with faculty mentors and get hands on experience. I think that students at this university are in a very good place to gain this research. This university is a research - what’s called a R01 institution. But it’s relatively small-in fact we may be the smallest R01 institution. So the ratio of research labs or research active faculty to undergraduates is very high. I really think that any student who really wants to gain research experience can find a mentor or professor or lab to work in. I really want to sort of promote that culture of research at this university. It’s my hope that every student will at least consider some way of getting some practical hands on research experience during their time as an undergraduate.

**JUR:** Thank you so much! That was very helpful.

**Ghaemmaghmi:** You’re welcome.

*Photo credit: University of Rochester Newscenter, <https://www.rochester.edu/newscenter/sina-ghaemmaghmi-named-new-director-of-undergraduate-research-393812/>*

# Review of a Selection of Physiology Tests Performed at the PEAK Laboratory and their Relevance and Applicability to Testing on an Athletic Population

**Bianca A. Hall**

*Advised by Dr. Karen Mustian, Interdepartmental (School of Medicine and Dentistry)*

A common and appropriate practice in preventative and rehabilitative exercise programs is to measure physical fitness. The tests that extract these measurements should be valid, reliable, reproducible, and preferably inexpensive. Combined with medical and exercise history, these tests are able to provide a baseline for participants' current health and physical fitness status, and thus provide a framework for individual exercise prescription. Furthermore, data collected for these participants can be used to measure changes in fitness and health as they age, as well as provide a means of motivating participants to achieve plausible health and fitness goals.

In athletic populations, tests to measure physical fitness are focused on the highest level of physical performance of an athlete. However, these tests are equally important for injury prevention and rehabilitative exercise programs as they would be for any other population in need of exercise intervention. The following exercise tests performed at the PEAK (Physical-Exercise-Activity-Kinesiology) Human Performance Clinical Research Core Laboratory at the University of Rochester Medical Center measure physical health and fitness and could also be used to test an athletic population for the purpose of performance.<sup>1</sup>

## General Guidelines to be followed before undergoing testing

It is important that before any clinical tests are conducted, procedures are pretested to ensure participant safety. Conducting the informed consent process, exercise pre-participation screening, and other tests to ensure preparedness for physical activity - such as the PAR-Q+ (Physical Activity Readiness Questionnaire) - will further ensure participant safety before physiology tests are conducted. In addition, any essential documents related to testing such as consent, screening forms, and data recording sheets should be ready before testing proceeds. All equipment should have been maintained and calibrated regularly to ensure test validity and reliability. The testing environment conditions should also be controlled as closely as possible; for example, room conditions maintained between 20°C -22°C with adequate airflow and humidity of less than 60%. Test anxiety and emotions experienced by the patient can be controlled for by proper communication and relaxed, confident interaction with participants so as to not obscure test results and ensure participant comfort.<sup>1</sup>

## Body Composition

### Body Impedance Assessment (BIA)

BIA provides a cost-effective method of determining the fat-free mass (FFM) and total body water (TBW) in subjects when using population specific or pathology specific BIA equations and established procedures.<sup>2</sup> The FFM and TBW are measurements used to describe the percentages of fat, bone, water, and muscle in human bodies. Body composition, especially the presence of FFM, is directly related to health outcomes. A normal balance of fat in the body indicates a healthy lifestyle; however, excess fat can greatly increase risks for cardiovascular disease, diabetes and other physiological ailments.<sup>3</sup>

BIA works by measuring how much a small electrical signal is impeded through different cell membranes in different types of tissue, each having varying degrees of ion mobility. Tissues that contain large amounts of fluid and electrolytes, such as blood, have high conductivity (lower impedance), while fat and bone slow the signal down (greater impedance). As BIA determines the resistance to flow of the current as it passes through the body, it provides estimates of body water vs. body fat and is calculated using regression equations based on the relative constant relationship between TBW and FFM (0.73 water to fat ratio). Changes in hydration are proportional to changes in the extracellular water and therefore the absolute volume of free fat mass and fat. It was found that higher resistance values are expected with relative over-hydration and lower resistance values with relative under-hydration in humans. Furthermore, BIA devices functionally assume that the human body is composed of uniform cylinders. While this is not true, bioimpedance testing is nevertheless an accurate predictor of body composition due to even fluid distribution throughout the body.<sup>4</sup>

In athletes, determining body composition is integral to determining nutritional status, training outcomes, and general health. Knowing the FFM and FM (fat mass) of an athlete provides useful information for athletic trainers and strength coaches, while simultaneously providing a resource to develop athlete-specific dietary interventions, which can all improve athletic performance.<sup>5</sup> The most accurate and reliable methods of measuring body composition are hydrostatic weighing (HW), dual energy X-ray absorptiometry (DEXA), air-displacement plethysmography, total body potassium counting, and various multi-compartment models. However, these tests are expensive and impractical for use with large populations.



As such, BIA is a practical and inexpensive method for determining the body composition of a larger population.<sup>5</sup>

As stated before, using the BIA technique requires the use of a generalized equation for a population determined by data recorded from large samples. Unique characteristics of athletes such as the type of sport played, physical role in their sport, acute changes in hydration from training, individual hydration status variability, and menstruation can lead to large errors in predicting FM and FFM. A comparison of the DEXA and BIA techniques for determining the fat free mass index (FFMI) of 33 male collegiate baseball players and 16 female gymnasts showed a consistent underestimation of FFMI.<sup>6</sup> However, 98% of estimates were within acceptable  $\pm 2$  kg/m<sup>2</sup>. It can be inferred then that a lack of a standardized equation for athletes can presumably be a limiting factor to BIA as using equations that hold the TBW:FFM ratio to be a strict 0.73 can be misleading amongst athletes.

### *Skinfold Test*

Skinfold (caliper) testing is an anthropometric method that estimates body fat percentage by determining the thickness of several folds across the body.<sup>1</sup> The thickness of folds at varying positions of the body is correlated to the amount of subcutaneous fat, which is furthermore proportional to the total amount of body fat. It is estimated that subcutaneous fat accounts for a third of all body fat, however there is great variation in the distribution of fat between intramuscular, intermuscular, and on internal organs.<sup>7</sup>

Because subcutaneous fat varies among races, ages, and sexes, regression equations are used to convert skinfold thickness to body density and then to body fat percentage. Skinfold tests are more susceptible to experimenter error due to the nature of the procedure - having to know how much skin to pinch and where to put the anatomical landmarks for measurements.<sup>17</sup> Thus, without significant experience, accuracy of the tests can be compromised. Furthermore, having an extremely lean or overly obese subject can also interfere with results. The accuracy of skinfold tests are within  $\pm 3.5\%$  body fat, assuming proper procedure is undergone.<sup>7</sup>

Skinfold testing is not a very practical method for determining body fat percentage in an athletic population. When this method of testing was compared to the BIA technique of determining body composition amongst 219 male professional athletes, it was found that body fat determination was significantly correlated amongst the two assessment methods ( $r=0.96$ ).<sup>8</sup> However, skinfold testing was deemed the more impractical method as it was significantly more time consuming than the BIA method, a method more suitable for routine use.

### *Circumference Measurement*

Measuring the circumference of various regions in the body can be important to determining fat distribution, especially at the waist and hip.<sup>1</sup> Increased fat in various regions of the body can be indicators of risk of physiological disease such as an-

droid obesity (more fat on the trunk) and this can indicate increased risk of hypertension, dyslipidemia, cardiovascular disease, and premature death.

Like skinfold testing, measuring the circumference of various regions of an athlete is not nearly as practical or time-efficient as other methods of assessing body composition. However, circumference measurements can be used in multi-compartment models for more accurate body composition testing as well as in the development of new regression equations for undefined populations.<sup>1</sup>

### *Multi-compartment Model & Future Research*

Researchers reviewed an assortment of studies to evaluate how body composition was to be best utilized in athletes using various bioimpedance analysis techniques. They found that a generalized athlete-specific BIA equation developed from a multiple-compartment model, using more than one body composition technique, is most ideal for future research. They also stated the need for further understanding of the individual variability between single assessments and repeated measurements of body composition.<sup>9</sup>

### *Sleep*

Sleep is a naturally recurring state in which the body experiences inhibition of nearly all voluntary muscles and the mind experiences a state of altered consciousness. There are two basic types of sleep that we cycle through: rapid eye movement (REM) sleep and non-REM sleep, the latter of which has three stages. Circadian rhythm, which controls the timing of sleep, and sleep-wake homeostasis, which keeps track of the need for sleep, are two internal biological mechanisms that work together to regulate states of awake and asleep. One's need for sleep is affected by medications, stress, sleep environment, current medical condition, and food and drink consumed.<sup>10</sup>

### *Actigraphy*

During sleep, several important physiological changes can be used to monitor sleep and diagnose or rule out various sleep disorders. Polysomnography (PSG) uses a combination of measuring electroencephalography (EEG) of brain waves, electrooculography (EOG) of eye movements, and electromyography (EMG) of skeletal muscle activity. It is performed in a specialized sleep lab to give the current most accurate recording of sleep.<sup>11</sup>

Actigraphs are compact, lightweight, computerized accelerometer-based devices that are cheaper and more portable than PSG equipment. Modern actigraphs have accelerometers and other movement detectors that sample movement up to several times per second and record continuously for 24-hours for up to several weeks. The data collected on these devices can be analyzed to determine levels of activity/inactivity, rhythm parameters, and sleep/wake parameters.<sup>12</sup>

At the PEAK Lab, one method of data collection for studies which require sleep monitoring is done using the GTX3+ Actigraph device. One study assessed the validity of wrist



actigraphy and hip actigraphy compared to PSG for sleep measurements. The study showed that while wrist actigraphy showed similar estimates of total sleep time and sleep efficiency, it overestimated wake after sleep onset. Overall, compared to PSG, the sensitivity, specificity, and accuracy of wrist actigraphy were 90%, 46%, and 84%, respectively. As such, a GTX3+ Actigraph worn on the wrist (a method used in the PEAK Lab) provides a valid and accurate measure of sleep when compared to the accuracy of PSG.<sup>13</sup>

The process of sleep is widely regarded as critical to both cognitive and physiological function. Furthermore, athletic performance outcomes are greatly influenced by the ability of humans to cope with physiological and psychological stresses.<sup>14</sup> Disturbances in sleep cycles through playing at night, early training times, or traveling can increase homeostatic pressure and can affect emotional regulation, core temperature, and circulating levels of melatonin, causing a delay in sleep onset.<sup>15</sup> Therefore, these disruptive changes in environment can lead to sleep loss, possibly compromising neurocognitive and physiological performance. Instances of sleep deprivation have significant negative effects on athletic performance, while instances of sleep restriction (partial disturbance to sleep wake cycles) show conflicting results. This is a concern as most athletes experience periods of sleep restriction rather than deprivation. Furthermore, the harmful effects to cognitive function are unambiguous during instances of sleep loss. There is not sufficient literature or testing on athletes to thoroughly determine the effect on sport-specific outcomes and future research is required.<sup>14,15</sup>

## Vitals

There are four primary vital signs used to indicate the status of the body's life-sustaining functions: body temperature, pulse (heart rate), respiratory rate, and blood pressure. Normal ranges for these signs vary by age, sex, weight, and other factors. A "fifth vital sign" used in the PEAK Lab was oxygen saturation as measured by pulse oximetry.<sup>16,17</sup> Other vital signs which do not sense acute changes in state, but rather the impact of prolonged illness, are height, weight, and body mass index.<sup>1</sup>

### *Vitals: Endurance Athletes*

Normal ranges for vitals even differ within athletic populations depending on the activity level of the sports. In endurance athletes, long-term endurance training significantly influences how the autonomic nervous system controls heart function. Decreased sympathetic activity to the human heart at rest and increased parasympathetic activity both contribute to a possible reduction in resting heart rate. Some research has shown a discrepancy in gender-specific autonomic differences, in that females have increased parasympathetic and decreased sympathetic control of their heart rate.<sup>18</sup>

The heart can show variability in the intervals between normal sinus beats because of respiration, blood pressure regulation, thermoregulation, actions of the renin-angiotensin system,

circadian rhythms, and other unknown factors.<sup>19</sup> Moreover, increases and decreases in heart-rate variability (HRV) can relate to changes in the fitness and freshness of elite athletes. Endurance athlete training for example, leading to decreases in HRV, showed positive adaptation to increases in cardiorespiratory fitness.<sup>19,20</sup>

Furthermore, while looking at the differences in blood pressure and risk for hypertension in endurance athletes and non-athletes, it was found that there was not a major systematic difference between the two groups. During a review of the literature, researchers noted that strength-trained athletes have slightly higher blood pressure than endurance-trained athletes, but there was no significant difference between either group and the control group (non-athletes).<sup>21</sup>

## *Muscular Fitness*

Muscular strength, as termed by the American College of Sports Medicine, refers to a combination of a muscle's ability to exert maximal force on one occasion, to continue to perform successive exertions of force over a unit of time, endurance, and to produce a certain amount of power. This definition represents muscular health as an integral part of total health-related fitness.<sup>1</sup> The information gained during a physical fitness test of muscle strength and endurance can reveal baseline information about a subject's current fitness level. Furthermore, athletes or those who wish to be professional athletes can greatly benefit from undergoing a physical fitness test, as it helps trainers and coaches to develop individualized workout plans.

### *Isokinetic Dynamometry (Hand, Shoulder, & Upper Leg)*

Isokinetic contraction is the muscular contraction that accompanies constant velocity limb movements around a joint, as controlled and maintained by a dynamometer specific to isolating that muscle group. The resistance of the dynamometer is equal to the muscular forces applied throughout the range of movement. This method allows the measurement of the muscular forces in dynamic conditions and provides optimal loading of the muscles.<sup>1</sup>

The current instrument used for isokinetic muscular testing in the PEAK Laboratory is the BioDex 3. The reliability and validity of the machine's ability to give truly accurate measurements of position, torque, and velocity based on theoretical calculations was tested and found to be successful on all criteria.<sup>22</sup> The caliber of this equipment has proven useful to athletes and coaches wanting to isolate and strengthen various muscles and produce higher level sport gameplay.

The BioDex 3 equipment was used to measure the effect that off-season plyometric training had on the throwing abilities of 24 Division I college baseball players. The results found significant increases in the velocity of the throws of the group undergoing off-season training but also noted no significant differences in isokinetic strength between those who participated in off-season training and those who did not. This high-

lights the limits of the muscle strength improvements that can be measured using isokinetic muscle testing. The researchers reasoned that the dynamic nature of a plyometric exercise is opposite to the principle of an isolated muscle exercise. To test the strength of a plyometric exercise, a mechanism that is able to do so while in full motion (rather than the isolated nature of the BioDex 3 equipment) would be more suitable.<sup>23,24</sup>

## Cardiorespiratory Fitness

Cardiorespiratory Fitness (CRF) refers to one's ability to perform large muscle, dynamic, moderate-to-vigorous intensity exercise during a sustained period of time. Execution of this exercise requires an integrated physiologic and functional state of the respiratory, cardiovascular, and musculoskeletal systems. The primary measure of CRF is  $VO_{2max}$ .<sup>1</sup>

### Maximal Oxygen Uptake ( $VO_{2max}$ )

$VO_{2max}$  is the maximum rate of oxygen consumption measured during exercise of incrementally increasing intensity. Open circuit spirometry is used to measure  $VO_{2max}$  during graded incremental exercise. When direct measurement is not feasible, other tests measuring various maximal and submaximal exercise can be used to estimate  $VO_{2max}$ .<sup>1,25</sup>

There are a variety of testing protocols that are used to measure maximal oxygen uptake. These include: Yo-Yo intermittent testing, 20 meter shuttle run, and the Bruce protocol treadmill test. The mode of exercise chosen is dependent on the availability of equipment, setting, and training of personnel. Some examples of testing modes include treadmills, cycle ergometers, steps, and field tests.<sup>1</sup> At the PEAK Lab, forms of submaximal testing include performing the Bruce protocol on the treadmill or performing the six-minute walk test.

The reliability and validity of a continuous incremental treadmill protocol for the determination of lactate threshold, fixed blood lactate concentration, and  $VO_{2max}$  was evaluated by researchers. Lactate threshold has been shown to correlate best with  $VO_{2max}$  and endurance running performance compared to other parameters of lactate measurements.<sup>26,27</sup> Previous literature indicated that discontinuous treadmill protocol of a series of 10-minute runs provided valid data to determine lactate threshold. 15 male runners were tested on two occasions through vigorous continuous and discontinuous treadmill protocols. It was found that both protocols resulted in similar values of  $VO_{2max}$  and lactate threshold. As such, it was concluded that a continuous horizontal treadmill protocol using three-minute stages was a reliable and valid measurement for determining the  $VO_{2max}$  of running athletes.<sup>26</sup>

## Conclusion

Though the PEAK Human Performance Clinical Research Core Laboratory conducts physiological testing on populations that typically do not include elite athletes, the main principles of exercise physiology were shown to be applicable to athletic populations using the testing equipment currently available. It was inferred that body impedance assessment,

heart rate variability, and measurement of vitals and maximal oxygen uptake were more practical testing methods for athletic populations. Measuring body composition using skinfold testing and determining circumference were not practical for use on a large scale due to the speed of testing. Isokinetic strength testing was inferred to be not as practical for determining sport-specific muscular strength. This was because muscles were isolated during testing in contrast to real-life contexts, which require free movement. Lastly, more research is required to determine the effect of sleep restriction on athletic populations; however, it is still necessary to monitor sleep, as sleep deprivation has been proven to reduce athletic performance.

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# Kerry James Marshall's Knowledge and Wonder: Towards a Public Particular Classification of Site-Specific Art

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*Advised by Joan Saab, Art History*

On October 1, 2018, Chicago Mayor Rahm Emmanuel announced the city's plan to bring one of its public artworks to auction and then use the funds raised to upgrade and expand services at the Legler Branch of the Chicago Public Library. The artwork in mind was a mural created for the library by Chicago-based artist Kerry James Marshall. Titled *Knowledge and Wonder*, the painting depicts a group of black children gazing at a world of books and learning, created expressly for the site in which it has been located since its completion. The city's intention to sell this mural quickly spurred controversy: many people, from Chicago residents to art world elites decrying the sale. Such an impassioned response demonstrates the Chicago public's investment in its public art, while pointing to greater concerns of value, ownership, and the localization of meaning.

*Knowledge and Wonder* embodies the paradigm of community based site-specific art suggested by art historian Miwon Kwon, but its intrinsic relationship to the spatial and social locale in which it is situated prompts the necessity of a more precise classification. What I will be referring to hereon as "public particular" art. Both Kwon's notion of community based site-specific art and my notion of public particular art are apt paradigms through which we may consider *Knowledge and Wonder*, as well the nuances of the controversy spurred by its potential relocation. In light of the artist's intentions in creating and presenting the mural, the mural's physical placement in the Legler Branch of the Chicago Public Library, and the social engagement and continued exposure to the work enjoyed by the library's predominantly black community, it is apparent that this is a work inextricably linked to a chosen community. I aim to explore the relationship between this work of art and its intended audience through my notion of public particular art. This approach intends to specify the site of an artwork as not merely the physical space in which it resides but as a psychic space composed of encounters and engagements with a socially construed public. It is through such interactions between art and public that cultural value is incurred; in a manner extraneous to contemporary market values. Such access to the work activates it and provides a certain exclusive meaning to the public for which it has been made. It is this excludability that designates its particularized value and explains the fervor that ensues when such art is intended to be sold.

Standing at an impressive 114 x 275 inches, *Knowledge and Wonder* is an expansive testament to the awe-inspiring world of learning that is accessible through books: particularly the resources available at a public library such as the Legler

branch. The mural's titular words form part of the titles of two of the books featured in the composition: *The Big Book of Knowledge* and *The Golden Book of Wonder*. Celestial bodies, dragons, natural forms, comets, and constellations merge as a mystic field that forms the paintings' backdrop. Standing before these forces of human intellect and natural awe is a row of children and adolescents, each painted in the charcoal-back tone that has become Marshall's signature in his depictions of black Americans. Their faces are unseen, as they are positioned away from the viewer, gazing upon the marvels that compose the image. Some are shown pointing at figures in the scene, while others merely tilt their chins upward in observation. The notion of ascension forms a particularly interesting visual motif, hinted at by the presence of a white ladder on the mural's right-hand side and a child floating up into the cosmos upon a hovering astral body. Such figures appear as allusions to the notion that, through reading and engagement with the library's many resources, youths are able to elevate themselves and further connect with the world.

Certainly, context, site, and community are key to this painting's perception and reception. However understanding the intentions of an artist creating a work dependent upon its intention for a space, as opposed to merely creating an independently-completed work in a space that is public, is crucial in piecing together precisely where value, meaning, and cultural connection reside. This designation is particularly pertinent in this case. It was only after another publicly situated artwork of Marshall's sold for a record-breaking price that *Knowledge and Wonder* was rediscovered and reconsidered as a monetary asset. The former work, *Past Times*, was put up for auction in May of 2018 by Chicago's Metropolitan Pier and Exposition Authority and sold for \$21.1 million including fees.<sup>1</sup> The sale marked an auction height for Marshall: invigorating interest in his work and compelling the city to seek a similar turnout for Legler's hidden gem.

The marked difference in these two works, and the public reception regarding the sale of each, is less about their creation by an artist with ties to the Chicago community or their presentations in public spaces but in the marked differences in their origin stories and conceptual geneses. *Past Times* was purchased from a Los Angeles gallery for \$25,000 before being hung in McCormick Place, a convention center in downtown Chicago. Alternatively, *Knowledge and Wonder* was born from a commission Marshall received from the city's Department of Cultural Affairs to create a work for the Legler Branch Library.<sup>2</sup> In the latter case, the resultant work



was conceptualized and executed expressly for the public space in which it has been situated. Speaking on *Past Times* and this difference, Marshall is blunt; “it was a completely different thing. It’s not site specific.”<sup>3</sup>

At its onset in the 1960s, site-specific art emerged as a means of rejecting consumerist notions of artmaking as well as the capitalist forces that dictate market value; site-specific artwork, damaged or outright destroyed if relocated, resists the intentions of the art market. Art produced with the intent of residing in public space, especially with a certain site in mind, inclines artists to operate on the assumption that the work is to remain the property of the commissioner. Marshall’s comments in an interview with the Chicago Tribune further emphasize a practical discrepancy; for if public artwork is expected to accrue value and be considered as liquid assets, “there would be no reason to do public works, especially public works that could be moved, because at any opportunity that work could be seen as nothing but cash on the wall.” Thus, site-specific works demand permanence or transience; they may either survive in the location for which they were made or be irrevocably altered upon their removal.

Though there is certainly public concern whenever cultural assets are dispensed for financial gains, the outcry over *Knowledge and Wonder* supersedes that of its predecessor, and the artist himself concurs the difference. After all, he had no hard feelings about the former sale, while the unexpected news about *Knowledge and Wonder*’s impending auction elicited the following response:

“Considering that only last year Mayor [Rahm] Emanuel and Commissioner [of the Department of Cultural Affairs Mark] Kelly dedicated another mural I designed downtown for which I was asked to accept one dollar, you could say the City of Big Shoulders has wrung every bit of value they could from the fruits of my labor.”<sup>4</sup>

After making his opinion known, Marshall was contacted by Mayor Emmanuel who responded to Marshall’s concerns by pulling the painting from the auction; though not yet relocated to its former space in the library, *Knowledge and Wonder* remains the property of the City of Chicago. This decision, compelled in large part by the artist’s intent and dissent, emphasizes the multifaceted factors at play that influence public art deaccessions. At least in this case, an artist’s intentions for a work, the consideration of the public for which a work has been produced, and the preservation of sustaining an ongoing relationship with said public has enough pull to outweigh a \$15 million auction estimate. Considered alongside the comparable sale of *Past Times*, it is evident that site-specificity is a key asset contributing to this equation.

Much can be made of the particular relationship an artist has to a community: the implications of the artist’s intentions on the status and validity of a work as being “site-specific”, the importance of these intentions in locating the meaning, and by extension localizing the value of a work of art. As a

Chicago-based artist known for his compelling representational paintings of black subjects in common spaces, Marshall was certainly an ideal choice to create a site-specific mural for a library on Chicago’s west side, especially in consideration of his particular fondness for children and connecting with young people through his art. The resulting scene of children gazing into a world of learning that constitutes *Knowledge and Wonder* strikes at the core of Marshall’s intentions as a painter of African-American life. Commenting on his practice in 1995, the same year that *Knowledge and Wonder* was completed, Marshall emphasizes this aim, “Art is regenerative. Art history makes new artists. It made me one.”<sup>5</sup> Marshall is attuned to the influence of images and representation on young people, frequently citing the formative influence of his kindergarten teacher on his genesis as an artist.<sup>6</sup>

Necessarily, the artist’s intentions for and relationship to a site, or the public in which a work of art is intended for, carries weight in such conversations about localization of meaning. This premise is essential to the notion of community-based site specific art that Miwon Kwon conceptualizes in her genre-defining text on site specific art, *One Place After Another: Site Specificity and Locational Identity*. Kwon’s paradigm of community based site specific art has a few key features, emphasizing one such “dominant principle” as being “the presumption of a unity or identity between the artist and the community and between the community and the art work.” Born and raised in Birmingham, Alabama, Marshall moved to Chicago in 1987, where his career strengthened and he has since been a local figure.<sup>7</sup> His work is ultimately about representation, a force used to “move the black figure from the periphery to the centre.”<sup>8</sup> In doing so, Marshall effectively makes space in the canon of art history for black people, their lives, and their communities, depicting such spaces with care and quotidian simplicity. These values and histories align Marshall with the community in which his work resides, and so the initial premise of community-based site specificity is achieved.

Besides consideration of the identity of the artist, community-based site specificity requires an intentionality of communion between a work and the community who is to engage with it. Kwon emphasizes the importance of members of a community being able to “see and recognize themselves in the work,”<sup>9</sup> in the sense of being “affirmatively pictured or validated.” The scene Marshall creates in his mural, representing black children engaging with library resources, certainly imparts this effect. Community based site specific works thus emphasize a mode of “social integration,” seeking to compass the active engagement of the community for whom it is produced.<sup>10</sup> Through such engagement, perhaps a new space of meaning is constructed: one contingent upon the physical reality of a work, but alternately located in a space of discourse or engagement between an individual viewer and the art object itself. Designating a psychic space which functions as a site in of itself is pertinent to Kwon’s community based paradigm:

“But more importantly the emphasis on the social stems from the belief that the meaning or value of the art work does not reside in the object itself but is accrued over time through the interaction between the artist and the community. This interaction is considered to be integral to the art work and equal in significance (it may even be thought of as constituting the art work).”

This is an immense assertion: situating meaning within a space of engagement. The demands of this definition call to question how an artwork designated as site specific by an artist, instantiated as such, and then ultimately dislocated, is affected by these shifts in its engagement. This disruption may even occur within the physical site, so long as the psychic site of access is not permissible. For example, if someone from another city sees *Knowledge and Wonder* hanging in the Legler library, the work remains whole and capable of being accessed by a spectator with this communal link, but a spectator who lacks this specified relationship remains excluded by its designation. Locating meaning in this space of access, and ascribing value to it, is an essential and compelling factor behind the decision to maintain community-based site specific art within the site of its inception.

It is evident from all of the discussed considerations that the location of a work intended by an artist to be site specific certainly contributes value to its endured situation in that location. However, the onus of considering this value to outweigh a \$15 million estimate at auction remains a difficult burden to prove. There is a debate over whether or not the library can practically preserve and keep a multimillion-dollar painting safe or if it is indeed ethically dubious for the city to make some communities choose between public art and public services. Therefore, the particularly loaded relationship between a work of art, its public, and its placement must be dissected. In this aim, I propose a new classification that aims to elucidate the localization of meaning and, by extension, derivation of unique value that occurs in works which can be defined as public-particular. Melding Kwon’s conception of community-based site specific art with conceptions of what exactly constitutes a public, I find a space where the intention for a work to be accessed is not merely by a directed community but an expressed public and remark that a particular value is derived from the excludability of this intended access to members of this preselected public. It is this space, an exclusive realm designated by the artist and functioning in proximity to the site in which a work is placed, that compels protection from the public and associations of value that are capable of competing with massive market values. My intention in instantiating this new definition is to clarify where meaning and value resides in a work such as *Knowledge and Wonder*, which I argue would be harmed by displacement and dislocation.

When the mayor of Chicago elected to pull the mural from auction, citing the artist’s concerns and the cultural value of the item to the community in which it is based, he affirmatively suggested that this painting’s site-specificity is worth a

value upwards of \$15 million or at least possesses a value comparable to the monetary sum it could be transacted for. Though the painting’s withdrawal inevitably occurred as the culmination of personal and political factors on the Mayor and City’s behalf, the implication extends to protect a space of meaning derived from the work’s engagement with the public for whom it was produced.

Be it Marshall’s intention to inspire black youth to pick up books, or the repeated public engagement that cultivates a meaning external yet contingent to the physical parameters of the work, *Knowledge and Wonder* only exists in its entirety when hung in its site of intent and presented to its designated public. Had it been sold, relocated, and rehung in a collector’s home or stowed away in a storage unit like many great artworks have come to be, the work would be fragmented and, I argue, worth less than the work that exists at Legler. For in this case, a pertinent aspect of the work’s inherent interest would be inaccessible to art world elites and mega-collectors lacking the perspective and lived experiences essential to evoking the work’s total potential. Acknowledging the worth of these factors—the exclusive meaning derived from the framework through which the artwork is accessed and the expressive identity of the artist, the viewer, and the public—is important in showing that this painting demonstrates the validity of site-specificity and the endurance of cultural notions of value in an age of soaring auction prices and mega-collectors.

## Footnotes

1. Victoria L. Valentine, "Priced to Set New Artist Record, 'Past Times' by Kerry James Marshall is Consigned to Sotheby's by Chicago Convention Center," *Culture Type*, 25 Apr. 2018, <https://www.culturetype.com/2018/04/25/priced-to-set-new-artist-record-past-times-by-kerry-james-marshall-is-consigned-to-sothebys-by-chicago-convention-center/>.
2. Wilma Randle, "A Special Treasure," *Chicago Tribune (1963-Current File)*, 3 Sept. 1995, <https://search.proquest-com.ezp.lib.rochester.edu/docview/2055052792?accountid=13567>
3. Steve Johnson, "Kerry James Marshall says he is done making public art work," *Chicago Tribune*, 23 Nov. 2018, <https://www.chicagotribune.com/entertainment/museums/ct-ent-kerry-james-marshall-quitting-public-art-after-controversy-1107-story.html> 5/6.
4. Sarah Douglas, "'Kerry James Marshall on Painting Sale: Chicago 'Has Wrung Every Bit of Value They Could from the Fruits of My Labor,'" *ARTnews*, 3 Oct. 2018, [www.artnews.com/2018/10/03/response-plan-sell-public-painting-kerry-james-marshall-chicago-city-wrung-every-bit-value-fruits-labor/](http://www.artnews.com/2018/10/03/response-plan-sell-public-painting-kerry-james-marshall-chicago-city-wrung-every-bit-value-fruits-labor/).
5. Anne Keegan, "An Artist's Vision: Kerry James Marshall's 'Garden Project' is Opening Eyes," *Chicago Tribune (1963-Current)*, Nov 28, 1995, <https://search-proquest-com.ezp.lib.rochester.edu/ocview/2074889816?accountid=13567>.
6. Anne Keegan, "An Artist's Vision: Kerry James Marshall's 'Garden Project' is Opening Eyes."
7. Ibid.
8. Haq Nav, ed., *Kerry James Marshall: painting and other stuff*, (Antwerp: Ludion, 2014), pg. 26.
9. Miwon Kwon, *One Place After Another: Site Specific Art and Locational Identity*, (Cambridge: MIT Press, 2002), pg. 95.
10. Ibid, 95.

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# The Interpretation of Homosexuality in Dante's *Inferno*

Zina Miqdadi

*Advised by Pamela Yeesp, Medieval and Early Modern Studies*

Genesis 18-19 tells the story of Sodom and Gomorrah, two Biblical cities, plagued by the wickedness of their inhabitants. The cities received divine retribution in the form of destruction through fire. The Bible explicitly associates Sodom and Gomorrah's sin with radical inhospitality; however, many Christians have come to interpret their wickedness in different ways. In particular, Sodom's wickedness came to be widely associated with the sin of homosexuality. This led to homosexuality being referred to as "sodomy" in the Middle Ages, a term defined as a sexual "crime against nature". During the Middle Ages, the widely accepted belief of Christianity was that sexual behavior was aimed at procreation. All other forms of sexual acts were considered sinful. In particular, homosexuality was regarded as a crime against Natural Law. Punishments for homosexual acts included dismemberment and death. These punishments extended across medieval Europe as well as Italy. In addition, Italy had many civil laws against homosexuality. Towards the late Middle Ages, Florence developed a reputation for being pervaded with homosexuality. In order to combat this, the Florentine government created the Office of the Night, a special magistracy that aimed to persecute sodomites. According to Steven Stowell, a historian of late medieval and early modern Italian art, "approximately half the male population of Florence was brought before the Office for having been accused of engaging in a transgenerational homosexual relationship...anyone might have been cast as a sodomite, since the crime was so widespread" (Stowell 4-5). Such hostility against homosexuality in medieval Italy influenced the writings of Dante Alighieri, Florence's most famous writer.

*The Divine Comedy* is a 14th-century epic poem written by Italian poet Dante Alighieri. The poem chronicles the journey of Dante the poet and his journey through all three stages of the Christian afterlife: hell, purgatory, and heaven. The poem is split up into three different parts to represent the three different stages of the afterlife: *Inferno*, *Purgatorio*, and *Paradiso*. *Inferno* is the first part of *The Divine Comedy*. The poem is divided into 34 cantos, the principal form of division in a long poem. The *Inferno* chronicles Dante's journey through Hell, guided by Virgil, an ancient Roman poet famous for writing the *Aeneid*. Here, Hell is comprised of nine concentric circles of torment located within the Earth, gradually increasing in wickedness as one ventures deeper. The sinners of each circle are punished eternally according to their sin. This is called *contrapasso*, which is the punishment of souls that contrasts or resembles the sin itself. In Canto 14, Dante encounters the sinners of the third round of the seventh circle. These sinners are said to have committed acts of violence against God, art, and nature. In this circle, naked sinners are forced to

inhabit a great plain of burning sand. They are also scorched by great flakes of fire raining down endlessly from the sky, reflecting the destruction of Sodom and Gomorrah. The sodomites are eternally damned to run in circles on the burning sand. In Canto 15, Dante recognizes Brunetto Latini, his former mentor, within a mass of running Sodomites. Latini and Dante converse, and it is here that Dante's deep and sorrowful appreciation for Latini is revealed; he holds the utmost respect for Latini. Latini identifies other sodomites and departs, and in Canto 16, Dante encounters a trio of Florentine sodomites, who Dante knows from the realm of Florentine politics. Dante admires these figures and even considers leaving his safe path to walk alongside them on their burning path. In *Purgatorio*, Dante encounters the homosexuals in Canto 26, on the least sinful terrace. This terrace houses both homosexuals and heterosexuals, whose overarching sin is excessive lust. These sinners are depicted as being in constant motion, walking towards each other and embracing in the middle of a great fire before parting and shouting various expressions of excessive lust.

Joseph Pequigney, a professor of English, is the author of "Sodomy in Dante's *Inferno* and *Purgatorio*", a journal article in the 36th edition of *Representations*. He asks: how does Dante treat the subject of homosexuality? Pequigney argues that "the representation of sodomy in the *Divine Comedy* is fuller, more complicated, less consistent, more heterodox, pro-founder, and more important than the commentary has yet made known" (Pequigney 22). One of Pequigney's main points examines the way Dante discusses homosexuality in *Inferno*. For example, Pequigney cites Thomas Aquinas, a 13th-century theologian who heavily influenced Dante's *Divine Comedy*, and his definition of a sin against nature. Aquinas said that the criteria for a sin against nature is (1) that if a sin is against reason, then it is against nature, (2) if a sin is characteristic of both men and animals, then it is against nature, and (3) if it involves the union of men, then it is against nature. Pequigney argues that "only the first of those three criteria for unnaturalness will be found in the *Inferno*, and not the other two" (Pequigney 25). Dante only cites the sin of fraud in the context of Aquinas' argument. Dante does not use the other two criteria to apply to any other sin, even homosexuality. It is never outright stated that sodomy is unnatural. Many of his contemporaries used Aquinas' criteria to discuss sins against Natural Law, but Dante did not. During the Middle Ages, many considered homosexuality to be unnatural. Consequently, Pequigney concludes that this is a very progressive way of discussing homosexuality in the Middle Ages, especially when it comes to religious figures and Dante's contemporaries.

In my paper, I will agree with his ideas. However, I will take his



argument a step further and add to it. Although Dante does discuss the topic of homosexuality in a progressive way, I will add to his argument that Dante also gives specific homosexuals characterization that surpasses their sin. In his paper, Pequigney does not apply Dante's progressivism in the *Commedia* to the real world. I will use his argument and add to it to address the real world implications of Dante's progressive portrayal. In other words, I will be expanding the significance to his argument. I will propose the question: Can Dante's depiction of homosexuality in *Inferno* and *Purgatorio* be considered 'progressive' for the time? Although some critics may not define sodomy as a sexual sin, Dante Alighieri's depiction of homosexuals in *Inferno* and *Purgatorio* is remarkably progressive for the time period because of how it humanizes homosexuality in two key ways: its portrayal is sympathetic and nuanced, and it gives homosexuals characterization outside of their sin.

Opponents of my argument may say that the very basis of my argument is not factual at all, that the sodomites in Cantos 15 and 16 are not guilty of the sin of homosexuality at all. Therefore, it doesn't matter if Dante's portrayal is progressive or not. None of the individuals mentioned, especially Brunetto Latini, were associated with homosexuality outside of *Inferno*. In fact, other than the *Inferno*, there is no recorded evidence that exists that accuses Latini of homosexuality. Since the possibility of Latini's sexuality is not mentioned anywhere else, this suggests that Dante may have associated sodomy with a non-sexual sin. Richard Kay, a historian of the *Commedia*, argues: "In the Bible ... Sodom is the image of a community that has been perverted by its leaders, and moreover the perversion attributed to Sodom in the Bible is not primarily sexual and in fact may not be sexual at all" (Kay 2). Here, Kay is relating sodomy with political corruption based on a different interpretation of the Biblical story of Sodom. Dante and Latini had differing political views. Dante regarded democracy as unnatural and advocated for monarchy; however, Latini did not and believed in the concept of independent city-states. In this regard, Dante is accusing Latini of sodomy in the sense that he "perverted" Florence and other Italian communities by misleading them in the form of democratic principles. Due to the fact there is no proof outside of the *Inferno* that condemns Latini or any of the other identified figures as being guilty of homosexuality, Dante most likely used sodomy to describe political corruption, which is a non-sexual sin.

Although none of the sinners were associated with homosexuality outside of *Inferno*, I would argue that Dante accuses these figures of sodomy in the sense of sexual transgressions. In the Middle Ages, the common usage of "sodomy" referred exclusively to homosexual behavior. The common populace knew "sodomy" as a sin against the Natural Law. Even in scholarly circles, the term "sodomite" mostly indicated someone who is guilty of homosexuality, which is apparent in many of the writings of medieval Christian theologians, especially Aquinas. His readership would have understood the obvious meaning of sodomite and its equation to homosexuality; if he had meant to convey another meaning, he would've surely offered

another context clue that dissuaded this popular notion. Pequigney states, "All sexual sinners in the *Commedia* ... are shown to be constantly moving; and this movement could hardly be so uniform and salient a feature of their otherworldly plights without being symbolic--of, no doubt, the agitation of passion, the restlessness imposed on the psyche by erotic desire" (Pequigney 7). The symbolism of the fire, which represents burning desire, and the sodomites' constant movement signifies the underlying sexual meaning of the sin. Dante's invocation of sexual symbolism and knowledge of colloquial language in Cantos 15 and 16 clearly shows the sexual nature of sodomy.

Dante's portrayal of homosexuality in *Inferno* is exceptionally tolerant and sympathetic for his time. In the late thirteenth century, attitudes towards homosexuality grew intensely more antipathetic than they had previously been. This antipathy affected many of the theologians that influenced Dante, including Thomas Aquinas. Since sodomy is sexual behavior that does not involve procreation, many scholars argued that homosexuality was among the many sins that defied the Natural Law. The rationale for this argument came from the *Summa*, Thomas Aquinas' most famous work. Out of all of the sins discussed in *Inferno*, Dante says "But since fraud is found / In humankind as its peculiar vice" (*Inferno*, 11.24-25). Here, Dante is describing fraud as a "peculiar vice" because it involves the wrongful use of reason. Dante never describes homosexuality as unnatural or cites Aquinas' rules governing the Natural Law, which is unusual for Dante, as he was heavily influenced by Thomism. Dante does not exhibit such strong antihomosexual feelings expressed by his contemporaries. Pequigney states, "Homosexuality is linked twice in the *Summa* with bestiality and cannibalism as vices that go beyond what can properly be considered human" (Pequigney 6). Aquinas viewed sodomy as a vice that degraded sinners into a subhuman category. However, Dante's portrayal does the opposite; Dante draws a distinction between the sin of homosexuality and the sinners themselves, humanizing them and portraying them sympathetically. In a speech to Brunetto Latini, Dante woefully proclaims, "Could I have everything for which I long, / You would not still endure this banishment / Away from human nature..." (*Inferno*, 15.75-77). Here, Dante is expressing his wish for Latini to be able to leave Hell and escape his punishment. Dante is acting very sympathetic here as he makes a distinction between the sin and Latini himself. Dante allows himself to feel pain at Latini's fate, despite the fact that Latini has allegedly transgressed against God. Latini is not subhuman; in fact, Dante makes a point to humanize Latini and act sympathetically towards him. This is exceptionally tolerant and sympathetic within the context of the time period. Other than the aforementioned interaction, Dante does not explicitly verbalize his sympathies for Latini throughout the rest of the passage. However, he shows evidence of compassion in many other ways. This will be discussed later on in the paper. Dante's portrayal of homosexuality in *Inferno* is progressive because of the way he defied Aquinas' criteria and sympathized with Latini.

Dante's treatment of sodomy is particularly tolerant due to his handling of sodomy in both *Inferno* and *Purgatorio*. In *Purgatorio*, Dante places homosexuals in the highest and least sinful terrace of Purgatory, that of excessive love. The souls here identify themselves as homosexuals by shouting "Sodom and Gomorrah" (*Purgatorio*, 26.40) and align themselves with Caesar by shouting "Regina [Queen]" (*Purgatorio*, 26.41), alluding to Caesar's parade of triumph through Rome. Dante mentions the *Purgatorio* homosexuals in passing, just as one of the groups on the terrace, but does not explain further. What this passage lacks, however, in direct engagement, it makes up for in implication. Dante's inclusion of homosexuals in *Purgatorio* drastically warps the demonized view of homosexuality - commonly shared by many of Dante's contemporaries who subscribed to Thomism - into a view that presents homosexuality as a sin that is redeemable. John E. Boswell, historian of medieval gay culture, states, "This is particularly striking...because one might have thought that the repentant sodomites in Purgatory would be guilty of the same moral failing as the unrepentant ones in Hell..." (Boswell 8). I agree with Boswell here. The very act of including homosexuals in Purgatory implies that homosexuality is a redeemable sin. Since many scholars and contemporaries viewed homosexuality as a sin in and of itself, Dante's portrayal is radically progressive.

From a modern perspective, Dante's treatment of homosexuals in *Purgatorio* is exceptionally tolerant. This is, in part, due to his placement of homosexuals in Purgatory. Dante's positioning of homosexuals in the lustful purgatorial terrace includes heterosexuals as well. This implies that the underlying sin associated with homosexuality is not homosexuality itself, but something else that both groups in *Purgatorio* and *Inferno* have in common. With this placement, Dante does something profound and reclassifies homosexuality as a form of lust. Out of all of the Christian sins, pride is considered to be the deadliest sin. In contrast, lust is considered to be on the opposite end of the spectrum, and Dante even regards it as the least sinful transgression against God. In his description of the terrace of lust, Dante says, "...this is / the care and this the nourishment with which / one has to heal the final wound of all" (*Purgatorio*, 25.121-139). Here, Dante is describing lust as the last and least serious vice of Purgatory. Even though the lustful are punished by walking through a scorching fire, a punishment that immediately strikes readers as being immensely painful, these souls show no signs of pain. In fact, they are depicted as enjoying their punishment and singing. These souls seem to fear the areas where there is no fire, because Dante says: "cautiously, / they never left the boundaries of their burning" (*Purgatorio*, 26.13-15). This is interesting: the sinners are enjoying and willingly engaging in their contrapasso. This suggests that their sin is not as serious in the context of Christian theology. This group of souls, of course, includes the homosexuals. Teodolinda Barolini, a professor of Italian, states, "Dante's reclassification has far-reaching implications, since it tells us that lust - excess desire - is the impulse underlying any form of sexuality, normative or non-normative" (Barolini 13). I agree with Barolini - this reclassification is groundbreaking.

Lust is a sin of incontinence, which means that lust is not sinful when it is controlled or moderated. By reclassifying homosexuality as a sin of lust, the implication is made that controlled and moderated homosexual behavior is not damning, similar to limited heterosexual behavior. This is wildly revolutionary for the time; the implication that homosexual behavior is permissible if it is controlled defies the arguments of Dante's influencers, who viewed sodomy as a sin that is unacceptable under any circumstances. Dante's treatment of homosexuality in *Purgatorio* is progressive because he reclassifies it as a sin of lust.

In *Inferno*, Dante gives Brunetto Latini characterization outside of his sin. Dante's idolization of his former mentor, Brunetto Latini, is something that has been remarked upon frequently. In his famous speech upon seeing Latini, Dante states his desire for Latini to return to the living world: "Your image - dear, fatherly, benevolent - / ... has imbued / My heart: when in the fair world, hour by hour / You taught me, patiently, it was you who showed / The way man makes himself eternal..." (*Inferno*, 15.75-82). Here, Dante is praising Latini as a teacher and is reminiscing him fondly. He is discussing the positive impact that Latini has had on his life and is woefully lamenting. Dante establishes Latini as someone who was very dear to him in the world above, someone who had a huge influence on him. Dante doesn't reduce Latini down to his sin, but rather characterizes Latini as his mentor before characterizing him as a sodomite, an important factor when discussing Dante's portrayal of homosexuals. Dante is affording Latini characterization that has nothing to do with sodomy. He even describes Latini using paternal language, which emphasizes their close relationship. Bruce Holsinger, a professor of literature and culture in the medieval world, says, "...a refashioning ... that represents the productive effects of Brunetto's paternal *imagine* [figure] on Dante's own memory and writing" (Holsinger 249). As a result, Dante humanizes Latini, which is extraordinarily progressive for his time as his contemporaries argued homosexuals were subhuman and could not be characterized outside of their sin.

In *Inferno*, Dante gives the three Florentine homosexuals he meets characterization that surpasses sodomy. These three Florentines are Guido Guerra, Tegghiaio Aldobrandi, and Iacopo Rusticucci. These three men are politicians whom Dante greatly respected and admired; he was of the same political party as them and valued their politics. Dante affords the three Florentines great respect, despite their situation. "I would have thrown myself down into the fosse [pit] / Among them / ... fear drained the appetite / My good will gave me to embrace them. I said, / 'No: it was not contempt but sorrow I felt / At your condition / ... I always heard / ... and have told over / Lovingly, your names and actions, both revered'" (*Inferno*, 16.40-51). Here, Dante is describing how he was so eager to embrace the Florentines that he would have thrown himself down if not for the danger of the fire, and that he has always held them in such high esteem. Dante presents these three men as honorable figures that were very dear to him as he makes frequent declarations of respect and admiration to-

wards them. Dante even expresses grief at the wounds on the bodies of the sinners. These frequent declarations distinguish Dante from other Christian writers, such as Aquinas, who portrayed homosexuals as monstrous and depraved. Robert Hollander, a professor of European literature, remarks, "Dante treat[s] the homosexual Florentines in *Inf.* 16 with greater respect than any other infernal figures except those in Limbo" (Hollander). Dante presents all of the sodomites as impressive and accomplished figures. He characterizes these figures as more than their sin, as people who have attributes other than homosexuality. These figures are dear to Dante because they were involved in the realm of politics and Dante primarily characterizes them as political allies rather than sodomites. Dante admired their impact on the Guelph party and on the politics of Florence. This is progressive because Dante's portrayal is very much unlike the dehumanizing portrayal of homosexuals as deranged individuals by his contemporaries.

In summation, Dante's portrayal of homosexuality in *Inferno* is remarkably progressive for his time because it humanizes homosexuals through a representation that is sympathetic and nuanced and through characterization that surpasses homosexuality given to notable sodomites. Although more widely accepted today, homosexuality is still stigmatized by certain demographics of the population, including groups heavily influenced by religious doctrines. Dante's *Inferno*, a classic example of a Medieval Christian text, can be useful in examining the relationship between religion and sexuality and how it has evolved over the ages through its depiction of homosexuality. Although progress has been made to advance the rights of the LGBT community, they are still discriminated against today, so examining the attitudes of people from the Middle Ages towards gay people can be helpful in providing commentary on our current society and culture.

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# Disparities in Locations of Sheltered and Unsheltered Sites, Focusing on Low-Levels of Carbon Monoxide Exposure Amongst the Homeless Population of Rochester, NY

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The University of Rochester School of Medicine Street Outreach program offers a community health triage seeking to eliminate healthcare barriers for the unsheltered homeless population of Rochester, NY. Considering the sometimes unsafe living environments where the homeless live when they are unsheltered, it is important to understand the hazards to which they may be exposed. The purpose of this case study is to report on low-level exposures of carbon monoxide (CO) amongst the homeless within Rochester, NY. A mixed methods case control study technique was used, employing quantitative data on levels of exposure and ethnographic interview techniques. Data was collected via interviews, conversations, personal observations, and field notes. After consulting with University of Rochester faculty and members of Street Outreach, a Carbon Monoxide Exposure Symptom Severity (COESS) Scale was used to rank the severity of the CO poisoning. Concentrations of CO were recorded during interviews and for up to seven days following, using a CO Data Logger. Analytic themes were based on coded data and personal memo writing from field notes. Analysis revealed five thematic categories: survival, environmental, financial issues, health, and family. These put together a “story” about routines within their daily lives that could lead to exposure to toxic air pollutants in the unsheltered population and their rationale behind choosing not to be in a shelter. There was no CO detected in the sheltered locations, while the unsheltered locations averaged above 5 parti-

cles per million (PPM). Exposure to CO is one of many environmental factors that may contribute to detrimental health outcomes among the unsheltered community. It was one of the measured disparities among others learned through interviewing. As homelessness continues to persist in Rochester, barriers to housing, health, and social services persist as well. The need to provide more support, mainly in housing for the homeless, is evident, especially in the unsheltered community. There needs to be a combined effort amongst the homeless population to encourage better decision making in regards to their health and housing. In Rochester, shelters and organizations advocating for the homeless community are constantly sought after, as this issue is a highly complex and volatile mix for all hubs involved. Street Outreach members have both a humanistic and professional duty to be involved and help out. As the program is run by the University of Rochester, a private university, one could question the impact of health-promoting interventions that conflict with the cultural perceptions and practices of the community they seek to serve. Within those unorganized and unsheltered sites, patients: (1) were generally unaware of the effects of CO, (2) did not minimize exposure, such as by going outside for cleaner air because of the cold temperatures, (3) were depressed about events causing their homeless situation, and (4) faced various adverse symptoms of CO poisoning. There is a positive association between being homeless and being exposed to a consistent level of CO within these unsheltered locations.

## Introduction

### *The Population: People Facing Homelessness in Rochester, NY*

Rochester is located in western New York, just south of Lake Ontario. The city exists in a climate with a cold winter. This season lasts for 3.3 months from December to March and temperatures average below 0° Celsius.<sup>1</sup> Snowfall typically accumulates up to 306.1 centimeters each winter. Being the third most populated city in New York state, Rochester has 208,000 people living in the city, while the metropolitan area has a population of 1.08 million. Rochester ranks as the 51<sup>st</sup> largest metro area in the United States and has the second largest economy in New York, aside from the NYC metro area.<sup>2</sup> Rochester faces economic challenges common to those of “Rust Belt” cities with its increasing homeless population.<sup>3</sup> At the last estimate, there are about 849 people who experience homelessness every night in Rochester and the surrounding Monroe County area.<sup>3</sup>

The National Health Care for the Homeless Council defines a homeless individual as one without permanent housing who may live on the streets, stay in a shelter, mission, single room occupancy facilities, abandoned building or vehicle, or in any other unstable or non-permanent situation.<sup>4</sup> There is an average of 835 people facing homelessness in Monroe County every night.<sup>5</sup> When wind chill drops below -17° Celsius or temperatures drop below 0° Celsius, local shelters call for a Code Blue Alert. This calls for the allocation of more space to shel-



ter the homeless. As there are more homeless people than beds offered in Rochester, it is currently impossible to house all of those struggling with homelessness, according to the Homeless Resolution Strategy offered by the city of Rochester.<sup>6</sup> When considering Maslow's hierarchy of needs, physiological and safety needs are the primary concern for the homeless population. Physiological needs, having the most significance, must be prioritized first because the human body cannot function when these needs are not satisfied. Therefore, the unsheltered population must prioritize basic survival needs over long-term health care.

### *The Community Organization: URMC Street Outreach*

As a result of the many harms of living in unsheltered environments and the often-complex biopsychosocial circumstances that render individuals homeless, the University of Rochester Medical Center's (URMC) Street Outreach organization seeks to serve the unique healthcare needs of the homeless community. Street Outreach offers a community health triage approach to eliminating healthcare barriers for the homeless population of Rochester, NY. A student-run organization within the University of Rochester, Street Outreach's mission is to ensure quality medical care for the unsheltered homeless population. Members evaluate patients while considering the psychosocial model of care. At the general and basic level, members offer emotional and practical support. By allowing patients to know there is someone listening to their problems, sympathizing with them and talking, Street Outreach members offer the emotional aspect of support. In regards to practical support, members offer resources such as water, food, clothing, and information on local resources. Members get to know unsheltered homeless patients on a more personal level. When a patient is looking for more supportive care, members offer additional spiritual and cultural support. This is done by linking patients with members of similar cultures or spiritual beliefs, giving them a better sense of comfort and inclusion. Street Outreach

members also assist with basic case management and social work type roles for the patient. This not only furthers their personal relationship and brings comfort to the patient, but also it helps determine steps to move forward. On the next level, there is also specialist care available from a doctor, nurse, or social worker. This requires trust and the formation of a bond between the specialist and the patient. In the case of an obvious opioid overdose, members are trained in Naloxone administration. Finally, in the event of emergency care, members can call 911. Street Outreach is a frequent and familiar presence in the patients' lives and opens more paths for patients to improve their personal health and stance on health care.

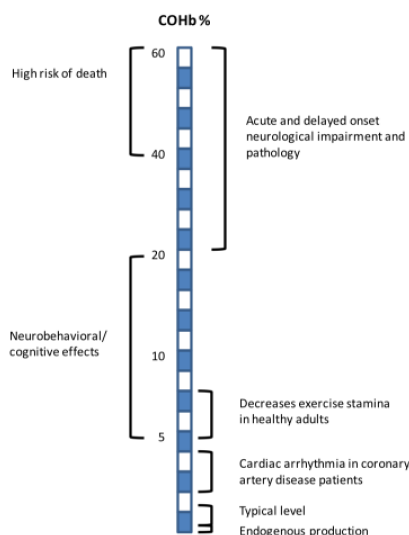
Relationship building and patient communication are crucial in order for the homeless to trust members. Through this trust, Street Outreach members can gain further insight into the patient's lives, which can help identify the problems with the patients' health. In order to improve health outcomes amongst the homeless, Brown and Ramsay stated, "a research-based theatre approach may be utilized by other distributed sites of medical schools to foster community engagement, advocacy for the community's needs, and promote policy change."<sup>7</sup> Research within the homeless community through Street Outreach can influence different factors that have the ability to change people's health. A community-based participatory research approach can enforce social accountability within the University of Rochester to engage itself within the city. By establishing relationships, building trust, and working with both formal and informal leadership in both unsheltered and sheltered sites, Street Outreach embodies the individual holistic approach. This engagement produces beneficial health results in the homeless community.<sup>8</sup>

### *The Problem: Carbon Monoxide*

During the daytime, the population of Rochester increases by 55,097 people due to daily commuters.<sup>9</sup> This increase in commute directly affects the amount of air pollution emissions occurring daily.<sup>10</sup> The highways and roads that run

through the city contribute to the levels of air pollution, which the unsheltered homeless are exposed to daily. Within this air pollution there are fine particles, ground-level ozone readings, tobacco smoke, and noxious gases. Of the noxious gases that are emitted daily, CO levels can be found in locations where the homeless typically reside. Other sources of CO, including domestic CO from heating appliances, will be discussed later. While there are only a few industrial sources, CO in Rochester comes from typical diffuse urban sources.<sup>11</sup> The toxicant can also be released through heating sources such as space heaters, open fires and cigarette smoke. Unsheltered homeless people are exposed to CO through the polluted air they breathe, which can be compounded by the heating sources they use, cigarette smoke, and other sources in the community.

When this gas is released, it goes towards natural targets in the human body and causes different reactions. According to the Toxicological Profile for CO, it is a colorless, odorless, and tasteless gas that is a harmful toxicant to the human body. It is easily absorbed through the lungs, where it diffuses into the bloodstream and is distributed throughout the body. CO accumulates mainly in the blood, spleen, lungs, kidneys and skeletal muscle, while also having detectable levels in the brain and adipose tissue.<sup>12</sup> Once in the blood, CO binds to heme proteins, such as hemoglobin or myoglobin, resulting in the formation of carboxyhemoglobin (COHb). Clean air allows these proteins to deliver oxygen to body tissues, but polluted air with CO elevate one's COHb levels instead. As can be seen in Figure 1, exposure to CO levels higher than the amount produced in the body can cause adverse health effects. Wilbur, Williams, Williams et al. states, "Any exogenous source of CO exposure would have the potential for exceeding the threshold and producing potentially adverse effects."<sup>13</sup> This explains why there is no-observed-adverse-effect level associated with CO. Any level of CO exposure in humans can be harmful to their health. The lowest-observed-adverse-effect level was found to be at sim-



**Figure 1: Blood COHb Levels Corresponding to Adverse health Effects of Carbon Monoxide in Humans, ATSDR 2012.** Data recommends the exposure threshold for CO would be at or near the endogenous production rate.

ilar concentrations found in endogenous production of CO, approximately 0.1-0.5 parts per million (PPM). Elimination occurs mainly through breathing. The homeless population can be affected by longer exposure when they are left unsheltered and searching for warmth, but smokers are at risk for recurrent CO poisoning and subsequent cognitive impact.<sup>14</sup> The nicotine in cigarettes has been proven to release acetylcholine, a chemical known to raise one's body temperature resulting in an additional source of warmth, despite its small effects.<sup>15</sup>

An Environmental Health objective of Healthy People 2020 was EH-22.7: to increase the number of states, territories, tribes, and districts that monitor diseases or conditions that can be caused by elevated CO exposure. Yet, there are only four which have been added since 2007.<sup>15</sup> With less than one year left in reaching this goal, there have only been a few additional monitors placed. People continue to face adverse health effects due to CO poisoning. However, EH-1 aims to reduce the number of days the Air Quality Index exceeds 100, which has resulted in a reduction in air pollu-

tion.<sup>16</sup> The air the general public breathes not only includes the outdoor air but also the indoor air which has less CO. It is important to understand and study the effects of CO on human health in those who are constantly exposed, such as those facing homelessness.

The general homeless population is more susceptible to adverse health outcomes. These stem from substance use, health issues, unemployment, intimate partner violence, differing viewpoints with authority, relationship issues, and adverse childhood exposures. In a study conducted at the University of Rochester by Evans, Halterman, Hopke, Fagnao and Rich,<sup>17</sup> it was found that urban asthmatic children in Rochester, NY, are more vulnerable to different environmental asthma triggers due to increased exposure to CO and ultrafine particles. This shows that individuals without shelter are left to bear harsh environmental conditions, which have been shown to negatively affect human health. Another study conducted by Wrenn and Connors examined CO poisoning during ice storms in Rochester, NY and Nashville, TN.<sup>18</sup> The two main sources of CO were propane and kerosene heaters which, coincidentally, are used in the structures of Peace Village. This increases the likelihood of exposure within the homeless population. After two years of constant measurements, researchers Zhou, Hopke, Zhou & Holsen proved ambient concentrations of CO were higher in the winter and in the spring.<sup>19</sup> The weather is not the only environmental exposure encounter which is proven to negatively affect human health. Thus, the homeless are left to wander the streets to not only be affected by the winter weather conditions but to also be affected by air pollution in the city. In another study done in collaboration with Street Outreach, non-homeless Medicaid patients and patients documented with homelessness were shown to be over seven times more likely to return to the emergency department within 30 days and over eleven times within two years.<sup>20</sup> The lack of medical care and low barrier housing in the homeless population can be due to patients primarily focusing on survival instead of their health needs. Therefore, it

is important to eliminate barriers to healthcare within the homeless population. By visiting and bringing medical care directly to locations where people need the most assistance, Street Outreach makes major impacts on people's health and housing situations.

### *The Setting: Shelters and Encampments*

There were three sheltered sites; two were low-barrier shelters (easier for the homeless to find a spot) and the other was a mental health services center offering housing resources. Participants interviewed in these sites reported having shelter. Conversations with participants at unsheltered sites were recorded in an encampment, a parking garage, and an abandoned subway tunnel in downtown Rochester. The encampment, a property in the middle of Rochester, is located between a highway, a busy road, and a railroad. There are tents and structures resembling huts that serve as homes for residents. The average daily traffic had a minimum of 75,001 additional vehicles from the busier railroad side and 4,001 vehicles on the road.<sup>21</sup> As seen in Figure 2, the tents and structures comfortably sleep two to four people (respectively), yet there were up to seven people in the structure at one sitting during a visit. To stay warm, residents use a propane space heater and keep the entrances closed. Those not in these structures were found in unstable tents that collapsed after consistent snow accumulation. There were eight tents with snow piled on them. The parking garage, a privately-owned building, has warm temperatures, so it is a prime location for the homeless to stay the night. Here, the homeless are allowed to stay the night beginning at 9pm and get kicked out at 4am. Several streets over is an abandoned subway tunnel, exposed to busier concentrations of constant traffic. Heat is released from steam pipes and residents make fires in metal garbage cans, making it a desired site for the unsheltered to stay warm. Despite this being a safer and healthier alternative to avoid below-freezing temperatures, people risk affecting their health through different exposures that will be discussed later on.





**Figure 2: Structure and tent located in encampment, 2019.** An image shows living environment for residents of the encampment.

The purpose of this study is to engage with and immerse into the Rochester homeless community via Street Outreach to learn the severity of symptoms faced in the population living in unsheltered sites with low concentrations of CO. By examining behaviors, other adverse exposures, and learning the stories of those experiencing homelessness, the ultimate goal is to promote better health through community collaboration.

## Approach

There were mixed methods used to explore the effects of CO poisoning within the homeless population in Rochester. Quantitative data was collected using a CO data logger at three locations that were identified through collaboration with the homeless community in Rochester over multiple years. From March 2019 to April 2019, CO concentrations were measured at an encampment, parking garage, and an abandoned subway tunnel located in the Center City. At the encampment, the data logger was in the corner of the main tent people sleep in. The parking garage site had the data logger located on the ceiling towards the side of the lower level. In the abandoned subway tunnels, measurements were taken during two brief visits.

The abandoned subway tunnels had 10 second and 1-minute intervals for approximately five to ten minutes during each visit.

Once participants agreed to enroll in the study, a conversation with the patient regarding their health began. In order to protect the confidentiality and safety of the participants, all participants were informed that the purpose of the interviews was to learn about environmental exposures the homeless face, their behaviors and relationships, with the ultimate goal of collaborating to find an intervention to better health outcomes. As stated in the book *Principles of Community Engagement*, “Community collaboration requires long-term commitment by the engaging organization and its partners,<sup>22</sup> so by establishing this concept during the first few interactions with participants, a mutual understanding, respect, and motivation to improve circumstances for individuals arose.

Semi-structured ethnographic interviews were conducted on 66 participants, which focused on a person’s life history, behavior, and CO poisoning symptoms. After receiving permission from individuals, the researchers inter-

viewed everyone who was enrolled in this study. There were 29 cases determined as those who had never been in unsheltered locations and those who were sheltered ranging in ages from 23-65. The controls were 37 participants that spent at least one night in any of the mentioned locations with ages ranging from 21 to 62. In the parking garage, the encampment, and the abandoned subway tunnel, people were interviewed and had measurements taken simultaneously.

After consulting with faculty at the University of Rochester on CO exposures and poisoning, ten symptoms were identified and comprised the CO Exposure Symptom Severity (COESS) Scale. It was scored from 0, being no effects, to 4, being most severe effects. The COESS scale, seen in Figures 4a and b, was found by asking patients to rank their symptoms and their effects on different aspects of their lives. These aspects included health, social, educational, economic, environmental and cultural factors. Individual socioeconomic characteristics were collected through demographic data collection and included age, sex, education level, employment status, insurance status, smoking, and marital/family status. Duration of exposure was measured as acute, subacute, subchronic, and chronic. Acute exposure was less than twenty-four hours, subacute was from one day to one month, subchronic was between one month and three months, and chronic was over three months. There was no formal structure that was followed for each conversation and interview so long as each symptom was assessed in a non-priming manner. It was more important to foster personal connections grow rather than to push for more information from individuals in order to make a larger direct impact on their health, such as with case management or social work roles. The person’s health status was evaluated before the questions were asked. Throughout conversations and interviews, participants were educated on the dangers of CO poisoning following the ‘first, do no harm’ principle of Public Health. In situations where there was an urgent medical issue developing, a Street Out-

Unsheltered Locations-Figure 4a

Symptom	n =29	No Effects (Score=0)	Mild Effects (Score=1)	Moderate Effects (Score=2)	Severe Effects (Score=3 & 4)
Fatigue		3	16	6	3
Dizziness		13	14	1	0
Confusion		5	4	19	0
Shortness of breath		7	14	6	1
Loss of consciousness		8	16	4	0
Blurred vision		10	16	2	0
Stomach pain		12	14	1	0 & 1
Nausea		14	14	0	0
Vomiting		25	3	0	0
Dull Headache		10	14	4	0

Sheltered Locations-Figure 4b

Symptom	n =37	No Effects (Score=0)	Mild Effects (Score=1)	Moderate Effects (Score=2)	Severe Effects (Score=3 & 4)
Fatigue		17	19	0	0
Dizziness		29	7	0	0
Confusion		28	8	0	0
Shortness of breath		27	9	0	0
Loss of consciousness		35	1	4	0
Blurred vision		31	5	0	0
Stomach pain		12	14	1	0
Nausea		14	14	0	0
Vomiting		25	3	0	0
Dull Headache		10	14	4	0

Total COESS Score: Normal: 0 Mild: 1-10 Moderate: 11-25 Severe: 26-40

Figure 4a and b: COESS Scores, 2019. Symptoms were scored and recorded, along with Street Outreach members, through in person ethnographic informal and formal interviews.

reach member would join the conversation and assess the participant. Interviews would range from 10-minutes to an hour and a half.

Conversation topics were guided by focusing on descriptions of waking and resting conditions. The process involved working with Street Outreach, where I would engage in dialogue after the person had their health status checked. Data

were collected through on-site observations, interviews, and debriefs at the end of rounds.

## Results

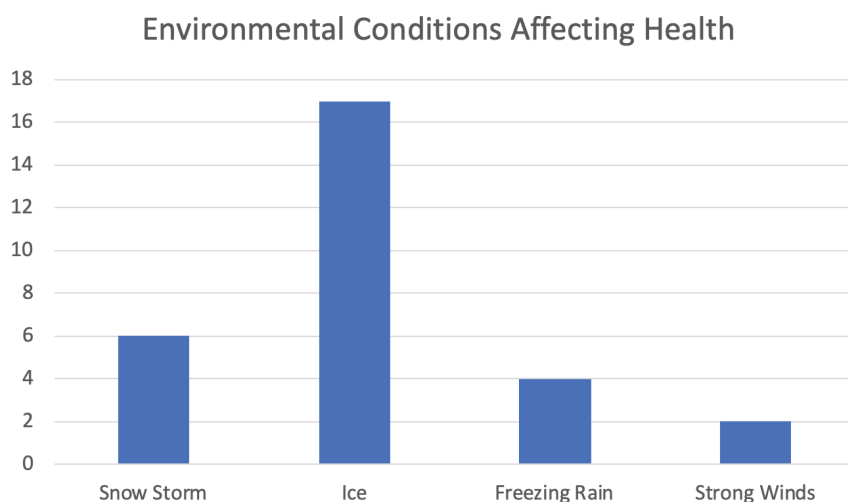
### Daily Activities Leading to Adverse Environmental Exposures

Different environmental conditions encountered by the homeless can be seen in Figure 5, with the most common envi-

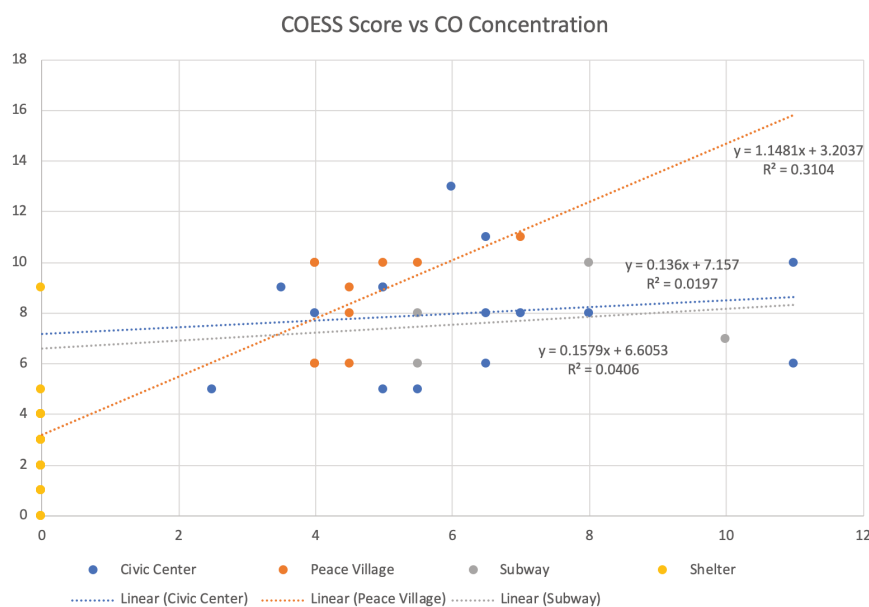
ronmental exposure that affected people's health being ice. Since the homeless have less access to public transportation, walking is a primary means of transportation. However, black ice, easily formed due to freezing conditions, is a major hazard for the homeless community, as well as everyone else. On rounds, Street Outreach members would occasionally slip when there was snow or rain. Knees, ankles, and wrists were found to be the most commonly injured due to icy conditions. Snow storms and freezing rain forced people to find shelter, as temperatures could drop to well below freezing, and people found themselves staying in tunnels, parking garages, abandoned buildings, and other locations. Strong winds were able to knock down people's structures in unsheltered locations. Freezing rain made it difficult for people to stay outdoors, leaving them to find different locations to dry off. However, they would be rejected by many privately-owned locations. The public locations may be crowded, so the unsheltered feel embarrassed or simply want to avoid interaction and stay to themselves. The homeless believe there is a stigma that people do not want to be around them. This causes them to find other locations where people may not find them. However, those who had housed friends or family were able to escape these conditions by seeking shelter with others. Additionally, black ice is an issue when people have appointments or meetings. People cannot get to their location on time, preventing them from getting the health care or housing assistance needed. Finally, snowstorms were the most feared of all conditions.

Other adverse conditions included using hand sanitizer as a fuel for fires or as part of treatment for animal or insect related injuries. People would fear for their safety, their personal belongings and their health. In conditions like these, people avoided moisture in their shoes. Patients covered their feet in two pairs of socks and keep on a plastic bag in between the first and second pair. However, this did not protect them from the cold. The bag was used to fight against adverse effects like trench foot rather





**Figure 5: Reported Environmental Conditions that Affected a Person's Health, 2019.** Information collected from 29 informal ethnographic interviews throughout unsheltered sites representing how the environment has adversely affected their health.



**Figure 7: COESS vs. CO PPM, 2019.** COESS results were compared with CO concentration levels at the time people were interviewed in both sheltered and unsheltered locations, showing a positive association.

than frostbite. Clothing was a necessity and patients were always willing to take in more clothes, especially during the colder nights. This allowed them to stay warm in unsheltered locations. Food, clothing, drugs, and housing were the top priorities amongst the sheltered and unsheltered populations.

When comparing behaviors and symptoms with locations where people spend a lot of time or reside, there is a trend of

lower concentrations of CO. As seen in Figures 6a and b, the times where people would stay in tents within the encampment would reveal averages of 3.2 PPM and 4 PPM. There are no other places for people to go since the temperature is too cold or the weather does not permit it. Those who smoke chose to avoid going outside and were usually smoking inside of tents. Looking at the parking garage in Figure 6c, there were higher average concentrations during the times home-

less were permitted to reside. Results show they are exposed to significantly higher concentrations of CO with a maximum of 26 PPM, however Street Outreach did not visit the locations at these times.

Looking at Figure 7, a positive association can be seen between CO concentration exposure and COESS score; as more exposure to CO occurs, the more severely participants are affected. This information would not have been able to be collected if it were not for the willingness of the participants. The informal interviews allowed for people to open up to members more as people, rather than healthcare professionals/students that were trespassing in the community. When comparing the sheltered and unsheltered populations' exposure to CO, there were no controls that faced any sort of CO exposure within the shelters and the average COESS score of 2.59. However, the unsheltered population faced an average of 5.83 PPM and an average COESS score of 8.17. There was less traffic exposure within the encampment and the subway tunnel, demonstrating the importance of a location secluded from the environment. Despite there being a strong odor when approaching the entrance, there is ventilation in the design of open arcs within the tunnel, crossing over the Genesee river.

Those in the unsheltered locations experienced low-levels of CO exposure, ranging from as low as 1.5 PPM to as high as 7 PPM. COESS experienced after exposure to low-levels of CO were closer to mild adverse levels than the sheltered, who were significantly closer to normal. The highest concentrated areas of CO were the parking garage, then the abandoned subway tunnel, and finally the encampment. CO measurements were taken in unsheltered locations after learning behaviors and thinking behind finding a place to sleep. People reported times in which they were usually in the encampment and those times can be seen in Figures 6a and b. Looking at the CO levels, the homeless were exposed to an average of 4 PPM and 3.2 PPM of CO. In the encampment, people typically sleep from 10pm to 6am. Sometimes they reside in there an entire day, only

Figure 6a

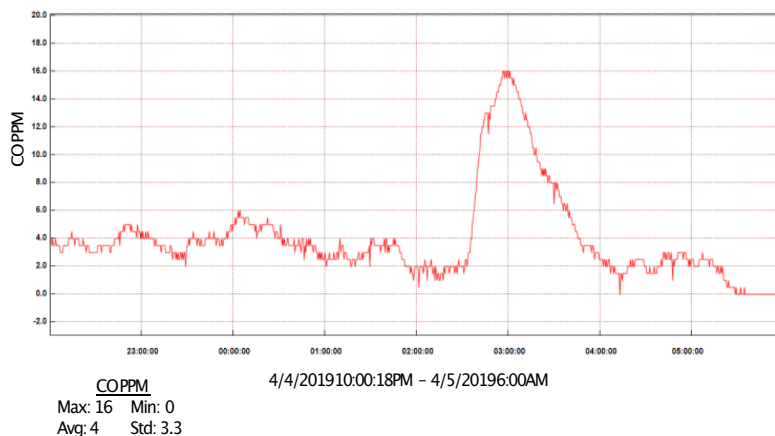


Figure 6b

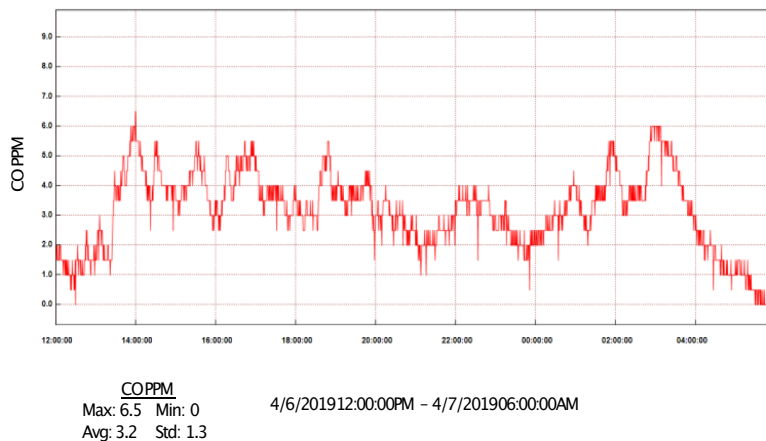


Figure 6a and b: CO Levels within Structures at Encampment, 2019. Graphs show CO concentrations within structures when people reported spending the most time in them.

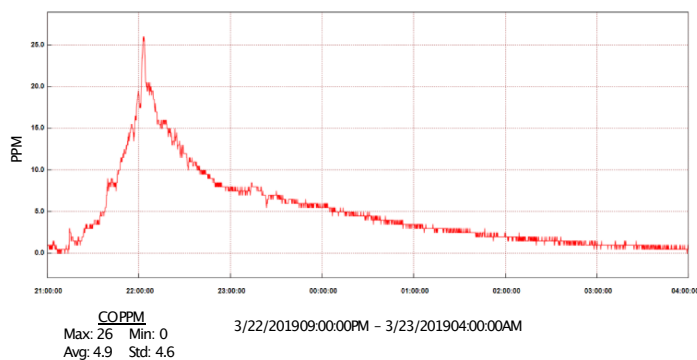


Figure 6c: CO Levels at Parking Garage, 2019. The graph shows CO concentrations within the parking garage when people reported spending the most time. Measurements were taken with 10 second intervals.

stepping out to relieve themselves. People would avoid staying in camping tents during winter months (January, February and March) due to their inability to store heat. In the parking garage, security guards are welcoming to homeless

residing during the night. People begin their nights at 9pm and are kicked out by 4am. During this seven-hour time period, the unsheltered are exposed to a dangerous CO maximum of 26 PPM and an average of 4.9 PPM. During the times

people were interviewed, they were being exposed to low concentrations of CO and were scored in the higher mild CO-ESS range. Within these locations, heavy breathing, headaches, confusion, and difficulty concentrating were symptoms common amongst those with a COESS score higher than 5. There were more than 3 people facing acute exposure, 13 facing subacute exposure, 2 facing sub-chronic exposure, and 11 facing chronic exposure. Forty-five percent of the unsheltered participants resided for at least one month in sites with low-levels of CO.

### Voice for the Homeless

While the homeless have to deal with these adverse exposures, there are organizations and people that advocate for better living conditions for the homeless. The Rochesterians Engaging in Action for the Chronically Homeless (REACH) Advocacy are making strides to increase the number of low-barrier housing options in Rochester. Workers and volunteers focus on treating and training the homeless. After receiving a \$50,000 grant through the Rochester Monroe Anti-Poverty Initiative (RMAPI) participatory budget process, REACH representatives will be building a tiny home which will range 200 to 300 square feet in total size. Through this tiny homes project, the ultimate goal is to contribute to sustainable solutions that will help people facing homelessness. By employing those who have difficulties finding work, REACH is aiming to train workers in manufacturing, improving the homeless job situations.

The homeless are able to participate in advocacy programs revolving around different housing initiatives in Rochester. By hosting weekly meetings at a local church downtown, the REACH Advocacy organization offers a platform for homeless people to share their stories, and they also host potential interventions for collective action within housing instability. The time of those in outside organizations is important for beneficial changes to occur for the homeless. After exploring Rochester's housing codes, which have not been updated since the 1970's, advocates learned

that placing a wooden pallet under the structure categorizes the site as a structure rather than a home. This allows people to stay in the encampment. However, there are other regulations which make it tougher for healthy conditions to prevail. For example, not being allowed to have open flames prevents people from having warm meals or drinks and staying warm.

A lack of financial support for these groups was found to be another recurring theme within shelters. The REACH House helped secure permanent housing for more than 40% of their guests, yet they are forced to shut down for the warmer months due to financial constrictions. According to the REACH April Newsletter, despite the housing rate, REACH does “not know what will happen next winter, but given the numbers we are seeing each year, it is most likely we will be opening another winter shelter.” Locations such as REACH deserve guaranteed funding based off their impacts on housing the homeless. The United States Department of Housing and Urban Development offers a Continuum of Care program which provides funding for nonprofit providers to quickly rehouse homeless individuals and families to minimize the trauma and dislocation caused by homelessness.<sup>23</sup> However, due to different standards set by the Continuum of Care program, the REACH house does not receive funding, which limits its ability to effectively serve those most in need of care.

In order to determine how the REACH organization is so successful, one of the interviewed workers said, “Looking at people as humans rather than numbers for the shelter really pushes me to continue following up with individual situations. I want to help people reach their housing goal.” The workers at REACH are, again, focused on the individual person rather than the overall picture of their organization being successful.

After learning financial issues were the top reason people believed they were facing homelessness, Tiny Homes would empower homeless people to acquire more money through working experience, which can be used to improve



**Figure 3: Middle tent located in Peace Village, 2019.** An image shows living environment for residents of Peace Village.

housing instability. Other reasons for homelessness include drug use, health, family disagreements, environmental conditions, and lack of access to resources. By allowing Street Outreach to offer free services, treatment is provided on site while also promoting other initiatives, such as the Tiny Homes project, to get more people involved in providing more low-barrier housing options.

### *Survival*

When people experience homelessness, they realize how expensive it is to be in that situation. Minimum-wage jobs are problematic for many reasons; they are physically demanding, they can cause health issues, schedules are unpredictable, and the income is so small that people cannot save enough to work on their next health or housing goal.<sup>24</sup> Another finding included that smoking cigarettes was a common habit among the

individuals interviewed. This habit takes up a significant amount of their budget, but it seemed to be a crucial part in managing stress. Other spending areas included transportation, food, clothing, and other drugs, which also align with their main priority of survival. There was an instance where we were graciously rejected from entering because it was too smokey for us. When going on rounds, a member once said they were nauseous from the amount of smoke while we were inside the make-shift home. It was much cloudier inside the tent when we were rejected. Smokers consisted of 90% of the unsheltered and 87% of the sheltered population, averaging 14.6 cigarettes per day. The homeless warm up due to the acetylcholine produced from smoking. Cigarettes would be used for other reasons too, including to take the edge off, socialize, and simply to keep their mouth occupied. Since an average



pack of cigarettes contains 20 cigarettes and the homeless smoke 14.6 per day, on average then people designate about \$10 per day for cigarettes. Cigarettes took up a significant amount of their budget. This also increases COHb levels resulting in more effects seen in Figure 1.

The homeless exhibited mainly lethargic behavior in locations with more smoke accumulations, any weeknight (especially during events downtown), and heat emitting sources (vents, smoke and space heater). People were less engaged in conversations and had delusional thoughts. However, the homeless tend to avoid busier venues in favor of more secluded ones scattered around Rochester. Sometimes these locations involve more safety risks; however, a protected and restful night is more beneficial for survival. People prioritized the warm conditions over the colder weather, discouraging them from going outside to breathe cleaner air. Such instances are examples of when their safety is at risk.

### *Ethnographies: Stories from Interviews*

Larry, a 45-year-old homeless male, rode his bike to pick up groceries for himself and his partner, a 45-year old homeless female, who was back at an unsheltered location. On his way out of the store, Larry noticed someone riding his bike towards him on the sidewalk. Larry tried to stop them, but the person lifted his shirt and flashed a gun tucked under his belt. Larry put his hands up and moved out of the way instead of risking getting shot. The experience has left him and his partner without any means of transportation and no money, as they had spent their money on groceries. Larry and his wife were very careful about the limited food they had left. After making sure the location would suffice until next steps were figured out, they chose Peace Village. Larry and his wife found a spot in Peace Village and made an informed decision to preserve their health and safety. In the colder months, people were found to reside more often within structures as seen in Figure 2. As the weather got warmer, more people started migrating towards the middle tent seen in Figure 3. These structures were considered

as homes. The homeless would treat individual spaces with respect and privacy. Street Outreach visited the shed this winter. When the switch in locations was questioned, residents denied ever sleeping in the shed and claimed that they spent the winter in the middle tent. This denial is focused around survival as well. It was later learned that it would be against the law to stay in that specific structure. By saying they never resided in that structure, people are looking out for their security. There have been situations where people have woken up with their belongings stolen, with knives or guns being held up to them, with animals taking their food, with their food rotting, and being unsure of the purity of substances they are using.

Arnie, 38, and April, 39, both resided for two weeks in the abandoned subway tunnel. Arnie has heart conditions and April has high blood sugar. In order to survive the night and stay warm, they cover themselves with whatever they can find, sleep on steam pipes emitting heat, or light open fires in the corner away from the opening to avoid being seen. There is a gas pipe running about fifteen feet away from the fires. The symptoms the couple faced after exposure to CO, from sources including the constant vehicle traffic just right above, fires, cigarettes, and air pollution are the least of their worries. They are focused on containing fires, avoiding rodents and insects, protecting their supplies, and getting some rest. Their mind is set on survival.

Adam is a 58-year-old homeless male diagnosed with a neurological condition, who told me all about his basketball playing skills before he needed an assistive device to ambulate. He is currently in the process of resolving his homelessness situation and has a monthly income of \$850. Most of his money goes towards required medical payments, thus he is unable to afford housing. This forces him to save and make money illegally on the side through an insecure job he believes will benefit him the most. While he understands the importance of having a shelter over his head, he also understands that he should not bring his illegal business inside the shelter. Instead, he

leaves his merchandise off the shelter's campus out of respect to the shelter workers. Adam understands the dangers of distributing illegal substances, but he continues to do so because he needs the money for survival. Even if people are in the process of finding a home, they must have some sort of income to survive. The income people were receiving was not enough for them to afford appropriate housing. Finding housing becomes even more difficult when a down payment consists of multiple months' worth of work.

Ashley was found sleeping in a parking garage. He did his best to hide away from security and the public eye by hiding in the stairwell. Once there were fewer cars, he became more comfortable by moving to a location with warm air blowing out and making a set up with pallets to rest on. Ashley then continued to have a fully engaged conversation about his sexual relations with celebrities. After seeing him outside of the parking garage, his behaviors, demeanor, and body language were different. It was more difficult to stay on topic with him. When asked if he knew what CO poisoning was, he was not aware. After being informed on the risks of staying in a poorly ventilated parking garage, he stated he needed a place to sleep, but shelters were not accepting him. He had given up trying to find a home and believed he must go through the motions of experiencing homelessness without doing anything to change it. He was sanctioned because of a fight he had in one of the shelters, and Street Outreach encouraged him to continue searching for safer and sheltered locations.

Those found in the unsheltered locations were typically sanctioned, meaning they are ejected from the Department of Homeless Services shelter system for a minimum of 30 days. According to an executive summary by a professor of sociology at Nazareth College, Dr. Harry Murray, Rochester has a higher sanction rate than New York City despite the major difference in population size.<sup>25</sup> Reasons for this include significant negative experiences, issues with different institutions, anxiety for being rejected, fear for their safety, and substance abuse. These

barriers prevent the homeless from finding shelters directly, leaving them to endure harsh conditions and pollutants while focusing on survival. Meanwhile, those who are in shelters have more access to resources that can better improve their situation, whether through health, housing, or social services.

People seemed more comfortable in sheltered locations. Since their main priority is no longer simply survival, they can begin considering other aspects. Although their environment was different, priorities continued to line up with those in unsheltered locations. When Street Outreach would go to these locations, people would be reminded several times that they were not allowed by members who were on rounds. Even after the final announcement, the homeless would continue to approach members for help. Street Outreach's presence encourages people to have their health examined and ask necessary questions for improvements.

### *Barriers to Health Care*

When looking at housing instability and other factors that influence health, environmental factors are just one of the multiple hindrances the homeless population faces. Financial issues, transportation, primary care provider unfamiliarity, and social pressures are all eliminated with the offer of Street Outreach's services. By working with the homeless, it allows them to make the best informed decisions for their future. People do not worry about paying Street Outreach members, as their services are free. Members distribute bags containing hygiene products along with two bus tickets to get to and from their next appointment or meeting, which helps with transportation. The members are used as temporary substitutes for primary care providers, and developing a relationship with patients allows members to gain insight on their issues. With direct engagement and appropriate relationship development between patient and member, resources are brought directly to the homeless and social stigmas are eliminated. Members view patients as people and know what is in their best interest when giving assistance. The resources

collected will be increased as the Goergen Athletic Center at the University of Rochester will have its lost and found donated to Street Outreach at the end of each semester. There is never enough clothing to be handed out, especially in unpredictable, cold weather.

### **Discussion**

Despite the small sample size in this study, the results indicate the degree to which the sleeping environment and access to shelters determines exposure levels to CO within the homeless population. Confounders include stress, smoking, previous health history, age, lack of access to basic necessities (food, water, clothing, etc.), health/housing services, and frequency of exposure. The higher number of unsheltered smokers could mean even non-smokers could be affected through second hand smoke, since they reside in such closed-off quarters (a tent, a shed, a tunnel, or sub-level of a parking garage). Recall bias could have been encountered as most participants seemed to think for a longer period of time.

If it were not for the willingness and participation from the homeless community to disclose their habits, locations where they stay, frequency of visits, and their overall life stories, information would not be available on homeless CO exposure. By learning the daily struggles people face, when people reside in unsheltered sites, and what they use as heating sources, a bigger picture was revealed. CO concentrations within the shed and tents could vary due to less ventilation. Also, the homeless would close off all entrances when the temperature was unbearable to keep in the heat. The significance of sheltered sites can be seen in the differences in health evaluations as shown by COESS scores. People who were exposed to cleaner air (no concentrations of CO) exhibited less mild COESS scores than those who were in unsheltered locations. There was a difference in concentrations amongst the unsheltered locations. However, the COESS score and CO concentration should not be thought of as representative for the entire population of those facing homelessness. There are other

pollutants and different factors that affect weather conditions, temperature, traffic, and exposure to CO emitting sources. Additionally, people in the encampment and the tunnels did not have consistent CO emitting sources as the parking garage does, thus the techniques used to stay warm caused CO emission to vary. Averaging at 3.1 PPM in the subway tunnels and 3.6 PPM in the encampment per participant, concentrations were lower than concentrations in the parking garage, averaging at 5.59 per participant. The encampment was organized to improve access to low-barrier shelters, which have cleaner air than in other unsheltered locations. Despite the statistical inconsistencies in the subway and parking garage, there is a trend of low-level exposure seen throughout the study. The differences in  $R^2$  values in individual locations is due to a smaller sample size, however, there still remains a positive association with CO exposure and an elevated COESS score in all of the unsheltered locations. While more information can be gathered, it is clear ventilation methods must be improved without losing heat. This way people can find shelter, breathe cleaner air, and improve their health outcomes. By designing low barrier housing options with better ventilation, environmental exposures are significantly reduced, leading to improved health outcomes.

Sheltered sites offer resources and contacts with appropriate organizations and people. Unsheltered sites rely on organizations like Street Outreach to come to them and offer different resources. However, even then people were left shy of medical attention or of the supplies brought. The continuing existence of shelters, throughout all seasons, is key to improve the health of the homeless. These organizations seek financial and practical assistance constantly. Two of the low barrier sheltered locations were closed down due to funding issues. However, they expected this issue, so they closed strategically around when temperatures were warming. This forced residents out into the streets to find other options. Phillip was a consistent member of one of the two closed down shelters. He fell into depression after the

close and was forced back onto the streets. He was unable to go to any of the other shelters because of his drug use and was unable to afford housing due to the limited jobs that would accept him. Generally, the only jobs available to the homeless were low-paying labor jobs like manufacturing, painting, and food service. Phillip found a spot in Peace Village and the warmer weather allowed for the structures and tents to be bearable to live in. By tending to Philip on every round, the Peace Village workers are able to cheer him up emotionally. He forgets about his issues for a moment and engages in a conversation with members. These low-barrier shelters and housing organizations advocating for the homeless community are constantly searching for volunteers and assistance, as homelessness is a highly complex and volatile mix of different hubs involved, i.e. REACH, Street Outreach, social workers, other local resources. Fundraising efforts not only for Street Outreach, but also for the other hubs, is crucial. Street Outreach can continue collecting information based on individuals' needs and offering basic medical and personal assistance at the least. However, there is only so much the University of Rochester can do at these locations. For example, adding a needle exchange program within anywhere in the University is going to be nearly impossible or at least extremely difficult, as members believe the school wants to cover themselves and make sure no one can charge the University through unseen loopholes.

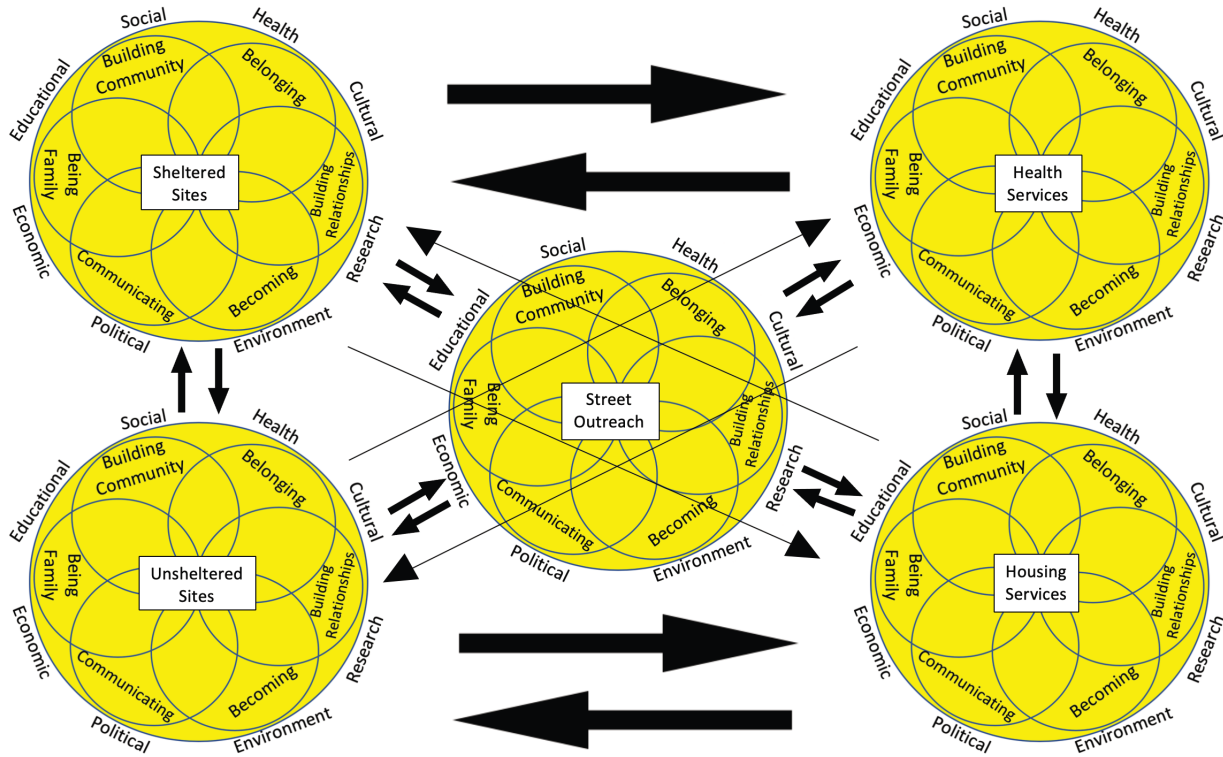
The homeless are just as willing to improve research in the health of their community as members are to assist

with medical or housing related issues. It took time to develop these trusting relationships where the homeless could reveal behaviors they find embarrassing or shameful. By removing the social stigma around different homeless habits, people would be open to more dialogue. Having each necessary hub play an engaged part in the patient's life is crucial to open different pathways, so the homeless can improve their health. Improving collaboration amongst different community-based organizations centered around health and housing services, as well as the unsheltered and sheltered sites, would encourage healthier decisions. As shown in Figure 8 in a modified Interdependent Hubs and Transformational model, the eight transformational pathways do not require interaction amongst one another in order to encourage healthier decision-making by the homeless.<sup>26</sup> Pathways are in an open system. Meanwhile, each hub must interact with one another, utilizing the six relational processes when treating the homeless as people rather than a number. Doing so increases opportunities for the homeless to improve their lifestyle. For example, when funding was low for the REACH house, another shelter, the House of Mercy, loaned payroll for the final few weeks.

As homelessness continues to persist in Rochester, barriers to housing, health and social services do as well. The need to provide more support, mainly in low-barrier housing and unsheltered sites for the homeless, is evident. Shelters and organizations, advocating for the homeless community, are in high demand for support, and Street Outreach offers that. Members have both a humanistic and

professional duty to be involved, help out, and encourage healthier decision-making. Even if decisions involve exposure to concentrations of CO rather than the cold weather and harsh environment, Street Outreach offers support. There should be continued involvement from Street Outreach, as their holistic approach and psychosocial model of care involves the homeless almost every step of their way. There can also be more involvement from the University of Rochester by collaborating with graduate programs concerned with improving health, housing, the environment, and social justice in Rochester.

This study suggests that a safe shelter plays a significant role in the physical and mental health of the homeless. Common symptoms around lower concentrations of CO with a COESS score higher than 5 consisted of trouble breathing, headaches, confusion, and difficulty concentrating. A useful future study could examine longer periods of exposure on more frequent visits to each unsheltered location. Investigating practices of adverse environmental exposures is not only useful when developing regulations within homeless sites, but also it allows more information on human health effects with different exposures. This is only possible through community engagement to learn more about individual stories and behaviors and to understand the relationship between housing instability, health effects, and access to health care. The holistic approach reveals patterns and trends within behaviors associated with CO exposure, rather than solely considering the source.



**Figure 8: Modified Interdependent Hubs and Transformational Pathways Model, 2019.** An additional pathway, environmental, was added. By engaging with relational processes and working with other hubs, more transformational pathways open to encourage the homeless to make healthier choices.



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# Applying a Bandage Instead of Treating the Infection: Dress Codes as a Cover-up for Dealing with Male Sexualization of the Female Body

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In September of 2014, school officials banned the wearing of leggings by female students in Evanston, Illinois, citing the clothing article as “too distracting” for male students. Later that year, a new student who inadvertently broke a Florida school dress code was forced to wear a “shame suit” - red sweatpants and a neon yellow shirt that read “Dress Code Violation”. At the Maggie Walker Governor’s school, an elite magnet school in Richmond, Virginia, it was announced over the loudspeaker that school officials would be performing a “shorts length spot check”. If more than ten girls were found to violate the short length rule, all female students would be banned from wearing shorts.<sup>1</sup> While strides have been made in equality of the sexes, the roots of patriarchy that society was founded upon still show through, specifically in schools, which serve to develop the social skills of the youth. Many schools employ dress codes to maintain this purpose, yet the way in which they are written and enforced shows troubling examples of oppression. Dress codes have served to ensure that young girls understand what their place in society will be as grown adults - as sexualized bodies, defined by the oppressive systems that governed society for years before their existence. This paper seeks to show how dress codes further the oppression of the female body by providing examples of how female bodies are immediately sexualized by members at all levels of society, how this sexualization is furthered by young girls themselves, and how this behavior manifests in schools - ultimately continuing this cycle.

## The Sexualization of Female Bodies

In order to understand how clothing regulations sexualize young girls and women, the term sexualization needs to be understood. According to the American Psychological Association, sexualization occurs when “a person is held to a standard that equates physical attractiveness with being sexy, a person is sexually objectified, that is, made into a thing for others’ sexual use rather than seen as a person with the capacity for independent action and decision making, sexuality is inappropriately imposed on a person”.<sup>2</sup> Dress codes and rules regarding dress are said to exist to promote a culture of morality and increase safety on school campuses, as shown in a study by Workman and Freeburg. The study found that out of eighty dress codes, sixty-seven stated that dress codes were put in place to “provide for the psychological and physical safety of the students through appropriate laws and regulations”.<sup>3</sup> Safety is achieved by regulating the clothing choices of female students in order to prevent any unwanted atten-

tion from male students. Therefore, the female student in a school room is assumed to be a sexual being, one who serves as a distraction to other students. She is not seen for her intelligence, her thoughts, her work ethic, or any other characteristics that make up her identity. She is a body, a body that is representative of one purpose: sex. She is objectified by her counterparts, and this objectification is only furthered by the school’s imposition of regulations regarding her dress choices.

Why is this important? According to the American Psychological Association, “sexualization can negatively impact cognitive and physical function, mental and physical health, sexuality, and their attitudes and beliefs about gender and sexual roles. Sexualization of girls may also hinder the ability of boys and men to interact intellectually with girls and women, which is necessary for males to develop intimacy with female partners”.<sup>4</sup> Not only is this process inhibiting the education of girls, something that is still not believed to be important in many parts of the world, but it also is inhibiting that of male students. How can a girl balance the expectations that she is to attract a man to fulfill her one purpose in life, marriage, while also attempting to be a student and an intellectual? The existence of dress codes furthers the need to ask this question, in addition to promoting sexualization under the guise of maintaining a proper school environment with high moral standards. For adolescents, schools are the place where they come together during a time of sexual identity development, and therefore how sexuality is understood will have a significant impact on their overall view of sex.<sup>5</sup> Additionally, school is the place in which children and adolescents are supposed to be prepared for their future careers. Schooling is therefore of utmost importance in the development of young people within society. Dress codes and regulations impede this development because they set the standard for what is acceptable and unacceptable in terms of dress and even character - especially in a girl’s sexuality.

The sexualization that occurs in schools based on dress codes is exemplified by the case of fifteen-year-old Marcia Stevenson, which rocked newsstands all over Canada in 1999. Stevenson was sent home from school because of her spaghetti-strap tank top. The principal of the school reportedly sent her home because of the amount of cleavage that was shown by Stevenson in said tank top, noting that “on a different young women, the top might reveal less cleavage. In fact other ‘less developed’ young women were not asked to

change out of tank tops similar to the one that got Marcia sent home".<sup>6</sup> In addition to assuming that Stevenson's shirt would cause her to be viewed sexually by others within the school, the principal's decision demonstrated that only certain types of bodies were subject to dress code regulations. Stevenson's body was offensive to the moral character of the school because it could likely be sexualized more easily based on the way it was developed. Furthermore, the dress code that Stevenson supposedly broke states that only clothing that references drugs, alcohol, sex and other rude or racist language is banned. Stevenson's shirt did not overtly suggest any of these things; the sexual nature of the shirt was imposed upon her by the male principal, as she "had done more than simply use her tank top as a billboard for sex. She had used her entire body. The tank top was part of a signifying practice that caused the principal to read Marcia herself as a reference to sex in her entirety".<sup>7</sup> Stevenson's tank top represents the normalized sexualization of the female body, and further, the exposure of said body results in the assumption that the purpose of that body is exclusively sexual. The case of Marcia Stevenson is not an isolated incident and represents the inherently adverse effects on women resulting from the enforcement of dress codes.

While Marcia Stevenson's body was deemed sexual because of the parts of her body that were shown, many members of society assume that a woman who dresses provocatively does so to gain sexual attention. In a study of undergraduate Israeli college students' perceptions of clothing, Avigail Moor found statistical evidence of the problem that lies deep within the oppressive society of the current world. Male students were reported to answer to the question "of whether they assumed that women dressed in sexy clothing were trying to arouse them or elicit sexual advances from them, 30.6% and 20.2% respectively stated that those were uniformly the intentions, in their opinion. An additional 53.2% and 55.6% thought those were the intentions most of the time".<sup>8</sup> On the contrary, only 3.2% of the women "said they had intended to arouse men with their style of clothing, and the percentage of those who meant to seduce was a mere 5.3%. Very few women reported a desire to be touched or stared at as their motivation for dressing this way, 2.1% and 2.3% respectively".<sup>9</sup> Although many women do not want to be sexualized due to their appearance and dress choices, the majority of men believe the opposite. Some argue that dress codes prevent this sexual behavior because they often require females to cover their bodies. Therefore, dress codes enforce the norm that the sexualization of female bodies is based on the choices of the female herself and not those who objectify her body.

This objectification taught in schools through the enforcement of dress codes carries upwards to all levels of society. In a case in Dane County Wisconsin, county court judge Archie Simonson sued the UPI and API<sup>10</sup> over the claim that they defamed his character by publishing his comments on the case of a fifteen-year-old boy pleading not guilty to the charge of second degree sexual assault that happened in a

high school stairwell.<sup>11</sup> The boy was sentenced to a year in prison only and Simonson commented,

"Even in open court we have people appearing, women appearing, without bras and with the nipples fully exposed and they think that is smart and they sit here on the witness stand with their dresses over the cheeks of their butts and we have this type of thing in the schools. So, is that the attitude of our community? Am I supposed to be responsive to that?... It is wide open and are we supposed to take a impressionable person 15-16 years of age who can respond to something like that and punish that person severely because they react to it normally?"<sup>12</sup>

The comments blame females for their continued sexualization and argue that sexual assault is understandable when the victim is dressed in a certain way. Responding to sexual stimulation with assault is not "normal", it is illegal. The normalization of this behavior is perpetuated by the men that are considered established members of society, as well as those that are supposed to mentor boys. For example, in the case of the so-called "Spurs Posse" in 1993, a group of teenage boys was arrested for molesting and raping girls in Lakewood, California. One of the fathers of the accused stated that his son's behavior was normal and healthy and that the real culprit were the girls, who were promiscuous. "We live in a promiscuous society. I can tell you these girls around my son are giving it away. It's frightening".<sup>13</sup> It is often stated that "boys will be boys" and there is nothing that can be done to change this culture. This insinuates that the only way to prevent something like a sexual assault from happening is to regulate the sexuality a girl supposedly exudes from her choice of dress, ultimately blaming the girl for any eroticization of her body.

## How Dress Codes Change Girls' Perceptions of One Another

The sexualization of female bodies and the subsequent shaming of those bodies by men has carried over gender lines and impacts how women view one another. The admonishing behavior in which women shame other women based on their dress choices is known as the slut paradigm. As dress codes teach women to hide any aspect of their body that may be eroticized, those who do not conform to this ideal are seen as sluts. Merriam-Webster defines slut as "a promiscuous woman, a woman who has had many partners".<sup>14</sup> However, research has found that within white, suburban America, "a 'slut' is not merely a girl who 'does it' but any girl who-through her clothes, her makeup, her hairstyle, or her speech- seems as if she might".<sup>15</sup> The word slut has taken on a whole new meaning, yet the term still implies that a girl or woman is having sexual relations with more than one man, which is deemed abnormal behavior.<sup>16</sup> Moreover, a girl is now a slut if she receives sexual attention from multiple men, even if this attention is unwanted. Female dislike for other females based on how their male counterparts define them is detrimental to the advancement of womanhood. In response

to a school-wide issue of boys slut-shaming female students, a female high school principal stated “it’s one thing for me to say I find it despicable when boys call girls ‘hoes’ and ‘sluts,’” she says, “but it’s not as meaningful as if our PTA supports the idea that certain behavior - including certain comments and language used consistently on campus - has adverse effects on the psyche of the girls and effects on their academic performance”.<sup>17</sup> While spewing language that degrades someone based on their body is a form of bullying, it also makes it seem as though sex is an activity women should not seek out. Dress codes have been implemented to prevent this kind of bullying and behavior, but they are simply a bandaid for the problem. Why not just teach society that the way someone dresses can be for themselves, and doesn’t have to serve the purpose of being sexy? By forcing girls to dress in a way that is deemed non-promiscuous, the cycle that they cannot be sexual is furthered, and if they are and face mistreatment because of it, it’s their fault because they broke the rules that were put in place to protect them. By the same token, the increased stipulation around dress that is an effect of dress code acts as a reminder to girls that their bodies define them, and a boy’s sexuality is uncontrollable, so they must dress in ways to prevent this uncontrollable desire from affecting them.

In order to better understand how dress codes impact schoolgirls opinions of one another, Rebecca Raby studied groups of middle and high school students in Southern Ontario, Canada. Raby asked students about dress codes that exist on the principle of preventing students from wearing “something degrading to themselves,” such as clothing that is deemed revealing.<sup>18</sup> To this, female students responded that if they saw one of their female counterparts at school wearing skimpy clothing, they would assume that she “has no self-respect” and wants to “flaunt herself in the hope of feeling loved”.<sup>19</sup> These remarks show the impact that the regulation of dress has had on females’ views of one another, generating the assumption that girls only dress that way to seek out male attention. Therefore, girls who wear clothing deemed provocative “are considered to lack self-respect, then responsibility for their marginalization is their own, rather than located in the social control of female sexuality”.<sup>20</sup> The belief that the oppression of females by the patriarchy is the fault of women themselves forces society to remain stuck in a continuous system, where women and girls who are products of the society they come from must continue the oppression of other females who do not conform to the ideals of what constitutes a good woman. Dress codes further this status quo among the youth, molding them to believe that this oppression is to be expected.

## How Sexualization Manifests Itself in Schools via Dress Codes

Sexualization is a form of unequal treatment and is illegal in educational institutions via the Equal Protection Act as well as Title IX. Dress codes go against these statutes but are not seen as violations of equal protection due to the morality that

they are supposedly imposing. Title IX of the Education Amendments Act of 1972 states that “No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance”.<sup>21</sup> The regulation of female bodies via dress codes is promoted based on the ideal that it prevents sexualization of the female body by requiring girls to hide their bodies from others, which in turn causes adolescents to internalize this inherent sexualization and continue its behavioral patterns later in their lives. This ideal was challenged in *Johnson versus Joint School District* in the Idaho Supreme Court in 1973. The plaintiff sued the school board due to the fact that as a female student, she was not allowed to wear pants. The dress code of the school at the time stated that “any type of clothing or attire which attracts undue attention to the wearer and thus causes a disturbance in the school or classroom is not acceptable” and “girls are expected to wear dresses or skirts which are more than two inches above the knee”.<sup>22</sup> While the refusal to allow girls to wear pants goes against Title IX, the dress code in this scenario promoted the idea that the female body serves as a distraction.<sup>23</sup> The plaintiffs argued that “the wearing of slacks, pantsuits or culottes to school by a female student does not have a detrimental effect on safety and morals of the students; any disruptive conduct which might arise can be controlled by disciplinary procedures other than to require the wearing of only skirts or dresses by female students”.<sup>24</sup> The case was ruled in the plaintiff’s favor, citing cases before that had ruled that the restriction of students’ appearances went against their civil liberties. The decision of the *Johnson* case represents more than just the ability of girls and young women to wear pants in school; it shows that the idea of regulating a girl’s body based on the implications that body could have on others is unlawful. While the case was a landmark decision in the seventies, its analysis with cases of more recent dress regulations shows the complete lack of advancement in this issue. Females’ bodies are regulated in all aspects of life and have their beginnings in places of education. The continuation of this behavior has proved that society has remained stagnant, and in order to change this, action must be taken for women to become equal members of society, rather than just being seen as sexualized bodies.

Another case, *Wallace versus Ford*, heard in the Arkansas District Court in 1972, served the purpose of deciding which clothing regulations were lawful. The plaintiff’s central claim was that the dress code rule that skirts must be no more than six inches above the knee was unlawful. This gave the judges difficulty, but they ended up upholding the statute “because it found the standard, as applied to most girls, to bear a ‘valid relationship to the legitimate objective of prohibiting immodest clothing’ which was ‘necessary to carry out the educational mission of the school’”.<sup>25</sup> The other aspects of the dress code were ruled lawful only if they promoted actual shows of disruption. The *Wallace* decision upheld the concept that female bodies are dangerous when not regulated,



and therefore, female sexuality must be policed. The enforcement of dress regulation not only leads girls to believe that they are no more than a sexualized body in school, but it also instills in them that the regulation of their bodies is something that will prepare them for life after education. Researchers found that among teachers at Matthews Middle School in Texas, "policing the dress code extended to an emphasis on teaching students how to dress 'well'. Many even coupled this interest with genuine, caring, concern for student upward mobility in this working class context".<sup>26</sup> If the goal of the school is to prepare students for success in a patriarchal world, and to inculcate in female students that they are no more than bodies to be objectified, then dress codes promote that goal. However, it should be the goal of the school to help mold students into those who will aid in the changes that must be made for society to advance. Dress codes and regulations are the easy way out in helping students achieve success, which would involve playing a role as a cog in the larger machine of a capitalist society. To create students who are innovators, the school must take the harder route, one which involves teaching students that they are more than just the connotations of their body which are thrust upon them by society. But due to the patriarchal tendencies that govern the majority of powerful institutions in the modern world, education continues to promote the objectification of the female body.

Dress codes have sexualized the female body since their creation, yet they are still being fought against, most recently in Peltier et al. versus Charter Day Schools Inc. in December of 2018. Three mothers of daughters of varying ages enrolled at Charter Day School in Brunswick County, North Carolina sued the school for violating Title IX by requiring girls to wear skirts to school. The founder of the school stated that the dress code promotes "chivalry" and "respect", yet many of the girls who attended the school felt the opposite.<sup>27</sup> For example, when one girl attending Charter was in the first grade, she was told she could not sit cross-legged in class, and when she questioned the teacher as to why the boys were permitted to sit cross-legged while she was not, "she was told it was because she was wearing a skirt... 'I guess I learned the lesson because I was careful about the way I sat from then on, but it always took focus away from my classwork'".<sup>28</sup> Here is where the problem lies: the girl had to adjust how she was sitting because of her required dress. This adjustment which may be seen as not too difficult to others ended up impacting how the girl felt as a student and her education as a whole. Additionally, another girl reported that "The requirement that girls wear skirts 'makes the boys feel empowered' and contributes to ideals like that expressed by one of her friends 'that girls could not play football'".<sup>29</sup> By inhibiting her ability to partake in the same activity as her male counterparts, the regulation of the girls' dress directly violates Title IX, while also promoting archaic gender stereotypes. The plaintiffs won the case, with the judge ruling that "Skirt requirement places an unequal burden on girls and results in 'perpetuating' the legal, social and economic inferiority of women".<sup>30</sup>

The ruling in Peltier demonstrates that dress codes go against federal legislation that has held up through decades, and also reinforce the subjugation of females within modern day society.

To change the understanding of what a woman can contribute to modern society, schools must teach girls and young women that their potential achievement is limitless and is not defined by the body they were born into. This, unfortunately, does not occur because schools enforce the unjust ideal of modesty, as well as the belief that male sexuality is normal and female sexuality is not, through dress codes. For women to advance in society, society must stop viewing their bodies as objects that serve the purpose of male pleasure. This objectification can be lessened by the removal of the bandage that is dress codes and by applying the medicine that girls' bodies are not meant to be sexualized based on the clothing they wear.

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