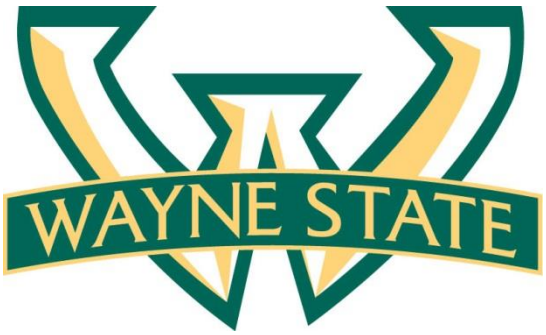

McNair Scholars Research Journal 2018

A MESSAGE FROM THE WSU MCNAIR SCHOLARS PROGRAM

The Ronald E. McNair Postbaccalaureate Achievement Program is one of eight Federal TRIO educational access and equity initiatives. The Wayne State University McNair Scholars program is funded by a $1,125,000 grant from the U.S. Department of Education, Office of Postsecondary Education.

The McNair Scholars program is designed to prepare the next generation of scholars, professionals and leaders for doctoral study in the nation's top research universities. The purpose of the program is to increase the number of academically talented persons from low income/first generation and or underrepresented backgrounds with an earned Ph.D. McNair Scholars programs currently exist at over 200 colleges and universities.

The McNair Scholars program attracts applications from a highly competitive pool of undergraduate students with strong interest in research and graduate studies. Throughout the program year, McNair Scholars begin preparing for graduate school, receive research training and instruction and develop research proposals. The experiences prepare students for the Summer Research Experience where students conduct research projects under the guidance and mentorship of a faculty member. Scholars also complete an intensive research course, obtain GRE test preparation and engage in professional development workshops.

McNair Scholars present their research at the WSU Undergraduate Research Conference and select National McNair Conferences held throughout the nation.

The 2018 edition of the Wayne State University McNair Scholars Research Journal highlights the accomplishments of our Scholars and reflects the work of a wide variety of academic disciplines.

Please join the McNair Staff in congratulating the Scholars on their contributions to the advancement of knowledge in their respective fields of interest.

GO WARRIORS!!!!!

The Wayne State University McNair Scholars Staff

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EMERGENCY DEPARTMENT UTILIZATION AND ADVERSE BIRTH OUTCOMES

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ABSTRACT

Background: Disparities in infant and maternal mortality persist. Particular neighborhoods in Detroit have average infant mortality rates of 14.1 deaths per 1000 live births, compared to 5.9 deaths per 1000 live births nationally. Preterm birth and low birthweight are infant mortality predictors. Literature suggests that some pregnant women present to the Emergency Department (ED) for care during the early prenatal period; yet the relationship between ED use and adverse birth outcomes remain unexplored.

Objective: This study aims to evaluate the relationship between prenatal ED use and adverse birth outcomes.

Methods: We performed a retrospective chart review of 15,322 deliveries from January 1, 2015 to December 31, 2016 in the Henry Ford Health System. We excluded multiple gestation pregnancies, those with known lethal congenital anomalies, and any ED visit for a trauma complaint. Using chi-square and t-tests, we analyzed pregnancy outcomes associated with prenatal ED use compared with no ED use.

Results: Among women with prenatal ED use, majority were 20-25 years old (36.32%), Black (40.65%), and publicly insured (57.46%). Pregnancies associated with prenatal ED use are more likely to result in low birthweight (9.83%, compared with 5.74% in pregnancies not associated with prenatal ED use) and preterm birth (11.37%, compared with 6.45% in pregnancies not associated with prenatal ED use).

Conclusion: These findings indicate that women with prenatal ED use are more likely to be young, Black, and publicly insured. Furthermore, any ED use during pregnancy was more likely to result in low birthweight or preterm birth. Therefore, the ED may be a critical setting to improve prevention efforts in early pregnancy.

BACKGROUND

Globally, there are one million neonatal deaths per year.[1] Infant mortality is especially high in the United States (U.S.) when compared to other developed countries.[2] As of 2015, the U.S. infant mortality rate (IMR) was 5.9 deaths per 1,000 live births.[3] In Detroit, Michigan, the IMR was 14.1 deaths per 1000 live births in 2015, more than double the national rate.[4] While the U.S. IMR has decreased over the years, racial disparities persist.[5] The infant mortality rates for infants born to African American, American Indian, Alaskan Native, Hispanic, Asian, and Pacific Islander mothers make up the majority of neonatal deaths.[2] As of 2015, the U.S. IMR for Black infants was 10.6 per 1,000 live births compared to 5 per 1,000 live births

for White infants. In the state of Michigan for the same year, the IMR nearly tripled to 14.3 per 1,000 live births for Black infants compared to 5 per 1,000 live births for Whites.[6]

The leading causes of infant mortality are due to preterm birth, low birth weight, congenital anomalies, sudden infant death syndrome (SIDS), maternal complications during pregnancy, and accidental injuries.[7] While there are a wide range of medical conditions related to infant mortality, preterm birth is among the most researched.[2] Preterm birth is commonly defined as birth before 37 completed weeks of gestation. Preterm birth is associated with lifelong disability and impairment for newborns.[8] The more preterm a neonate, the greater the likelihood of mortality and morbidity in the first year of life. Studies demonstrate that preterm birth alone is responsible for roughly 27% of neonatal deaths, which may be higher because preterm birth leads to other conditions, such as asphyxia and pneumonia. Considering all of these factors, preterm birth is responsible for roughly 70% of infant death.[1,2]

Research suggests that premature death is the result of five areas: behavioral patterns, genetic predispositions, social circumstances, environmental exposures, and shortfalls in medical care.[10] Social and biological factors like maternal psychosocial stress contribute to infant mortality.[9] The psychosocial stress of mothers from disadvantaged backgrounds takes a toll on the pregnancy, especially in minorities.[2] Other factors associated with infant mortality include smoking, teen pregnancy, advanced maternal age, obesity, multiple gestations, induced ovulation and artificial reproductive technologies (ART), inter-pregnancy intervals less than twelve months, urogenital infections, genetics, and environment.[2]

Maternal morbidity, mortality and quality of obstetrical care are major factors that have been shown to contribute to infant mortality.[2] According to the Centers for Disease Control and Prevention (CDC) during 2011 to 2013, the maternal mortality rates were 12.1 deaths per 100,000 live births for white women, 40.4 deaths per 100,000 live births for Black women, and 16.4 deaths per 100,000 live births for women of other races. Cardiovascular disease, infection/sepsis, and hemorrhage were noted as the top causes.[12] The CDC Division of Reproductive Health conducted a study analyzing the sociodemographic characteristics of women with pregnancy-related deaths. It was found that pregnancy-related mortality increased with maternal age and that non-Hispanic Black women had the highest risk of dying from pregnancy complications. It was also concluded that pregnant women with chronic health conditions such as diabetes, obesity, and hypertension are at a higher risk of adverse maternal outcomes.[13] These findings illustrate health disparities among expectant mothers and further indicate correlations between sociodemographic characteristics and birth outcomes. Furthermore, maternal and infant morbidity and mortality are useful indicators of the health status of the community, as the health of mothers and their infants determines the health of generations to come.[14]

While there is a distinction between disparities in health outcomes and disparities in health care, the latter has been found to contribute to the former.[15] Considering these persistent pregnancy-related disparities, prenatal care is a service provided to ensure the best possible outcomes for mothers and their babies. Prenatal care is an effective, integrated service that provides health screening, management of medical conditions, and psychosocial support. Inadequate prenatal care is associated with increased complications during pregnancy.[16] Populations with higher rates that lack prenatal care or inadequate prenatal care include those who are uninsured, in a non-White ethnic group, adolescent, unemployed, immigrants, have low education/ socioeconomic level, or have a delayed recognition of pregnancy.[16]
Populations with inadequate prenatal care and persistent health disparities in infant and maternal morbidity and mortality, such as Black women or women with chronic health problems, may also use the Emergency Department (ED) frequently for care during the early prenatal period.[17] The ED does not typically provide routine prenatal care, as it is traditionally an acute care setting and usually only cares for

pregnant women before the pregnancy is viable (20 to 24 weeks of gestation).[18] Though research on ED use as it relates to prenatal care has been largely unexplored, emerging literature suggests that some women may use the ED during the prenatal period for non-emergent issues, even when they have an obstetrical provider.[19] Non-emergent ED visits are defined as those in which delayed treatment to a condition would not increase the likelihood of adverse outcomes.[17]

The 2011 National Hospital Ambulatory Medical Care Survey found that pregnancy-related problems were the fourth most common ED discharge diagnosis and the fifth most common reason for initial presentation to the ED in women aged 15 to 65.[20] Pregnancy-related ED visits for women of reproductive age 15-44 years are likely much more prevalent, given that women over 45 are less likely to be pregnant in general.[21] For example, a cohort study through the Yale University School of Medicine found that 50% of pregnant women utilized the ED at some point during their pregnancy.[22] Some of these prenatal ED visits were non-emergent, indicating that the clinic setting may have been an appropriate alternative. For pregnant women, non-emergent visits to the ED may be due to an unplanned pregnancy or missed prenatal care visits.[19]

Many women present to the ED during pregnancy because of problems such as vaginal bleeding and abdominal pain.[23] Since pregnant women in the ED are usually less than 20 weeks gestation, vaginal bleeding is most commonly due to miscarriage, ectopic pregnancy, and other forms of abnormal conception.[22] Sociodemographic characteristics, such as young age, minority race, public insurance, single relationship status, low health literacy, and low education have been found to be strongly associated with Emergency Department utilization.[19] However, given that current research reflects non-emergent ED use of the general population, these associations may or may not be generalizable to pregnant women in the ED.[19] Other characteristics that have been found to have a direct relationship to prenatal ED visits include history of a sexually transmitted disease (STD), marijuana use, low parity, African American race, low social support and self-esteem during pregnancy, high symptom distress, low readiness for caregiving, low prenatal care knowledge, and low prenatal care satisfaction.[22]

The characteristics of women who may use the ED frequently during the early prenatal period are similar to those who have delayed/no prenatal care and disproportionately high adverse maternal and infant outcomes. In the city of Detroit, aside from 29% of infant deaths being attributed to preterm birth and low birth weight, 21.3% of infant deaths are correlated with maternal stressors and social chaos, 30.5% are correlated with unintended pregnancy, 42% are correlated with less than a 12th grade education, and 61% are correlated with inadequate prenatal care.[24] Detroit is extremely vulnerable when it comes to maternal and infant health and research shows that neonatal outcomes are a reflection of maternal variables. Given that prenatal care provides mothers with information and early diagnoses of pregnancy-related problems, lack of adequate prenatal care could be a significant contributor to the city's high IMR. Many pregnant women who lack prenatal care may be relying on the ED for care during the early prenatal period. Therefore, Detroit is an optimal place to evaluate the relationship between ED use during the early prenatal period and adverse maternal and infant outcomes. These data may identify opportunities in the ED to intervene and prevent adverse maternal and neonatal birth outcomes.

OBJECTIVE

Our objective is to evaluate prenatal ED use as it relates to adverse birth outcomes. We hypothesize that any ED utilization in the early prenatal period may be an important predictor of adverse maternal and neonatal outcomes, specifically preterm birth and low birth weight.

METHODOLOGY

I participated in three components of this study: (1) primary data collection, (2) retrospective chart review (data abstraction), and (3) preliminary data analysis. We received IRB approval for all components of this study from Henry Ford Health System.

Primary Data Collection

During the primary data collection, research assistants (RAs) administered surveys to a cross-sectional sample of pregnant patients in the Henry Ford Emergency Department in Detroit, Michigan to gather data on their socioeconomic demographics, ED utilization patterns, unintended pregnancy rates, and reproductive health history and needs. The survey also obtained information to understand what approaches to postpartum birth control counseling might be most acceptable in the ED. The electronic health record was screened for the following inclusion criteria: (1) female sex, (2) age 15-44, and (3) an emergency severity index (ESI) level of a 3, 4, or 5, which indicates a non-emergent visit. Exclusion criteria included: (1) patients who did not speak English, or (2) those who were in physical, emotional, or mental distress upon recruitment.

RAs also abstracted 5 key variables from the electronic health record (EHR) to input into the survey form before administering it to the patient: (1) patient age, (2) ESI level, (3) number of previous visits to the ED, (4) chief complaint for the current ED visit, and (5) ethnic group/racial background. Otherwise, surveys were anonymous. After screening, the patient was given an information sheet explaining details of their rights, risks, and benefits of participating. Once verbal consent was obtained, the survey was self-administered to eligible patients on a tablet while awaiting care in the ED. Participants were offered a printout of low-cost and free clinics to get birth control in the city of Detroit at the end of the survey. Data collection is currently ongoing; therefore, these data have not yet been analyzed for inclusion in our results.

Retrospective Chart Review

The retrospective chart review component of the study abstracted historical data regarding pregnancies over a two-year period from the EHR. Inclusion criteria included all deliveries in the Henry Ford Health System in Michigan between January 1, 2015 and December 31, 2016. These hospitals included Henry Ford Hospital Detroit, Henry Ford Macomb Clinton Township Medical Center, Henry Ford West Bloomfield Medical Center, and Henry Ford Wyandotte Medical Center. Exclusion criteria included multiple gestation pregnancies, those with known lethal congenital anomalies, and any ED visit for a trauma complaint. A Henry Ford Health System data analyst previously abstracted variables of interest from the EHR, including maternal demographics and pregnancy outcomes. Adding to this database, two RAs searched the medical record numbers (MRNs) of women associated with each delivery and abstracted the following data: (1) postpartum birth control plans, (2) social work involvement, and (3) child protective services (CPS) involvement. We developed and piloted a data abstraction protocol.

To locate the postpartum birth control variable, RAs reviewed notes from women's postpartum visit encounters. Birth control plans were categorized into the following groups: (1) lactation amenorrhea method (LAM), (2) natural family planning (NFP), (3) female sterilization, (4) male sterilization, (5) oral contraceptive pill (OCP), (6) intra-uterine device (IUD), (7) implant, (8) condoms, (9) patch, (10) ring, (11) shot, or (12) other. If no post-partum contraceptive method plan was identified, RAs did a general search in the patient's electronic health record, utilizing keywords such as "contraception" or "birth control" and locating corresponding notes following the mother's date of delivery. If no data was found, the

postpartum birth control plan was categorized as "none documented." In cases in which more than one postpartum birth control plan was identified, all contraceptive methods planned were documented.

Abstracting the CPS and social work involvement variables was more complex. Social work involvement variables were split into whether social work was consulted or not and if social work needs were identified or not during the pregnancy. CPS involvement was recoded as present or not. Research assistants searched the EHR for notes in the woman's chart written by either a case manager or social worker. If no information was available for CPS or social work involvement, RAs performed a general search inputting keywords such as "CPS," "social work," or "case manager" into the search engine. If no information was found for the variable, they were categorized as "no CPS involvement," "no social work consulted," and "no social needs identified" by default. We performed several inter-coder agreement trials throughout the data abstraction protocol development, but did not reach 80% agreement. To calculate inter-coder agreement, we divided the number of agreements by the total number of data points abstracted. Once 80% inter-coder agreement is achieved, RAs will continue to independently abstract data.

Data Analysis

Because our primary data collection and retrospective chart review abstraction is ongoing, our analysis is preliminary and only includes data that was previously abstracted by the data analyst. We preformed preliminary data analysis of 15,322 deliveries that occurred between January 1, 2015 and December 31, 2016 in the Henry Ford Health System using Stata 14.2 (Stata Corporation, College Station, TX, USA) to calculate descriptive statistics. Our primary independent variable was prenatal ED use, categorized as any prenatal ED use vs. none. Our co-variates were select maternal demographics including age, race, and insurance type. Our dependent variables were preterm birth, low birth weight, and concern for maternal abuse. Preterm birth is defined as birth that occurs before 37 completed weeks of gestation. Low birth weight is defined by the American College of Obstetricians and Gynecologists as newborn weight less than 2,500 grams. Concern for maternal abuse was coded as present is women answered "yes" to any one of the three physical abuse screening questions at any time during the pregnancy. Using t-tests and chi square tests, we analyzed the relationship between ED use during the prenatal period and our dependent variables.

RESULTS

The majority of women with any prenatal ED use were 20-30 years old (cumulatively, 66.7%), Black (40.7%), and publicly insured (57.5%) **(see Table 1)**. There were very few uninsured women in the sample. Pregnancies associated with prenatal ED use are more likely to result in low birthweight (9.8%, compared with 5.7% in pregnancies with no prenatal ED use) and preterm birth (11.4%, compared with 6.5% in pregnancies not associated with prenatal ED use). Concern for physical maternal abuse was infrequent, but twice the proportion in those who used the ED for prenatal care compared those who did not use the ED for prenatal care (6.3% vs. 3.4% respectively) **(see Table 2)**.

Table 1. Maternal demographics of deliveries in the Henry Ford Health System from January 1, 2015 to December 31, 2016 by prenatal ED use.

	Total N=15,322	No Prenatal ED (No ED visits) N=10,063	Any Prenatal ED (1 or more ED visits) N=5,259	p-value
Age in years, n (%)				
≤ 19	735 (4.8%)	423 (4.2%)	312 (5.9%)	<0.0001
20-25	4, 451 (29.1%)	2,541 (25.3%)	1,910 (36.3%)	<0.0001
26-30	4,751 (31.0%)	3,154 (31.3%)	1,597 (30.4%)	<0.0001
31-35	3,743 (24.4%)	2,763 (27.5%)	980 (18.6%)	<0.0001
36-40	1,364 (8.9%)	988 (9.8%)	376 (7.2%)	<0.0001
41-45	258 (1.7%)	181 (1.8%)	77 (1.5%)	<0.0001
≥46	20 (0.1%)	13 (0.1%)	7 (0.1%)	<0.0001
Race, n (%)				
White	8,488 (57.8%)	6,140 (64.1%)	2,348 (46.0%)	<0.0001
Black	4, 067 (27.7%)	1,991 (20.8%)	2,076 (40.7%)	<0.0001
Hispanic	124 (0.8%)	76 (0.8%)	48 (0.9%)	<0.0001
Other	2,010 (13.7%)	1,375 (14.3%)	635 (12.4%)	<0.0001
Insurance Type, n (%)				
Uninsured	74 (0.5%)	62 (0.6%)	12 (0.2%)	<0.0001
Public	6,979 (45.5%)	3,957 (39.3%)	3,022 (57.5%)	<0.0001
Private	8,269 (54.0%)	6,044 (60.1%)	2,225 (42.3%)	<0.0001

Table 2. Adverse pregnancy-related factors and outcomes of deliveries in the Henry Ford Health System from January 1, 2015 to December 31, 2016 by prenatal ED use.

	Total N=15,322	No Prenatal ED (No ED visits) N=10,063	Any Prenatal ED (1 or more ED visits) N=5,259	p-value
Low Birth Weight, n (%)	1,105 (7.2%)	583 (5.7%)	522 (9.8%)	<0.0001
Preterm, n (%)	1,235 (8.1%)	642 (6.5%)	593 (11.4%)	<0.0001
Abused, n (%)	669 (4.4%)	340 (3.4%)	329 (6.3%)	<0.0001

DISCUSSION

Our data suggest that young, African American, and publicly insured women in a single health system comprised of multiple hospitals used the ED during pregnancy more than their counterparts. These findings support other literature that describes the sociodemographic characteristics of those who utilize the ED. Interestingly, there were very few women who were uninsured in our sample, regardless of ED use. This may be because pregnant women often qualify for Medicaid, a public insurance. We were unable to characterize other key demographics such as education, income, zip code, and relationship status because this information was unavailable in the EHR. Our ongoing primary data collection with pregnant women in the ED may offer more insight into these characteristics.

Our data also suggest that low birth weight and preterm birth, which are leading causes of infant mortality, are higher in those who utilize the ED during the prenatal period. These findings may suggest that prenatal ED use is a marker of inadequate prenatal care, which is known to be associated with increased pregnancy-related complications. The ED is unlikely to provide adequate, routine prenatal care since it is an acute care setting.[18] Prenatal ED use and poor birth outcomes may also be related because women who are sicker or with more co-morbidities may end up in the ED more often. So prenatal ED use may be an indicator of maternal health overall. Finally, this finding may be a direct result of the higher concentration of women with known risk for adverse birth outcomes found in the prenatal ED use group, including public insurance, which is a surrogate for income in many cases, and Black race. To further explore this, our future analyses will control for maternal co-morbidities and maternal demographics to assess if prenatal ED use is independently associated with adverse birth outcomes.

Concern for maternal abuse during pregnancy was also found to be more frequent in women who utilize the ED than women who do not utilize the ED during the prenatal period. With past literature identifying psychosocial stress in mothers from disadvantaged backgrounds and mothers of minority groups as a social and biological contributor to infant mortality,[2,9] abuse can be a notable link to adverse pregnancy outcomes. This particular finding may indicate that enhance screening for abuse in the ED setting for pregnant women may be warranted. Additionally, our maternal abuse variable may related to other variables like social work and/or CPS involvement, which we will explore in the future.

What remains unknown from this study are the reasons why women used the ED during the prenatal period. This will be the subject of future analysis in which we will perform descriptive statistics regarding

ED chief complaints and severity of illness. We also intend to explore how frequent ED use (4 or more visits in 12 months) vs. non-frequent ED use may differ regarding demographics, ED visit reason, severity of illness and birth outcomes.

There are several limitations of this retrospective chart review analysis. First, our study only included deliveries over a two year period, which may not be a sufficient time span to capture salient associations since pregnancy lasts 9 months. However, we had over 15,000 observations, which provides a sizeable sample. Also, the health system records were not electronic prior to dates and paper records would be significantly limited in provided the wealth of data contained in our database. Next, our study only analyzed data from the hospitals that are within the Henry Ford Health System of Southeastern Michigan. Therefore, our results may not necessarily be reflective of other regions of the state or the broader scope of the country, causing limiting generalizability. Inherent to the retrospective chart review methodology, we had difficulty abstracting some variables, such as relationship status, due to inconsistent charting. For this reason, prospective data is more beneficial; however, that would not be feasible given the resource-intensive nature of prospective data collection on this scale.

Using the ED during pregnancy may be an important marker for poor birth outcomes, indicating that prenatal ED users may be most vulnerable. These findings also suggest that the ED may be a critical setting to improve prevention efforts in early pregnancy. Future interventions to leverage the ED as access to care for vulnerable women can improve obstetrical and neonatal health disparities. In a city like Detroit, where the infant mortality rate is extremely high, programs that address various contributors of poor birth outcomes may be beneficial. Such programs could include improved transitions of care from the ED to adequate prenatal services for pregnant women, greater access to contraception that prevents high risk and unintended pregnancies, and improved training on awareness of these issues among health care providers.

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PTSD AND ITS ASSOCIATION WITH HYPERTENSION AND ELEVATED BLOOD PRESSURE

By Sabina Emerenini
Major: Public Health
Mentor: Phillip Levy, PhD, Department of Emergency Medicine

BACKGROUND

Cardiovascular Disease

Each year, approximately one third of deaths in the United States are related to cardiovascular disease (CVD) (CDC,2011). It was estimated in 2010 that the overall costs of CVDs annually were $444 billion (CDC, 2011). With a high number of associated deaths and costs, understanding CVD and the contributing risk factors is very important. The American Heart Association refers to CVD as heart and blood vessel diseases (AHA, 2017). There are several types of CVD including conditions that involve diseased blood vessels, structural and functional heart problems, and blood clots (Saban, 2014). Coronary artery disease (CAD), heart failure, and sudden cardiac arrest (CA) are among the more common specific types of CVD (Saban, 2014). Major risk factors of CVD include hypertension (HTN), stress, obesity, co-morbidities (e.g., diabetes, hyperlipidemia, autoimmune disorders) sedentary life style and poor nutrition (Boudie, 2016).

Hypertension

Hypertension (HTN), also known as high blood pressure, is very common in the US affecting more than 85 million people over the age of 20 years old (AHA, 2017). High blood pressure is known as a "silent killer" because it is often asymptomatic and can lead to more serious health outcomes, such as strokes and CVD, if left untreated (AHA, 2017). As a major CVD risk factor, it is important to understand the things that can contribute to high blood pressure (BP) including genetics, lifestyle choices, and stress. One's race/ethnicity can adversely affect their risk of developing HTN. HTN is more common among African Americans (42.0%) compared to their White counterparts (28.8%) (CDC, 2015). The National Health and Nutrition Examination Survey for the period 2003–2010 also found that African Americans were less likely to have their HTN controlled compared to Whites (35.5% vs. 48.6%, respectively) (Valderama, 2013).

An individual's lifestyle choices and life stressors also influence one's likelihood of developing HTN. A healthy diet and regular physical activity can help improve one's cardiovascular health. For example, high sodium diets increase the blood volume and flow in blood vessels which will raise one's BP (AHA, 2017). Stressors, such as being exposed to violence or living in poverty, can also play a role in one's chances of developing hypertension.

Hypertension and Risk Factors in Detroit

Hypertension is a major health problem in the city of Detroit. The rate of city residents who have been told they have high blood pressure is 44.9% compared to the State of Michigan's average of 33.9%

(Fussman, 2015) The rates of heart attacks and strokes are also greater among Detroit residents compared to others in the State (Fussman, 2015).

Detroit residents face several risk factors and stressors that contribute to high rates of HTN. About 83% of the Detroit population identifies as African American which is itself a risk factor (census.gov, 2017). Systemic racism with historic roots has been shown to be a stress related factor in Detroit (Williams, 2014). Of all Detroit's residents, 40.3% are living below the poverty level (census.gov, 2017). Residents of Detroit are also less likely to consume fruits or vegetables on a daily basis compared to the State as whole, which can be due to the limited access to healthy foods (Fussman, 2016). With Detroit having the second highest rate of violent crimes in the United States, there are safety issues that may prevent people from outdoor activity, such as going for a walk in their neighborhood. (fbi.gov/stats-services/crimestats)

The threat of violence, and exposure to crime can be associated with traumatic experiences that may result in post-traumatic stress disorder (PTSD). The American Psychiatric Association (APA) defines PTSD as a history of exposure to traumatic events which meets specific symptoms that are categorized into four symptom clusters: intrusion, avoidance, negative alterations in cognitions and moods, and alterations in arousal and reactivity (APA, 2013). The conceptual model was initially introduced in 1980, when the APA acknowledged PTSD as a vital mental disorder (Friedman, 2013). Although controversial at first, PTSD diagnosis now fills an important gap in psychiatric theory and practice. From a historical perspective, this change allotted room to view the disorder as dealing more with the tangible reality that an individual may face rather than simply marking the individual as "weak" (Friedman, 2013). The National Institute of Mental Health describes PTSD as a condition of persistent mental health and emotional stress occurring because of injury or severe psychological shock (NIH, 2017). Experiencing trauma may further affect one's risk of developing HTN; however, not much research has been done to support this.

Allostasis and Allostatic Load

Dealing with stress does have adverse effects on the body. Allostasis is defined as the process of achieving stability, or homeostasis, after experiencing a physiological or behavioral change (Logan and Barksdale, 2008). It is essential to maintain internal viability amid changing conditions. Allostasis takes into count how your mental state impacts your physical health. (Logan and Barksdale, 2008). Allostatic load is the consequence of repeated chronic stress. Individuals that live within an urban environment face numerous outlets that place a heavier load on their ability to maintain a balanced allostasis level. There are many components that can contribute to allostatic load, such as complex physical, psychological and environmental challenges. This "wear and tear on the body" may negatively affect one's cardiovascular health; however, there is limited research that attempts to quantify PTSD as a specific component of allostasis, or a direct contributor to CVD risk factors such as HTN.

JUSTIFICATION OF NEED

The justification for this study is the unmet need surrounding a possible association of PTSD with HTN prevalence and control. As a novel content area, this study will provide unique insight into HTN while adding to the knowledge base regarding the adverse impact of PTSD on cardiovascular risk. By focusing on HTN and PTSD, this project will add to the existing HTN registry and allow ED researchers to identify novel mechanism that can decrease morbidity and mortality in citizens of Detroit. The objective of this project is to evaluate the relationship between PTSD and an existing HTN diagnosis, and BP control among those with known HTN.

METHODOLOGY

The design of the study involves use of the existing prospective, observational study, The Hypertension Registry of Emergency Department Patients (IRB #050216M1F; PI: Aaron Brody, MD, MPH), being conducted by the Wayne State University School of Medicine Department of Emergency Medicine Division of Clinical Research. The purpose of the HTN Registry is to establish a prospective registry and biorepository of consecutive patients who present to the emergency department (ED) with an established diagnosis of HTN (controlled and uncontrolled) or elevated BP absent a prior history of HTN. Participants are actively being recruited from three emergency departments (EDs): 1) Detroit Receiving Hospital, 2) Sinai-Grace Hospital, and 3) Harper University Hospital. Table 1 lists the eligibility criteria for the participants. Those eligible must provide written consent prior to study participation.

Table 1: The Hypertension Registry of Emergency Department Patients: Inclusion and Exclusion Criteria

Inclusion	Exclusion
≥ 18 years of age	Patients with known end organ damage; - stage IV or V chronic kidney disease, - Chronic heart failure with preserved or reduced ejection fraction, - Coronary heart disease or myocardial infarction, - Cerebrovascular disease (stroke or transient ischemic attack)
Patient discharged home from the ED	Patients with medical, surgical, or psychiatric illness requiring hospital admission.
Recognized HTN as defined by a prior HTN diagnosis or prescribed anti-hypertensive medication OR Elevated BP (defined as bp >140 systolic *AND* BP>90 diastolic) and no HTN history	Patients with hypertensive emergency
	Pregnant women confirmed by a serum or urine pregnancy test
	Prisoners
	History of cocaine and heroin abuse

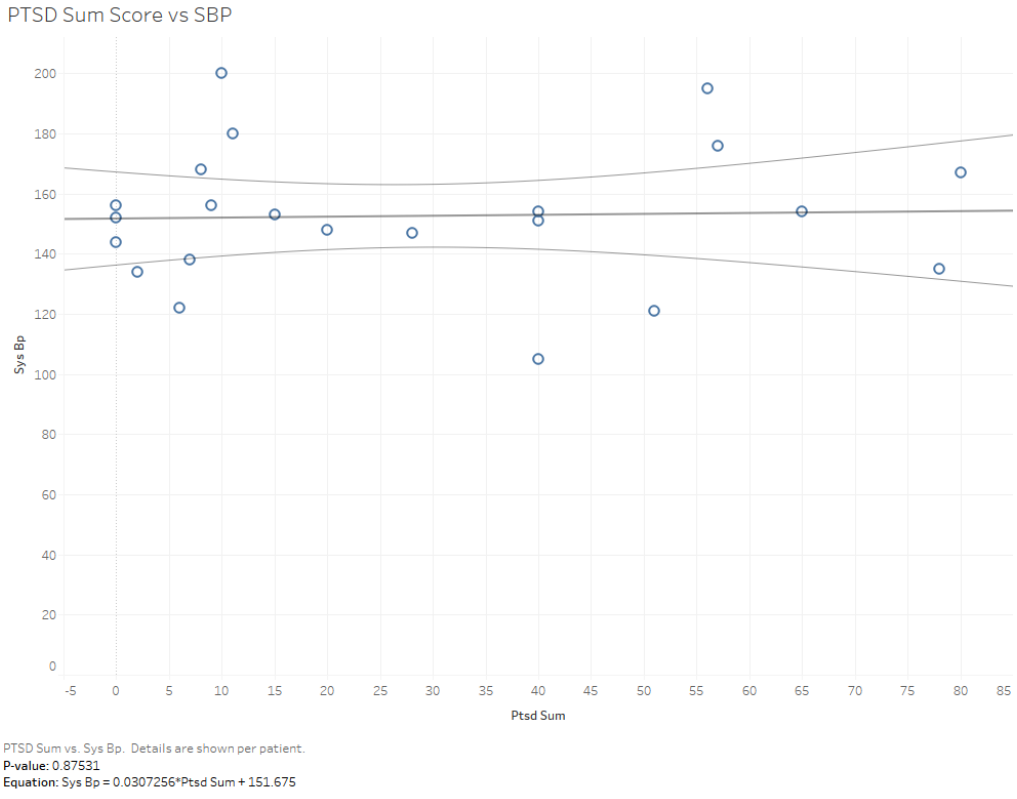
The study design consists of two parts. Part one involves the collection of bio-specimens, vital signs (five blood pressure readings) and information obtained from other diagnostic tests ordered as a component of routine patient care in the ED. Part two consists of the participants completing several survey tools. This research project focused on the addition of the PTSD checklist for DSM-5 (PLC-5), a 20-question

survey which can be found in Appendix A. It is a self- reporting tool that helps screen for the probability that one may be experiencing PTSD. Using a rating scale, participants choose the frequency of PSTD-related symptoms within the past month. The surveys can be scored in multiple ways and must be interpreted by a clinician. For this research project, each response is given a number (0= "Not at all"; 1= "A Little bit"; 2= "Moderately"; 3= "Quite a bit"; 4= "Extremely") and added together to determine a Symptom Severity Score. A score of 33 or higher indicates a provisional PTSD diagnosis and the need for further evaluation. Demographic, HTN history and BP data were compared with PTSD scores as continuous data using t-tests and as categorical data using chi-squared analyses.

RESULTS

To date, a total of 22 HTN registry participants have completed the PTSD survey. The cohort consisted of 7 males and 15 females. All the participants identified as African American. The average age of the cohort was 43.8 years old. The average PTSD sum score for the cohort was 28.3 and the average systolic BP was 152.5 mm Hg. Figure 1 shows the relationship between the PTSD sum score and the systolic BP measurement taken in during the ED visit, which was not statistically significant relationship between the two variables (p=0.87531).

Figure 1: PTSD sum score compared to systolic blood pressure



Being above or below the average PTSD score for the cohort did exhibit a significant relationship (p-value= 0.595) with being hypertensive or not using (Table 2). There was not a significant correlation (p-value= 0.785) when comparing patients with a high (≥ 33) or low (< 33) PTSD score (Table 3).

Table 2: Average PTSD Score and Systolic Blood Pressure

Systolic Blood Pressure	Average PTSD Score Average	
	Below	Above
Hypertensive (≥ 140)	10	6
Non-Hypertensive	3	3

Table 3: Sum PTSD Score and Systolic Blood Pressure

Systolic Blood Pressure	Sum PTSD Score Average	
	< 33	≥ 33
Avg. Sys BP	153.7	150.9
Number of Records	13.0	9.0
Std. dev. of Sys BP	20.1	27.6

DISCUSSION

The results from this study failed to show a correlation between PTSD and a history of HTN or elevated BP. The results suggested that the hypothesis that there is a significant impact of past trauma on present likelihood of HTN or an increase in BP was incorrect. However, we caution against over-interpretation of our findings as our sample size (n=22) is quite small, and enrollment of more patients may indeed reveal an association.

Our findings are distinct from what has been reported in the previous literature. The literature that we came across had a great correlation between an individual's setting, and their current health status. Many of the literature that I came across failed to observe variables such as past experiences and trauma as a key factor to expound on why there was a difference in BP across different area codes. Also, present

literature focused a lot on race and ethnicity as a major factor when discussing high blood pressure; there failed to be much literature focusing on the impact the trauma had on specific populations.

This project's viewpoint of including trauma as a variable is very important because many individuals that deal with CVD identify themselves as African Americans. African Americans are more likely to live in an urban setting with higher chances of encountering traumatic experiences and are more likely to develop CVD when compared to other races. With stress as a variable that causes CVD, it is important to see if there is a correlation between traumatic stress within a population that faces many stressors and the population's HTN control. CVD is one of the leading causes of deaths in the United States, and more knowledge on such a disease is beneficial. This study and studies like it will assist with receiving more knowledge on how to keep the population healthy. A healthy population is important to contributing to economic progress, and the communities being more productive.

LIMITATIONS

The main limitations of this project arise from the time span given to collect the survey. To enable added collection of the PTSD survey, we needed to obtain institutional review board approval. While an amendment was submitted to the IRB soon after study inception, approval was not completed until 17-July-2017 which resulted in a limited time frame of collecting the data. We did collect PTSD survey data until August 8, which only allowed for a three-week time frame. However, we did enroll more than 1 patient a day once approved which suggests that our sample size could have been much greater with more time.

In addition to this, we sought a cohort of individuals that came into the ED with high BP or a history of HTN, which necessitated a prolonged screening process. Moreover, the HTN registry enrolls only patients who are being discharged from the ED, meaning we also had to find relatively healthy patients. This task was very difficult because many patients who come to the ED are admitted into the hospital. Further, of those who were eligible, some were unwilling to participate. This may represent mistrust in the relationship of patients and researchers, though the ED research team has a long history of working with this population, making this less likely. The length of the surveys was also another limitation; some patients were unwilling to continue when they realized that the survey was a bit long. As the ED has multiple on-going studies, some patients are better suited for other research projects, excluding them from the HTN registry.

Lastly, our findings may have been impacted by focusing on ED patients. Blood pressures measured in the EDs are known to be higher than those measured in clinic settings and this limited the amount of patients we were able to come across with controlled BP. The BP of those that are encountered in the ED do not reflect the most accurate HTN control. Also, the stressors of being in the ED at any moment can play a vital role in BP. These things should be considered when interpreting our data.

FUTURE DIRECTIONS

This project introduced a different perspective regarding CVD risk and the PTSD survey is now embedded as part of the HTN registry. We will continue to enroll patients and see if there will be a significant correlation between PTSD and HTN. In addition, we plan to link PTSD data with our survey measures and biospecimen analysis to gain a broader understanding of bow genetics, lifestyle, and stressors interact with each other to effect BP.

CONCLUSIONS

Cardiovascular disease is the leading cause of death in the United States for both men and women (Scarborough, 2008) and HTN is the single strongest risk factor. While some data suggest a linkage between life stressors and HTN, we found no association between HTN or BP control with PTSD in our small cohort. However, our results and their interpretation are to be taken very lightly because recruitment is still on-going.

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APPENDIX

14.16 The PTSD Checklist for DSM-5 (PCL-5)

Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then select "Not at all", "A little bit", "Moderately", "Quite a bit", and "Extremely" to indicate how much you have been bothered by that problem in the past month.

	In the past month, how much were you bothered by:	**Not at all**	**A little Bit**	**Moderately**	**Quite a bit**	**Extremely**
1	Repeated, disturbing, and unwanted memories of the stressful experience?					
2	Repeated, disturbing dreams of the stressful experience?					
3	Suddenly feeling or acting as if the stressful experience were actually happening					

	again (as if you were actually back there reliving it)?					
4	Feeling very upset when something reminded you of the stressful experience?					
5	Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?					
6	Avoiding memories, thoughts, or feelings related to the stressful experience?					
7	Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?					
8	Trouble remembering important parts of the stressful experience?					
9	Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, and the world is completely dangerous)?					
10	Blaming yourself or someone else for the stressful experience or what happened after it?					
11	Having strong negative feelings such as fear, horror, anger, guilt, or shame?					
12	Loss of interest in activities that you used to enjoy?					
13	Feeling distant or cut off from other people?					

14	Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?					
15	Irritable behavior, angry outbursts, or acting aggressively?					
16	Taking too many risks or doing things that could cause you harm?					
17	Being "super alert" or watchful or on guard?					
18	Feeling jumpy or easily startled?					
19	Having difficulty concentrating?					
20	Trouble falling or staying asleep?					

FUNCTIONAL USE OF CURSIVE VS. PRINTING IN PERSONAL HANDWRITING: ASSESSMENT OF ADOLESCENTS' USE OF DIFFERENT FORMS OF WRITING

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Major: English
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ABSTRACT

This project is an initial step toward determining what scholarship losses may be suffered if cursive handwriting instruction is eliminated from elementary schooling in the 21st century. A special meeting, " Handwriting in the 2!51 Century: An Educational Summit", Washington, D.C., January 23, 2012, brought together educators and handwriting researchers to debate the implications of excluding handwriting instruction from school curricula in the early grades. Their studies found a positive correlation between handwriting and proficiency in producing clear and coherent writing. Students wrote more words, wrote words faster, and expressed more ideas than those who used keyboarding as their method of writing. Their work also suggested that the self- generating action of handwriting sets up brain systems for reading, and appears to contribute to reading fluency by activating visual perception of letters.

In this study, 15 and 16-year-old students were assigned 10 minutes of free writing. The number of words written, grade level of the writing, and whether the student used cursive, manuscript or a mixture of the two were measured. The students were expected to display faster, more advanced writing to the extent that they used cursive over manuscript printing. A large majority of the students' handwriting consisted of manuscript printing. Nevertheless, the hypotheses about the nature of their writing was largely supported by the data. Use of cursive was associated with greater speed and more advanced writing.

INTRODUCTION

Is handwriting fundamental? Can you imagine a world without handwriting? Is it merely a cultural tradition or are there benefits that extend beyond the writing process? What will it cost us as a society to lose this form of communication which is considered one of the two basic written language skills; the other being reading (Graham & Weintraub, 1996). The Chronicle of Higher Education calls cursive an "endangered species" (Hotchkiss, 2014). Keyboarding skills are being championed as a replacement for handwriting skills in this technological age (James & Atwood, 2009).

The " Handwriting in the 21st Century: An Educational Summit" convened education and handwriting researchers to debate the place of handwriting instruction in the 21st century classroom and the implications of excluding that instruction from school curricula in the early grades. They agreed that handwriting is a necessary part of the skill set that ensures academic success. Recent research illustrates how writing by hand engages the brain in learning (Bounds 20 I 0). Children's brains benefit from learning handwriting in ways not afforded them by typing or keyboarding (James & Gauthier, 2006 and James &

Engelhardt, 2012). Additionally, handwriting may also benefit symbol learning. Research has found that the benefits of handwriting extend into adulthood (James & Atwood, 2009). The point of this paper is not to argue that technological skills are unnecessary in a technological age but to further the discussion that, based on research, the two can co-exist and thrive-each lending its' own importance to the classroom.

This study assessed the writing styles of 15 and 16-year old students. The goal was to determine whether their writing style (cursive, manuscript, or a combination of the two), impacted the other measured characteristics of their writing, which included legibility of the writing and complexity of the writing (Graham, Weintraub, & Berninger, 1998). Free-writing samples from 31 students were examined. All samples were scored for handwriting style and legibility. We anticipated that the students who used cursive or a combination of cursive and manuscript would show increased writing speed (Hamstra-Bletz & Blote, 1990; Sassoon, Nimmo-Smith, & Wing, 1987).

In this project, adolescent youth were assigned a short period of writing, based on use of one of four prompts. The characteristics of their writing were analyzed to explore whether there were links among their preferred type of handwriting and other characteristics of that writing, including speed, legibility, and complexity of expression.

PURPOSE OF THE STUDY

The purpose of this study is to examine the handwriting abilities of 15 and 16- year-old students to determine whether the use of cursive handwriting is faster than manuscript and whether that speed correlated to higher levels of writing complexity. If it is found to be true, among these participants, that the use of cursive handwriting is faster, this study could be an important step in exploring the advisability of removing cursive handwriting instruction from the elementary classroom, which is an issue under national consideration (Kucera, 2017; Bounds, 2010).

METHODOLOGY

Participants

Youths aged 15- and l 6-years old were the participants. They attended school in a facility for high-risk students in two counties in Southeast Michigan (see Table 1). Half of the students were White, about one-quarter African American, and the remaining quarter of other ethnicities. All students were native English speakers, with English being their first language.

Approximately one-third were female, the remainder male. The age distribution was 60% age 15 and 40% age 16. Age and ethnicity were similarly distributed among female and male students.

Table 1

Demographic Characteristics of Participants

Participant Characteristics	Percent of Youth (N = 31)
Gender	
Female	36.7
Male	63.3
Ethnicity by Self-Identification	
White	50.0
African American	26.7
Multi-racial or Other	13.3
Hispanic	10.0
Age Distribution	
15 years	60.0
16 years	40.0

All students were participating in a dog-training program ongoing at the time of this project's activities. Each participant had volunteered with permission given by their parents or legal guardians. The activities related to this project were conducted in their classrooms, with directions given by adults who were unfamiliar with the purposes of this project.

Conditions

The participants were given 10 minutes of free writing, incorporated into a regular journaling activity in their classrooms. They were not told any definite content to address, although suggestions were made including a few prompts. Among these were prompts to write about how their day had gone thus far, write about the animal they were involved in training, or write a letter to a potential adoptive family for the dog they had been training. This timed task provided writing samples that became the primary data for the project. It should be noted that the participants were at no time graded or evaluated on their writing as to appearance or content concerning things that they wrote while journaling. Thus, evaluation was expected to have no effect on participant's writing samples.

Among the items analyzed in the writing samples were ratings of the legibility of the handwriting, a measure of the grade level or complexity of the writing, writing type (cursive, manuscript, mixed-mostly cursive or mixed-mostly manuscript) , and speed of writing, expressed as words written per minute. (See Table 2 for information about the characteristics of the writing samples used as variable in this study).

Instruments

Legibility. The writing of the participants varied considerably in size and in conformity to how lettering is to be written ideally. Some samples, while not easy to read, were readable. Therefore, every sample was rated for legibility. It was decided that unless a sample was mostly legible, it could not be used in this project. Furthermore, unless at least 24 sample s were deemed mostly legible or better, these samples could not be used for this project. Thus legibility, with most of a sample being rated as legible, was a necessary condition for inclusion into this project. A sample was rated I if entirely illegible, 2 if mostly legible, or 3 if entirely legible. No text sample from among the 31 samples was rated as entirely illegible, thus legibility was deemed sufficient to examine the other variables related to the handwriting samples. (See Table 3 for data related to legibility).

Table 2

Variables Used in This Project

Variables Measured	Instrument	Explanation
Complexity of Writing	Gunning-Fog Index of Readability	•Takes into consideration total words, number of longer words, and average sentence length in passage of about 100 words •The Index represents approximate grade level
Type of writing used	Rating of Writing Type	1 = Printed 2 =Mostly printed 3 = Mostly cursive 4 = Cursive
Legibility	Rating of Legibility	1 = Not legible. 2 = Mostly legible 3 = Entirely legible
Number of words	Average words written per minute	Number of words/ time writing

Note. Participants had 10 minutes to write.

Complexity-Readability-Grade Level. The Gunning-Fog Index was used as an estimate of the grade level of each participant's writing. (See Table 3 for Gunning-Fog descriptive results.) This index (Gunning, 1968), which provided this study's data on readability or grade level of the writing samples, is based on the average word count of sentences with a sample that is roughly 100 words in length. It also takes into account, the number of words that are longer than is typical, by using the number of words of 3 syllables

or longer in the sample of text being rated. The formula for the Index Score consists of the average sentence length, plus the number or words of 3 syllables or longer, added together, with the total multiplied by 4. The result is called the Fog Index or Gunning-Fog Index, with the number indicating the average grade level of the sample of text being rated.

Expressed as a formula, this is:

[(ASL + NHW) X 4) = FOG Index score.
ASL = average sentence length
NHW = number of hard words, e.g., number of words of 3 syllables or longer, excluding words made into 3 syllables by adding -e d, -ly, etc., as endings.

Speed of writing. The writing speed of participants was assessed as the mean number of words written per minute; results are contained in Table 3. This was calculated by taking the total number of words and dividing that by 10, given 10 minutes for free writing. Most participants wrote about 9 words per minute.

Table 3

Descriptive Statistics for Measures

Measures	Mean	Median	Standard Deviation
Complexity of Writing (Gunning-Fog Index)[a]	6.74	6.64	1.63
Words per Minute	9.36	9.40	3.37
Legibility	2.90	3.00	0.30

Note. [a]Higher scores indicate more complex, higher grade level of writing.

Style of writing. The writing style of participants, whether using manuscript printing and/or cursive, was rated by examination of the words written in their IO minutes of free writing. The handwriting of each sample was rated as I = entirely manuscript printing, 2 = mostly manuscript, 3 = mostly cursive, or 4 = entirely cursive. As Table 4 below indicates, the majority of students wrote in manuscript printing, with relatively fewer using cursive or mostly cursive handwriting.

Table 4

Distribution of Types of Writing Across Participants

Type of Writing Used	Number of participants	Percent of participants
Manuscript (printed)	19	63.33
Mixed, mostly manuscript	7	23.33
Mixed, mostly cursive	1	3.33
Cursive	4	13.33

DATA ANALYSIS PLAN

Given that the data was found to be legible, thus making it possible to calculate other desired indices for the variables in this project, the plan for examination of the data was as follows:

First, descriptive data would be calculated where possible, including means, medians, and standard deviations.

Second, for variables existing as non-linear characteristics, percentages were calculated for those measures.

The third step was planned to split the sample into high and low complexity/readability.

Fourth, make a determination as to whether the other variables (words written per minute, type of handwriting) differed according to how they existed among high versus low grade level/complexity of the handwriting. This fourth step was used to address the study hypotheses.

HYPOTHESES

There were two central hypotheses for this project:

1. Handwriting speed was expected to be higher among students who use cursive rather than manuscript (printed) handwriting.

2. Complexity of handwriting, as measured by the Gunning-Fog (1968) Index, was hypothesized to be higher for participants as a function of their use of cursive rather than manuscript writing.

RESULTS

Speed of writing

Analysis of writing samples provided by High Fog Index scores versus Low Fog Index scores, demonstrated definite presence of higher speed among those participants who wrote more complex, higher grade level writing. Students who wrote with less complexity or Low Fog Index scores, wrote slower. We were unsure whether complexity would affect speed of writing. (Table 5 contains the results relating to speed of writing).

Use of cursive vs. printed handwriting

Participants who wrote higher level content, as measured by the Fog Index, were more likely to incorporate cursive handwriting into their writing. The difference between the speeds of cursive writers and manuscript writers was not significant. Students who wrote predominately or exclusively in manuscript wrote a tiny bit faster (9.35 Mean words per minute) than cursive writers (9.05 Mean words per minute).

Table 5

High vs. Low FOG Index Writing by Handwriting Characteristics

Measure	High Fog	Low Fog
Mean FOG Score[a]	8.01	5.20
Mean Words Written Per Minute[b]	10.19	8.35
Type of Writing Percentage		
Percent Cursive	0.188	0.071
Percent Mostly Cursive	0.063	0.000
Percent Mostly Manuscript[c]	0.250	0.214
Percent Manuscript	0.563	0.714

Note. [a]Higher scores indicate more complex, higher grade level of writing. [b]This is the measure of writing speed. [c]Manuscript is handwriting done with printed lettering rather than cursive lettering.

DISCUSSION

The initial examination of the writing samples showed that cursive handwriting was relatively Jess common in use by the participants in this study. Thus, it was surprising to find that even with a low use of cursive writing, there were distinct, positive differences observed in favor of participants who used cursive writing wholly or to some degree, rather than printing. These students figured higher on the Fog Index due to the complexity of writing.
The data that we found were not what we expected. Our hypothesis was that handwriting speed was expected to be higher among students who use cursive rather than manuscript (printing) handwriting. Since the results did not support that hypothesis, further research could be done by changing the variables, i.e., participants would be given a sample to copy rather than having to create their own sample. This could potentially reduce the time used by students to think up or create their own the sample.

The Gunning-Fog measurement for complexity of handwriting, which was used to assess as our second hypothesis, assessed whether participants who used cursive rather than manuscript writing would score higher in the grade level of their writing area. These measurements were only slightly different for cursive preferring and manuscript preferring participants, but again as with our first hypothesis, had we given each participant samples to copy, perhaps this measurement, too, would have been more in line with what our hypothesis was.

In addition to our hypotheses, we observed other findings that demonstrated certain advantages of speed and complexity by kind of preferred writing. Students who wrote more complex, higher grade level writing did write notably faster than the students who wrote less complex writing, with speed of writing being a Mean of I 0.19 words per minute versus a Mean of 8.35 words per minute, in comparisons of the lower grade level writers versus the higher grade level writers (The Fog Index was the measurement of grade level /complexity of writing). Although the absolute percentages of participants who preferred cursive writing was low, those who did prefer cursive wrote at a higher grade level in their work than was seen among the participants who preferred manuscript writing.

LIMITATIONS

One of the limits/weaknesses of this study may have been the small sample size of 31 students. More students would have given us more data to analyze. Writing time was taken up by the creation of the sample in that participants had to think up what to write, rather than providing a sample to copy each participant at the start of the study. Or, perhaps a mixture of the two would be best, assessing writing both created by participants and copied by participants. Give a certain number of students samples to copy while instructing the other group to create their own sample. The difference could be measured. Just these two changes to our methods could produce vastly different results.

One of the limits of this study might also have been the amount of time given to write. Perhaps a shorter timeframe for copying the sample would be more appropriate. Or, considering that as students advance in school, a larger and larger portion of their time consists of taking notes in class. Thus older students, particularly in classes after college, need to write in order to record what has been discussed in their classes. That would be an important aspect of writing to assess for stylist differences.

RECOMMENDATIONS

Because the research investigating cursive vs. manuscript writing is dated, new studies need to be conducted to further this body of evidence. Studies that include high school seniors as well as college students should be conducted to determine whether there is a significant difference between cursive and manuscript handwriting in the areas of speed, legibility. and complexity of handwriting, when ongoing use of those skills extends beyond ordinary K-12 education. Such studies could possibly be the substantive anchor for the retention of cursive handwriting in the classroom.

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YOUTH THOUGHTS OF URBAN EDUCATION

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ABSTRACT

The purpose of research was to assess the opinion of urban public high school students regarding punishment and establishment of community within school settings as it relates to thoughts on functionality. A 40- question Likert Scale was administered to 100 public high school students; data was collected from 64 samples. Students were participants from Wayne State University's APEX and Math Corps programs. Five dimensions were assessed on the survey; dimensions were as follows: (1) teacher administration role in deviant behavior, (2) positive opinion while attending school setting, (3) Management of problematic behavior in schools, (4) Community establishment with school settings, (5) the experience and/or witnessing of deviant behavior while in school settings. Responses from the questionnaire were assigned a numeric value ranging from -2 to 2. The average of each dimension was (1) -0.297, (2) 0.703, (3) -0.188, (4) 0.609, (5) 0.901. Responders believed that teachers/administration played a role in the establishment and/or continuation of deviant behavior. Responders also believed the current management of problematic of behavior was detrimental to the school environment. The establishment of community within schools settings may have influenced positive feelings expressed by students. The findings gained from this research may help researchers to better engage marginalized populations and spark dialogue regarding the social ramifications of harsh polices of punishment.

INTRODUCTION

What is the School to Prison Pipeline exactly? The School to Prison Pipeline is a complex theory but it can be simply explained as the development of ultra strict discipline policies that remove students deemed as "problematic" or "undesirable" from school settings (Christle, C., et al, 2005). These policies will often displace students from the school environment and place them elsewhere outside of mainstream society and into the criminal justice system. Policies such as "zero tolerance" often push students out of the school environment as a form of punishment regardless of circumstances of the event that triggered it. Zero tolerance requires school officials to hand down specific, consistent, and harsh punishment—usually suspension or expulsion—when students break certain rules. Students can be punished for such minor infractions as bringing nail clippers or scissors to school. These policies have severe consequences on not only students but society as a whole. Students who are suspended and/or expelled are shown to be more likely to be retained in a grade, drop out, commit crime, and be incarcerated (School-to-prison pipeline, n.d.). Throughout the United States in 2000, there were over three million school suspensions and over 97, 000 expulsions, a near double of the 1.7 million suspensions recorded in 1974. In some states, the number of suspensions in 2000 exceeded the number of enrolled students by 10% (Christle, C., et al, 2005).

It is important to first assess the opinions of those most directly affected by the School to Prison Pipeline to later make significant change. Policies, such as "Zero Tolerance", have led to a police/authoritative

culture that further isolates and perpetuate incidents of negative behavior expressed by students. These policies are disproportionately applied to minorities, those with special needs, and lower socio-economic status students (School-to-prison pipeline, n.d.). Suspension and expulsion have become more common in school environments. In a matter of decades, the rate of suspension in American public schools has shifted from 1.7 million in 1974 to 3.1 million in 2000 (Wald, 2003). These policies seek to temporarily rectify problematic behavior by complete removal of students from the school environment. The solutions that these policies offer do not properly rehabilitate problematic behavior and further damages and isolates students from the school environment, which encourages more deviance (Wald, 2003).

The purpose of this study is not to directly expound upon the School to Prison Pipeline, but rather, to assess the opinion and experience of public urban high school students about the prevalence of such deviance systems as it relates to their thoughts of future success. Students that are assessed in the research are that of Wayne State University's Math Corps and APEX programs. Math Corps is an academic enrichment and mentoring program that targets middle and high school children in the Metro Detroit area. APEX is an alternative admissions program designed to bridge the gap between high school and college. Within both programs students attend classes taught by university staff, and are mentored by other high school and college students. These programs were chosen as the sample due to its homogeneity, availability, and predominance of high school aged students enrolled in Detroit Public School settings. The participants of the survey completed a 40 – question Likert Scale surveys assessing their opinion and experience within school environments.

LITERATURE REVIEW

Positive Community Traits

Student academic success and behavior may be reflected by the sense of community felt in the school settings. For a school community, common goals shared by individuals could be the pursuit of acquiring academic and professional skills or the process of fitting in with peers who share common interests. Those involved in a community pursue goals collectively, build on their distinctive talents and capacities of others and value the consensus of other members involved. Acceptance of the differing opinions and belief set shared by others within the group stems from mutual respect and the belief that divergent ideas may lead to progress (Westheimer, 1993) which are traits of a positive community. A positive community benefits all its members through the process of inclusion. Inclusion, with a positive community, allows members to survive, cope and build on already present skills with better ease through the aid of a group.

To further expound upon the influence of community, the article How Management Moderates the Relationship between Abusive Supervision and Workplace Deviance was assessed. In the article, researchers evaluated how management styles influenced deviance in the workplace. This work was inspired by social exchange theory. This theory states that within an interdependent workplace poor treatment by one's superiors indicates an imbalance that one seeks to rectify by engaging in deviant behavior (Thau, 2009).

In the study management style was defined by management's actions and decisions that impact the relationship between employees' perception of mistreatment and engagement in the workplace (Thau, 2009). To execute this study a sample of 1,163 graduates from a large Midwestern university were selected from the years 1988 – 98. Participants were mailed surveys asking questions regarding their perceptions of leadership style and workplace deviance. Variables that may have influenced the results such as age of employee, tenure and gender were assessed and accounted. It was hypothesized that

employees who perceived their management's style of leadership to be highly structured and fairer would experience little uncertainty; therefore the quality of interpersonal treatment would become less salient towards them, thus making the occurrence of deviant behavior less strong. Those who perceived their organization's management style as loose, uncoordinated and unfair were predicted to be more likely to engage in deviant behavior (Thau, 2009).

Results from this study showed that management style does indeed moderate the impact of perceived supervision treatment and workplace deviance. The positive relationship between abusive supervision and organizational deviance was stronger for employees perceiving the overall management style to be less structured and organized than those who perceived their management style to be more structured (Thau, 2009).

This study is relevant to the topic as it relates to the concept of community. The workplace is a community just as the school is one. Much like those at a school community, employees work towards a common goal of serving their organization. Social exchange theory can be used to apply in a school setting as an explanation for deviance also. When abused by authority, students may engage in deviant behavior as a method to sabotage the organization (school) and other members belonging to it.

Fairness Theory

The fairness heuristic theory argues that once fairness judgements have been made people use these judgements to decide how to behave (Thau, 2009). If employers are perceived as fair, employees will react more favorably and acquiesce to demands with little concern for material outcomes (Thau, 2009). Employees who feel like they are treated fairly by supervisors are shown to become more highly committed to working within groups that represent that authority's interest and voluntarily aiding it (Thau, 2009). This same concept could be applied to ensure commitment to the school community. If students feel more respected by authority figures, such as staff, they may be more likely to engage within this community.

Alienation as a Cause for Deviance

In the article, Alienation: A Cause of Juvenile Delinquency, researchers sought to further expound on the concept of alienation as it relates to deviancy in youth. Youth labeled as juvenile delinquent had higher levels of alienation than those not labeled. A sample of 157 incarcerated adolescents aged 16 – 17 were recruited and compared to 1,318 adolescents enrolled in high school using the Dean Alienation Scale. The Dean Alienation Scale is a global measure of alienation. It was selected as it would not reflect the adolescents' relationship to their immediate environment. Ninety-five percent of the incarcerated youth had been previously suspended or expelled from schools. They were also described as behaviorally disabled, learning disabled, and socially maladjusted. All of the incarcerated youth were male and both samples were from the Midwestern and Eastern regions of the United States. (Calabrese, 1990)

Alienation

Results from the study showed that incarcerated adolescents felt significantly higher levels of total alienation, isolation and powerlessness than their counterparts, non-incarcerated high school adolescents. To further justify these results, alienation from incarceration was quantified and accounted for as a variable of alienation (Calabrese, 1990).

To understand the significance of this article it is necessary to understand the state of alienation. Alienation is an emotional state brought by environmental and emotional states. Within a state of alienation individuals sense a state of separation from their work and/or school, themselves and each other. Separation is expressed through feelings of powerlessness, separation from others, meaninglessness – inability to see purpose in one's life or work and normlessness – and refusal to accept societal restrictions (Calabrese, 1990). Deviants often exhibit traits reflective of high levels of alienation— these traits can include: loneliness, fear, and resentment. Evidence also shows that deviants have not developed values consistent with societal norms and thus their behavior becomes a rejection of it. Researchers believe that due to the deviant's view of the world being so radically different from non-deviants, norms that are consistent with non-deviancy may be seen as meaningless. This often leads to the delinquent being rejected by the peer group at large, reinforcing the belief that they do not belong (Calabrese, 1990).

Is it wrong to assume that higher alienation scores represent a failure of the criminal justice system to rehabilitate those expelled from community? This temporary removal of the deviant does nothing to change the core problems and may not alter the perception that the deviant may hold on society. Thus when reentering society (Karp, 2001), the deviant may still be prone to anti-social behavior and recidivism. There needs to be an emphasis on alleviating the feelings of alienation in rehabilitation. By focusing on alleviating the causes, society may be able to reduce recidivism. It can be inferred that these feelings are some causes of deviance and that they encourage youth to act in antisocial ways. To reduce feelings of alienation, it is essential to teach those labeled as deviant to trust (Karp, 2001). This sense of trust counteracts the feelings of alienation and allows inclusion that builds relationships.

Punishment in School Settings

The traditional approach of punishment is regressive. Rather than choosing to solve problems at the root cause, this system of punishment chooses to place blame upon students and instantly dismiss problems through the means of suspension or expulsion. Simple behavioral problems that could be solved with community intervention are often met with harsh policies such as expulsion or confrontation from police authority. This does nothing but further alienates population from the school community, further encouraging deviance (Hopkins, 2002).

The restorative justice approach is innovative in the way that it chooses to deal with such behavior. Rather than choosing to "punish" offenders, it chooses to view deviance as the decay of social bonds and emphasizes repairing harm done to relationships and people over the need for assigning blame. Restorative justice incorporates all parties affected by a behavior or event and allows them to address one another in order in a meaningful way to find appealing solutions rather than involving the criminal justice system (Karp, 2001). Within this context, those labeled as wrongdoers are no longer alienated, but are recognized as being affected by the behavior as well. This approach allows for restorative justice to sharply contrast with traditional approaches to punishment. Reports have demonstrated that after the implementation of restorative justice offenders have lower rates of reoffending, that victims have felt more capable of handling similar situations after and that offenders feel more accepted and connected to their communities (Cameron, 1999).

Restorative justice can be explained in three components: a set of processes, a set of skills and distinctive philosophy and ethos (Hopkins, 2002).

1. "The set of processes are the most recognizable facet of restorative justice. The processes include all formal and informal interventions that aim to resolve conflict. Examples of such interventions can include: mediation, conferences, healing circles, etc." (Hopkins, 2002); p 145

2. "The initiation of interventions may require particular skills on the part of facilitators to be effective. These skills may include creative questioning, the ability to remain impartial and not impose ideas, warmth, developing rapport, etc." (Hopkins, 2002); p 145.

3. "Skills are informed by intention, namely the importance of underlying ethos that encompasses the values of respect, tolerance, openness, empowerment, etc. These values establish a culture which allows for the establishment of restorative justice (Hopkins, 2002)." p 145

The establishment of restorative justice is important to the diminishment of the school-to-prison pipeline. This approach not only builds community, but also discourages alienation—a shown cause of deviance—through its emphasis on inclusion. Restorative justice may prove to beneficial not just in the classroom, but in the larger world as well. Adolescents can learn through socialization and behavioral modeling within these early institutions (Karp, 2001).

METHODOLOGY

One hundred Likert Scale surveys were administered to the students of Wayne State University's APEX and Math Corps programs. Questions on the survey pertained to participants' thoughts on public education and punishment as it related to their feelings of future success. Students of these programs were selected due to the homogeneity in age, as being newly graduated or still enrolled in high school, and their high representation of Detroit Public School students. No identifiable information was collected from participants. Surveys consisted of 40 questions and were generated using the website Survey Monkey. Surveys were printed and distributed by faculty in those departments.

PURPOSE

The purpose of this study is to explore perspectives on punishment and community in school settings as it relates to thoughts on future success. This research also examines public school student opinion about their school settings. Knowledge gained from this research will be used to suggest later effects of policies within public education.

MEASUREMENTS AND ANALYSIS

Survey questions have been equally divided into five dimensions (8 questions each) based on content. These dimensions are: (1) teacher administration role in deviant behavior, (2) positive opinion while attending school setting, (3) Management of problematic behavior in schools, (4) Community establishment with school settings, (5) the experience and/or witnessing of deviant behavior while in school settings. Responses from the Likert Scale were assigned a numeric value ranging from -2 to 2, e.g.: Strongly Disagree (-2), Disagree (-1), Undecided (0), Agree (1), Strongly Agree (2). Responses for each dimension were averaged and compared to one another to explain trends in findings.

Dimension 1	Teacher administration role in deviant behavior,
Dimension 2	Positive opinion while attending school setting
Dimension 3	Management of problematic behavior in schools
Dimension 4	Community establishment with school settings
Dimension 5	The experience and/or witnessing of deviant behavior while in school settings

RESULTS

The experiment assessed the opinion of high school children belonging to Wayne State University's programs regarding public education. The population was chosen due to the higher enrollment of Detroit Public School children within each program. 100 surveys were administered to young adults within the programs. Out of the 100 surveys distributed, 76 were collected. Of these 76, the study assessed the responses of 64 recent public school students. The average of each dimension were (1) -0.297, (2) 0.703, (3) -0.188, (4) 0.609, (5) 0.901.

DISCUSSION

The study assessed student opinion regarding experience while attending public high schools. To do this, researchers assessed five different dimensions. The average response of dimensions 1 and 3 were less than zero. These responses showed that responders believed that teachers/administration played a role in the establishment or continuation of deviant behavior and that responders believed that current management of problematic behavior was detrimental to the school environment. The belief that teacher/administration does not play a role in deviant behavior has been countered by previous research. This research has stated that teacher/administration may both perpetuate and/or curb deviant behavior (Hopkins, 2002). Dimension 2 and 4 shared similar results, 0.703 and 0.609. This correlation may be due to the establishment of community within these schools. Researchers have stated that the establishment of community creates a sense of inclusion and empowerment to those included within a social network (Calabrese, 1990). The establishment of community within the school settings of responders may have influenced positive feelings. The average response of dimension 5 was the highest, 0.901, showing that a large population of responders admitted to either witnessing or engaging in problematic behavior while at school.

Research was limited by several factors, including the strong representation of Detroit Public School students and the limited sample size. Responses were selected from only 64 students. Students were selected from only two Wayne State University programs, APEX and Math Corps. Not all students enrolled in these programs were from Detroit Public Schools nor will all who graduate choose to pursue college. Detroit Public Schools has also gained international infamy due to such factors as higher rates of school closures and great financial distress. Data gathered from this research may not reflect the entirety of Detroit Public School students and may not be applicable to larger audiences.

It is hoped that researchers will continue this research on larger, more diverse populations. Findings gained from this research could help researchers to better engage marginalized populations, spark dialogue regarding the social ramifications of harsh polices such as suspension and expulsion, and encourage the pursuit of alternative forms of punishment to that of suspension/expulsion. Findings from this research also show a correlation between the establishment of community within school settings and positive feelings. Research has also shown that students may be open to explore alternative forms as punishment as they reported they do not believe that the current method of mitigating problematic behavior is effective or sufficient. This should serve as an encouragement to seek alternative forms of punishment such as restorative justice. Restorative justice encourages the establishment of community. This approach sees deviance as the decay of social bonds and emphasizes repairing harm done over the need to assign blame. Using this approach, schools are able to rectify the problem by incorporating all parties affected by the behavior, thus no longer alienating those labeled as "wrongdoers" (Cameron, 1999).This approach sharply contrasts to more traditional forms of punishment and builds upon the strength of community.

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CAN THE FOOD IN YOUR CABINET SAVE YOUR LIFE? [PART II] A CASE STUDY ON THE FOOD ENVIRONMENT IN DETROIT AND ITS RELATION TO HEALTH

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ABSTRACT

The purpose of this research is to understand the effects a person's environment has on their health and general outlook on food. If there is a significant relationship, it is important to understand what measures can be taken to improve the overall health of American citizens. In particular, this research focuses on how the environment plays a role in how food is perceived. This is an issue that must be addressed because a lack of grocery stores and healthy food providers is prevalent throughout Michigan. Michigan now has the 10th highest obesity rate in the nation according to the Michigan Department of Health and Human Services and 133 million Americans are affected with chronic, lifelong illnesses. People consume food daily, but it is less clear how people care about what they are eating. In my previous research based on survey in Metro Detroit.[1] I found that people valued the taste of food and who they ate with, over what effect food could have on their body. Building upon those findings and insights, in this research I explore the question of how environment can make a difference in their outlook on food.

PURPOSE STATEMENT

The purpose of this study is to identify to what extent a person's environment can affect the value they put on their ideas about food and health. How does the place where a person shops for daily groceries affect their attitude about the food they eat? In Detroit there are more liquor stores than grocery stores, and Detroit is often referred to as a "food desert" in the popular media. In 2009, for example, CNN reported that although Detroit is one of the largest cities in America, there was not one chain grocery store within the city[2]. For this matter, foods that are deemed healthier are marked up higher. This begs the question of how does food access disparities affect people's perceptions about food. This is an important issue that must be understood better because according to Michigan Department of Health and Human Services, Michigan has the 10th highest obesity rate, and within the United States over 133 million people have chronic illnesses related to dietary practices. Studies have long shown that there is a correlation in the foods we eat and our health. A study regarding dietary inequalities indicates that dietary

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outcomes improve with higher priced healthy foods.[3] How can we further understand how a person's environment affects what one chooses to eat and how they perceive food overall and its relation to health? Although there are different ways for people to learn information regarding diet and health, people are constantly getting sick and it is taking a daily finical, physical, and mental toll on Americans. According to the American Cancer Society, food additives can be linked to cancer. Food additives were initially added to help preserve the shelf life of foods. [4] Processed foods can also be linked to increase in obesity. According Natural News, studies have shown that 90% of Americans average food budget it spent on processed foods.[5] This could be due to the lack of available nutritious and fresh foods. The environment in which people live could be a factor that causing them to value the taste of the foods they eat over what effect the food has on their body.

LITERATURE REVIEW

To determine whether a person's environment can affect the value they place on their food and health, we must first identify what the environment of food looks like in Detroit. By definition an environment is a complex of physical, chemical and biotic factors acting upon an organism or and ecological community and ultimately determining its form of survival. It is coherent that there is a correlation between a person's lifestyle and their environment. In Detroit there are more liquor stores than grocery stores, Detroit is often referred to as a food desert. A food desert can be defined as a region with inadequate structural and socioeconomic access to places selling nutritious foods.[6] Due to the shortage of grocery stores in the city of Detroit, the agricultural study "Fruit and Vegetable Intake in African Americans: Income and Store Characteristics" suggests there could be a correlation between the dietary quality received among low-income women and the access to food causing a negative impact amongst the community.[7] There have been many public health studies showing that in low-income neighborhoods, predominately neighborhoods in which African American reside, supermarkets are less accessible than in higher income communities. A public health study on "Neighborhood racial composition, neighborhood poverty, and the spatial accessibility of supermarkets in metropolitan Detroit" found that on average the neighborhoods in which African Americans resided had supermarkets that were 1.1 miles farther than the nearest supermarkets in predominately-white neighborhoods. The study concluded that due to racial segregation in Detroit, African Americans live in more improvised neighborhoods, thus reducing access to supermarkets.[8] This study found race to play a vital role in respect to the access to supermarkets in more impoverished communities. "76% of neighborhoods with a high proportion of African Americans were

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among the most impoverished."[9] The inadequate supermarket accessibility has become a hindrance to Detroit residents in their efforts to eat healthy.[10] Due to improvised communities within Detroit, racial and financial disparities hinder residents to make healthy choices. In another study on food deserts in Detroit, researchers found that age, income and employment had little effect on health. However race/ethnicity displayed an apparent correlation with living in Detroit.[11]

Furthermore, due to the lack of accessibility, food prices in supermarkets grocery store in impoverished areas tend to be higher than affluent communities. The surge in grocery prices can also be explained by the increase of crime rate in urban areas according to a study found in the journal *Health and Place*. The surge in prices can be contributed to the issue of transportation for low-income households as well. This limitation forces residents to shop at stores closer to the neighborhood for convenience even at the cost of higher price and lower quality.[12] This could play a significant role the health of low income families.

What is the value placed on food and health in these communities in relation to their environment? According to an article [list the title of the article] discussing the characteristics of food environments, the researchers concluded that "future research would need to establish the health value of foods in the many individually owned grocery stores and ethnic food stores and restaurants. The food permit data also suggested the need to examine how within-venue exposure to food in large stores might constrain or enhance exposure to diet quality and health."[13]

METHODOLOGY AND FINDINGS

To determine Detroiters' understanding on health and food access, a survey was distributed at the Eastern Market, Corktown Farmer's Market, and Whole Foods Nutrition and Health classes in Detroit. The total sample size of surveys collected was 176. Survey consisted of six questions (see appendix). Four were multiple-choice questions and two were qualitative questions.

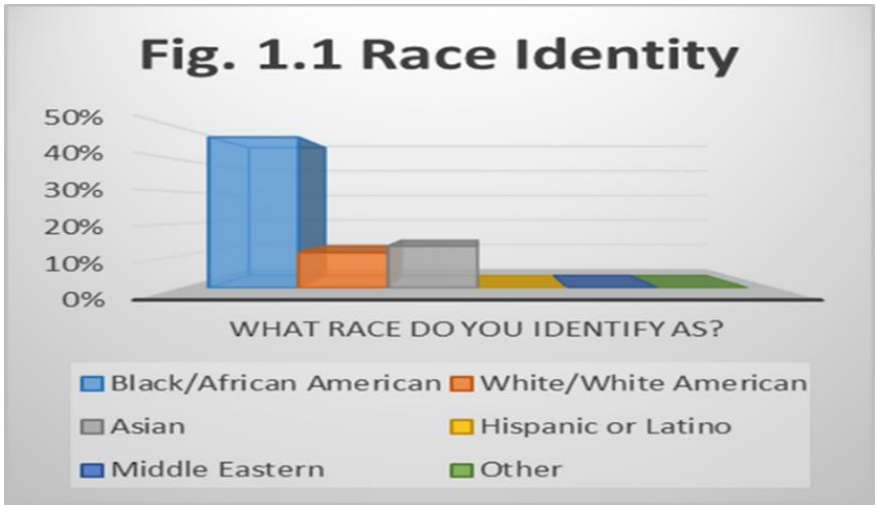
[9] Zenk, Shannon N., Amy J. Schulz, Barbara A. Israel, Sherman A. James, Shuming Bao, and Mark L. Wilson. "Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit." *American Journal of Public Health* 95.4 (2005): 660-67. Web

[10] Kieffer EC, Willis SK, Odoms-Young AM, Guzman JR, Allen AJ, Two Feathers J, Loveluck J Reducing disparities in diabetes among African-American and Latino residents of Detroit: the essential role of community planning focus groups.(2004)

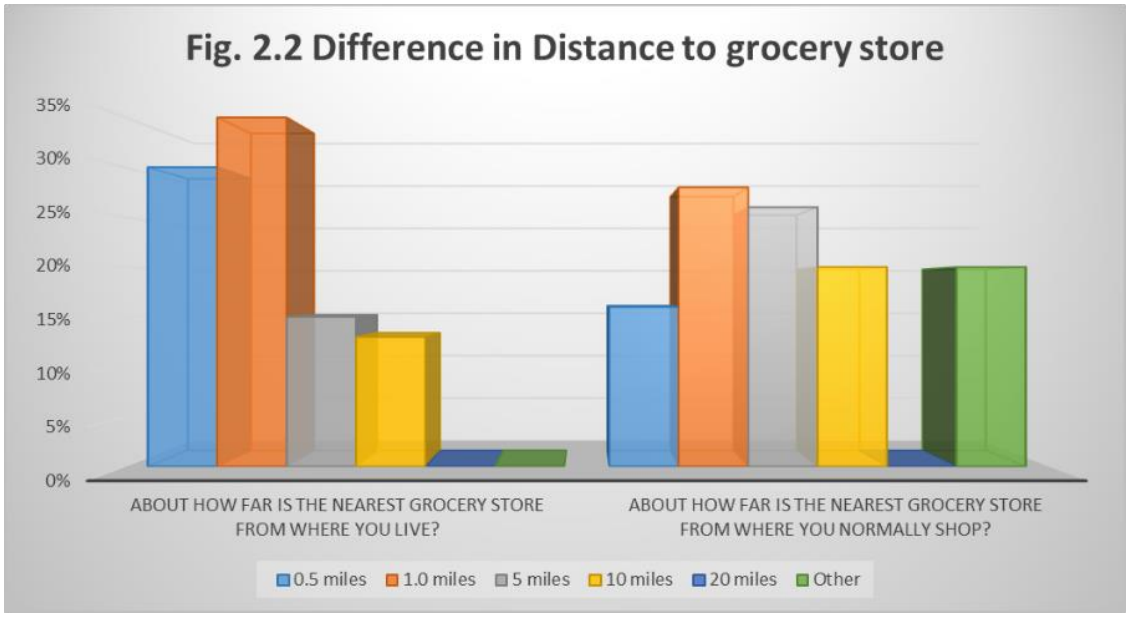
[11] Budzynska, Katarzyna, Patricia West, Ruth T. Savoy-Moore, Darlene Lindsey, Michael Winter, and Pk Newby. "A Food Desert in Detroit: Associations with Food Shopping and Eating Behaviours, Dietary Intakes and Obesity." *Public Health Nutrition* 16.12 (2013): 2114-123. Web.

[12] Burke Jessica, Keane Christopher, Walker Renee. Disparities and access to healthy food in the United States: A review of food deserts literature. Health & Place, Vol 16, Issue 6 (2010).: 876-884. Web

[13] Moudon, Anne V. "Characterizing the Food Environment: Pitfalls and Future Directions." Vol. 17, no. 7, pp. 1238–1243., Cambridge University Press.

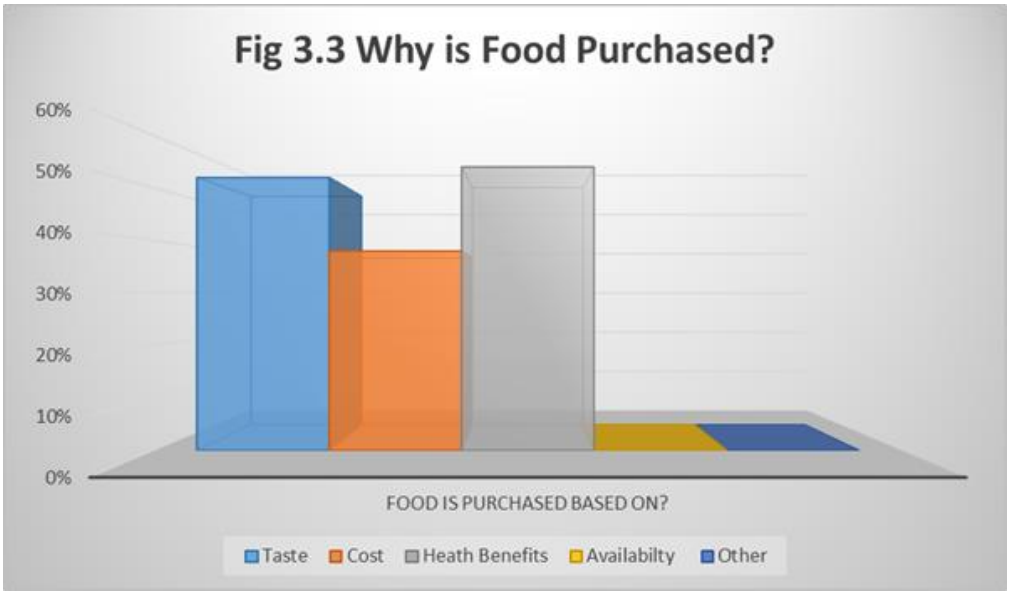


As depicted in figure 1.1 the majority of survey participants, 47%, identified their race as Black/African American. The second highest were people of Asian descent at 13%. Similarly, 11% were people who identified as White/White American. There was not a significant amount of people who identified themselves as Middle Eastern, Hispanic or Latino, or Other who filled out the survey.



The second and third question of the survey (Fig. 2.2) asked participants the difference in distance between their home and the nearest grocery store, as opposed to where they normally shopped. On average people tended to travel farther for their preferred grocery store instead of their local store. 35%

of participants answered that the closest grocery store was about 1 mile away. 30% responded that the closest store was about 0.5 miles away. 15% said the store was about 5 miles way and 13% answered that it was 10 miles away. There were no significant results for a distance of 20 miles and other. In comparison, 28% of people traveled about 1 mile to the store in which they normally shopped. 26% traveled about 5 miles, 20% traveled about 10 miles, 20% also answered other miles and 16% traveled about 0.5 miles. There were not significant results for 20 miles. The next question asked why people purchased the foods that they did.



As seen in Figure 3.3, 54% of participants answered that they purchased food based on health benefits, taste was closely related with 52% of people purchasing food according to taste. 38% of participants responded that the purpose of purchasing food was because of cost. Availability and other were not significant.

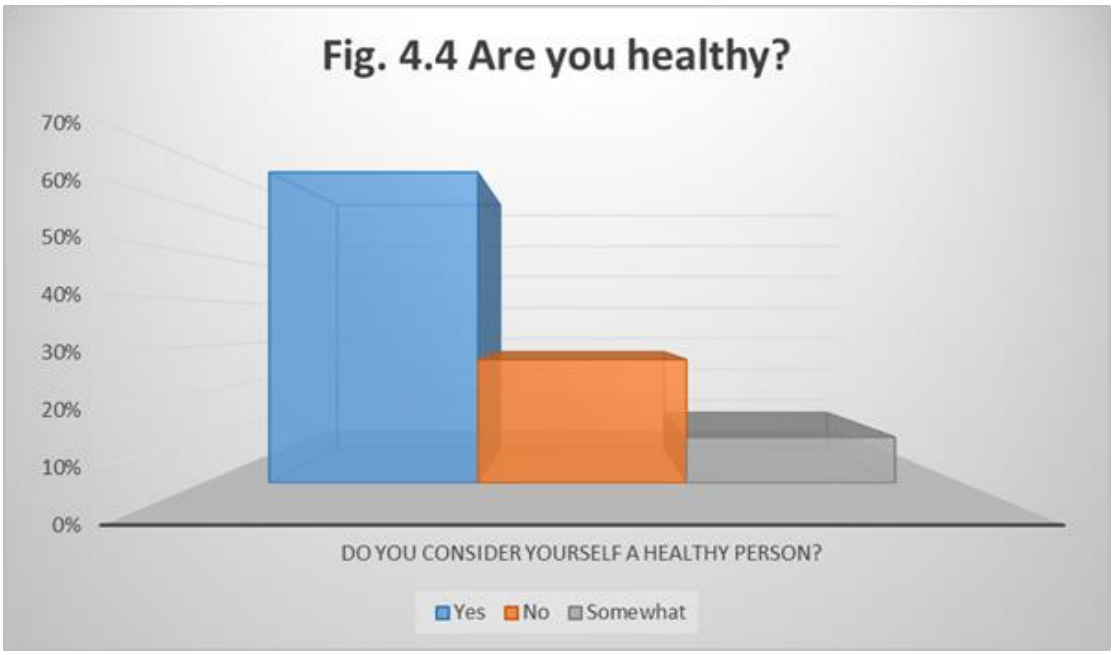
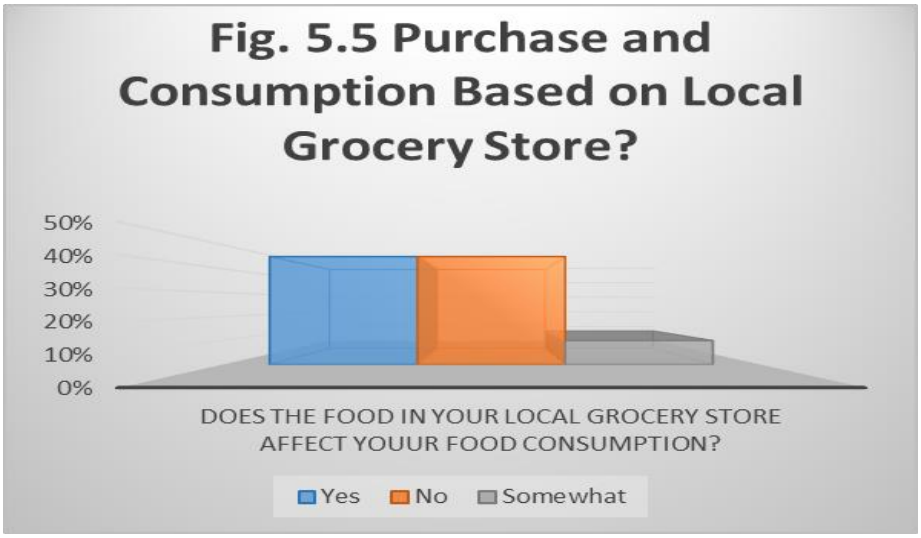


Figure 4.4 displays the results for whether or not people consider themselves to be healthy. 68% of participants said that they were, 22% did not consider themselves healthy and 10% answered somewhat. The last question asked the opinions of the participant's on whether or not they felt that what was available in the grocery stores affected their food purchase and consumption. According to the survey the results were evenly distributed with 45% answering yes and 45% answering no. Only 10% of participants answered somewhat, as can be seen in Figure 5.5.



DISCUSSION AND CONCLUSION

It was not surprising that 35% of the participants identified themselves as Black because according to the United States Census Bureau in 2010, 82.7% of the people that lived in Detroit were Black. Significant results that stood out in this research was the distance in which people traveled to their preferred grocery store. The travel distance was farther than the distance to the local grocery store in their neighborhood. In addition, 45% of participants each said yes or no to whether or not the foods they purchased and consumed was affected by the food available in grocery stores. From this, it is unclear if the types of food sold in local grocery stores affect what foods people choose to purchase and consume. Many who responded no, reasoned that they chose which store they shopped at based on the store's inventory and so many shopped at multiple stores. Therefore, they did not feel affected by what was available in the store. Those who answered yes, reasoned that availability, cost and convenience influenced the foods they purchased. Availability did not play a significant role in why people chose the foods they purchased in question four, however many respondents who said yes to question six mentioned availability as a reason they purchased and consumed the foods they did. Based on this information, people do not realize the significance of availability. Availability did not seem to be an issue to those who responded no to the question pertaining the effect of products sold in grocery stores because the majority of the respondents stated that they either shopped at a lot of different stores or that they would go to a different store if the initial store did not provide their intended needs. They were indeed affected because it caused them to have to shop at multiple stores to get what they needed. As discussed in the literature review, transportation is an issue in low-income neighborhoods. People who have limited transportation do not have the freedom to shop around and are only able to purchase what is available, cost effective and convenient. Also, nearly 68% of participants considered themselves healthy. People who considered themselves to be healthy answered that they ate fruits and vegetables and exercised regularly, whereas people who considered themselves unhealthy stated that it was because they did not eat the right foods or had an ailment. Fascinatingly enough, the type of food a person consumed was the overall difference between a person who considered themselves healthy or unhealthy. These results did not identify if race made a difference in Detroiters perspective on food because majority of participants identified as Black/ African American. In general people tended to purchase their food based on health benefits and taste. Cost was another factor that influenced what people purchased. Where people shop could play a factor in their outlook on food and health. All three places where the surveys were collected were fresh food markets and people generally saw themselves to be healthy. This is interesting because 7 of the 10 leading causes of death in Michigan are due to chronic illnesses. This leads me to believe that the environment plays a role in how people view health. A person who has transportation also has the freedom to change their environment, thus shaping their outlook on health. One who has limited mobility is subjected to purchase the foods accessible to them. Based on this research people traveled farther to get food items they valued and because of this emphasis on valued food they considered themselves to be healthy. Availability plays a significant role in a person's health, but is not viewed that way. Taste is still highly regarded in people's food choices. The percentage of participants last year who purchased foods for health benefits was equivalent to the percentage this year, both at 54%.

In conclusion, this study evaluated how Detroiters valued the foods they purchased according to taste, cost, health benefits and accessibility. Freedom of mobility allows people to travel to different stores giving them the ability to buy food items they liked based on cost, health benefits and taste. Whereas people with limited transportation are compelled to buy the food items provided within their local grocery store. Whether a person has access to mobility or not, they still will purchase their foods according to taste, but the environment they shop in (grocery store/s) affects what food is purchased. The foods people

purchase and consume determined how healthy they felt they were, since people based whether or not they were healthy/unhealthy on the foods that they ate.

LIMITATIONS

One of the biggest limitations pertaining to this research was time. Time was very limited and therefore the sample size for participants was not as large as the initial research in the summer of 2016. Also, the WSU Farmers Market was not open this year which reduced the sample size. In addition, the Corktown Farmers Market changed locations this summer, and the number of people who attended the market was not as large as last year.

ACKNOWLEDGEMENTS

With tremendous gratitude, I would like to thank Dr. Yuson Jung for overseeing this research, it would not have been possible without her guidance. Special thanks to the Ronald McNair Program for providing this opportunity to me to continue the research on food as medicine. I would also like to thank the participants of the Eastern Market and Asa Nori's Nutrition and Health classes offered at Whole Foods Market Detroit.

Survey

Environment and Outlook on Food

1. What race do you identify as? (Circle All that Apply)
   A. Black/African American
   B. White/White American
   C. Asian
   D. Hispanic or Latino
   E. Middle Eastern
   F. Other _____

2. About how far is the nearest grocery store from where you live? (Circle One)
   A. 0.5 miles
   B. 1.0 miles
   C. 5 miles
   D. 10 miles
   E. 20 miles
   F. Other _____

3. About how far is the grocery store in which you normally shop? (Circle One)
   A. 0.5 miles
   B. 1.0 miles
   C. 5 miles
   D. 10 miles
   E. 20 miles
   F. Other _____

4. Do you purchase food based on… (Circle All that Apply)
   A. Taste

B. Cost
C. Health Benefits
D. Availability
E. Other _____

5. Do you consider yourself a healthy person? Why or why not?
_____
_____
_____
_____

6. Does the food in your local grocery store affect the foods you purchase and consume? How or how not?
_____
_____
_____
_____

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DETECTING PRODUCTION OF HYPOCHLORITE OXIDIZED CYSTEINYL DOPAMINE (HOCD) IN PC12 CELLS

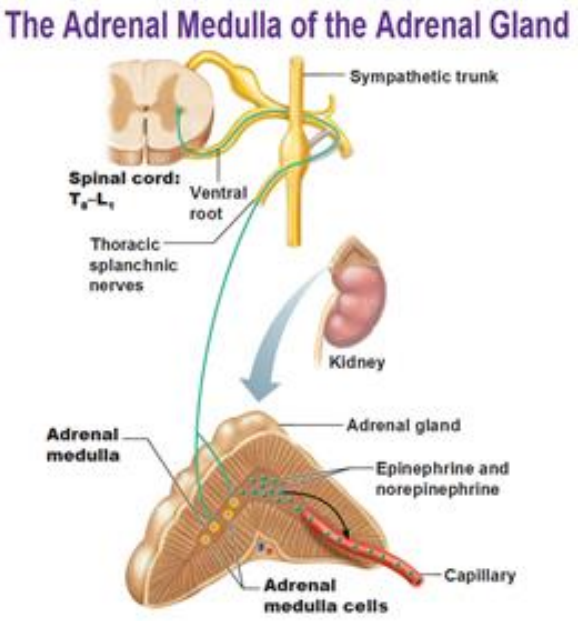
By Karrington Seals
Major: Biological Sciences
Mentor: David Njus, PhD, Department of Biological Sciences

INTRODUCTION

Parkinson's Disease (PD) plagues about 1 million people in the US. This neurodegenerative disease is characterized by uncontrollable tremors and trouble initiating movement. The Njus lab believes to have isolated the chemical responsible for PD. While the basic defect in PD is understood (the death of neurons that secrete dopamine in the brain), there has never been identification of a chemical that causes this progressive degeneration. Currently no cure for stopping or reversing the disease exists; there is only treatment of symptoms. Identifying the chemical that may cause PD and understanding its lethal effect on dopaminergic neurons could lead to more effective treatment to stop or slow progress of the disease.

REVIEW

Detecting production of Hypochlorite-Oxidized Cysteinyl-Dopamine (HOCD) in PC12 Cells is a difficult task. HOCD is hypothesized to be produced naturally in the brains of Parkinson's disease patients. Before this can be tested, methods must be developed to detect the low concentration expected using a more accessible system. PC12 cells, derived from adrenal medulla of rats, are a good choice for this.



They are useful because cells of the adrenal medulla make dopamine (as a precursor of epinephrine) like the neurons of the substantia nigra in the brain. The production of HOCD from cysteinyl-dopamine (from L-cysteine and dopamine, both naturally occurring compounds in the body) is explained by the oxidation of cysteinyl-dopamine by hypochlorite produced by the enzyme myeloperoxidase. While there is immense literature on all the subtopics, there has been no work on HOCD detection. Important abbreviations for this literature review are: Reactive Oxygen Species (ROS), Parkinson'sDisease (PD), Dopamine (DA), Hypochlorite-Oxidized Cysteinyl-Dopamine (HOCD), 5-S Cysteinyl-Dopamine (5-SCys-DA), Superoxide Dismutase 2 (SOD2), Substantia Nigra (SN), Myeloperoxidase (MPO).

I. Oxidative Stress and Reactive Oxygen Species (ROS)

Oxidative Stress, or the state of a cell when its internal inhibition of oxidation (antioxidant) system is overcome with ROS (Bisaglia et al.) has been identified as a contributing factor in Parkinson's Disease (PD). Postmortem PD brains contain high levels of oxidatively damaged molecules (Mosca et al.) which suggests that oxidation of dopamine (DA) can yield overwhelming ROS, harming the cell. Low levels of ROS can be beneficial to the cell in signaling; however, an excess can cause a progressive decline in the function of a cell (Bisaglia et al.). One reason there is an excess of ROS in the cell after the oxidation of DA is because said oxidation destroys mitochondrial proteins, namely SOD2 (Bisagliaet al.), which combats the presence of the superoxide anion (O2-) in the cell by changing it to normal molecular oxygen (O2) and hydrogen peroxide (H2O2). When catechols–including catecholamines–are autoxidized, "reactive products of partially reduced oxygen, such as superoxide anions, hydrogen peroxide, and hydroxyl radicals, are generated. These species are believed to be involved in cytotoxic processes…," (Fornstedt et al., 1990). So, increasing DA autoxidation elevates the presence of cytotoxic ROS in the cell, evoking peroxidative damage contributing to the death of substantia nigra neurons seen in PD (Shen and Dryhurst 1996).

Fornstedt et al. conclude that, despite the body's numerous endogenous antioxidant defenses, reactive oxygen species derived from catechol autoxidation or from MAO-catalyzed deamination of catecholamines play a role in degeneration of DA neurons (Ambani et al., 1975; Graham et al., 1978; Cohen, 1983). Although mitochondria and the production of ROS from altered complexes is not a focus of my research, it is pertinent to include that affected mitochondria complexes (with a focus on complex I) can cause an excess of superoxide (an ROS) causing oxidative stress (Hauser and Hastings, 2013).

There is widespread consensus that the production of reactive oxygen species is a contributing factor to degeneration of neurons in PD.

II. Rotenone and Myeloperoxidase (and a little Mitochondria)

The mitochondria are known as the powerhouse of the cell. They produce many compounds necessary for cell survival, especially ATP, and are the site of respiration. And because of this responsibility, a defect in the mitochondria can have detrimental cell consequences. Subramaniam & Chesselet write "Mounting evidence suggests that mitochondria are the primary source of reactive oxygen species that may contribute to intracellular oxidative stress. Superoxide radical is the primary ROS produced in mitochondria as a result of single electron transfer to oxygen in the respiratory chain. (Starkov, 2008; Murphy, 2009)." Rotenone is a mitochondrial toxin. This toxin, causing a deficiency in complex I, can induce the loss of dopaminergic neurons (Subramaniam and Chesselet, 2013) which is characteristic of PD. "It is believed that substantia nigra is more vulnerable to complex I dysfunction compared to other

brain regions due to the generation of ROS by the nigral dopaminergic neurons during dopamine metabolism (Chinta and Andersen, 2008)," so an abnormality or impairment in the mitochondrial complex I can lead to oxidative stress (from increased ROS generation). It is also said that this oxidative stress can lead to compromising of the mitochondrial DNA. Rotenone is known to increase myeloperoxidase expression in cells, suggesting it also enhances the conversion of 5-SCys-Da to HOCD (Mehta et al., 2016) which inevitably means an increase in ROS production. MPO, which produces HOCl (a factor in the production of HOCD described below) is also a factor to ROS production (Chang, Chi Young et al., 2011).

Conclusively, these authors demonstrate that compromised mitochondria might be involved in PD pathogenesis. Rotenone enhances MPO production, ROS generation and oxidative stress, causing stress on the SN.

III. Cysteinyl Dopamine

Dopamine (DA) is a naturally occurring catecholamine in the body. It is a neurotransmitter, known to be the precursor to epinephrine as well as the neurotransmitter involved in addictive behavior and pleasure. Dopamine, in its normal concentration, is not toxic to the cell. A surplus of DA can form highly toxic products. When DA is at a neutral pH (7.0 – 7.4), autoxidation can occur because it is not stable. It can then pick up a thiol group (namely cysteine or glutathione). Shen and Dryhurst (1996) state, "It is possible that a low catechol autoxidation rate is harmless for the function and survival of the neurons, but if the rate is enhanced by exogenous agents, a deteriorating cellular defense system, or an increased neuronal activity, the generation of toxic oxidation products might reach levels beyond the defense capacity of antioxidants and scavengers." It is known that self-oxidation of DA produces both the superoxide anion radical and hydrogen peroxide (Bisagliaet al., 2014). Increasing degeneration and depigmentation in human SN is correlated to a gradual increase of 5-SCysDa (Fornstedt et al., 1989; Spencer et al., 1998). Studies indicate that the addition rate of L-cysteine to DA and its derivatives is higher than that of glutathione, which means that the formation of cysteinyl-dopamine is favored over other adducts (Shen and Dryhurst, 1996 & Zhang, and Dryhurst, 1993). It is the major product. In experiments that use varying amounts of 5-SCys-DA, it was concluded that 5-SCys-DA has a significant prooxidant effect on neural cells compared to DA and that 5-SCys-DA can induce cellular production of ROS (leading to oxidative stress) and induce cell death more pronounced than just DA at the same concentration (Mosca et al., 2006). These species created from autoxidation can lead to damage to dopaminergic neurons.

All authors agree that cysteinyl-dopamine is the major product when catecholamines oxidize in the cell in the presence of thiols.

IV. PC12 Cells

Westerink and Ewing quote "The adrenal phaeochromocytoma (PC12) cell line was originally isolated from a tumour [sic] in the adrenal medulla of a rat in 1976 (Green & Tischler 1976)." PC12 cells both make and store DA, where that is the major catecholamine stored (but in very small amounts). They resemble post-ganglionic neurons in the sympathetic portion of the peripheral nervous system (PNS) (Westerink and Ewing, 2008). These cells are used to investigate neurodegenerative or neuron-affecting conditions or mutations.

Westerink and Ewing described the neurobiological significance of PC12 cells and how their resemblance to sympathetic neurons allows scientists to observe effects on dopaminergic neurons as well as mutations affecting dopamine.

V. Hypochlorite-Oxidized Cysteinyl-Dopamine

Hypochlorite (ClO-) is a byproduct of the catalysis of Cl- and H2O2 by myeloperoxidase in the cell. This occurs naturally. Mehta et al. (2016) observed that in PC12 cells, when 5-SCys-DA (that has no efficient redox cycling capability) is met with myeloperoxidase and H2O2, the resulting hypochlorite oxidized the 5-SCys-DA creating a substance with immense redox cycling ability (in the presence of ascorbic acid). The rate of redox cycling is proportional to hydrogen peroxide concentration. Not only does the treatment of 5-SCys-DA with hypochlorite yield a product with redox cycling capability, but it also turns not so toxic 5-SCys-DA into a very toxic substance to cells (because of its ability to produce ROS). This Hypochlorite-Oxidized Cysteinyl-Dopamine is able to kill PC12 cells at lower concentrations as well as much faster (Mehta et al., 2016).

Mehta was able to specify the specific ingredients required to yield a redox cycling product: 5-SCys-DA, H2O2, myeloperoxidase and Cl-. He also discovered that taurine, a scavenger of hypochlorite in PC12 cells, has no effect on detoxifying HOCD in cells, but can almost completely detoxify 5-SCys-DA in cells.

VI. Redox Cycling

Redox cycling involves chemical agents that undergo reduction and oxidation repetitively. Reduction is when a compound gains electrons, oxidation is when a compound loses electrons. There is a one electron transfer that leads to reactive oxygen radicals, and usually depletes oxygen. This is called oxygen sequestering. In the case of HOCD, it is reduced by ascorbic acid and then oxidized by molecular oxygen. As it cycles, molecular oxygen is taken up. The detection of this oxygen sequestering is a mechanism to show the presence of redox cycling compounds. Above, we have outlined the creation of two compounds pertinent to this experiment, 5-SCys-DA and HOCD. And although 5-SCys-DA does not make an effective redox cycler–nor does DA on its own–the treatment of 5-SCys-DA with hypochlorite yields a product (HOCD) that redox cycles very efficiently after adding an antioxidant like ascorbic acid (Mehta et al., 2016). Ascorbic acid or other antioxidants (though not as well), initiate the redox cycling ability of HOCD. H2O2 is the ultimate product of redox cycling (Mehta et al., 2016).

Mehta explains that HOCD is the only DA-derived compound with redox cycling abilities. The sequestering of O2 allows the detection of HOCD in a compound. Redox cycling is only measured after the addition of ascorbic acid.

The culmination of the ideas shown in the literature I have referenced will eventually result in the detection of Hypochlorite-Oxidized Cysteinyl-Dopamine in the brain. Mosca's work is important because, while my project is about detection, knowing the effects of cysteinyl-dopamine can create more efficient ways to work with viable cells. Mehta's work is important because, not only did his work lay the foundation for my project, but working in the same lab with someone who has extensive knowledge of both PC12 cells and the redox capability of HOCD will allow me firsthand access to the production of HOCD to study it more intensely. The other authors provide insight into the intricate details of autoxidation of cysteinyl-dopamine and oxidative stress, which is more of a good knowledge base to continue my work.

With this obtained knowledge, detection of HOCD in the brain can be attacked from many different avenues.

METHODOLOGY

I. HOCD Preparation

In a beaker, 30mL water and 4.39 g of ceric ammonium nitrate were mixed. In a second beaker, 20mL water and 0.76g dopamine HCl (4mMol) were mixed. In a third beaker, 10mL water and 0.79g L-cysteine HCl (5mMol) were mixed. Then the dopamine HCl solution was added to the ceric ammonium nitrate solution to produce a red solution. This was stirred for 30 seconds and then the L-cysteine HCl solution was added. This lighter mixture was incubated for 5 minutes and then 10mL of 2M K3PO4 was added. After 4.5 more minutes of stirring, the yellow precipitate was removed using a Whatman #41 filter and then filtered a second time. 2mL of concentrated HCl was added to the solution which now contains cysteinyl-dopamine. After adding 160ml of ethanol and cooling in the freezer for 1 hour, the white crystalline precipitate was removed by filtration. 14mL of concentrated HCl was added . Then at 5 minute intervals, 25mL of sodium hypochlorite was added to a total of 125 ml. Redox cycling activity in 5µL was assayed after each addition of sodium hypochlorite. The assay is performed with 4mL of 0.2M phosphate buffer, 1 µM EDTA at 37°C, pH 7.4. After 30 minutes, the sample was extracted against 80mL dichloromethane. 5µL of each phase was assayed. The aqueous phase was allowed to evaporate for 2 days. After 2 days, assay 2µL of sample. The remainder of the evaporated sample was placed into a round bottom flask and dried in the rotary evaporator at 37°C for about 3 hours. Acetone was added to this sample the precipitate removed by filtration. Assay redox cycling of 5µL of the acetone solution. Assay insoluble material in 10mL water and assay 5µL for redox cycling. To the acetone solution, add 3.5g sodium bicarbonate and then filter using a Whatman filter to remove the precipitated salt. Assay 5µL of filtered solution for redox cycling. Then add 200mL diethyl ether to the filtered solution in a separatory funnel. Allow phase separation and collect the aqueous phase. Assay 1µL of aqueous phase for redox cycling. Then allow the aqueous phase to evaporate to dryness.

II. Tissue Extraction

To 10g of refrigerated chicken livers, 10mL of water was added and the livers homogenized with the Tissumizer and then a Potter Elvehjem homogenizer. To the homogenate, 200µL HOCD was added. An assay of redox cycling was performed using 4mL of 0.2M phosphate buffer (same buffer as above) and 50µL of homogenate. The sample was centrifuged at 5,000rpm for 5 minutes in the SS-34 rotor. The supernatant was poured off and the pellet was re-suspended in an equal volume to the supernatant. The redox cycling of 50µL of both the supernatant and pellet were assayed. Then the supernatant was mixed with 2.5mL of 100% trichloroacetic acid, centrifuged, and assayed.

III. Induce Cell Synthesis of HOCD

PC12 cells were grown in F12K medium supplemented with 15% heat-inactivated horse serum, 2.5% fetal bovine serum and 1% penicillin/streptomycin/glutamine at 370C and 5% CO2. Cysteinyl-dopamine was prepared by adding 250µM dopamine, 300µM cysteine and 100units of tyrosinase to 4ml of F12K medium without serum at 370C. After stirring for 15mins, the product, cysteinyl-dopamine, was filter-sterilized and then diluted to a concentration of 50µM with complete medium for treating the cells. Rotenone was dissolved in DMSO and added to PC12 cells to a concentration of 10µM. Cells were treated with 50µM

cysteinyl-dopamine, 50µM cysteinyl-dopamine + 10µM Rotenone, and control (untreated cells) for 24hours before performing the extraction protocol for HOCD.

IV. HOCD Extraction from PC12 Cells

To begin the extraction, add 2.5mL of 100% trichloroacetic acid (prepared by dissolving 15g of trichloroacetic acid in 10.5mL of distilled water) to 10mL of each sample of PC12 cell culture (control, Cys-DA treated and Cys-DA + Rotenone treated). After centrifuging the sample, place the supernatant (about 11mL) in a 150mL beaker and add 66mL of acetone. After vigorous mixing, use suction filtration with Whatman #2 filter paper (42.5mm diameter) to remove the insoluble material. To neutralize the acidic aqueous filtrate, add 1.0g sodium bicarbonate (mw 84.0066) and use suction filtration again to remove the insoluble material with Whatman #2 filter paper (42.5mm diameter). Using liquid-liquid separation, in a 250mL separatory funnel, add the filtrate and 150mL of diethyl ether. Collect the lower phase and assay 1 mL for redox cycling at 37°C using 3mL of 2.5M K3PO4, 100µm EDTA, pH 7.4 adding 100µL of 100mM ascorbic acid.

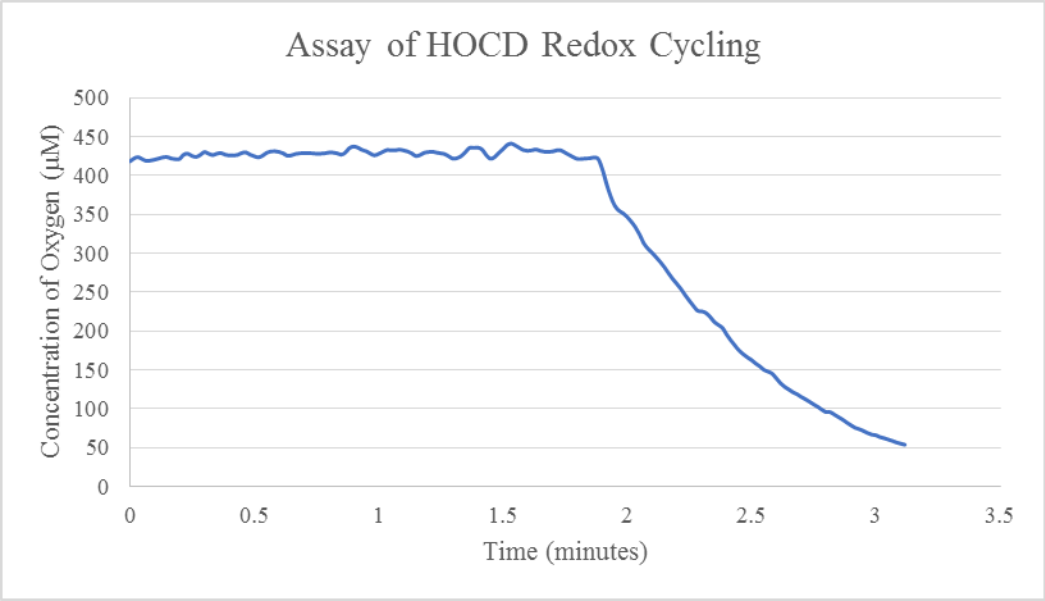
V. Analysis

Redox cycling was measured using a YSI Model 5300A Clark-type oxygen electrode. We analyze our redox cycling using the program Tracer Daq. The oxygen electrode connected to the computer measures the amount of oxygen in our sample. Tracer Daq then imports the oxygen electrode output into a Microsoft Excel spreadsheet table. Using an algorithm, the spreadsheet is converted into amount of oxygen remaining in the sample plotted against time. Time was converted to minutes and the oxygen electrode output (calibrated using glucose and glucose oxidase) was converted into oxygen concentration (µM). We use Excel to produce lined scatter plot graphs and charts. The rate of redox cycling (µM/min) is measured as the slope of the graph following addition of ascorbic acid.

RESULTS

Redox cycling of HOCD occurs in the presence of ascorbic acid (Figure 1). When HOCD is placed in 4 ml of a solution at pH 7.4 at 37ºC and the O2 concentration is recorded, the O2 concentration does not change. When ascorbic acid is added, however, the O2 concentration drops quickly. As HOCD is alternately reduced by ascorbic acid and reoxidized by oxygen, the O2 in the solution is depleted.

Fig. 1. Assay of HOCD Redox Cycling. 100µL Ascorbic acid was added at 1.88 minutes to initiate redox cycling.



To test methods for detecting HOCD in tissues, we homogenized chicken liver, added HOCD, and then attempted to detect redox cycling activity in that homogenate. In this experiment, there was a lot of "background" which muddied the results (Figures 11 and 12). Nevertheless, when the tissue was centrifuged, the supernatant redox cycles much faster than the pellet. This demonstrates that HOCD is found in the soluble fraction of the chicken liver extract. However, not all the HOCD was separated from the pellet into the supernatant. This could be improved by further centrifugation. Several experiments of this kind allowed us to refine methods for extracting HOCD from chicken liver. This method was then used to extract HOCD from PC12 cells.

In PC12 cells, control cells may make some HOCD from endogenous dopamine. Cells grown in the presence of cysteinyl dopamine, the precursor for HOCD, should have more of the redox cycler than the control cells. This should be further enhanced in cells grown in the presence of both cysteinyl dopamine and rotenone, which induces the hypochlorite-producing enzyme myeloperoxidase. PC12 extracts were tested after the three stages of treatments corresponding to Fig. 6 below. First, the PC12 cells were extracted with trichloroacetic acid and the soluble fraction was extracted with acetone and ether (Figures 2 and 4). Then this was allowed to dry and the residue was extracted with acetone (Figure 5). Finally, the residue remaining after this was dissolved in methanol (Figures 7-9).

Fig.2. Assay of HOCD Redox Cycling After Extraction Protocol (before drying). 100µL Ascorbic Acid was added at 4.88 minutes to initiate redox cycling.

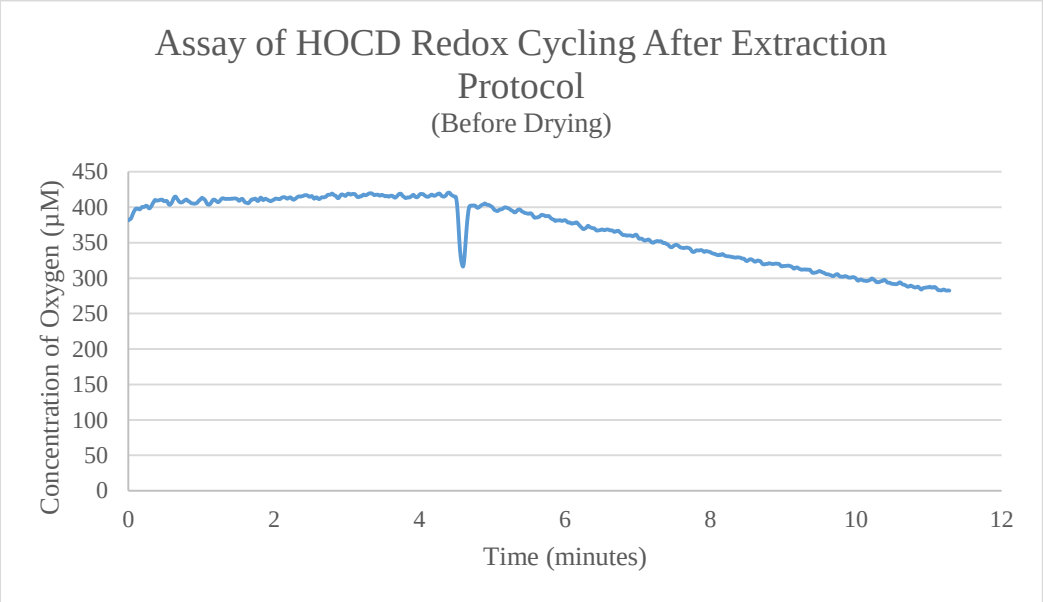


Fig. 3. Assay of Redox Cycling After Extraction Protocol (after drying). 100µL Ascorbic Acid was added at 4.72 minutes to initiate redox cycling.

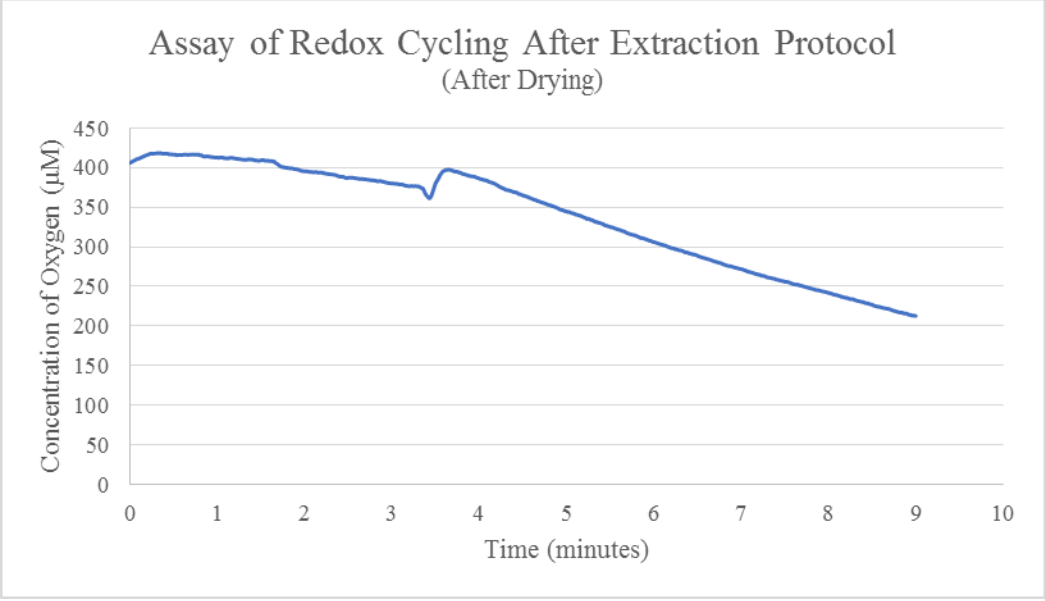


Fig. 4. PC12 Cells Extraction (before drying – all three treatments)

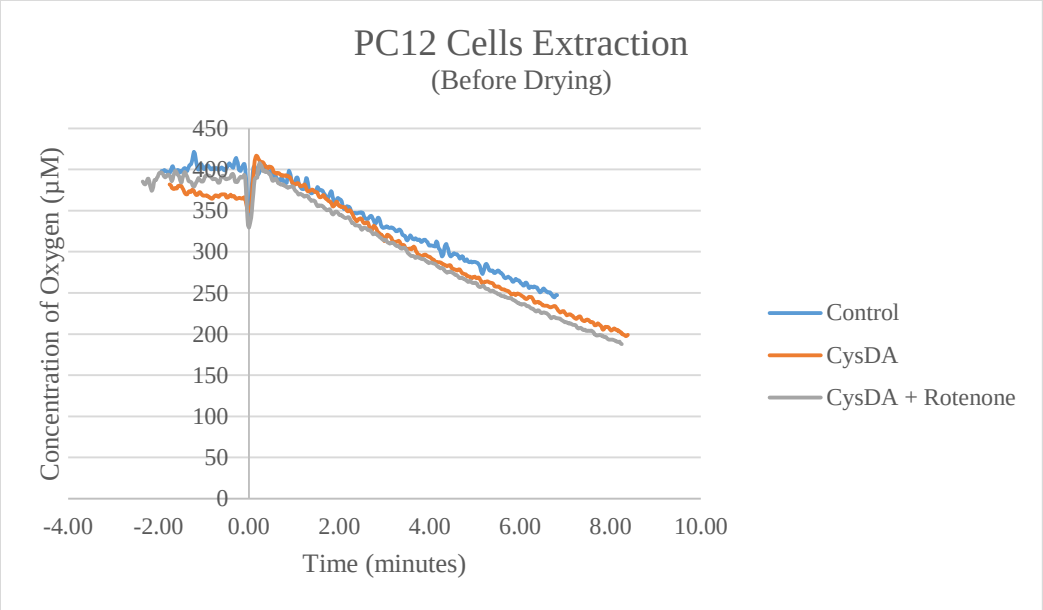


Fig. 5. PC12 Cells Extraction (after drying: taken up in acetone – all three treatments)

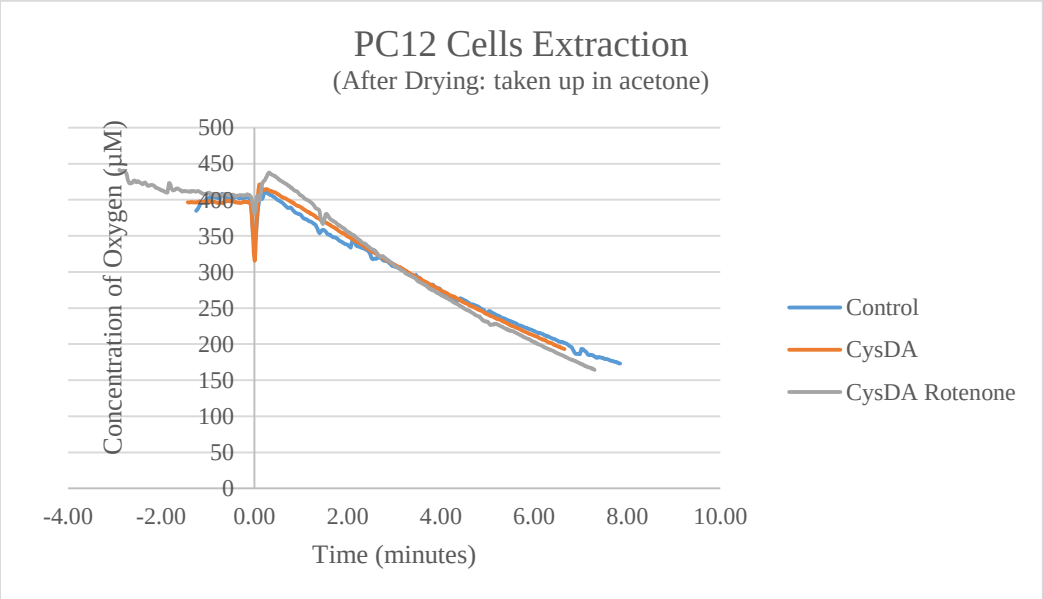


Fig. 6. Redox cycling activity in PC12 cell extracts. 1 – Cells were taken up in acetone; 2 – Cells were taken up in acetone; 3 – Cells were taken up in methanol. Redox cycling rates are expressed as a percent of the control value.

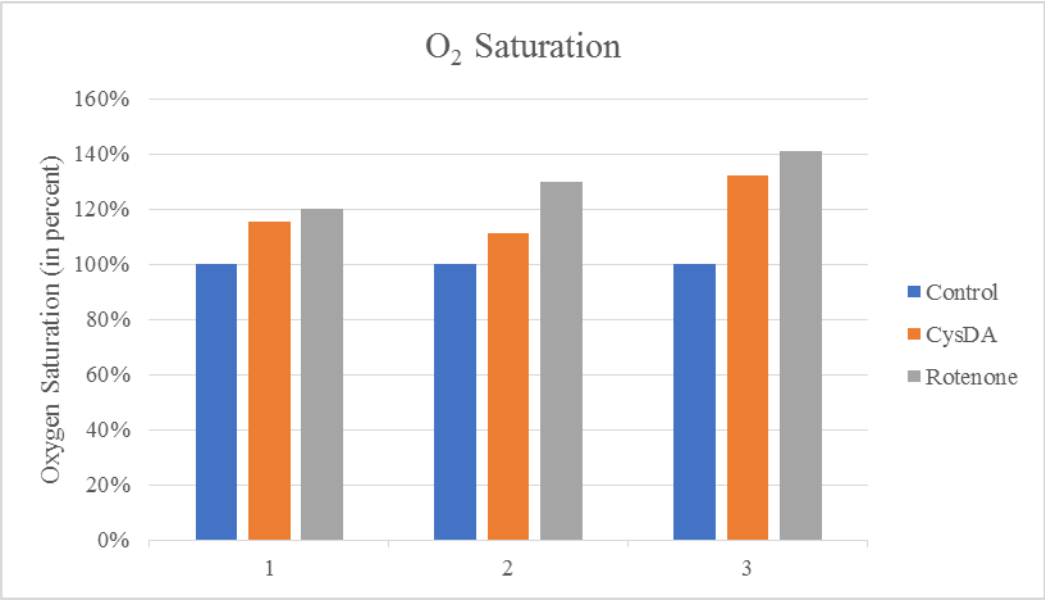


Fig. 7.PC12 Cells Control (After Drying: taken up in MeOH). 100µL Ascorbic Acid was added at 1.25 minutes to initiate redox cycling.

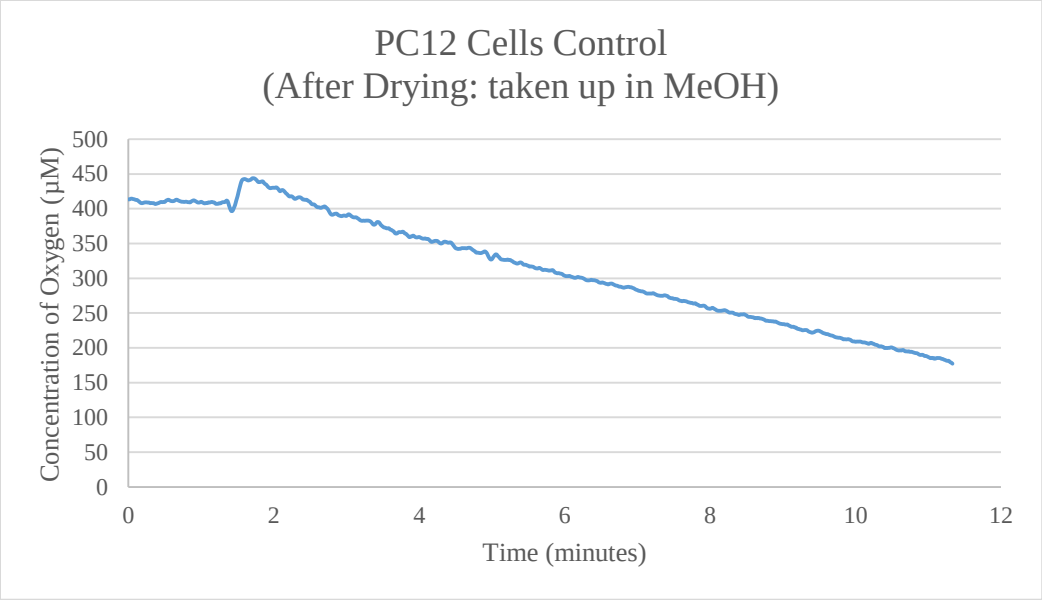


Fig. 8. PC12 Cells Cys-DA (After Drying: taken up in MeOH)

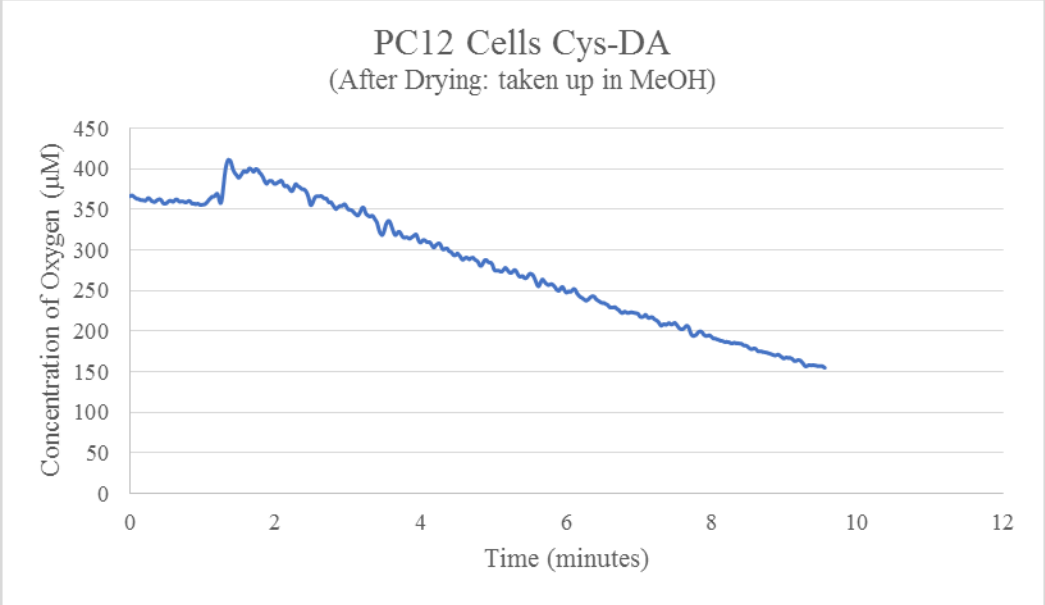


Fig. 9. PC12 Cells Cys-DA + Rotenone Cells (After Drying: taken up in MeOH). At 2.58 minutes, 100µL Ascorbic Acid was added to initiate redox cycling.

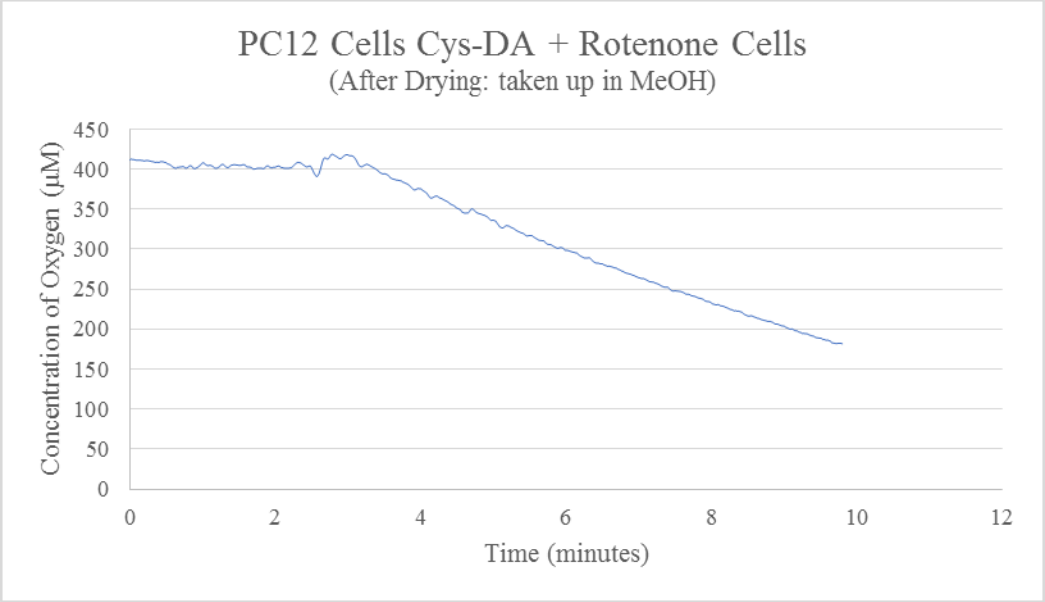


Fig. 10. FK12 Media Assay. At 3.5 minutes, 100µL Ascorbic Acid was added to initiate redox cycling

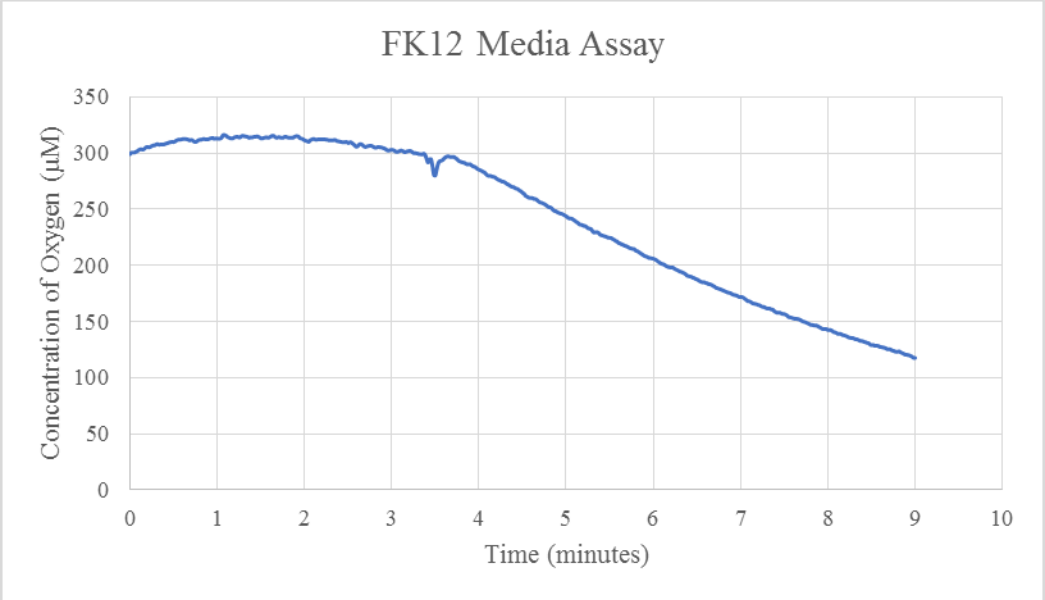


Fig.11. Chicken Liver Supernatant Assay

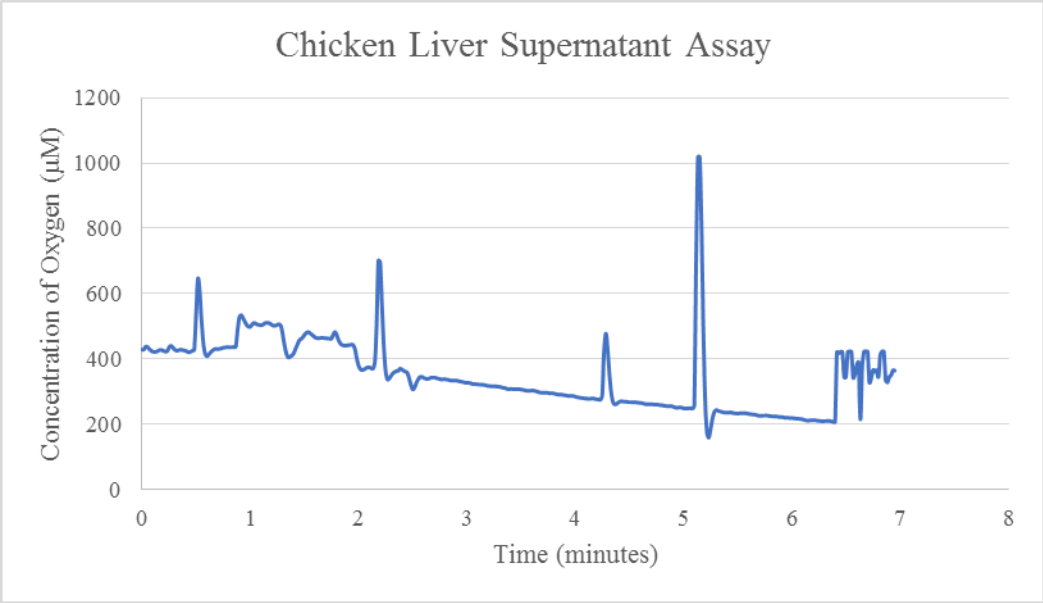
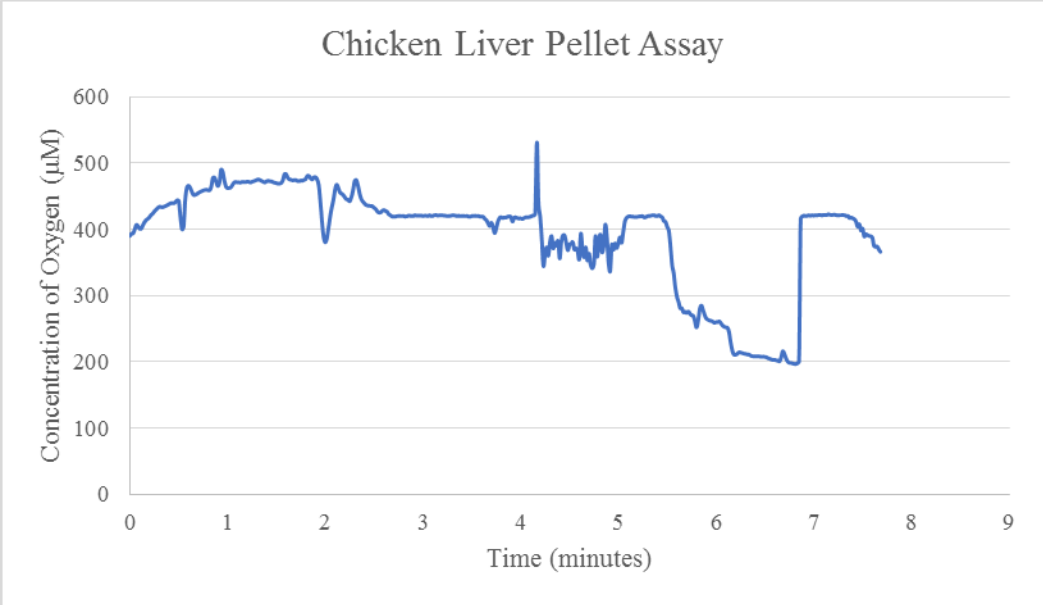


Fig. 12. Chicken Liver Pellet Assay



The PC12 cells were under three treatments: Control (or plain K12 media and cells), Cys-DA and Cys-DA + Rotenone. It was expected that the cells that produce HOCD (Cys-DA + Rotenone treatment) would have higher redox cycling capability than the other two treatments (with Cys-DA as the second fastest redox cycling and control and the slowest). This is confirmed in that the slope of the treatment of Cys-DA + Rotenone is the steepest, followed by Cys-DA treatment. Fig. 6 also shows that after treatment twice with acetone and then methanol, Cys-DA + Rotenone treatment had the highest rate of redox cycling. Thus, continued concentration and extraction of HOCD reduced background redox cycling yielding more visible differences.

The high redox cycling of the control PC12 cells prompted a testing of the medium by itself (no PC12 cells). The medium has redox cycling capability (Figure 10), explaining why the control for the PC12 cell extraction was nearly as high as the other two treatments.

DISCUSSION

As previously stated, scientists believe that rotenone works in the pathogenesis of PD by enhancing the conversion of 5-SCys-DA to HOCD. While experimentation has shown that Cys-DA has little redox cycling capability, when it is converted to HOCD, that capability is increased. Because we are working with minute amounts of HOCD, the difference will not be large, but definitely noticeable. The results show that Rotenone treatment enhances redox cycling compared to just Cys-DA treatment, confirming previous scientists' hypotheses. This research topic is new, therefore comparing these results with past experiments was not an option. Because these experiments were conducted in numerous trials, it is clear that the results are aligned and corroborated by multiple trials. As the experimental procedures became sounder, results became more accurate.

Another important concept is identifying when the HOCD is most concentrated. As can be seen from Fig. 2 and Fig. 3, redox cycling after drying yields a faster rate. Drying of the sample concentrates the HOCD so there is more potent redox cycling capability.

It is clear that the higher the concentration of HOCD in cells or solution, the faster the redox cycling. This shows the propensity of HOCD to deplete oxygen. From Fig. 1, it is shown how quickly HOCD on its own can redox cycle. This is also shown after the extraction of both the chicken livers (in the pellet, Fig. 12) and the PC12 cells (in the control and Cys-DA treatment), the substance with the highest concentration of HOCD redox cycled at the greatest rate.

Methods for detecting HOCD in PC12 cells were developed successfully. The first stage of experimentation involved adding HOCD to chicken liver extracts in order to determine the optimal extraction from cells (which happened to be tissue). With those methods as a basis, procedures to extract HOCD from PC12 cells were developed and used. Cells treated with cysteinyl dopamine and rotenone had the highest level of redox cycling as expected. Control cells had the lowest. Control cells did have a very high level of redox cycling activity, however, and this obscured the increase in redox cycling caused by cysteinyl dopamine and rotenone. Upon further investigation, it was discovered that considerable background redox cycling activity was present in the medium in which the PC12 cells are grown. The next step, therefore, will be to remove the medium from the cells before extracting HOCD to counteract the background activity.

The ability to detect redox cycling in PC12 cells could potentially permit early detection of neurodegeneration marking PD. Practically, knowing the cells can produce HOCD provides the means to compare the purity and structure of the cell-produced HOCD and the two lab-produced HOCD

preparations. A match in all three structures would allow for detection in actual brains of rats and eventually humans, leading to treatment or a cure.

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USE OF MENTAL HEALTH SERVICES AMONG URBAN ADOLESCENTS: RELATIONS AMONG STIGMA, CHURCH ATTENDANCE AND THERAPY ATTENDANCE

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Major: Psychology
Mentor: Marilyn Franklin, PhD, Department of Psychology

ABSTRACT

Mental illness in adolescents is a growing problem. There are treatments options available such as therapy and medication. However, many are not utilizing these mental health services. Stigma towards seeking mental health is large contributing factor as to why adolescents are not using the resources available. Church and engagement in religious practices are associated with positive mental health outcome that suggest church attendance is beneficial for adolescents. However, this is also a factor in the stigmatization of mental health treatment. The current study investigated levels of stigma related to mental health treatment, church attendance, and mental health services utilization among a sample of adolescents. The study also aimed to explore the relative influence of stigma and church attendance on mental health treatment. Participants in the study were recruited from two Baptist churches and an integrative adolescent primary care health clinic in Detroit, Michigan. Adolescents were deemed eligible for the study based on their age and the availability of a caregiver who was willing to participate. The primary hypotheses were conducted using Pearson's r correlations to test the strength and direction of the association between variables for hypotheses one through six. Independent samples t-tests were used to identify mean differences in self-stigma, social-stigma, and church attendance for youth in the treatment and no-treatment groups. For the exploratory aim, a logistic regression was used to identify the relative influence of self-stigma, social-stigma, and church attendance on therapy attendance. Overall, results revealed few significant associations between church attendance, stigma and mental health utilization among the adolescents.

Keywords: Religion, Religiosity, Church attendance, Spirituality, Stigma, Self-Stigma, Social-Stigma, Mental Health, Adolescents

Mental illness is a significant problem among adolescents. Approximately 10-20% of 5-18 year olds are affected by some form of mental health issues (Kaushik, 2016). Common disorders faced by adolescents are anxiety disorders (31.9%), substance use disorders (11.4%), behavior disorders (19.1%) and mood disorders (14.3%) (Kaushik, 2016; Merikangas, He, Burstein, Swanson, Avenevoli, Cui, & Swendsen, 2010). The incidence of specific disorders varies by demographic factors, but it is widely acknowledged that mental health issues are a concern amongst adolescent across age, gender, gender, ethnicity, and socioeconomic status.

There are many treatment options for adolescents with mental health disorders. For example, cognitive behavior therapy (CBT) focuses on goal oriented behavior changing (Antshel, 2014). Another growing field of treatment is art group therapy, which allows adolescents to express themselves through describing their artwork (Riley, 2001). This provides therapists insight into adolescents' mental health. Medication is another option that can be used to treat adolescents battling mental health illness.

MENTAL HEALTH SERVICE UTILIZATION

Despite the available options, only about one-third of adolescents with mental health concerns utilize mental health services (Sylwestrzak, Overholt, Ristual, & Coker, 2015). Some barriers that prevent seeking this assistance include the individual wanting to handle the problem themselves, lack of parental consent, assuming the problem would improve, and the cost of care (Sylwestrzak et. al, 2015). Turner, Jensen-Doss, and Heffer (2015) reported that race and ethnicity of the family were also factors contributing to why many are not making use of the resources available. Prior research has shown that access to the treatment facility showed to be more prominent barriers to Hispanic families when compared to Caucasian and African-American families. However, African-American parents reported having attitudes that were more negative regarding stigma related concerns to mental health (Young & Rabiner, 2015; Turner, Jensen-Doss & Heffer, 2015). Thus, stigma in combination with parents' attitudes towards seeking assistance has been shown to influence mental health treatment utilization among adolescents.

SELF-STIGMA RELATED TO MENTAL HEALTH

Stigma related to mental health symptoms and treatment has been shown in previous research to be a barrier to mental health service utilization. Self-stigma is one feeling that has been shown to prevent those in need from seeking mental health services (Lannin, Vogel, Brenner, Abraham & Heath, 2016). Self-stigma related to mental health is described as how an individual internalizes societal negative attitudes or ideals towards mental health and applies these negative attitudes towards themselves. Often this is reflected by the person endorsing widely accepted negative public opinions (Corrigan, 2004). When seeking mental health services, one potential first step for an adolescent could be looking online for assistance. Research has identified notable associations between self-stigma and a decrease in the likelihood of seeking mental health information (Lannin, Guyll, Vogel, & Madon, 2013; Vogel,Wade, & Haake, 2006). Self-stigma may cause adolescents and parents to avoid seeking

SOCIAL STIGMA RELATED TO MENTAL HEALTH

Social-stigma related to mental health may also serve as a barrier to seeking treatment among adolescents. Social or public stigma related to mental health refers to the extent to which the public endorses generalized negative perceptions and discrimination towards people with mental health (Pedersen &Paves, 2014). Comprised of mostly stereotypes, social stigma has the ability to prevent people from excelling in life due to fears of being perceived negatively by others. An example of social-stigma is the criminalization of mental health issues within the justice system and in the media. Diefenbach's 1997 study found that 50% of the actors in crime shows, news magazine, reality-based shows and movies portrayed the offenders as mentally ill. Out of the 184 programs in the study, 32% percent of the programs contained at least one mentally ill individual. These portrayals contribute to elevated levels of social-stigma related to mental health.

Adolescents also carry self-stigma towards seeking mental health resources (Kranke, Guada, Kranke & Floersch, 2012). A study conducted by Moses (2004) found that 25%-32% of the adolescent sample felt that shame or embarrassment would come from peers knowing about their mental health issues. This study also found that the participants who reported higher levels of perceived public stigma also reported higher levels of self-stigma, lower self-esteem and had a higher depression scores. Other studies have reported that some adults view children as more prone to violent behavior, and may want to distance themselves from the children when a mental health condition are discovered (Williams & Polaha, 2014). Stigma in combination with parents' attitudes towards seeking assistance influences mental health treatment utilization among adolescents (Turner, Jensen-Doss, Heffer, 2015).

The ethnicity of the individual also influences the level of social stigma related to mental health. Feelings of inadequacy and shame are often paired with mental health within the African-American community (Samuel, 2015). Findings from Samuel's 2015 study and several other studies report that instead of seeking treatment for mental health problems, African-American participants preferred to utilize informal cultural practices associated with religion to address their mental health treatment.

CHURCH ATTENDANCE

Church affiliation is viewed as an important element within many cultures. Pargament (1997) & Petts (2014) report with church attendance youth gain a set of skills that enable them to cope with life stressors. Regular attendance could potentially increase the adolescents' impression of connectedness and belonging. Research indicates that African-Americans are more likely to engage in religious practices than other races (Breland-Noble, Wong, Childers, Hankerson & Sotomayor, 2015). Twenty-four percent of African-American youth, in comparison to other racial backgrounds, reported higher levels of participation within churches whose congregations were predominantly black (Breland-Noble et. al, 2015).

Religiosity has been correlated with positive outcomes pertaining to mental health (Berry & York, 2011). Higher levels of religious attendance among adolescents have been found to be associated with a decrease in depressive symptoms when monitored through higher-grade levels (Dew, Daniel, Goldston, & Koenig, 2008). When families are involved in the social aspect of religious attendance, data has shown that children positively benefit from the participation. Higher household church attendance has been associated with a lower likelihood of divorce (Call & Heaton, 1997). A secure home life could possibly protect the adolescent from stress related factors that may increase the probability of mental health symptoms.

Church and engagement in religious practices are associated with positive mental health outcome that suggest church attendance is beneficial for adolescents. However, this is also a factor in the stigmatization of mental health treatment (Breland-Noble et. al, 2015). Prayer, a key component in religious practices, is often seen as a solution to problems an individual may be facing. When facing issues pertaining to mental health problems, one is encouraged to give their problems to God. This promotes the idea that the person does not have control over their treatment or recovery which makes it less likely they will seek formal mental health services (Breland-Noble et. al, 2015).

CURRENT STUDY

The current study investigated levels of stigma related to mental health treatment, church attendance, and mental health services utilization among a sample of adolescents. The study also aimed to explore the relative influence of stigma and church attendance on mental health treatment. Prior research has examined the relations among stigma, church attendance, and mental health symptoms, but research on these factors among adolescents is more limited. Based on the previous literature the current study proposed the following aims and hypotheses:

Aim One: The first study aim was to explore the association between self-stigma and social-stigma related to mental health treatment among adolescents.

Hypothesis 1: Self-stigma will be positively associated with social-stigma, such that as self-stigma increases, social-stigma is also higher.

Aim Two: The second study aim was to explore the association between mental health related stigma and mental health treatment.

Hypothesis 2: Self-stigma will be negatively associated with mental health treatment, such that participants with higher levels of self-stigma will report no current or past therapy attendance.

Hypothesis 3: Social-stigma will be negatively associated with mental health treatment, such that as participants with higher levels of social-stigma will report no current or past therapy attendance.

Aim Three: The third study aim explored the associations between church attendance and mental health related stigma.

Hypothesis 4: Church attendance will be positively associated with self-stigma, such that as church attendance increases, self-stigma is also higher.

Hypothesis 5: Church attendance will be positively associated with social stigma, such that as church attendance increases, social stigma is also higher.

Aim Four: The third study aim investigated the relationship between church attendance and mental health service utilization.

Hypothesis 6: Church attendance will be negatively associated with mental health treatment, such that participants who report higher levels of church attendance will report no current or past therapy attendance.

Aim Five: The final aim of the current study was to explore the relative influence of self-stigma, social-stigma, and church attendance on mental health service utilization. Because there is less research evidence regarding this question, the aim was more exploratory in nature; there was no associated hypothesis regarding which variable would be more strongly related to mental health treatment.

METHOD

Participants

Participants in the study were recruited from two Baptist churches and an integrative adolescent primary care health clinic in Detroit, Michigan. Adolescents were deemed eligible for the study based on their age and the availability of a caregiver who was willing to participate. The current study focuses on a subsample from the larger research study selected based on completion of measures relevant to the study. A total of 99 adolescents were included in the sample for this study. The overall sample included 71 (72%) adolescent females and 28 (28%) adolescent males who were between the ages of 13 to 18 years (M = 14.97, SD=1.52; see Figure 1). With respect to ethnicity, 73 adolescents (73%) described themselves as African-American/Black, 3 adolescents (3%) were Caucasian/White, 2 adolescents (2%) were Latino-American, and 12 adolescents (12%) identified themselves as Other (see Figure 2). There was no ethnicity reported for 9 adolescents (9%). Household income was reported by the primary caregiver involved in the study (see Figure 3). The family income for 31 adolescents (31%) was less than 20,000 a year, between 20,000 and 50,000 for 39 adolescents (39%) and greater than 50,000 for 16 adolescents (16%). There was no family income reported for 13 adolescents (13%).

Procedure

Institutional review boards at Wayne State University and the hospital where this research took place approved all procedures prior to the study. The pastors of the church recruitment sites reviewed and approved the procedures. The participants were recruited either by a trained research assistant or the recruitment flyer. Appointments were scheduled for the Child and Family Studies Lab at Wayne State University or in the participants' home based on family preference. At the time of the scheduled appointment, adolescents indicated their willingness to participate in the study and were then separated to complete the study. The study was conducted by a trained research assistant in a face-to-face format. Youth who were less than 18 years of age provided two forms of consent. Their own written informed assent and their legal care givers written informed consent. Participants who were 18 years old supplied written informed consent. Adolescent participants completed a semi-structured interview including demographic information, questionnaires, two story-telling tasks, and a receptive vocabulary task. The adolescents and caregivers each received $20 in the form of a gift card or cash for their participation at the end of the study.

Measures

Church Attendance. The Religious Practices and Attitudes Questionnaire (RPAQ; adapted from Fetzer Institute/National Institute on Aging Working Group, 1999) was used to assess church attendance. This measure provides an overall measure of attitudes towards organized religious practices (See Appendix C). For the purpose of this study we used item number three which asked adolescents to answer, "How often

do you attend religious services?" This question assesses the frequency of religious practices on a 6-point scale (0 = never, 1 = less than yearly, 2 = 1-2 times/year, 3 = several times/year or monthly, 4 = weekly, 5 = several times/week). A total of 13 adolescents (13%) described their church attendance as never, 7 adolescents (7%) reported less than yearly, 9 (9%) adolescents reported more than 2 times a year, 23 adolescents (23%) reported several times a year/more than monthly, and 39 adolescents (39%) reported weekly, and 8 adolescents (8%) reported several times a week.

Self-Stigma. Adolescent perceptions of self-stigma related to mental health care were assessed using the 10-item Self-Stigma of Seeking Psychological Help Scale (Vogel, Wade, & Haake, 2006; see Appendix D). This questionnaire was developed and evaluated among college students to measure the impact of seeking psychological help on individuals' self-esteem, with a reported uni-dimensional factor structure and high internal consistency ($\alpha = 0.91$) and validity (Vogel, Wade, & Haake, 2006). Participants were asked to respond on a 5-point Likert scale indicating how much they endorse each item (1 = Strongly Disagree, 2 = Disagree, 3 = Agree and Disagree Equally, 4 = Agree, 5 = Strongly Agree), with five reverse scored items. The items were modified for age appropriate vocabulary and reading level (see Appendix D). Sample items include: "I would feel like I wasn't as good as other kids if I went to a therapist for psychological help" and "I would feel okay about myself if I went to see a therapist". Individuals who score higher on the stigma scales have increased negative stigma pertaining to seeking mental health services. The youth self-stigma scale had total possible points ranging from 10 through 50, with youth scores in this sample ranging from 11 through 41 ($M = 22.72$, $SD = 5.65$).

Social-stigma. Adolescent perceptions of social stigma were assessed using the 5-item Stigma Scale for Receiving Psychological Help Scale (Komiya, Good, & Sherrod, 2000; see Appendix E). This measure was developed to assess perceptions of social stigmatization regarding receiving psychological treatment. This measure has been used among adolescents population in many studies (Pinto, Hickman, &Thomas, 2015). The instrument has been evaluated among undergraduate college students and demonstrated acceptable internal consistency ($\alpha = 0.72$) and construct validity (Komiya, Good, & Sherrod, 2000). Participants were asked to respond on a 4-point scale indicating the extent to which they agreed with each item (1 = Disagree, 2 = Partly Disagree, 3 = Partly Agree, 4 = Agree). Total possible scores range from 4 through 20, and higher scores indicate more perceived social stigma associated with seeking psychological help. The measure was modified in terms of vocabulary and reading level (see Appendix E). Sample items include: "Seeing a psychologist for emotional or interpersonal problems is considered to be a bad thing in my community" and "People that see psychologist are not as well like as other people". Youth social-stigma scores in this sample ranged from 5 through 20 ($M = 10.37$, $SD = 3.57$).

Mental Health Service Utilization. Mental Health Service Utilization was assessed by self-report. Adolescents were asked to identify whether they were currently in treatment and if they had ever been in treatment in the past. Caregivers were asked the same questions about their child and themselves. For the purpose of subsequent analyses, adolescents were coded as currently in treatment if this was endorsed by either adolescent or caregiver report. Fifty-five adolescents (55%) in this sample were identified as currently receiving treatment or having received treatment in the past. A total of 40 adolescents (40%) were identified as not having any current or past treatment (see Figure 4).

RESULTS

Preliminary analyses were conducted on this data prior to analyses. The data were screened for accuracy of data entry, missing values, univariate and multivariate outliers, skewness and kurtosis. Relevant transformations were conducted to address identified skewness and kurtosis. Composite scores were

developed for the self-stigma and social-stigma scales. Descriptive analyses were performed prior to transforming the data for the purpose of describing the descriptive characteristics of the sample and study variable (see Table 1). The primary hypotheses were conducted using Pearson's r correlations to test the strength and direction of the association between variables for hypotheses one through six (see Table 2). Independent samples t-tests were used to identify mean differences in self-stigma, social-stigma, and church attendance for youth in the treatment and no-treatment groups (see Table 3, 4, & 5). For the exploratory aim, a logistic regression was used to identify the relative influence of self-stigma, social-stigma, and church attendance on therapy attendance.

Hypothesis one. I hypothesized that self-stigma would be positively associated with social-stigma. Data showed there was a significant positive correlation between self-stigma and social-stigma ($r = .304$, $p = .002$). This indicates that higher levels of self-stigma were associated with higher levels of social-stigma among this sample of adolescents.

Hypothesis two. I hypothesized that self-stigma would be negatively associated with mental health treatment. Bivariate correlations showed there was a significant negative association between self-stigma and mental health treatment ($r = -.260$, $p = .011$). Independent samples t-test analysis found that adolescents with current or past therapy attendance had statistically significant lower self-stigma scores ($M = 21.62$) compared to adolescents with no therapy attendance ($M = 24.55$), ($t(93) = 2.601$, $p = 0.011$).

Hypothesis three. I hypothesized that social-stigma would be negatively associated with mental health treatment. Bivariate correlations showed a negative association between social-stigma and mental health treatment, however this relationship was not significant ($r = -.143$, $p = .168$). Independent samples t-test found that adolescents with current or past therapy attendance did not have statistically significant lower social-stigma scores ($M = 3.12$) compared to adolescents with no therapy attendance ($M = 3.28$), ($t(93) = 1.390$, $p = 0.168$).

Hypothesis four. I hypothesized that church attendance would be positively associated with self-stigma. This hypothesis was not supported by the data. Data showed that church attendance was negatively associated with self-stigma, and this association was not significant ($r = -.117$, $p = .248$).

Hypothesis five. I hypothesized that church attendance would be positively associated with social-stigma. Data showed church attendance was negatively associated with social-stigma, and this relationship was not significant ($r = -.072$, $p = .480$).

Hypothesis six. I hypothesized that church attendance would be negatively associated with mental health treatment. Although bivariate correlations showed a negative relationship between church attendance and mental health treatment, this association was not significant ($r = -.071$, $p = .497$). Independent samples t-tests found that adolescents with current or past therapy attendance did not have statistically significant lower frequency of church attendance ($M = 2.84$) compared to adolescents with no therapy attendance ($M = 3.05$), ($t(93) = 0.682$, $p = 0.171$).

Exploratory Aim Results. I examined if that self-stigma, social stigma, and church attendance would all have an influence on mental health treatment. An exploring aim of the study was to identify which one of those variables is most strongly related to mental health utilization.

The logistic regression analysis was conducted to predict mental health treatment utilization for 95 adolescents using self-stigma, social stigma and church attendance as predictor variables. A test of the

full model against a constant only model was insignificant, indicating that the predictors as a set were not reliably discriminate between utilization and non-utilization of mental health treatment (chi square = 8.407, $p < .001$ with df = 3).

Nagelkerke's R2 of .114 indicated a weak relationship between prediction and grouping. Prediction success overall was 60% (35% for non-utilization and 78.2% for utilization. The Wald criterion demonstrated that only self-stigma made a significant contribution to prediction ($p = .021$). Social stigma and church attendance were not significant predictors. Exp(B) value indicates that when self-stigma is raised by one unit the odds ratio is nine times as large and therefore those with self-stigma are nine more times likely to utilize mental health treatment.

DISCUSSION

Research indicates that adolescent mental health issues are a significant concern, despite variation in incidence and prevalence of disorders across samples. Further, mental health treatment is underutilized among adolescents. By one estimate, only one-third of adolescents in need of treatment receive mental health services. Therefore, it is important to research the reasons behind the underutilization of mental health treatment among adolescents. The current study investigated the relations among stigma, church attendance, and therapy attendance in an adolescent population. Overall, results revealed few significant associations between church attendance, stigma and mental health utilization among the adolescents. However, there were several findings that supported my hypotheses.

The first aim of this study was to explore the relationship between adolescents' self-stigma and social-stigma related to mental health treatment. Based on prior research it was predicted that self-stigma and social stigma would have a positive association. Consistent with previous research, data showed this hypothesis was correct. Adolescents who reported feelings of self-stigma also reported feeling social-stigma regarding the utilization of mental health treatment (Moses, 2004).

The second aim of this study was to analyze the relationship between stigma and mental health treatment. I predicted that self-stigma would be negatively associated with mental health treatment. This hypothesis was supported. The data showed there was a significant association between self-stigma and mental health treatment. Similar to Kranke and colleagues (2012) findings, in my study adolescents with current or past therapy attendance had statistically significant higher self-stigma scores compared to adolescents with no therapy attendance. When adolescents carry self-stigma, desire to seek mental health services may decrease because of how they perceive someone else is judging their mental health condition. I hypothesized that social-stigma would be negatively associated with mental health treatment. Based on the data analysis there was a negative association between social stigma and mental health treatment. However, the relationship between the variables was not significant.

The third study aim explored the associations between church attendance and mental health related stigma. I predicted that church attendance would have a positive association with self-stigma and social-stigma. These hypotheses were not supported. No significant relationship was found between self-stigma nor social-stigma when associated with church attendance. These findings did not correspond with previous studies that found religious practices have an influence on feelings of self-stigma and on the use of mental health services within African-American populations (Samuel, 2015).

The fourth study aim investigated the relationship between church attendance and mental health treatment. I hypothesized that there would be a negative association between these variables. Consistent

with previous research, there was a negative association found in this study. However, this association was not significant.

The final study aim was more exploratory in nature and sought to clarify the relative influence of self-stigma, social-stigma, and church attendance on adolescent mental health service utilization. I predicted that self-stigma, social stigma, and church attendance combined would be negatively associated with mental health treatment, but was interested to see which variable had the strongest relationship. I found that self-stigma had the strongest prediction of utilization of mental health treatment. This indicates that in this sample, adolescents who reported lower levels of self-stigma were more likely to be in the current/past treatment group than the no treatment group.

STRENGTHS AND LIMITATIONS

One of the strengths of this study is the inclusion of a unique combination of variables. Previous research in this area has focused on stigma, religion, and therapy attendance independently. However, few studies have looked at the relations among these variables. Further, a significant amount of research regarding these variables has been conducted in adults rather than adolescents. Therefore, this study contributes novel information to the research literature on mental health in adolescents.

While we were able to identify an association between adolescents' self-stigma and any current or past therapy attendance, the cross-sectional nature of this data limits my ability to detect the directionality of this association. It is possible that self-stigma prevents adolescents from engaging in mental health services. However, it is also possible that mental health treatment leads to increased feelings of self-stigma. A longitudinal study would reveal more information about the relations between self-stigma and mental health service utilization.

Previous research suggests that there may be differences in mental health symptoms and treatment utilization amongst racial/ethnic groups and socioeconomic levels. Although the majority of the current sample was African American, there were also other racial/ethnic groups represented. There was also some variability in household income ranging from low to high income. Therefore, it is not possible to generalize these results to a particular demographic sample. Further, there were not enough participants in the less represented groups to detect differences between groups. It is not clear whether the associations between variables would look similar if the sample size was larger or if sample characteristics were different.

For the findings that were insignificant, other factors could be more strongly contributed to some variables not being associated. The environment the adolescent lives in, child rearing practices of the parent(s), or possibly different religious denomination could influence the sample.

FUTURE DIRECTIONS

The current study utilized adolescent self-report data rather than parent/caregiver report. However, parents often make decisions for adolescents regarding both church and therapy attendance. Therefore, parent's perspectives on these variables would likely offer valuable information and insight into these issues. Future studies in this area would benefit from the inclusion of parent data on stigma, religion, and therapy attendance.

The rating scales utilized to measure stigma in this study were developed in non-adolescent samples. Therefore, these scales had to be modified and adapted for this population. It is possible that results may have looked different if a scale developed for adolescents was available. Future research in this area would benefit from developing stigma related measures within an adolescent population. This could be done through the use of mixed-method studies that incorporate both qualitative and quantitative data.

A single item was used to measure church attendance, however there are many more aspects of religion and spirituality that were not tapped in the current study. It is possible that variables such as frequency of prayer or quality of relationship with pastor might show a stronger association with mental health service utilization. Future studies should include additional measures of religiosity and spirituality among adolescents.

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APPENDIX A

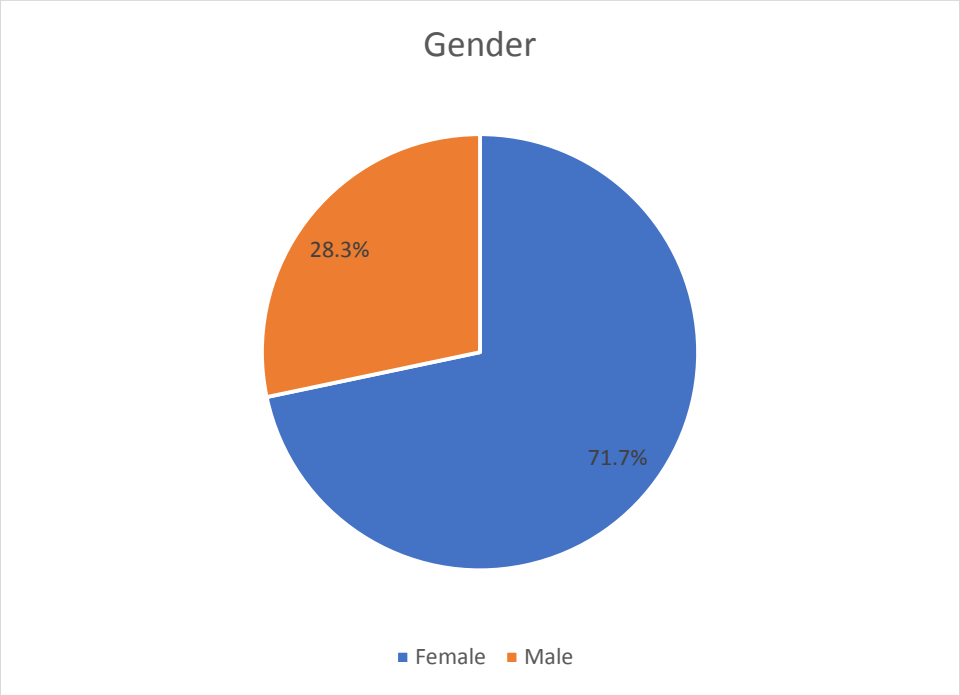

Figure 1. Gender of Adolescent Sample

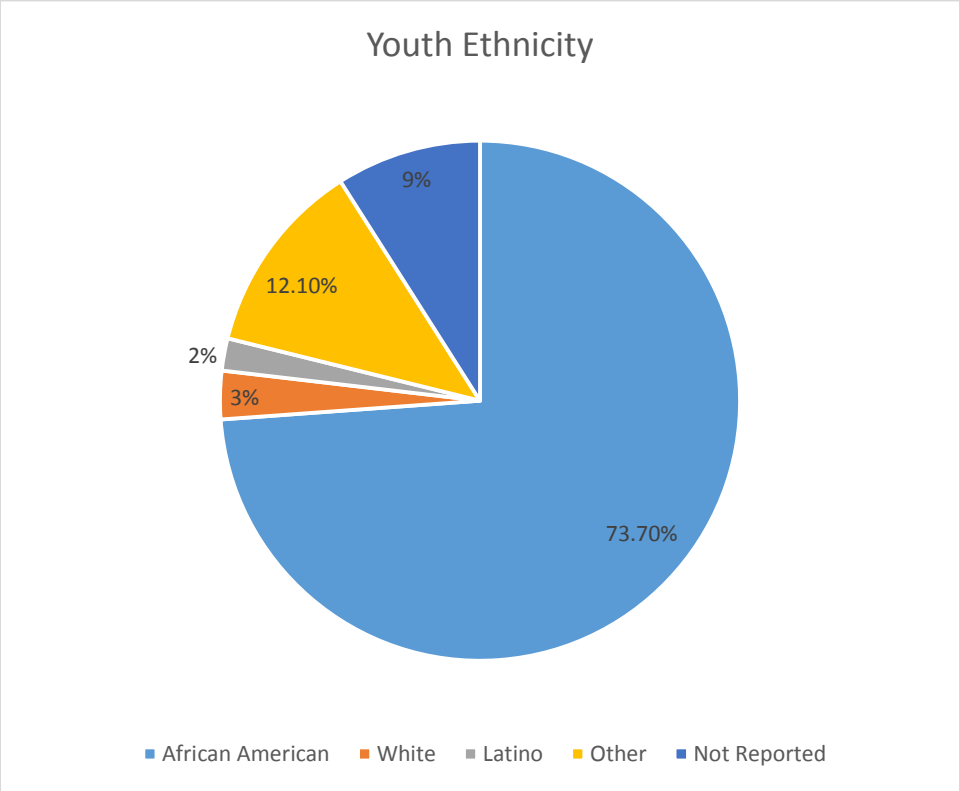

Figure 2. Ethnicity of Adolescent Sample

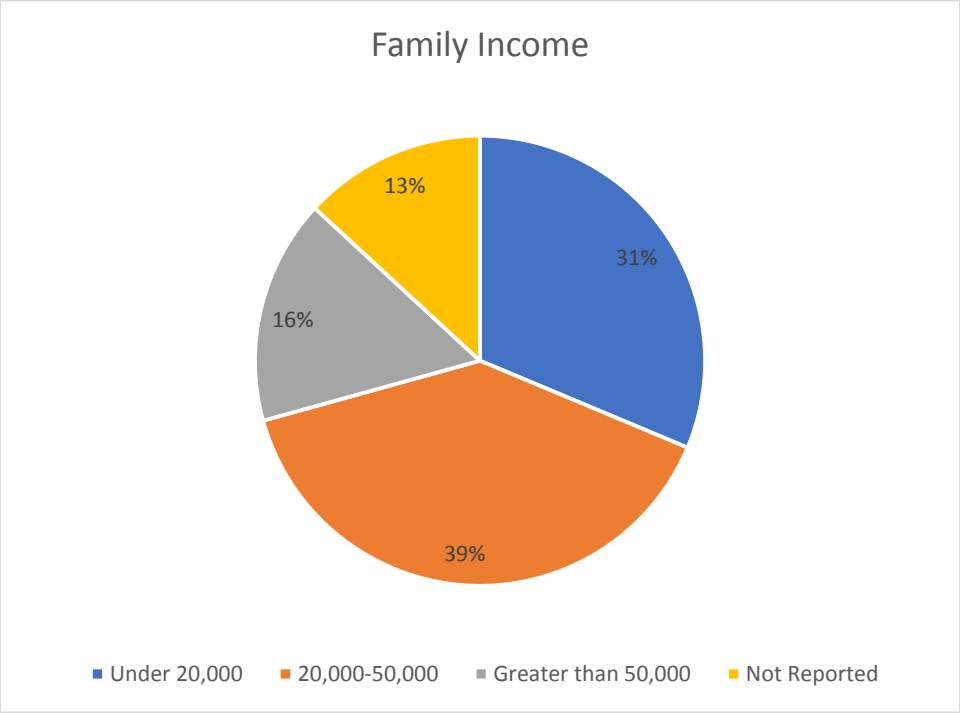

Figure 3. Family Income Reported by Caregiver

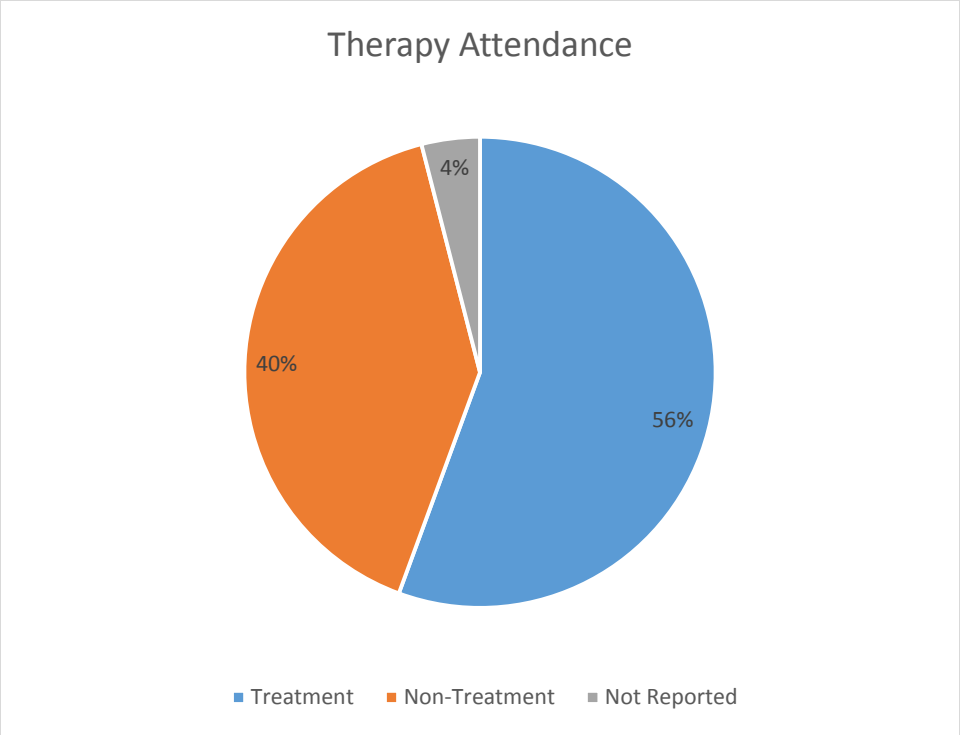

Figure 4. Therapy Attendance among Adolescent Sample

APPENDIX B

Table 1. Descriptive Statistics for Study Variables

	Mean	Standard Deviation	Possible Range	Observed Range
Youth Self-Stigma about treatment	22.72	5.65	10-50	11-41
Youth Social Stigma about treatment	10.37	3.58	4-20	5-20
Church Attendance	2.93	1.51	0-5	0-5

Table 2. Correlations among study variables.

	1	2	3	4
1. Any Mental Health Treatment	--			
2. Youth Social Stigma	-.143	--		
3. Youth Self-Stigma	-.260*	.304*	--	
4. Church Attendance	-.071	-.072	-.117	--

*.Correlation is significant at the 0.05 level (2-tailed)
**.Correlation is significant at the 0.01 level (2-tailed)

Table 3. Independent Sample t-test results of Adolescent Self-Stigma and Mental Health Treatment

	N	Mean	SD	SE	*t*	*p*
Non-Use of Mental Health Treatment	40	24.55	5.14	.813	2.601	.011
Use of Mental Health Treatment	55	21.62	5.62	.758		

Table 4. Independent Sample t-test results of Adolescent Social Stigma and Mental Health Treatment

	N	Mean	SD	SE	*t*	*p*
Non-Use of Mental Health Treatment	40	3.28	.50	.079	1.39	.168
Use of Mental Health Treatment	55	3.11	.58	.079		

Table 5. Independent Sample t-test results of Church Attendance and Mental Health Treatment

	N	Mean	SD	SE	*t*	*p*
Non-Use of Mental Health Treatment	40	3.05	1.41	.223	.682	.497
Use of Mental Health Treatment	55	2.84	1.57	.212		

APPENDIX C

Religious Practices and Attitudes Questionnaire

The following items concern your religious and spiritual beliefs and experiences. Some of the following statements refer to God. If this word is not a comfortable one, please substitute another idea that calls to mind the divine or holy for you. This top rating scale (**PINK)** goes from 1, which means the answer to the question is not at all, to 4, which means the answer to the question is a great deal.

1	**2**	**3**	**4**
Not at all	Somewhat	Quite a bit	A great deal

1. How important is religion in your life?	1 2 3 4
2. How much do you adhere to the teachings and practices of your religion?	1 2 3 4

Now we are going to use the bottom rating scale to indicate how often you engage in the following behaviors.

0	**1**	**2**	**3**	**4**	**5**
Never	Less than yearly	1-2 times/year	Several times/year; Monthly	Weekly	Several times/week

3. How often do you attend religious services?	0 1 2 3 4 5
4. Besides religious services, how often do you take part in other activities at a place of worship?	0 1 2 3 4 5
5. How often do you pray or meditate privately in places other than at church or synagogue?	0 1 2 3 4 5
6. How often do you watch or listen to religious programs on TV or radio?	0 1 2 3 4 5
7. How often do you read the Bible or other religious/spiritual literature?	0 1 2 3 4 5
8. How often are prayers or grace said before or after meals in your home?	0 1 2 3 4 5

9. With which of the following statements (**PINK)** do you most agree?

☐ Pantheistic: I believe that God is all around us. I look to nature to see God. I see God in every person I meet. I believe God is involved in everything we do and touches every person.

☐ Theistic: I believe God is a personal being who reigns over all creation, who looks after us and listens to our prayers and praise. He responds to our needs and protects us from evil.

☐ Deistic: I believe God created the world and everything in it and then left us to fend for ourselves. God is no longer involved in the happenings of this world and looks down on us from above without ever intervening in our lives.

☐ Agnostic: I am not sure what or who God is but I do think that it is beyond our understanding to comprehend such ultimate things. I often wonder if there is a God but I do not think that I will ever know for sure.

☐ Atheistic: I do not believe there is a God. I do not believe that God created the world or controls our affairs. There is no higher power that can intervene in our lives.

APPENDIX D

Self-stigma of Seeking Psychological Help Scale

Now I want you to rate the degree to which each item describes how you might react if you/your child needed psychological help. This scale starts at 1, which means you strongly disagree, and goes to 5, which means you strongly agree.

1	**2**	**3**	**4**	**5**
Strongly Disagree	Disagree	Agree & Disagree Equally	Agree	Strongly Agree

1. I would feel inadequate if I went to a therapist for psychological help.

   Adapted Items

   Child: I would feel like I wasn't as good as other kids if I went to a therapist for psychological help.

2. My self-confidence would NOT be threatened if I sought professional help.

   Adapted Items

   Child: My self-confidence would NOT be threatened if I went to a therapist for psychological help.

3. Seeking psychological help would make me feel less intelligent.

   Adapted Items

   Child: Seeing a therapist would make me feel less smart.

4. My self-esteem would increase if I talked to a therapist.

Adapted Items

Child: My self-esteem would increase (go up?) if I talked to a therapist.

5. My view of myself would not change just because I made the choice to see a therapist.

6. It would make me feel inferior to ask a therapist for help.

7. I would feel okay about myself if I made the choice to seek professional help

Adapted Items

Child: I would feel okay about myself if I went to see a therapist.

8. If I went to a therapist, I would be less satisfied with myself.

Adapted Items

Child: If I went to a therapist, I would be less happy with myself.

9. My self-confidence would remain the same if I sought professional help for a problem I could not solve.

Adapted Items

Child: My self-confidence would stay the same if I went to a therapist for a problem I could not fix.

10. I would feel worse about myself if I could not solve my own problems.

Adapted Items

Child: I would feel worse about myself if I could not solve my own problems.

APPENDIX E

Social Stigma for Receiving Psychological Help Scale

Next, I want you to rate the degree to which each item describes how others might react if you/your child needed psychological help. We are going to use the following rating scale.

1	**2**	**3**	**4**
Disagree	Partly Disagree	Partly Agree	Agree

1. Seeing a psychologist for emotional or interpersonal problems carries social stigma.

Adapted Items

Child: Seeing a psychologist for emotional or interpersonal problems is considered to be a bad thing in my community.

2. It is a sign of personal weakness or inadequacy to see a psychologist for emotional or interpersonal problems.

Adapted Items

Child: A person who sees a psychologist for emotional or interpersonal problems is seen as weak or not as good as other people.

3. People will see a person in a less favorable way if they come to know that he/she has seen a psychologist.

Adapted Items

Child: People will see a person in a less positive way if they find out that he/she has seen a psychologist.

4. It is advisable for a person to hide from people that he/she has seen a psychologist.

Adapted Items

Child: A person should not tell people that he/she has seen a psychologist.

5. People tend to like less those who are receiving professional psychological help.

Adapted Items

Child: People that see psychologists are not as well liked as other people