

SOCIAL DETERMINANTS OF PNEUMOCOCCAL AND INFLUENZA IMMUNIZATION
RATES OF NURSING HOME AND HOMES FOR THE AGED RESIDENTS IN
KALAMAZOO AND CALHOUN COUNTIES, MICHIGAN:
ROLE OF RACE AND SEGREGATION

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A

PROJECT REPORT

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By

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Abstract:

The disparity in health outcomes between African Americans and Caucasians continues to exist (US ACMH, 2009) despite public policy that promotes equity (US DHHS, 2012). Data suggests African Americans over age 65 living in institutions are less likely to receive flu and pneumonia vaccinations (US DHHS, 2013; US DHHS, 2012) and more likely to live in segregated housing (Smith, Feng, Fennel, Zinn, & Mor, 2007). This project collected data on the local level to determine the degree of impact of low vaccination rates and segregated housing on African Americans in Southwest Michigan. Data regarding flu and pneumonia immunization status was collected from 816 residents in 13 nursing homes (NH) and homes for the aged (HFA) in two southwest Michigan counties. The populations of African Americans in the NH and HFA was much less dense than the population of African Americans in the counties where the nursing homes were found suggesting no potential increase risk on the basis of segregated housing for the erosion of community immunity at this local level. A disparity in immunization rates persisted on the local level: Caucasians were 4.7 times (odds ratio = 4.7; $p > 0.001$) more likely than African Americans to be immunized against flu and 1.7 times (odds ratio = 1.7; $p = 0.002$) more likely to be immunized against pneumonia. While the presence of African Americans in a facility did not influence the immunization status of the health care worker, all facility residents spent the majority of their time with nursing assistants, a group of health care workers that was least likely to have received the annual seasonal flu vaccine. Fifty seven percent of nursing assistants in the study NH and 80% of nursing assistants in HFA had received the vaccine compared to 74% and 100% of registered nurses in NH and HFA, respectively.

Table of Contents

Signature Page		i
Cover Page		iii
Abstract		v
Table of Contents		vi
List of Tables		viii
Lists of Figures		x
List of Appendices		xii
Chapter 1	Introduction	1
Chapter 2	Background	2
Chapter 3	Goals and Objectives	12
Chapter 4	Methods	16
Chapter 5	Results	21
Chapter 6	Discussion	37
Chapter 7	Strengths and Limitations	43
Chapter 8	Public Health Implications	47
Chapter 9	Conclusions and Recommendations	49
References		56
Appendices		60

List of Tables

Table	Title	Page
Table 1	Summary of Study Population Immunization Status	22
Table 2	Summary of Percentage of Populations in Nursing Homes and Homes for the Aged	23
Table 3	Percentage of Study Population Immunized Against Influenza	24
Table 4	Percentage of Study Population Immunized Against Pneumonia	25
Table 5	Vaccination Percentage (totals) and Odds Ratio (OR) of Participants Receiving Flu and Pneumonia Vaccination by Race	27
Table 6	Comparison of Flu Immunization Percentage of Study Population to the Flu Immunization Percentage Reported in <i>Healthy People 2020</i>	29
Table 7	Comparison of Pneumonia Immunization Percentage of Study Population to the Pneumonia Immunization Percentage Reported in <i>Healthy People 2020</i>	30
Table 8	Comparison of Study Nursing Homes (NH) Flu and Pneumonia Vaccination Percentages to Reported Percentages at Medicare.gov by Odds Ratio (OR)	31
Table 9	Comparison of Study Population Flu and Pneumonia Vaccination Percentages to Reported Percentages at Michigan Care Improvement Registry (MCIR) by Odds Ratio (OR)	32
Table 10	Summary of Study Population of Health Care Worker and Their Influenza Immunization Status	34
Table 11	Percentage (and Number) of Registered Nurses (RN), Licensed Practical Nurse (LPN) and Certified Nursing Assistant (CNA) Immunized against Annual Seasonal Flu in Study Nursing Homes (NH) and Homes for the Aged (HFA)	35
Table 12	Average Minutes Per Nursing Home (NH) Resident Per Day Spent with Registered Nurse (RN), Licensed Practical Nurse (LPN), and Certified Nursing Assistant (CNA) As Reported by Medicare.gov	36

List of Figures

Figure	Title	Page
Figure 1	Conceptual Framework (Kilbourne et al., 2006)	11
Figure 2	Bar Graph Comparing Study Population Influenza Vaccination Rates by Race	24
Figure 3	Bar Graph Comparing Study Population Pneumonia Vaccination Rates by Race	26
Figure 4	Bar Graph Comparing the Percentage of Flu and Pneumonia Vaccinated People Over Age 65 in Michigan Care Improvement Registry (MCIR), <i>Healthy People 2020</i> by Race, Total Population Reported at Medicare.gov, and the Study Population by Race and Total Population	33

List of Appendices

Appendix A	Survey of Nursing Facilities	60
Appendix B	Initial Introductory Letter	62
Appendix C	Informed Consent Form	3
Appendix D	Social Determinants of Pneumococcal and Influenza Immunization Rates Research Design and Methods Table	65

Chapter 1: Introduction

There is a disparity in the health quality and disease prevention measures between the African American and Caucasian populations in the United States (Advisory Committee on Minority Health, 2009). In the adult population, prevention of infectious diseases may be hampered because African Americans could be less likely to receive immunizations such as pneumococcal and influenza vaccines. Some of the inequity that exists in disease prevention may be attributable to segregation. The conceptual model for research regarding health disparities provided by Stewart and Napoles-Springer (2003) suggests the social determinants of health should be examined in the health care system. Segregation in nursing homes and long term care facilities may add an additional disease risk to the population due to the erosion of herd immunity. Herd or community immunity occurs when a significant portion of the population is vaccinated which leads to protection for the unvaccinated, as an outbreak of disease is less likely (National Institute of Allergy and Infectious Diseases [NIAID], 2013). Annual seasonal flu and pneumococcal disease are two vaccine preventable diseases found among adults for which community immunity plays a role in disease prevention (Haber, et al., 2007 & NIAID, 2013)

Chapter 2: Background

Pneumonia and Influenza

Pneumonia is an inflammation of the alveoli of the lungs often caused by microbes, which are generally viral or bacterial (Mayo Clinic, 2013). Fifty percent of community-acquired pneumonia (CAP) cases are viral, and the majority of the remaining cases are caused by a variety of bacterial agents. Loebinger and Wilson (2008) report the incidence of CAP is 5-11/1000 adults. The authors also state that up to 42% of cases will require hospital admission, and the mortality rate among patients with CAP is between 5-12%.

The impact and epidemiology of CAP is difficult to determine because population-based statistics rarely report pneumonia alone, but rather the combination of pneumonia and influenza (Lutfiyy, Henley, Chang, & Reyburn, 2006). Brar and Neiderman (2011), as reported in Sato, et al.(2013), more conservatively estimate CAP cases at 5.6 million in the US annually with approximately 1.3 million of those cases requiring hospitalization.

Sato, et al. (2013), found the median cost of treating hospitalized CAP patients was \$9,380 (the mean was \$15, 385) and treatment costs rose with age and risk factors. The authors indicate the overall cost of treating CAP is estimated to be \$17 billion, which they suggest underestimates the actual cost (Sato, Rey, & Nelson, 2013). *Streptococcus pneumonia*, a Gram positive bacterium, is the leading cause of CAP in hospitalized patients, accounting for 20-60% of the cases (Jones, Jacobs, & Sader, 2010). Given these data, the cost of treating CAP attributed to *Streptococcus pneumoniae* ranges from 20% (240,000 cases) costing nearly \$225 million, to 60% (720,000 cases costing \$675 million).

The cost estimate for treating CAP is important because the leading cause of the disease, *Streptococcus pneumoniae* infections, can be prevented by vaccinating against the microbe. *Streptococcus pneumoniae* cells are surrounded by a layer known as a capsule. The capsule is known to stimulate the immune response in the human host and identifies the strain or serotype of the organism. While there are over 90 different capsules, or serotypes, of *Streptococcus pneumoniae*, 23 of the capsule types are associated with CAP as well as other diseases (Loebinger & Wilson, 2008).

A vaccine containing the 23 capsular polysaccharides was shown to be effective when administered to adults to prevent CAP caused by *Streptococcus pneumoniae*, although this is somewhat controversial. In a double-blind, randomized, placebo-controlled study of nursing home patients in Japan, Maruyama, et al. (2010), found a 45% reduction in pneumonia from all causes and pneumococcal pneumonia among over 1,000 patients in the study. Further, no deaths were reported from pneumococcal disease in the vaccinated patients. By contrast, 35% of patients who were not vaccinated died from their pneumococcal infection. (Maruyama, et al., 2010). The vaccine is recommended by the Advisory Committee on Immunization Practices (ACIP) for people 65 years of age and older and for people 19-64 years of age with underlying medical conditions including asthma and smoking (Nuorti & Whitney, 2010).

Influenza is a seasonal viral disease caused by an enveloped RNA virus. Usually a self-limited disease in most people, the virus causes an upper respiratory illness characterized by fever and malaise that can last up to two weeks. The disease can be more severe as the virus is responsible for 3000 to nearly 50,000 seasonal flu deaths (CDC, 2013) and over 200,000 hospitalizations per year in the United States (US DHHS, 2013) depending on the severity of the symptoms caused by the dominant yearly strain. Ninety percent of the deaths from the annual

seasonal flu occur in people who are over 65 years of age (Centers for Disease Control and Prevention [CDC], 2012). The CDC estimates the annual flu related death rate in people over 65 years of age to be 17/100,000 (Morbidity and Mortality Weekly Report [MMWR], 2010).

The CDC (2012) estimates the economic impact of the annual seasonal flu to be \$4.6 billion in direct medical costs, such as office visits for a physician, medication and laboratory costs, and hospitalizations. Molanari, et al. (2007) used modeling and epidemiologic data to estimate the cost associated with seasonal flu in 2003 and reported \$10.4 billion in direct medical costs.

When pneumonia and influenza are reported together they are the eighth leading cause of the death in the United States (CDC, 2013). African American men are more likely to die from pneumonia and influenza than Caucasian men (24.4 and 20.9 per 100,000 respectively), while Caucasian and African American women die at nearly the same rate, 15.5 and 16.7 per 100,000 respectively. Together, pneumonia and influenza are the 7th leading cause of death in people over 65 years of age. The American Lung Association (2010) estimated the cost in 2005 of pneumonia and influenza infections to the US economy to be over \$40 billion.

Vaccinations reduce death due to pneumonia and influenza among people over 65 (American Lung Association, 2010). The ACIP recommends the 23-valent pneumococcal polysaccharide vaccine for adults 65 years and older and 19-64 year olds with underlying medical conditions (MMWR, 2010). Immunity to the capsular polysaccharides wanes in later years and people over 65 years of age require boosters if they received pneumococcal vaccine before age 65 (Haber, et al., 2007). While data regarding community immunization rates is not available, *Healthy People 2020 (HP2020)*, 2013, targets 90% vaccination rate in this population

(US DHHS, 2012). The ACIP recommends that all people over 6 months of age receive the annual seasonal flu vaccine, unless contraindicated (CDC, 2013). Plans-Rubió (2012) indicates influenza vaccination rates of 80% for the general population and 90% vaccination rates for high risk populations are needed to provide community immunity for influenza.

Vaccinating health care workers (HCW) prevents the spread of influenza in nursing homes (CDC, 2013). The ACIP recommends vaccination of all health care workers against the annual seasonal influenza (CDC, 2013). The vaccination rate for health care workers is below the 90% target in *HP2020* (US DHHS, 2012). The vaccination rate for health care workers during the last two flu seasons has been approximately 63% (CDC, 2013). While vaccination rates for nurses are just over 79%, nurse's aides have the lowest vaccination rate at just over 49% (CDC, 2013). Low vaccination rates among health care workers put nursing home residents at risk for influenza. Since African Americans are likely to live in nursing homes with indicators of substandard care (Smith, Feng, Fennel, Zinn, & Mor, 2007), they may be more likely to encounter unvaccinated health care workers.

Segregation and Race

Minorities receive lower quality health care compared to their white counterparts (Advisory Committee on Minority Health, 2009; Smedley, Stith, & Nelson, 2002). The ethical and moral components for providing equal access and care are the foundation of sound public health policy. The Institute of Medicine's report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* (2002), offers compelling evidence of the effects of disparity. The report identifies sources of inequity and prejudice in health care settings, and provides recommendations to address the issue in an unequivocal call to action (Smedley, Stith, & Nelson,

2002). Despite these recommendations made at the dawn of the 21st century, the 2009 Recommendation Report from the Health and Human Services Advisory Committee on Minority Health (ACMH) entitled *Ensuring that Health Care Reform Will Meet the Health Care Needs of Minority Communities and Eliminate Health Disparities* found the gap in health care access and outcomes remained unchanged or widened between 2002 and 2009 and that in excess of 80,000 deaths a year among minority populations are attributable to lack of equitable care (ACMH, 2009).

The ACMH Report (2009) states that 75% of health care dollars are spent on preventable diseases (United States Advisory Committee on Minority Health, 2009). *Healthy People 2020* (HP2020) estimates that 42,000 adults die annually from vaccine preventable disease in the United States (US DHHS, 2013). Influenza vaccine reduces hospitalizations and risk of death in the elderly (Nichol, et al., 2003). Similarly, pneumococcal vaccine reduces the risk of pneumonia and death in geriatric populations (Wagner, Popp, Vlasich, & Rosenberger-Spitzy, 2003).

Healthy People 2020 goals provide for promoting equity in health and immunization measures (US DHHS, 2012). Focus on infectious disease prevention through immunizations is the goal of HP2020 Objectives IID. Subsections of Objective IID address goals for the promotion of seasonal influenza vaccination (Objective IID-12) and provisions for pneumococcal vaccinations (Objective IID-13). African Americans are less likely to have received these immunizations in nearly all categories (US DHHS, 2013). Subsections of *Healthy People 2020* specifically address immunization rates among adults, institutionalized populations, and adults at high risk.

Healthy People 2020 Objective IID-12 addresses influenza vaccine coverage. The goals are to increase vaccine coverage as follows:

- Increase from 38.6% to 80% the percentage of high risk non-institutionalized adults receiving seasonal influenza vaccine. Current rates are 38.7% for Caucasians 37.7% for African Americans.
- Increase from 66.6% to 90% the percentage of people over 65 who are not institutionalized who receive the seasonal influenza vaccine. Current rates are 68.1% for Caucasians; 52.9% for African Americans.
- Increase from 62.3% to 90% the percentage of people over 18 living in long term care or nursing homes who received the seasonal influenza vaccine. Current rates are 63.6% for Caucasians; 55.6% for African Americans.
- Increase from 45.5% to 90% the percentage of health care workers vaccinated for seasonal influenza. Current rates are 47.2% of females; 39.9% males; 48.4% for Caucasians; 31.9% for African Americans.

(US DHHS, 2013)

Healthy People 2020 objective IID-13.1 addresses pneumococcal vaccine coverage. The objective targets a 90% vaccination rate for people over 65 who are vaccinated against pneumococcal disease. Using the most current data available from 2008 as the baseline for this *HP2020* objective, the follow are the baselines for each group:

- 60.1 % of the entire population has been vaccinated.
- Nearly 63% of females are vaccinated and just over 56% of men have received the vaccine.

- Over 62% of Caucasians over age 65 are vaccinated while 44.1% of African American populations in this age group are vaccinated. (US DHHS, 2013)

Objective IID-13.2 targets 60% of high-risk 18-64 year olds for the pneumococcal vaccine. Data from 2008 indicates 16% of the high-risk population receives the vaccine (over 18% of females and 15% of males in the target group, 16.5% of whites and 16.3% of blacks) (US DHHS, 2013). Objective IID-13.3 is to increase to 90% the percentage of those 18 and older who are institutionalized who are vaccinated for pneumococcal disease. Baseline data from 2005-2006 indicates that 66.4% of this population is vaccinated (68.1% of females; 63.5% males; 68.4% of Caucasians; 55.3% of African Americans) (US DHHS, 2013).

Social determinants of health (SDOH) are the “conditions in which people are born, grow, live, work, and age...” (World Health Organization, n.d.). The interactions between the social fabric of the community and the individual are factors that impact health. Residential segregation is a SDOH (HealthyPeople.gov, 2013). Minority populations are likely to live in racially segregated housing. African Americans make up 13% of the US population (Rastogi, Johnson, Hoeffel, & Drewery, 2011), but live in communities where 45% of the population is African American (Frey, 2010).

African Americans who live in institutional settings, such as nursing homes, are also more likely to be segregated. Smith, et al. (2007), in a study of over 14,000 nursing homes serving nearly 1.5 million people, found a high degree of racial segregation, with the Midwest Region being the most highly segregated in the country. The study also found that African Americans are significantly more likely to reside in nursing homes that are deficient in the care

they provide, lack adequate staffing, and are financially suspect (Smith, Feng, Fennel, Zinn, & Mor, 2007).

African Americans have historically lower immunization rates compared to Caucasians (ACMH, 2009), both in the general population and in institutional settings (Bardenheier, et al., 2011 and (Churchwell & Schaffner, 2011). The segregated long term care facility leads to an increased risk of influenza or pneumonia due to the lack of community immunity in an under-immunized population. Strully (2011) uses data from the National Nursing Home Survey of nearly 1,200 nursing homes and over 12,500 residents to determine the impact of segregation on vaccine uptake. The author found that segregation in the nursing home increases the likelihood that African Americans will not be vaccinated. Further, the author uses modeling to predict that a spatially concentrated unimmunized population provides less community immunity protection from influenza (Strully, 2011).

Support for the Study

The Recommendation Report from the Health and Human Services Advisory Committee on Minority Health identifies 19 principles and 3 recommendations for health equity (United States Advisory Committee on Minority Health, 2009). The report suggested public health infrastructure must address SDOH, especially in minority and underserved populations and that health departments must hold their agencies accountable for health disparity. The authors further suggest that data collection relative to SDOH and health disparities is very important in order to accurately describe and address these issues. Local data collection helps local agencies understand and develop community specific goals to address health disparities (ACIP, 2009)

The National Association of County and City Health Officials (NACCHO), in a policy statement regarding immunization inequities, argues for more local data collection studies. The policy statement calls for support of local health departments as they characterize SDOH as related to immunization inequities. The NACCHO (2013) supports the efforts of the local health department to "...explore and institute strategies to better capture local level immunization rates (p. 1)."

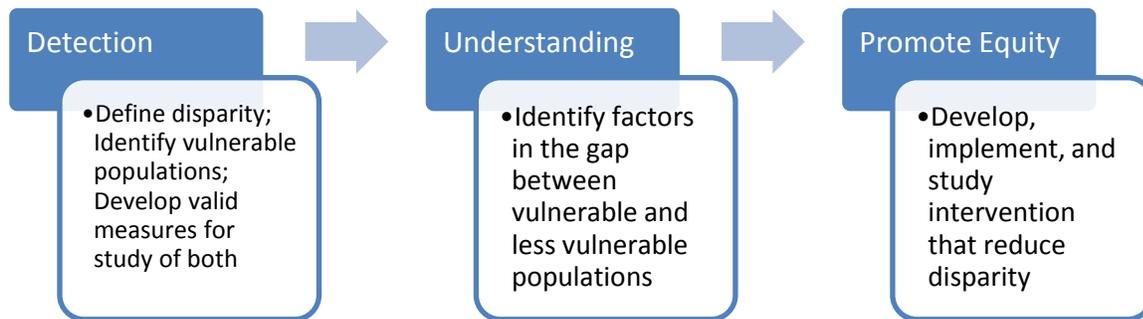
Problem Statement

African Americans are more likely to live in segregated nursing homes than Caucasians. National data suggests African Americans are less likely to be immunized against annual season influenza and pneumococcal disease than Caucasians. A concentrated population of unimmunized people would erode community immunity. Susceptible residents will be more likely to acquire infections from unvaccinated visitors, health care workers, and other residents. While modeling predicts erosion of community immunity and data suggests a lack of equity in the number of African Americans who receive flu influenza and pneumococcal vaccine compared to their Caucasian counterparts, there is little data on the local level to determine the interaction of segregation in housing and the possible impact on immunization rates in racial groups.

The conceptual framework for this study was proposed by Kilbourne et al., (2006) who suggest detection and measurement of health disparities in vulnerable populations will provide a functional understanding of the problems that lead to health inequity for vulnerable populations. The focus on detection of inequity in a health care setting based on a SDOH is considered by the authors a more global approach because practitioners and policymakers might be able to change

the structure of the system to provide for equity. The authors provide a framework for moving disparities research forward as referenced by the National Institutes of Health, the ACMH, NAACHO, and *HP2020*. (See Figure 1)

Figure 1: Conceptual Frame Work (Kilbourne, et al., 2006)



Chapter 3: Goals and Objectives

Project Goal: The overall goal of this proposed project is to characterize the relationship between immunization rates for influenza and pneumococcal disease and race in local adult populations in nursing homes and aging adult care homes in the Kalamazoo and Calhoun County area.

Specific Aims for the Proposed Project

Specific Aim #1

One aim of this project was to determine the local rates of immunizations among adults in nursing homes for the pneumococcal and influenza vaccines. *HP2020* Objectives IID provide goals and baseline national data for pneumococcal and influenza immunization coverage for adults over the age of 65 and institutionalized adults between 19 and 64 years of age.

Objective: Compare the rates of pneumococcal and influenza immunization (assessed and given) to the percentage of Caucasian and African Americans living in nursing homes and homes for the aged (NH/HFA).

Alternate Hypothesis (H_A): The rate of patients who were assessed and offered influenza and pneumococcal immunizations among short stay (less than 120 days) adult NH/HFA residents will be significantly higher in nursing homes with fewer African Americans in the population compared to those with a high population of African Americans.

Null Hypothesis (H_0): The rate of residents who were assessed and offered influenza and pneumococcal immunizations among short stay adult nursing home patients will not

be significantly different in homes with fewer African Americans compared to homes with a high population of African American.

H_A: The rate of patients who were assessed and offered influenza and pneumococcal immunizations among long stay (greater than 120 days) adult NH/HFA residents will be significantly higher in homes with fewer African Americans in the population compared to homes with a high population of African Americans.

H_O: The rate of patients who were assessed and offered influenza and pneumococcal immunizations among long stay adult NH/HFA residents will not be significantly different in homes with fewer African Americans compared to homes with a high population of African American.

H_A: The rate of patients who were assessed and offered influenza and pneumococcal immunizations among short stay adult NH/HFA residents will differ significantly from the rates reported at the national level in the *Healthy People 2020* report for Kalamazoo and Calhoun County NH/HFAs with few African Americans.

H_O: The rate of patients who were assessed and offered influenza and pneumococcal immunizations among short stay adult nursing home patients will not differ significantly from the rates reported at the national level in the Health People 2020 report for Kalamazoo and Calhoun County NH/HFAs with few African Americans.

Specific Aim #2

The second aim of this project was to better understand the relationship between potential segregation in nursing homes and aging adult care homes and the likelihood that residents are

vaccinated. Since there is a theoretical degradation in community immunity due to segregated housing, it is important to determine the degree to which the nursing home environment is segregated and if this SDOH is related to pneumococcal and influenza immunization rates.

Objective: Measure the Caucasian and African American populations in Kalamazoo and Calhoun County NH/HFAs.

H_A: Kalamazoo and Calhoun county NH/HFAs are segregated by race indicated by a demographic population that varies significantly from the general population.

H_O: Kalamazoo and Calhoun County NH/HFAs are not segregated by race indicated by a demographic nursing home population similar to the general population.

Specific Aim #3:

Health care workers (HCW) have low rates of immunization for influenza which puts residents in care facilities at increased risk for flu. The reported immunization rate of HCW vary depending on the source, from Christini et al., (2007) who found the rate of immunization among nurses 46% compared to 42% of nurse's aides, to the CDC (2013) which reports the vaccination rate for HCW during the last two flu seasons has been approximately 63%. A 2012 Morbidity and Mortality Weekly Report found just over 54% of HCW in long term care facilities received the influenza vaccine. The unimmunized HCW represents an additional threat to an under immunized population. If African Americans are less likely to be immunized against influenza then they are more susceptible to nosocomial disease transmission from the infected HCW.

Objective: Measure the rate of immunizations among health care workers in Kalamazoo and Calhoun County NH/HFAs

H_A: Health care workers in nursing homes with a higher population of African Americans are less likely to have received the annual seasonal influenza vaccine.

H₀: Health care workers (HCW) in nursing homes with a higher population of African Americans will be as likely as HCW in other nursing homes to have received the annual seasonal influenza vaccine.

Chapter 4: Methods

Study Population

After consulting the epidemiologist and the interim Deputy Director of the local Health and Community Services agency, the study population was identified. The initial plan was to gather data from nursing homes in Kalamazoo County. In subsequent meetings with the interim Deputy Director, the Long Term Care Ombudsman, and the Director of Older Adult Services, the initial proposal was expanded to include nursing homes and housing for the aging in Kalamazoo and adjacent Calhoun County. The study population includes all people over age 65 in all NH and HFA in Kalamazoo and Calhoun counties.

There were 13 NH in Kalamazoo County, nine NH in Calhoun County, 21 HFA in Kalamazoo County and 15 HFA in Calhoun County. Two NH were operated by the same administration; 5 administrative offices were responsible for 14 HFA. At the time of the study there were 1169 beds in Calhoun and Kalamazoo County NH (Centers for Medicare and Medicaid Services, 2014); no such database to estimate the population exists for HFA. The 816 residents in the participating NH and HFA represented 1.5% of people over 65 in Calhoun and Kalamazoo County

The Long Term Care Ombudsman provided a list of HFA names and addresses in the two counties. Nursing homes names and locations were identified at Medicare.gov and confirmed with the Long Term Care Ombudsman.

Survey Development

The study relied on self-reported survey data collected from NH and HFA in two counties in Michigan. The study hypotheses and input from the Director of Older Adult Services, the Long Term Care Ombudsman and the epidemiologist at the Community Health and Services Agency in Kalamazoo County guided the development of survey tool. The survey requested information on the number of residents of each race (Caucasian, African American, Hispanic) receiving flu and pneumonia vaccinations, the number of HCW who were registered nurses (RN), licensed practical nurses (LPN), and certified nursing assistants (CNA) who were immunized against annual seasonal flu, the type of reimbursement for care the institution receives (private, Medicare, Medicaid), whether the facility uses electronic health records, and a request for the sick day policy of the institution. (See Appendix A).

Data Collection

The study proposal and all supporting documents were submitted to the Institutional Review Board (IRB) at the University of Alaska Anchorage for approval. Upon IRB approval of the proposal the introductory letter, informed consent and the survey tool were prepared for mailing. In an Excel document, a unique code number was assigned to each NA and HFA and the unique identifier was recorded on a survey tool. A password was assigned to the Excel file containing agency names and code numbers. A second password-protected Excel file for recording the data was set up at this time containing only the code numbers and no other information about the institutions.

On October 16, 2014, a signed introductory letter (Appendix 1), an Informed Consent (Appendix 2), a coded survey (Appendix 3), and a self-addressed stamped envelope (SASE)

were mailed to each of 58 identified agencies via United States Postal Service (USPS). The investigator contacted each agency twice by phone after the survey packet was mailed. The purpose of the first phone contact was to make certain the institution had received the survey and determine the preference for data collection (return survey in the mail or report the data to investigator in a phone conversation). Several agencies provided a contact name and email for a re-mailed or emailed set of study documents. All agencies indicating their willingness to participate during this phone call also indicated their preference to return the survey by return USPS post. All email contacts secured during this initial phone conversation were subsequently reminded by email to complete the survey. The purpose of the second phone call was to encourage participation in the study and remind the facility directors to return the survey.

Survey data were recorded by the investigator in the password-protected code only Excel file as they were returned by USPS post or email. All surveys received by November 18, 2014, were included in the data set. Each institution submitting a survey received a note of thanks for participating in the study.

Protection of Human Subjects

All NH and HFA names were given a code number and saved in a password-protected Excel file. All data was recorded in a separate Excel file containing only the identifying code of the agency. This second code-only file was also password protected. All data was recorded in the report as aggregate data. It is further noted that in one county (Calhoun) only one NH returned the survey. In keeping with standard practice to protect the identity of participants, no county comparison was used to describe the data in order to protect the responding NH from being identified.

Data Analysis

Data from surveys returned by Calhoun and Kalamazoo County nursing homes and homes for the aged were analyzed. All analyses and calculations were performed using EXCEL data analysis software.

Data from 816 residents from 13 NH and HFA were analyzed. The rates of immunizations for pneumonia vaccinations and influenza vaccinations were analyzed by race and comparisons were made between rates of each vaccination for Caucasians and African Americans using odds ratio calculations. The percentage of each population in the study was reported for NH and HFA and total (both NH and HFA combined) Data obtained on the local level was compared to state and national data. Immunization rates for Caucasians and African Americans in the study NH and HFA were compared to the data collected at the federal level and reported in *Healthy People 2020*. Nursing home immunization rates were compared to data provided in the Minimal Data Set for Medicare.

The immunization rate among job classification categories was analyzed. Immunization rates for RN, LPN and CNA were determined and compared to one another using odds ratios. The percentages of immunized HCW were reported by work category (RN, LPN, CNA) for NH, HFA and total (combined NH and HFA). The immunization percentages for each category were compared to national published data obtained from *HP2020*. The immunization percentage for HCW in each category in NH was compared to published data from Medicare.gov. An association between published data and collected survey data was explored using odds ratios. An association between demographic data and HCW immunizations was explored using regression analysis performed in Excel.

The collected study data was analyzed using odds ratios to determine any association between race and immunization status. The study data was analyzed to find associations between the number of Caucasians and African Americans who were reported immunized in published data obtained from the county census, *HP2020*, and Medicare.gov using odds ratios. Regression analysis was performed using Excel to determine if a relationship existed between the variables of race and immunization status in NH and HFA study populations.

Chapter 5: Results

Fifty-eight surveys were sent to area NH and HFA. There were 13 NH in Kalamazoo County, nine NH in Calhoun County, 21 HFA in Kalamazoo County and 15 HFA in Calhoun County. Two NH were operated by the same administration; 5 administrative offices were responsible for 14 HFA. Thus, the number of administrative agencies responsible for completing the survey was 43.

Nineteen surveys were returned to the study investigator representing a return rate of 44% (19/43). A total of 13 surveys with data were analyzed which represents a return rate of 30% (13/43). Six surveys were returned with no data. The administrators of these institutions indicated they could not participate in the survey because of legal issues (2) or were too understaffed to collect the data (4). There were four categories of data to consider in this study: Kalamazoo County NH (KNH), Calhoun County NH (CNH), Kalamazoo County HFA (KHA), and Calhoun County HFA (CHA). Forty percent of KNH, 11% of CNH, 55% of KHA, and 40% of CHA returned the survey. While it would be interesting to compare facilities in the two adjacent counties, the low survey return necessitates the combining of the categories to maintain the confidentiality of the survey results. Thus, data is provided for NH and HFA only and no distinction is made regarding the county.

The questionnaire requested the number of residents in short and long term stay arrangements. The facilities reported only residents in long term housing commitments. The hypotheses regarding flu and pneumonia vaccinations originally make a distinction between short and long stay term residents. Since there were no short term residents reported in the data

set, the results only represent long term stay residents in the NH and HFA in the counties of study.

There were 423 residents reported in 5 NH and 393 residents in 8 HFA. Of the 39 African Americans living in the NH, 32 were vaccinated for flu and 17 were vaccinated for pneumonia. Three hundred and fifty seven of 383 Caucasians were immunized against flu and 266 were immunized against pneumonia. Of the 393 residents reported in the HFA, 29 were African Americans and 352 were Caucasian. Sixteen African Americans and 319 Caucasians were reported to have received the flu vaccine. Eighteen African Americans and 206 Caucasians in the HFA reportedly received the pneumonia vaccination. (See Table 1)

Table 1: Summary of Study Population Immunization Status

	Residents in 5 Nursing Homes	Residents in 8 Homes for the Aged	Total
Total Number of Residents	423	393	816
Total Number of Caucasian Residents Reported	383	352	735
Total Number of Caucasian Residents Reported Immunized Against Flu	357	319	676
Total Number of Caucasian Residents Reported Immunized Against Pneumonia	266	206	472
Total Number of African American Residents Reported	39	29	68
Total Number of African American Residents Reported Immunized Against Flu	32	16	48
Total Number of African American Residents Reported Immunized Against Pneumonia	17	18	35

People over age 65 make up 13% (33,150 people) of the population in Kalamazoo County and 16% in Calhoun County (21,600) (US Census Bureau, 2013) . The 864 residents in the participating facilities represent 1.3% of people over 65 in these two counties. Each county reports 11% of the population is African American and 82% of the population in Kalamazoo County and 83% of the population in Calhoun county identify as ‘white alone’ (US Census Bureau, 2013). The population in the reporting facilities is 8% African American and 91% Caucasian (See Table 2).

Table 2: Summary of Percentage of Populations in Nursing Homes and Homes for the Aged

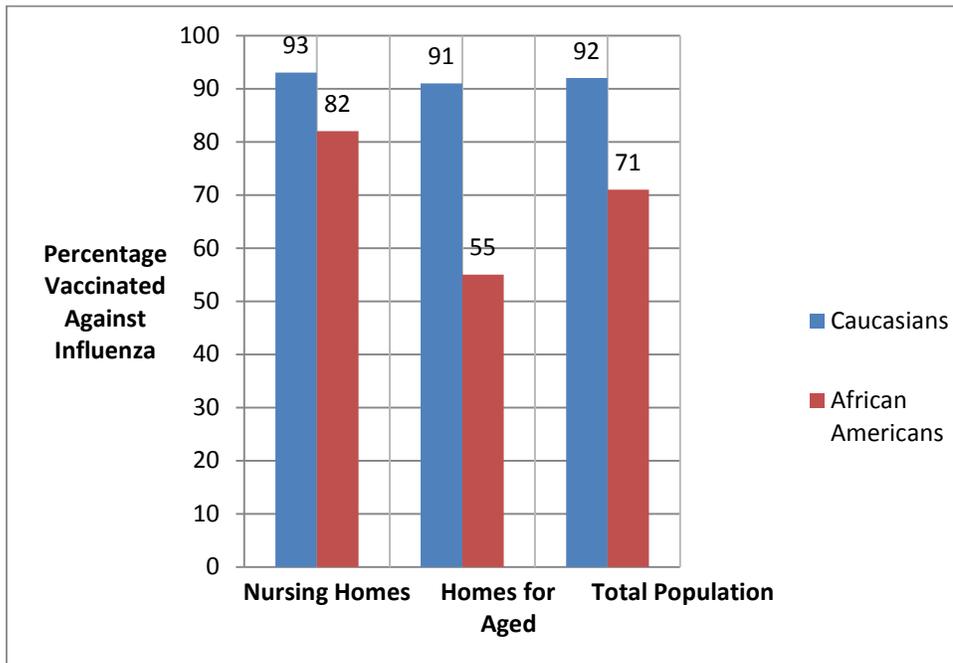
	Study Population Demographic Percentages (Total Number)	
	African American	Caucasian
Nursing Homes	9 (39)	91 (383)
Homes for the Aged	7 (29)	90 (352)
Totals in the Study Population	8 (68)	90 (735)

Eighty nine percent of the total study population was immunized against influenza. Immunization rates for flu were higher in NH, HFA, and in the total study population for Caucasians compared to African Americans. In NH 93% of all Caucasians were immunized against influenza compared to 82% of the African American population. In HFA 91% of the Caucasian population was immunized against influenza compared to 55% of the African American population (See Table 3). Only 71% of the total African American population in the study was immunized against influenza compared to 92% of the Caucasian population (See Table 3 and Figure 2).

Table 3: Percentage of Study Population Immunized Against Influenza

	Caucasian Immunized as a % of Total Population	Caucasians Immunized as % of Caucasian Population	African American Immunized as a % of Total Population	African Americans Immunized as % of African American Population
Nursing Homes	84	93	7.5	82
Homes for the Aged	81	91	4	55
Totals in the Study Population	82	92	6	71

Figure 2: Bar Graph Comparing Study Population Influenza Vaccination Rates by Race



Sixty two percent of the total study population was immunized against pneumonia.

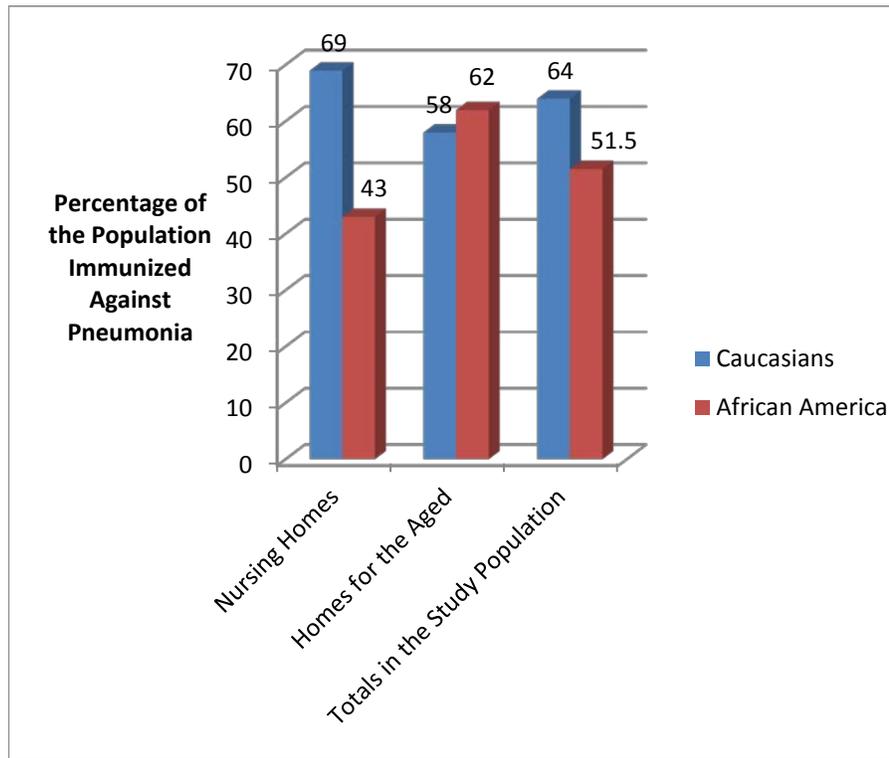
Immunization rates for pneumonia were higher among Caucasians in NH and in the total study

population compared to African Americans. In NH, 69% of the Caucasian population was immunized against pneumonia while 43% of the African American population was similarly immunized. In HFA, 58% of Caucasians were immunized against pneumonia, and 62% of African Americans were immunized against pneumonia. This was the only instance when African Americans were more likely to be immunized. (See Table 4 and Figure 3)

Table 4: Percentage of Study Population Immunized Against Pneumonia

Percentage of Study Population Immunized Against Pneumonia				
	Caucasians Immunized as a % of Total	Caucasians Immunized as a % of Caucasian Population	African Americans Immunized as a % of Total Population	African Americans Immunized as a % of African American Population
Nursing Homes	62	69	4	43
Homes for the Aged	52	58	4.5	62
Total	58	64	4.2	51.5

Figure 3: Bar Graph Comparing Study Population Pneumonia Vaccination Rates by Race



In NH the odds of a Caucasian being immunized against annual seasonal flu is 3.9 times that of an African American and the odds of Caucasians being immunized against pneumonia was 2.95 times that of African Americans. In HFA, the odds of a Caucasian being immunized against flu were 8.3 times that of an African American. African Americans were more likely to be immunized against pneumonia in HFA (Caucasians were 0.85 times (OR=0.85) as likely as African Americans to be immunized against pneumonia in HFA). In total, Caucasians were more likely to be reported as vaccinated for flu (OR=4.7) and pneumonia (OR=1.7) than African Americans in NH and HFA reporting data in Kalamazoo and Calhoun counties in Michigan (See Table 5).

Table 5: Vaccination Percentage (totals) and Odds Ratio (OR) of Participants Receiving Flu and Pneumonia Vaccination by Race

Nursing Homes	Flu Vaccination			Pneumonia Vaccination		
	% Vaccinated	% Not Vaccinated	OR	% Vaccinated	% Not Vaccinated	OR
Caucasian	93	7		69	31	
African-American	82	18		43	57	
Odds Ratio			3.9			2.95
Homes for the Aged						
Caucasian	91	9		58	42	
African-American	55	45		62	38	
Odds Ratio			8.3			0.85
Totals						
Caucasian	92 (676)	8 (59)		64 (472)	36 (263)	
African-American	71 (48)	29 (20)		51.5 (35)	48.5 (33)	
Odds Ratio			4.7			1.7

A regression model was used to determine if a relationship existed between the number of African Americans in the facility and the likelihood of vaccination of the residents. The regression model proposing a relationship between racial make-up of the population and flu vaccinations yielded an F value of 0.96_{df1, df9} and *p*-value of 0.4. The model investigating the relationship between the racial make-up and the pneumonia vaccination yielded an F value of 3.94_{df1, df9} and a *p*-value of 0.08. The relationship between the number of African Americans in

the facility and the likelihood of flu and pneumonia vaccination is not statistically significant. Similarly, regression models using the homes with African Americans above 8% of the population (flu: F value = 6.8_{df1, df3} p = 0.1; pneumonia: F value = 2.23_{df1, df3} p = 0.3) and below 7% of the population (flu: F value = 3.27_{df1, df6} p value = 0.1; pneumonia: F value = 0.02_{df1, df6} p = 0.9) failed to establish a relationship between the percentage of flu and pneumonia vaccines provided in the facility and the density of African American population.

Odds ratios were used to describe the relationship between immunization rates of Caucasians and African Americans in the local study and nationally reported levels of flu and pneumonia immunizations. These relationships were analyzed using the percentage of institutionalized people over ages 65 who were vaccinated against flu or pneumonia, as reported in *Healthy People 2020*, and comparing that data to the percentage of people who were reported to be vaccinated against these diseases in the respondent NH and HFA in Kalamazoo and Calhoun counties. Caucasians were as likely as African Americans to be vaccinated against flu in local facilities as they were nationally. The degree of difference between vaccination rates is the same between national and local data (OR=1.1). The odds of a Caucasian being vaccinated in a local facility were 5.7 times more likely than the odds of reported flu vaccination of Caucasians on a national level. African Americans were 1.8 times more likely to be vaccinated in local facilities than the national averages. (See Table 6)

Table 6: Comparison of Flu Immunization Percentage of Study Population to the Flu Immunization Percentage Reported in *Healthy People 2020*

	Study Nursing Home (NH) or Home for the Aged (HFA)	<i>Healthy People 2020 (HP2020)</i>	Odds Ratio (OR)
Odds of being immunized locally compared to <i>HP2020</i>			
Caucasians Immunized against Flu	92	63.6	
African Americans Immunized Against Flu	71	55.6	1.1
Odds Caucasians are as likely to be immunized against flu as those reported immunized in <i>HP2020</i>			
Caucasians Immunized against Flu	92	67	
Caucasians not Immunized against Flu	8	33	5.7
Odds African-Americans are as likely to be immunized against flu as those reported immunized in <i>HP2020</i>			
African Americans Immunized against Flu	71	57	
African Americans not Immunized against Flu	29	43	1.8

The odds ratio was determined for comparing the percentage of pneumonia immunized Caucasians and African Americans in study NH/HFA to the percentage of flu immunized people of each race over 65 reported in *Healthy People 2020*. Caucasians and African Americans were as likely to be immunized locally as they were nationally (OR=0.9). The odds of Caucasians being vaccinated against pneumonia in the local facilities were 1.1 times more likely than they

were nationally. Similarly, African Americans were slightly more likely to be immunized locally than on a national level (OR=1.3). (See Table 7)

Table 7: Comparison of Pneumonia Immunization Percentage of Study Population to the Pneumonia Immunization Percentage Reported in *Healthy People 2020*

	Study Nursing Home (NH or HFA)	<i>Healthy People 2020</i> (<i>HP2020</i>)	Odds Ratio (OR)
Odd of being immunized locally compared to <i>HP2020</i>			
Caucasians Immunized against Pneumonia	64	62	
African Americans Immunized against Pneumonia	51	44	0.9
Odds Caucasians are as likely to be immunized against pneumonia as those reported immunized in <i>HP2020</i>			
Caucasians Immunized against Pneumonia	64	62	
Caucasians not Immunized against Pneumonia	36	38	1.1
Odds African-Americans are as likely to be immunized against pneumonia as those reported immunized in <i>HP2020</i>			
African Americans Immunized against Pneumonia	51	44	
African Americans not Immunized against Pneumonia	49	56	1.3

Medicare collects and reports data from NH regarding the number of short and long stay residents who are assessed and given the flu and pneumonia vaccination, using the Minimum

Data Set (MDS), a federally mandated reporting system for NH receiving Medicare or Medicaid reimbursement. The study data was compared to the rates of pneumonia and influenza immunizations provided residents in area nursing homes as reported in the MDS (See Table 8).

Table 8: Comparison of Study Nursing Homes (NH) Flu and Pneumonia Vaccination Percentages to Reported Percentages at Medicare.gov by Odds Ratio (OR)

	Flu Immunizations			Pneumonia Immunizations		
	% Vaccinated	% Not Vaccinated	OR	% Vaccinated	% Not Vaccinated	OR
Percentage Reported at Medicare.gov	88	12		89	11	
Percentage Reported in Nursing Homes in Current Study	92	8	0.6	67	33	3.98
Total Percentage reported in Study NH and HFA	89	11	0.9	62	38	4.96

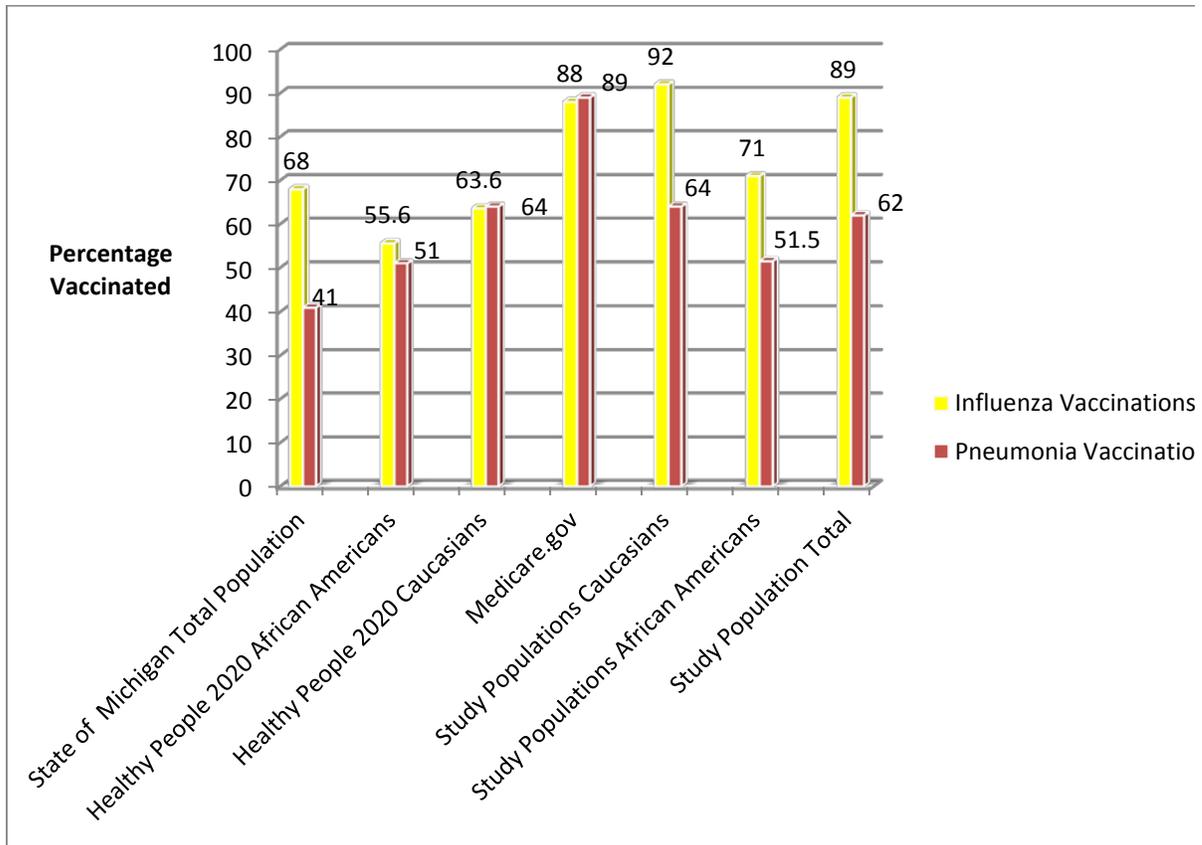
The study population was also compared to the number of people over age 65 reported immunized against influenza and pneumonia by the Michigan Care Improvement Registry (MCIR). Reporting vaccinations to MCIR for adults is voluntary. The study population was 3.8 times more likely to receive the flu vaccine and 2.3 times more likely to receive the pneumonia vaccine than other 65 year olds in the state of Michigan (See Table 9).

Table 9: Comparison of Study Population Flu and Pneumonia Vaccination Percentages to Reported Percentages at Michigan Care Improvement Registry (MCIR) by Odds Ratio (OR)

	Flu Vaccinations			Pneumonia Vaccinations		
	% Vaccinated	% Not Vaccinated	Odds Ratio	% Vaccinated	% Not Vaccinated	Odds Ratio
Study Population	89	11		62	38	
MCIR	68	32	3.8	41	59	2.3

The study population immunization rates for those receiving the influenza and pneumonia vaccines were compared to published data from *Healthy People 2020*, the Centers for Medicare and Medicaid Services, and the MCIR. (See Figure 4)

Figure 4: Bar Graph Comparing the Percentage of Flu and Pneumonia Vaccinated People Over Age 65 in Michigan Care Improvement Registry (MCIR), *Healthy People 2020* by Race, Total Population Reported at Medicare.gov, and the Study Population by Race and Total Population



Thirty one of 43 RNs, 30 of 51 LPNs, and 106 of 202 CNAs working in NH were reported to have received the annual seasonal flu vaccine. In HFA, 21 of 21 RNs, 29 of 30 LPNs, and 202 of 253 CNAs were reported to have received the annual seasonal flu vaccine. (See Table 2)

Table 10: Summary of Study Population of Health Care Worker and Their Influenza Immunization Status

	Health Care Workers in Nursing Homes	Health Care Workers in Homes for the Aged	Total
Registered Nurses	43	21	63
Registered Nurses Reportedly Receiving Flu Vaccine	31	21	52
Licensed Practical Nurses	51	30	81
Licensed Practical Nurses Reportedly Receiving Flu Vaccine	30	29	59
Certified Nursing Assistants	202	253	455
Certified Nursing Assistants Reportedly Receiving Flu Vaccine	106	202	308

Of the 13 surveys returned with data, 7 provided information about sick day on policies for employee absences. All seven provide an opportunity for employees to call in sick within two hours of their scheduled shift. All required a doctor’s note for employees to return to work if they had been out sick for over 3 days. One facility reported requiring flu vaccines. There was no data acquisition that allowed the determination of employment status (i.e. full time or part time employment).

The immunization rates among HCW was evaluated in three categories: registered nurse (RN), licensed practical nurse (LPN) and certified nursing assistant (CNA). Among the 9 facilities reporting employee immunization rates in these categories, 74% of RN in NH and 100 percent of RN in HFA were immunized against annual seasonal flu. Sixty-three percent of LPNs in NH and 97% in HFA received the flu vaccine. The rate of immunizations among CNAs was 57% in NH and 80% in HFA. The total percentage of nurses immunized against annual seasonal flu among the facilities responding to the survey was 80%; 74% of LPNs and 69% of CNAs

were reported as immunized (See Table 10). The relationship of the number of African Americans in a facility and the immunization status of the HCW was evaluated using regression analysis. The F value of 0.3_{df1, df7} was not significant ($p= 0.6$).

Table 11: Percentage (and Number) of Registered Nurses (RN), Licensed Practical Nurse (LPN) and Certified Nursing Assistant (CNA) Immunized against Annual Seasonal Flu in Study Nursing Homes (NH) and Homes for the Aged (HFA)

Facility	Health Care Worker Vaccinate Against Influenza by Category		
	Registered Nurses	Licensed Practical Nurse	Certified Nursing Assistant
Nursing Home	74 (31)	63 (30)	57 (106)
Homes for the Aged	100 (21)	97 (29)	80 (202)
Total	80 (52)	74 (59)	69 (308)

Residents were likely to spend time with an unimmunized HCW. Using data from Medicare.gov, the average time for HCW in different categories in nursing homes spend with residents was determined to be 50.5 minutes for RNs, 43.8 minutes for LPNs and two hours and 33.8 minutes for CNAs (See Table 12).

Table 12: Average Minutes Per Nursing Home (NH) Resident Per Day Spent with Registered Nurse (RN), Licensed Practical Nurse (LPN), and Certified Nursing Assistant (CNA) As Reported by Medicare.gov

Health Care Worker by Category	Average of Staff Time (Minutes) Per Resident Per Day in Study NH
Registered Nurses	50.5
Licensed Practical Nurse	43.8
Certified Nursing Assistant	153.8

Chapter 6: Discussion

The results of this study provide evidence that African Americans in NH and HFA in Southwest Michigan do not live in nursing homes more segregated than the surrounding community and populations of African Americans in nursing homes does not predict immunization rates among residents or HCWs. These findings do not support the work reported by Smith, et al., (2007) who found African Americans were more likely to live in facilities with indicators of substandard care (Smith, Feng, Fennel, Zinn, & Mor, 2007). African Americans in this study were less likely to receive both flu and pneumonia vaccinations, supporting the reports from the Advisory Committee on Minority Health (2009). Health care workers in this study were more likely to be vaccinated than the vaccination rates among health care workers reported by the CDC (2013). While more vaccinated than the national vaccination rate among HCWs the vaccination rate is below the target of *Healthy People 2020*.

The survey response rates are below the optimistic expectations of the investigator (50%), and published minimal expectations of Bryman (2012) who suggests a minimum rate of 50%. In a review of nearly 500 investigations using surveys in organizational research, Baruch and Holtom (2012) found that while individual responses were over 50%, an average response rate among organizations was 35.7% with a standard deviation of 18.8. When response rates are low, Chung (2014) suggests they may be valid if it can be shown the responders represent the greater population on key variables. Such an analysis, according to Chung, is based on characterizing the non-responders (Chung, 2014).

The response rate in this study (30%) was below the institutional response rate reported by Baruch and Holtom (2008) of 35.7%. The population in the study may not represent the greater population on key characteristics. The NH and HFA non-responders were more likely to

be found in Calhoun County where only 12% of the institutions surveyed returned a completed or partially completed survey (compared to 37% of surveyed institutions in Kalamazoo County). The study population represents just over 1% of people over 65 in the two counties surveyed, and the percentage of African Americans living in the facilities (8%) is below the percentage of the population reported in both counties (11%). The Caucasian population in the respondent facilities (91%) was higher than the population who report as 'white alone' in the census data for both counties (approximately 82.5%). The difference in these demographic characteristics may exist because the census data is self-reported and the race designation for an individual in the study was reported by the person who completed the survey. The study population does not reflect the general population with respect to race because the African American population in the NH and HFA in the study is lower than the general population and the Caucasian census in these facilities is higher than the general population.

Medicare collects and reports data from NH regarding the number of short and long stay residents who are assessed and given the flu and pneumonia vaccination, using the Minimum Data Set, a federally mandated reporting system for NH receiving Medicare or Medicaid reimbursement. This information could be used to determine the degree to which the study population represents the greater population by comparing rates of vaccinations against flu and pneumonia. While the survey attempted to gather the data based on short and long term stays in nursing homes, the data was reported as total vaccinations in racial populations. Thus, combining the categories (short and long stay) from the Medicare.gov website, an average of 88% of residents are immunized against flu, and 89% are immunized against pneumonia. Using this benchmark to compare to the study results, people in NH were less likely to be reportedly immunized against flu (OR=0.6) and more likely to immunized against pneumonia (OR=3.98).

When considered together, the NH and HFA in this study were nearly as likely as the Medicare study to receive flu vaccine (OR=0.9, and much more likely to receive pneumonia vaccine (OR=4.96). (See Table 8)

These results suggest the study population differs markedly from the greater population for pneumonia vaccinations in this measure. The difference appears to be that the NH in the study are less likely to provide flu immunizations and much more likely to provide pneumonia immunizations than the NH populations at-large. No such database exists for HFA.

The first study objective, to compare the rates of pneumococcal and influenza immunization (assessed and given) to the percentage of Caucasian and African Americans living in the NH/HA was analyzed using regression analysis. The first hypothesis suggested a relationship between the percentage of African Americans in the facility and the percentage of immunized residents. The regression model proposing a relationship between racial make-up of the population and flu vaccinations yielded an F value of 0.96 and *p*-value of 0.4. The model investigating the relationship between the racial make-up of the facility and the pneumonia vaccination yielded an F value of 3.94 and a *p*-value of 0.08. Neither relationship is significant; the data fails to reject the null hypothesis: immunization rates for flu and pneumonia were not associated with the racial make-up of the institution.

A second hypothesis for this objective explored the relationship between the local immunization rates and the rate reported nationally in *Healthy People 2020*. This relationship was analyzed using the percentage of institutionalized people over ages 65 who were vaccinated as reported in *Healthy People 2020* and comparing that data to the percentage of people who were reported to be vaccinated in the NH and HA in Kalamazoo and Calhoun counties. The odds ratio was determined comparing the percentage of flu immunized Caucasians and African

Americans in study NH/HA to the percentage of flu immunized people over 65 of each race reported in *Healthy People 2020*. Caucasians were as likely as African Americans to be vaccinated for flu in local facilities as they were nationally (OR=1.1). The odds a Caucasian was vaccinated for flu was 5.7 times more likely in local facilities compared to the rates of immunization on a national level. The odds of African Americans being vaccinated for flu were 1.8 times more likely in local facilities than the national averages. (See Table 6) Similarly, the odds ratio was determined for comparing the percentage of pneumonia immunized Caucasians and African Americans in the study NH/HFA to the percentage of flu immunized people over 65 reported in *Healthy People 2020* of each race. Caucasians and African Americans were as likely to be immunized locally as they were nationally (OR=0.9); Caucasians were slightly more likely to be immunized against pneumonia locally as they were nationally (OR=1.2); African Americans were slightly more likely to be immunized locally than on a national level (OR=1.3). (See Table 7)

Both Caucasians and African Americans in the reporting facilities were more likely to receive flu vaccine than Caucasians and African Americans were on a national level. The local population of Caucasians and African Americans was just as likely to receive the pneumonia vaccinations as Caucasians and African Americans on the national level. The variation in this study when compared to data collected on the national level is likely the result of the non-representative nature of the sample in this study.

While response bias exists, the data fall between immunization rates reported on the national level and immunization rates reported on the state level. The direction of this bias might suggest the data comes from facilities most likely to immunize their residents. Thus, the argument can be made that while response bias exists, these institutions are most likely to differ

from the non-responders in that the responding facilities reporting data for this study are more likely to have an immunized population. Despite the direction of this bias, the lack of equity in immunization rates persisted.

Another objective of the project was to investigate the population densities of Caucasian and African Americans in nursing homes. It was suggested in the literature that nursing homes were more segregated in the Midwest, and a link between segregated housing and the erosion of the community immunity could exist. The nursing homes reported an African American population census of 8% which is below the 11% of African Americans living in the communities surveyed. Similarly, the homes for the aging reported an African American census of 7%, and the total African American census for facilities reporting in this study was 8%. These data are anecdotally in keeping with the reported observations of the Ombudsman, suggesting that homes that care for the elderly in this area generally have few African American residents. Thus, the alternate hypothesis is accepted because the percentage of the population of African Americans in nursing homes is significantly different than the general population ($p=0.008$). The direction of this difference, more Caucasians and fewer African Americans in facilities than found in the general population, would suggest that African Americans may be less likely to live in environments where community immunity is eroded and their health at increased risk.

The third aim of the study project was to measure the immunization rates of HCW and determine whether a relationship existed between the census of African Americans in a facility and the immunization rates of HCW. The rate of flu immunizations among health care workers (HCW) was estimated to be 63% (CDC, 2013). The total rate of flu immunizations among RN, LPN and CNA in the institutions responding to the survey was 70%. The published rate of flu immunizations among all nurses is 79% and among CNAs is 49% (CDC, 2013). In an effort to

compare the locally obtained study data to the CDC estimates of immunized HCW by category, the RN and LPN categories were combined and the rate of immunization among all nurses in the responding institutions was 80%, and the rate among CNAs was 69%. Registered nurses in the responding institutions were slightly more likely than to be vaccinated for flu than RNs nationally. Certified nursing assistants facilities reporting data for this study were more likely to be immunized than the national data suggests. The HCWs from the facilities in this study exceeded published national data for annual seasonal flu immunizations.

A regression analysis was performed using the percentage of African Americans in the population and the percentage of immunized HCW in the facilities reporting immunizations of employees. No relationship was established. The alternate hypothesis suggests that a significant difference exists between immunization rates of HCW and homes with higher populations of African Americans. This hypothesis is rejected based on the regression analysis.

All residents are more likely to spend time with an unimmunized HCW because CNA are least likely to be immunized (69%) and spend the most time interacting with residents (2 hours and 33.8 minutes per resident). The most immunized category of health care worker, the RN, spends the least amount of time with a resident (50.5 minutes). There is no significant difference in immunization rates between RNs, LPNs and CNAs (p values range from 0.2 to 0.4).

Chapter 7: Strengths and Limitations

Strengths

This project sought to identify the degree to which flu and pneumonia immunization rates for African Americans put them at risk for a potential community health problem based on the concentration of minority populations in group housing arrangements. The project was developed after consultation with community partners and had the support of the local community health department.

The data analysis of immunization rates for pneumonia and influenza vaccinations of Caucasians and African Americans in this study reflect state and national trends and the influenza immunization rates fall between the values obtained by Michigan Care Improvement Registry (MCIR) and Medicare. The MCIR reports that 68% of people over age 65 were vaccinated against flu and 41% were vaccinated for pneumonia in 2013. The percentage of vaccinated people over age 65 is determined by dividing the number of vaccinations reported in MCIR by the census of people over age 65 in the county (Ellis, 2014). Agencies are not required to report vaccinations given in their agencies to MCIR. Thus, the percentage of reported immunization is likely under-representative of the population. Seventy percent of Caucasians and 52.5% of African Americans received the flu vaccine in Michigan. The institutions in this study report a total immunization rate for influenza vaccination of nearly 89% and an immunization rate for Caucasians of 92% and African Americans of 71%, well above those reported in the study counties (See Table 3, Table 4, and Table 9). The total immunization rate for pneumonia in this study (62%) is also well above the reported immunization rate of people over 65 in the state of Michigan.

Nursing homes certified to participate in Medicare and Medicaid are required to report the number of flu and pneumonia immunizations “assessed and given” (Centers for Medicare and Medicaid Services, 2014). Comparing immunization rates in this study to the data collected and reported at Medicare.gov for the specific NH facilities in the study, the rate of immunization against flu is consistent with the reported data, but pneumonia vaccination rates are consistently lower than reported at the Medicare.gov website (See Table 8). The actual immunization status of the population (i.e. an assessed resident may have been offered an immunization but declined) is not provided by the Medicare.gov database. Thus, the data would potentially over-report the number of vaccinations for flu and pneumonia, yet the percentage of flu immunization reported by Medicare.gov (88%) is consistent with both the study NH flu vaccination percentage (84%) and the total study population (89%). By contrast, pneumonia vaccinations in the NH (48%) and total vaccination pneumonia percentages for both NH and HFA (62%) were well below the 89% reported at Medicare.gov.

The immunization percentages for flu and pneumonia are both higher in the study population than reported at MCIR, where percentages are likely under-reported, and lower than Medicare.gov where percentages are likely over-reported. A potential strength of this study is that the reported vaccination percentages fall between percentages reported at the local and national level, and may be more accurate (See Figure 4)

The study data consistently shows the total population of Caucasians has 15% and 21% advantage in the percentage of flu and pneumonia vaccinations, respectively, over African Americans. In the study population 92% of Caucasians and 71% of African Americans received flu vaccine; of those reported vaccinated for pneumonia, 66% were Caucasian and 51% were African American. The 21% higher immunization percentage reported among Caucasians for flu

vaccine compares to the estimated 8% advantage reported in *HP2020* (US DHHS, 2012) and the 19% advantage reported by MCIR (Wolicki, 2014). The 15 point advantage for Caucasians for pneumonia vaccine compares to the 18% advantage reported by both *HP2020* (US DHHS, 2012) and MCIR (Wolicki, 2014). The data suggests a consistent lack of equity in total immunization rates between Caucasians and African Americans at the local level and this is consistent with published data at the state and federal level.

Limitations

Low response rates of the self-reported survey data resulted in significant limitations on the interpretation of the data gathered. Both the scope and accuracy of the data are in question. The self-reported survey data was collected from 13 of 43 facilities (30%). So few data were collected that aggregate data per category (NH and HFA in Kalamazoo and Calhoun Counties) could not be explored. While this is a significant limitation, the author has provided support from the literature indicating the 30% response rate is consistent with expected rates of responses from institutions (Baruch & Holtom, 2012). The four facilities reported they could not participate in the study because they lacked the staffing to collect the data; two indicated they could not participate because of legal issues.

Only one facility reported the use of electronic medical records (EMR) suggesting the accuracy of the data reported may be sub-optimal. Insight regarding the accuracy of the data and the limitation of facilities to access information from EMR can be seen in the differences between the flu and pneumonia immunization rates and comparisons to various local or national data. The flu vaccine is given every year and pneumonia vaccination is typically given once, but some adults require an additional dose. The distribution of the vaccines may be reported as

delivered to people over 65 through two government agencies: Michigan Care Improvement Registry (MCIR) and Medicare.

Survey data was collected on employee flu immunization percentages and the data was compared to local and national data. The source of the data for the HCW from the study population is unknown. The survey requested self-reported data and the accuracy of these results cannot be determined.

The collection of data regarding employee sick day policy (item 16 on Appendix 1) was driven by a concern that employees in NH and HFA continue to work with residents when they are ill because they may lose their job if they call in sick thus exposing residents to potential illness. The study question suggested health care workers in nursing homes with a higher population of African Americans are less likely to have received the annual seasonal influenza vaccine. The study question centered on determining if African Americans would be more at risk if they were exposed to an unimmunized HCW because African Americans are less likely to be immunized. The study question did not attempt to address HCW absenteeism or illness on the job.

Chapter 8: Public Health Implications

The essential public health services include investigating health hazards and conducting research (CDC, 2014). This research project was developed to investigate the potential for increased risk of flu and pneumonia in African Americans living in NH and HFA due to segregated housing and erosion of community immunity due to low immunization rates in local populations. While the support for local investigation of minority health issues is significant in the literature (National Association of County and City Health Officials (NACCHO), 2013) the support at the local level was not as effusive. Participation in this small, local study was very limited and the data sources for the self-reported survey are unknown. Despite the drawbacks and the rejection of the study hypotheses (African Americans in the study live in population densities less than the general population) their presence in the nursing facility does not predict a diminished capacity to receive immunizations or predict the immunization status of the HCW. The study shows the consistent lack of equity for immunization rates between Caucasians and African Americans on the local level.

In a policy statement regarding immunization inequities, NACCHO (2013) argued for more local data collection studies. The policy statement called for support of local health departments as they characterize SDOH in relation to immunization inequities. The National Association of County and City Health Officials encourage the local health department to “...explore and institute strategies to better capture local level immunization rates” (NACCHO, 2013). In the current study participation was limited. The four facilities reported they could not participate in the study because they lacked the staffing to collect the data; two indicated they could not participate because of legal issues. Thirty facilities did not participate and did not

provide a reason. Thus, while there is a need for data collection on the locally, it is challenging to achieve significant levels of participation in self-reported survey data collection.

The support for data collection regarding social determinants of health for at-risk populations in the literature is significant. The *Recommendation Report from the Health and Human Services Advisory Committee on Minority Health* (ACMH) identifies 19 principles and 3 recommendations for health equity. The report suggests public health infrastructure must address the social determinants of health (SDOH), especially in minority and underserved populations, and that health departments must hold their agencies accountable for health disparity. The authors further suggest that data collection relative to SDOH and health disparities is very important in order to accurately describe and address these issues. Local data collection helps local agencies understand and develop community specific goals to address health disparities (ACIP, 2009).

Survey data was collected on employee flu immunization percentages and the data was compared to local and national data. The HCW were consistently more immunized against flu than HCW at the national level. This study data shows a higher percentage of flu vaccinated nurses and CNA similar to the higher percentage of flu vaccinated patients.

Chapter 9: Conclusions and Recommendations

Conclusions

The results of this limited local study indicate that African Americans may live in NH and HFA in population densities less than the communities at-large. The population of African Americans in NH and HFA in the study are not associated with flu or pneumonia vaccination or the population of vaccinated healthcare workers. A lack of equity in vaccination percentages between Caucasians and African American against flu and pneumonia vaccine in the study population is consistent with state and national trends. Caucasians were 4.7 times more likely to receive flu vaccine and 1.7 times more likely to receive pneumonia vaccine than African Americans in the study populations.

Recommendations

- 1. Develop a better understanding of the populations of African Americans and Caucasians living in NH and HFA in the study area and surrounding geographic area as well as a more comprehensive view of the social determinants of health in these populations and sub-populations.**

The conceptual framework used for this project, proposed by Kilbourne et al., (2006) suggests the study of vulnerable populations will lead to a way of understanding the problem in order to promote solutions to close the gap of health inequity. A project goal of this study was to characterize the immunization rates of Caucasians and African Americans in local NH and HFA. The facilities in the study reported African American populations significantly below the general population (i.e. the African American population in the surrounding counties is nearly 12% while the NH/HFA African

American population was 8% of the facility total). It is important to understand the cultural dynamic of care for the aging in the African American community as well as the overall social and cultural similarities and differences between the Caucasian and African Americans that would lead to a population in the NH/HFA that differs from the surrounding community. Understanding the social and cultural dynamics of African Americans would likely lead to an expanded population sample by including those agencies/facilities where African Americans over age 65 from the community are more likely to gather.

This study reports a lack of vaccine equity in influenza and pneumonia vaccines in area NH/HFA populations. Exploration of the factors that lead to vaccination inequity should be considered. Again, using the conceptual framework, Kilbourne, et al., (2006), the authors suggest identifying the vulnerable populations and exploring the gaps between this population and those less vulnerable. Considering the knowledge base of the study populations regarding vaccine recommendations, the attitudes and beliefs regarding vaccination, and the factors that influence decision making regarding vaccination would provide the foundation to propose changes to address the lack of vaccine equity found at the local level.

2. Adopt consistent measures for collecting data and reporting health status and outcomes, including disease prevention measures.

A goal of this study was to determine the local rates of immunization among adults in NH/HFA for the pneumococcal and influenza vaccines. Based on the information

provided by Medicare, the original questions grouped the NH/HFA population into ‘short stay’ and ‘long stay’ groups and the data indicates vaccines ‘assessed and given.’ These categories were not reported by the NH/HFA in this study. The agencies reported only long stay residents and only if a person had received the vaccine.

Another goal of this study was to compare the rates of vaccination at the local level to those reported for influenza and pneumonia vaccine at the national level. There is a gap between agencies collecting health data in the reporting of measures of health and immunization rates are a measure of health that is not consistently reported. The Michigan Department of Community Health suggests indicators used to monitor racial and ethnic health equity include health outcomes, health status and social determinants of health. The health outcomes indicator measures disease and deaths while the health status indicator measures the chronic and infectious disease burden. The Michigan Health Equity Data Project cites the availability of data as the reason for the selected indicators. There is no indicator for disease prevention, such as immunization rates, and there is no system for reporting health promotion indicators by race. There are no immediate plan in the 2014 Health Disparities Reduction and Minority Health Section Activities Timeline to collect data regarding flu and pneumonia immunizations in the elderly. (Michigan Department of Community Health, 2014)

3. Improve data collection of immunization rates among adults.

The literature review for this study provided the foundation of support for the study. It was noted that 90% of flu and pneumonia deaths occur in people over age 65. The

estimates of this impact vary widely because there is no mandatory reporting of death due to flu in people over age 18. Similarly, deaths caused by pneumonia are not reported. Both are vaccine preventable diseases and measures of the effectiveness of this strategy (vaccination) on this target population (people over age 65 in NH/HFA) are difficult to assess because deaths are not reported to a central agency. While deaths attributed to flu and pneumonia are reported on death certificates, the data is difficult to access.

Most of the effort on the state and national level has focused on childhood immunizations. The Michigan Department of Community Health reported a renewed focus on adult immunizations in the state (Wolicki, 2014); this should be continued and strengthened.

4. Reduce the lack of equity in immunization rates between Caucasians and African Americans.

The goal of this study was to investigate the potential impact of segregated housing and subsequent erosion of community immunity due to high numbers of unimmunized people living in community with one another. While the study data did not support a potential for the erosion of community immunity, it did incidentally find a lack of vaccine equity between the Caucasians and African Americans in the study (92% of Caucasians and 71% of African Americans received the flu vaccine; 66% of Caucasians and 51% of African Americans received the pneumococcal vaccine). Current data identifies 20% difference in immunization status between Caucasians and African Americans for flu and pneumonia. In adults over 65 years of age, 56.8% of the population is vaccinated for

influenza: 59% of Caucasians and 40% of African Americans. Approximately 68% of the adults over 65 have received a dose of vaccine for pneumonia in the state of Michigan: 70.6% of Caucasians and 52.5% of African Americans. (Wolicki, 2014) While the immunization rates of the facilities in this study are higher than the rates reported at the state level, the 20% disparity in immunization rates between Caucasians and African Americans persists for flu vaccination and a 15% disparity exists for pneumonia vaccination (See Table 3 and Table 4).

5. Establish immunization rates for people over 65 living in NH and HFA by race.

The goal of this study was to establish immunization rates for Caucasians and African Americans in local area NH/HFA. The data suggests more investigation is necessary to firmly establish immunization rates among people over 65 living in NH and HFA. The study population response bias may not represent the non-responding institutions. Further, the data suggests a significant difference in the influenza and pneumonia rate of vaccination between Caucasians and African Americans, but no reasons for this difference are provided.

6. Improve vaccination rates among health care workers.

A specific objective of this project was to measure influenza immunization rates among HCWs. Wolicki (2014) notes a disparity in immunization rates among HCW in the hospital and nursing home facilities in Michigan. Hospitals in the state of Michigan have largely adopted mandatory immunization for flu and report over 90% of HCW in hospitals are immunized. In nursing homes the HCW rate of immunization is about 68%

(Wolicki, 2014). The rate of vaccination of HCW in the facilities reporting for this study were 80% for RNs, 74% for LPNs and 69% for CNAs (See Table 5) slightly above results reported state-wide, but below the rates of immunization for HCW in hospitals. As Wolicki (2014) reports and the data suggests, mandatory immunization improves vaccination rates among HCW, yet the most vulnerable population for flu deaths is cared for by HCW who are less likely to receive flu vaccine. Only 1 facility (7%) reported requiring flu vaccines in this study. This study of local facilities supports the state-wide data indicating a disparity in the immunization status of HCWs between hospitals and facilities that house people over age 65. Future studies should focus on the risk to people over 65 living in care facilities from their unimmunized health care worker.

7. Engage the population prior to initiating study and conduct formative research on the topics of study. Develop strategies to study the issues that need to be assessed in order to more completely understand the values and beliefs reflected in the social and cultural fabric of the communities under investigation.

8. Pre-test questionnaire/survey tools prior to distributing them to facilities.

Pre-testing the questionnaire would provide feedback regarding the wording of the survey tool, feedback on the reporting categories, and relevancy of the questions asked on the questionnaire. Feedback on the survey tool should be solicited by pre-testing groups culturally and socially similar to the study population in Southwest Michigan. In the current use of the survey tool, it was established that the qualifications of the person who

completed the survey and the source for the data they reported should have been part of the questionnaire.

In conclusion, data collection at the local level is difficult without formal requirements to report immunizations by ethnicity. The State of Michigan is collecting data on vaccinations through the MCIR and hopes to improve reporting of adult immunizations in the coming years. Reporting data to MCIR is complicated because the state site does not communicate with some EMR programs. Facilities lacking EMR would need to manually input data, a more cumbersome task than the 'work around' for EMR reporting to MCIR. In this study, only one of thirteen facilities reported the use of EMR. Medicare may gather data on immunizations, but the data is only required from facilities receiving Medicare or Medicaid funds (5 of 13 [38%] facilities in this study report receiving funds from Medicare or Medicaid). While the limitations of this study prevented a clear confirmation of increased risk of pneumonia or flu to African Americans living in nursing facilities due to segregation and erosion of community immunity, there is a persistent lack of equity in immunizations for flu and pneumonia between Caucasian and African Americans in the respondent nursing facilities in Kalamazoo and Calhoun Counties in Michigan. Future studies should focus on strategies to improve immunization rates and decrease the disparity in immunization rates between Caucasians and African Americans. Future studies should also consider and describe the social structure in which elderly African Americans live and evaluate the risk of flu and pneumonia based not only on individual health factors, but also upon the social network in which they grow, live, work and age.

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Appendix A:

Survey of Nursing Facility

Identification Number of Facility: _____

Name of Respondant and Position/Job Title: _____

Phone: _____

Email: _____

I am a student in the Masters in Public Health Program through the University of Alaska Anchorage and I conducting a study for my final project. This project will allow me to analyze the impact of the population size of different racial and ethnic groups on immunization rates. All information will be kept in a password protected Excel document and will be reported only in anonymous terms. This project is not connected to any State of Michigan program.

Total number of occupied beds in the facility	
Total number of beds in the facility	
Number of residents who are African American	
Number of residents who are Caucasian	
Number of residents who are Hispanic	
Indicate the percentage of the institution's budget provided by Medicaid	
Indicate the percentage of the institution's budget provided by Medicare	
Indicate the percentage of the institution's budget provided by private payers	
Indicate the number of patients who have received annual seasonal flu vaccine: Total number	
Number of Caucasians	Short Stay
	Long Stay
Number of African Americans:	Short Stay
	Long Stay
Number of Hispanics	Short Stay
	Long Stay
Indicate the number of patients who have received pneumococcal vaccine. Total number	
Number of Caucasians	Short Stay
	Long Stay
Number of African Americans	Short Stay
	Long Stay

Number of Hispanics	Short Stay	
	Long Stay	
Does this facility utilize electronic medical records?		
Indicate the percentage of health care workers who have been immunized against annual seasonal influenza.	Number receiving immunization	Total number
	RN	
	LPN	
	CNA	
Describe your employee policy regarding work absences (or attach policy)		

Appendix B:

Initial Introductory Letter

Greetings,

I am Cynthia Schauer, a student pursuing a master's degree in public health at the University of Alaska, Anchorage (UAA). I have completed all the course work and I am in the process of completing the final research project for the program. As a resident of Kalamazoo County I have elected to develop my project in my community. I have chosen to investigate the relationship(s) between the size of the racial population in nursing homes and rates of immunizations of both residents and nursing home workers in Kalamazoo and Calhoun Counties.

This project has been approved by all the practicum project committee members as well as the Institutional Review Board of the University of Alaska, Anchorage. All data is protected. The identity of the nursing facility in the study will not be identified. The facility name will be coded and the code will be stored in a separate file, not associated with the data. If you have any questions about this study, please contact the Investigator at the contact information listed below. If you have any questions about your rights as a research subject, please contact Sharilyn Mumaw, UAA Compliance Officer, at (907) 786-4566.

Your name or the name of your institution was provided by the Long Term Care Ombudsman for Kalamazoo County. I am writing to invite you to participate in this study. I have enclosed an Informed Consent form and I ask you to read and sign it if you agree to participate. All participation is voluntary and you may elect to withdraw from the study at any time without penalty.

Participation would require gathering some data which may take about an hour your time. You may elect to return the completed Informed Consent and survey by mail in the enclosed self-addressed stamped envelope. You may elect to submit the survey data to me during a short phone interview which should take no longer than 15 minutes.

I will contact you by phone in about 2 weeks if I have not received your completed survey in the mail. If you agree to complete the survey by phone we can set up a time to communicate the data. I have included my contact information; please contact me with any questions or concerns you may have regarding the project.

Sincerely,

Cynthia Schauer
Masters of Public Health Student
University of Alaska, Anchorage
cschauer2@uaa.alaska.edu
269.501.6005

Appendix C:

Informed Consent Form (University of Alaska, Anchorage, n.d.)

Title: Social Determinants of Pneumococcal and Influenza Immunization Rates of Nursing Home Residents in Southwest Michigan: Role of Race and Segregation.

Investigator:

Cynthia Schauer
Masters of Public Health Student
University of Alaska, Anchorage
cschauer2@uaa.alaska.edu
269.501.6005

Brief Description:

I am Cynthia Schauer, a student pursuing a master's degree in public health at the University of Alaska, Anchorage (UAA). I have completed all the course work and I am in the process of completing the final research project for the program. Dr. Nancy Nix from the University of Alaska Anchorage is my practicum committee chair and provides primary oversight of my work. As a resident of Kalamazoo County I have elected to investigate the relationship(s) between the size of the racial population in nursing homes and homes for the aging and rates of immunizations of both residents and nursing home workers in Kalamazoo County and Calhoun counties. Studies suggest that the effects of community (or 'herd') immunity are diminished when high numbers of unvaccinated people live in close contact with one another. Further, the Advisory Committee on Immunization Practice (ACIP) suggests local data collection helps local agencies understand and develop community specific goals. This project is an effort to collect and analyze data regarding immunization rates among nursing home patrons and health care workers relative to demographic information on race/ethnicity.

Procedure: Your name or the name of your institution and contact information were given to me by the Long Term Care Ombudsman because you provide care to people over 65 in Kalamazoo or Calhoun County. I am contacting you to ask if you would be willing to participate in a phone or paper survey about your institution. The brief survey includes questions on the racial/ethnic details of the patients, the number of immunized patients and the number of immunized health care workers. Participation in the survey is voluntary and you may withdraw from the study at any time without penalty. In addition to talking with you, I will also be reviewing nursing home facility Medicare reports as a part of my study.

Confidentiality: All data I collect will be reported in the aggregate and no individual respondents will be identified. The data will be de-identified with codes for nursing homes stored on separate spreadsheets, stored in password protected files, and destroyed within one year of completing the project.

Risks/Benefits: The survey you will be asked to answer presents no known risks. The telephone survey is expected to last 15 minutes; in addition, you may need to spend up to an additional hour to gather information covered by the survey.

Participation is voluntary. You may withdraw from the project at any time without penalty. Your institution may benefit from this study in the long run by helping researchers to identify evidence based goals for immunization rates in different racial/ethnic populations.

Compensation:

No compensation is provided for participating in this study.

Contact

If you have any questions or concerns at any time you may contact the investigator, Cynthia Schauer by phone at 269.501.6005 or email at cschauer2@uaa.alaska.edu. You may also contact my faculty research supervisor, Dr. Nancy Nix at 907.786.6590 or email at nanix@uaa.alaska.edu. If you have any questions about your rights as a research subject, please contact Sharilyn Mumaw, Compliance Officer at the University of Alaska Anchorage, at (907) 786-4566.

I have read the foregoing information. Any questions I have had have been asked and have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant _____

Signature of Participant _____

Date _____
Day/month/year

Appendix D:

Social Determinants of Pneumococcal and Influenza Immunization Rates Research Design and Methods Table

	Phase 1	Phase 2	Phase 3
Type of Evaluation	Data Collection	Data Collection	Data Evaluation
Purpose	Assess the rates of flu and pneumonia vaccinations in nursing home patients in Kalamazoo County, MI	Determine the racial demographics of Kalamazoo County Nursing Homes Determine the immunization rates for flu vaccine for each nursing home	Determine the relationship between racial demographics
Indicators	Vaccination rates of patients for influenza and pneumococcal pneumonia for both short and long stay nursing home placements	Ratio of the number of African American residents to total population Ratio of the number of White residents to the total population Ratio of the number of flu vaccinated health care workers (HCW) per the total number of HCW	Determine if the alternate or null hypothesis is supported
Data Collection	Nursing homes report data to Medicare.gov	Direct contact with nursing homes to quantify the racial populations and the number of HCW vaccinated with flu vaccine	
Approach	Quantitative methods	Quantitative methods	
Quantitative Analysis	Descriptive statistic (e.g. percentages, ranges and means)	Descriptive statistic (e.g. percentages, ranges and means)	
Design		Surveys and Focus Groups	Surveys and Focus Groups
Timing	2 months	Project begins in March, 2014 and will be completed by December, 2014	
Application			Use this data to determine if herd immunity is equally protective of Caucasian and African American populations living in nursing homes