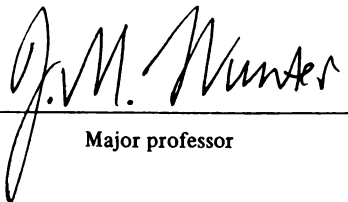This is to certify that the

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INFLUENZA IMMUNIZATION COMPLIANCE AMONG A GROUP OF ELDERLY
BLACK AND WHITE RESIDENTS OF LANSING, MICHIGAN

presented by

Karen Denise Johnson-Webb

has been accepted towards fulfillment
of the requirements for

____M.A.____ degree in __Geography__

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Major professor

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INFLUENZA IMMUNIZATION COMPLIANCE AMONG A GROUP OF ELDERLY
BLACK AND WHITE RESIDENTS OF LANSING, MICHIGAN

By

Karen Denise Johnson-Webb

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Geography

1994

ABSTRACT

INFLUENZA IMMUNIZATION COMPLIANCE AMONG A GROUP OF
ELDERLY BLACK AND WHITE RESIDENTS OF LANSING, MICHIGAN

By

Karen Denise Johnson-Webb

Elderly compliance with influenza immunization is low in the U.S. Few studies to determine compliance levels and related factors have been population-based and geographical. This study utilized a population-based sample derived using maps of elderly population distribution to identify census tracts with high proportions of elderly black residents. Two groups of black and white subjects were interviewed concerning their compliance and factors which may relate to it. Factors which were significantly associated with compliance were: gender, physician recommendation of vaccine, history of immunization, and intent to receive an immunization in the future.

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To My Husband
Tanya W. Webb
whose undying devotion
and support enabled
me to complete this work.

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Chapter One

Introduction and Problem

<u>Introduction.</u>

Influenza is an acute, usually self-limited febrile illness, characterized by such syndromes as: common cold, pharyngitis, croup, tracheobronchitis, bronchiolitis, or pneumonia. Outbreaks of varying severity occur almost every winter and epidemics of influenza are associated with enormous morbidity and lost time from school and work. Substantial mortality due to pulmonary and other complications occurs in groups that are at high risk for complications of influenza.

The viruses that cause influenza belong to the family Orthomyxoviridae. These viruses are comprised of three types - A, B, and C - that are related closely in structure, chemical composition, and biological activity. The three types have differing epidemiological behaviors, host ranges and immunological specificity of surface and internal proteins. Type C may resemble A in its ability to infect animals as well as humans. No evidence exists linking Type B to the existence of extrahuman reservoirs of infection. Influenza A is the most important type epidemiologically, and has the widest range of hosts (Kilbourne, 1975). Influenza A has been responsible for pandemics affecting one quarter of the U. S. population (eg. 1957, 1968) (Forbes, 1988).

Antigens of influenza are hemagglutinin and

1

neuraminidase. These antigens determine virulence. Immunity to the antigens of the influenza virus, especially hemagglutinin, reduces the likelihood of infection and lessens the severity of the disease should infection occur. Antigenic drift within a subtype of influenza may be so marked that vaccination or infection with one subtype may not confer protection against another subtype, even those subtypes that may be distantly related. Major epidemics of influenza continue to occur because of these antigenic drifts.

Influenza is transmitted from person to person by the respiratory route. The virus is carried in moisture droplets and influenza has a relatively short incubation period, usually 24 to 72 hours.

Influenza, usually accompanied by pneumonia, is one of the ten leading causes of mortality in the U. S.(Pyle and Patterson, 1987). Eighty-five percent of these excess deaths occur in persons who are 65 years and older (Lui and Kendall, 1981).

The effects of an influenza epidemic are emphasized by an increase in mortality due to influenza, pneumonia, cardiopulmonary and other chronic diseases which can be aggravated by infection with influenza (MMWR, 1992). Influenza has been associated with 10,000 to 40,000 excess deaths each year (Lui and Kendall, 1981). Hospitalizations for pneumonia and chronic medical conditions have also been shown to increase substantially during influenza epidemics

(Perotta et al, 1985; Barker, 1986). The impact of an influenza epidemic can be alleviated by vaccinating all high-risk individuals each year in the fall before the influenza season.

Persons over the age of 65 years and those experiencing underlying health conditions such as chronic pulmonary or cardiovascular system disorders, asthma, chronic metabolic diseases, renal disfunction, hemoglobinopathies, and children on long-term aspirin therapy are at an increased risk for complications from influenza infection and are at higher risk than the general population of being hospitalized if infected. These individuals are strongly recommended to take an influenza vaccination each year (MMWR, 1992).

Influenza vaccines are about 80% effective in protecting individuals from infection (Kilborne, 1975; Barker and Mullooly, 1988). Howells et al (1975) found that elderly individuals experienced significantly lower rates of bronchopneumonia and mortality when vaccinated against influenza.

The antigenic make-up of these vaccines is reviewed every year in order that the most recently circulating strains of the virus may be included. The vaccines usually contain a trivalent combination of one or more subtypes of influenza A and B. Purification has rendered the reaction rate of recent vaccines very low. Nevertheless, certain individuals may experience influenza-like symptoms 8 to 12

hours after vaccination, although current vaccines do not cause infection with influenza. Twenty-five percent of those vaccinated may experience a mild local reaction at the site of the injection (Cecil, 1991).

Individuals for whom influenza vaccination is contraindicated are those who are allergic upon exposure to eggs or to other components of the influenza vaccine. Delaying vaccination of adults with fever is advisable until the symptoms have subsided.

With the exception of the swine influenza immunizations of 1976, the U. S. Immunization Survey reported that each year between 1960 and 1985, only about 20% of high risk individuals were vaccinated against influenza (Fedson, 1990). National immunization rates remain low at present. A survey conducted by the Behavioral Risk Factor Surveillance System in 32 states and the District of Columbia in 1986 reported compliance rates among subject aged 65 years and older to be approximately 32%. The National Institute on Aging reported overall compliance rates for the elderly were 20% (MMWR, 1986).

The Influenza Vaccination Demonstration Project.

In 1988, the Health Care Finance Administration (HCFA) embarked upon a project to demonstrate the cost-effectiveness of influenza vaccination (Fedson, 1990). The Influenza Vaccination Demonstration Project (IVDP) was developed jointly by HCFA and the Centers for Disease Control (CDC). The goal of this project was to test the

cost-effectiveness of vaccinating Medicare enrollees for influenza. The demonstration projects were funded for 1988 through 1989. Three additional sites were added in 1989 through 1990.

Influenza vaccines, purchased by the U. S. Government, were distributed throughout the intervention areas and vaccination programs were implemented in physicians' offices, health department clinics, hospitals, nursing homes, and Health Maintenance Organizations (HMOs). Providers were reimbursed for the costs of administering the vaccine. If this project is deemed cost-effective by an independent source, influenza vaccine will be covered as a benefit under Part B of the Medicare program.

Seven counties in Michigan were chosen to take part in the study as either control areas or intervention areas. The intervention area counties included Calhoun, Ingham, Jackson, and Kalamazoo. The control area counties included Kent, Muskegon and Ottawa. Influenza vaccinations were distributed in the intervention area free of charge to Medicare B beneficiaries. In the control areas, vaccinations were distributed using methods in existence at the time of the comparison. The project also included influenza surveillance, and promotion and distribution of influenza vaccine.

In Ingham County, in 1991, the trivalent vaccine Flozone, by Connaught, was provided free of charge to Medicare B beneficiaries. This vaccine protected recipients

against Type A Taiwan 1/86 (H1N1), Type A Beijing/353/89
(H3N2) and Type B Panama/45/90 (ICHD, 1992). Ingham County
Health Department (ICHD) established 60 additional
immunization clinics throughout the county, distributed
vaccine to providers and acted as intermediary in the
billing process. Vaccine was also offered five days per week
in the ICHD walk-in clinic in Lansing. The ICHD is located
in South Lansing at 5303 S. Cedar Street in census Tract
53.04 (Figure 1).

Total compliance with influenza immunization for
residents of Ingham County who were 65 years and older was
approximately 51.5% in 1990 and 68.3% in 1991. A total of
5317 (32%) Medicare B influenza vaccines was administered by
ICHD. Other providers administered 10,498 (63%) Medicare B
vaccines and nursing homes administered 844 (5%) Medicare
vaccines in 1991 (ICHD, 1992).

An official in the Ingham County Health Department
Disease Control Office told the investigator anecdotally
that very few black residents of Ingham County had received
an influenza vaccination the previous year. For unknown
reasons, they had also had a cancellation of an immunization
clinic set up by ICHD in a black church in Lansing.
Statement of Purpose and Hypotheses.

This study falls within the realm of access to health
care and how that access varies geographically across
selected census tracts in Lansing. Its purpose is to
determine the compliance rates with influenza immunization

LANSING CENSUS TRACTS

33.01	32
33.02	1
34	34	3	2	31.02

33.01

32

33.02

1

34 34 3 2 31.02

31.02

8 9 NL

5 7

4

6 13 65 10

14

16 15 19

12

21

17.01 24 20

22

17.02 25 23

26 29.01 44.01

36.02

37

27 28

36.01 29.02

51 53.03 53.04

52.01

52.02 53.02 ICHD

55.01

0   miles   1

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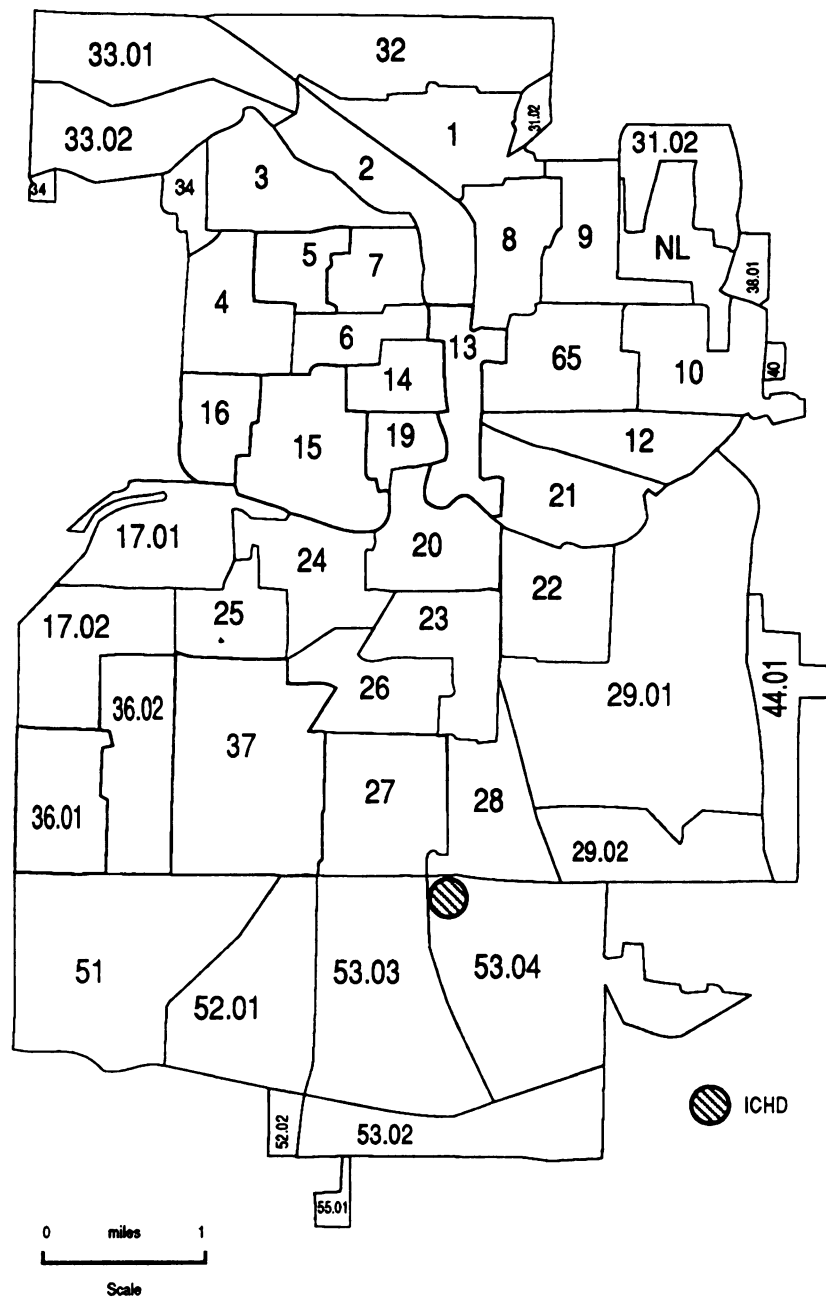
Figure 1. Map. Location of Ingham County Health Department

of a sample of black and white residents of Lansing, MI and
to determine if these rates differ statistically. Subjects'
demographic characteristics, along with their preventive
health care and social behaviors will be analyzed to
determine if they are associated with compliance with
influenza immunization.

The sampling design of this work is geographical; a
population distribution map of the black elderly population
of Lansing was used to determine a major portion of the
study area. The investigator was primarily concerned with
the compliance behavior of black elderly residents and if
that behavior varied among and within census tracts. A
population-based sample centered on those census tracts
which held greater proportions of black elderly residents
was chosen for analysis.

The following formal hypotheses (null) will be tested:

$H_0 1$: No difference exists between the compliance
rates of black and white elderly
subjects.

$H_0 2$: No difference exists in compliance rates among
census tracts in which high proportions of
black elderly residents live and in those in
which lower proportions live.

$H_0 3$: No difference exists between the compliance
rates of those subjects who received a
recommendation from their physician to take
the vaccine and those who did not.

$H_0 4$: No difference exists between compliance levels of
those who visit their physician frequently and
those who do not.

$H_0 5$: No difference exists between compliance levels of
those who have higher levels of education

and those who have lower levels of
education.

H_06 : No difference exists between the compliance rates
of those of higher income and those of lower
income levels.

H_07 : No difference exists between compliance rates of
those who are members of an HMO and those who are
not.

The first hypothesis is based on the findings of other
studies which found that compliance among whites differed
statistically from that of blacks (Rives and Mooney, 1978;
Aho, 1979; MMWR, 1989; Gemson et al, 1988; Sievert et al,
1989, Stehr-Green, 1990). The alternate hypothesis states
that compliance rates between black and white subjects
differ significantly, and that black subjects comply at
lower levels.

The second hypothesis is based on the assumption that
if black elderly residents comply at lower levels, then the
census tracts in which they make up a large proportion will
correspondingly have lower compliance rates than do tracts
with lower proportions of black elderly residents. The
alternate hypothesis states that compliance rates between
census tracts included in the study differ significantly.

The third hypothesis is based on the finding that a
doctor recommendation of the vaccination has been
demonstrated to be positively associated with vaccination
compliance in other studies (Ennis, 1976; Rundall and
Wheeler, 1979; Aho, 1979; Sievert et al, 1989; Public Health
Service, 1989). The alternate hypothesis is subjects who are

recommended by their physician to have an influenza immunization have statistically higher compliance levels than those who are not recommended by their physician.

The basis for the fourth hypothesis is that studies have demonstrated that frequent visits to a physician are positively associated with vaccination compliance (McKinney and Barnas, 1989, Barton et al, 1990). The alternate to this hypothesis is subjects that visit the doctor more frequently have higher rates of immunization.

The basis for the fifth hypothesis is that Monto et al, 1977; Rives and Mooney, 1978 and MacPherson et al, 1980, demonstrated that level of education was positively associated with immunization compliance. The alternate hypothesis is level of education of subjects is positively associated with compliance.

The sixth hypothesis is based on the findings of Monto et al, 1977; and MacPherson et al, 1980, which included a positive association between level of income and vaccination compliance. The alternative hypothesis is level of income of subjects is positively associated with vaccination compliance.

Preventive health behaviors have been demonstrated to be associated with compliance and thus, the basis for the seventh hypothesis (MacPherson et al, 1980, Stehr-Green, 1990). HMOs represent themselves as supporters and providers of preventive health care. A logical assumption is subjects who are HMO members have higher compliance levels. The

alternate hypothesis is subjects who are HMO members have significantly higher rates of compliance rates than those who are not.

Chapter Two

Review of the Literature

A formal review of the literature reveals an extensive amount of research on and concern with the compliance behavior of elderly subjects with influenza immunization. Several population-based studies were reviewed.

Pyle (1984) compared spatial similarities and differences in influenza vaccine acceptance. His study also analyzed the relationship between city size and acceptance of vaccine. Macpherson et al (1980) surveyed residents of Vermont by mail to determine swine influenza immunization compliance and demographic and other characteristics associated with compliance (total compliance 60%). Elderly rural residents had strikingly lower levels of compliance. Elderly single males and single subjects as a whole also had lower compliance rates in this study. Single subjects had lower compliance rates. Residents with higher education levels reported higher levels of compliance. Higher income residents, especially females had higher levels of compliance. A relationship was also found between preventive health care, history of vaccination for influenza and well doctor visits and higher compliance levels. A similar survey performed by the Behavioral Risk Factor Survey System in 44 states in the U. S. reported that men had slightly higher immunization rates in the 18 to 44 years age group and white

elderly respondents had higher compliance rates than blacks (MMWR, 1989) (32% total compliance).

Monto and Ross (1979) reported 69.3% compliance with swine influenza immunization from their population-based telephone survey in Lenawee County, MI. Monto et al (1977) also found that subjects who were female, of a higher education and income level, who were married and who were older had higher compliance rates with swine influenza immunization (22% total compliance). Rives and Mooney (1978) conducted a survey by personal interview in the general population of South Delaware and found that nonwhites, those over 45 years and those with less than a high school diploma had lower swine influenza vaccination compliance levels (23% total compliance).

Stehr-Green et al (1990) found race other than white along with lack of other preventative health behaviors to significantly decrease the likelihood of immunization among persons 65 years and older. They also found that frequent and recent medical checkups were related significantly with compliance (total compliance 32%).

Rundall and Wheeler (1979) surveyed senior citizens in Tompkins County, NY by mail about their health beliefs in relation to swine influenza immunization compliance. The most important determinants of compliance were perceived susceptibility to the disease and perceived risk of receiving the immunization (total compliance 72.1%). Ennis et al (1976) surveyed subjects by telephone to determine

levels of compliance and factors associated with it. The
most common reason for noncompliance was lack of a perceived
need for it. Non-compliance was also significantly
associated with lack of a physician recommendation for the
vaccine (26.9% overall compliance).

Several studies examined physician behavior and
attitudes toward influenza immunization of their patients.
McKinney and Barnas (1989) found that elderly patients who
had been vaccinated the previous year and those who made
multiple visits to physicians had a higher rate of
immunization compliance (47% vs 39%). Rates were unrelated
to age, gender or race. Physician uncertainty about the
contraindications of the vaccine and its efficacy were found
to be factors in the rate in which they offered vaccine to
their patients. A telephone survey of physicians in New
York, NY found that physicians whose caseloads consisted of
a majority of minority patients recommend influenza
vaccination significantly less than do physicians with
majority white patient caseloads, (Gemson et al, 1988).
Factors associated with this difference included: physician
training and education, socio-economic level of the patients
and time spent with patients.

In a hospital-based study in the United Kingdom (UK),
Tranter (1976) found that physicians received influenza
immunization at nearly non-existent rates and may not, as a
result of their own attitudes toward the vaccine, have
offered it to their patients. Nicholson et al (1987)

surveyed general practitioners in the UK and found that clinics that had a policy in place for the administration of influenza vaccine had significantly higher rate of compliance among their patients (19.5% total compliance).

The Public Health Service (1988) conducted surveys in independent living senior citizen housing complexes in Fulton and DeKalb Counties, GA, and found that the most important factor associated with vaccination status was recommendation of vaccine by a health care provider (overall compliance 55.0%). Whites also had significantly higher rates of compliance than did blacks.

Several other investigators studied subjects found at senior citizen centers or those who resided in senior living complexes. Aho (1979) interviewed Black and Portuguese subjects in Providence, RI. who were residents of a senior citizen complex about their immunization status and health beliefs. Efficacy and safety of the vaccine, gender and race, along with planning to be immunized in the future were significantly associated with immunization status (52-56% overall compliance). Sievert et al (1989) surveyed residents of senior citizen housing communities in person and by telephone about their immunization status and other demographic variables. Black respondents had lower immunization levels than did whites. Physician recommendation was also an important factor significantly associated with compliance in this study population.

Compliance rates for institutionalized elderly patients

were determined in several studies (Setia et al, 1985; Patriarca et al, 1985; Siewert et al, 1988; Bloom et al, 1988). Rates ranged from 33-87% compliance. Factors significantly associated with compliance with influenza immunization for institutionalized subjects included: familial consent, educational promotion, physician recommendation, and the facility having an immunization program in effect.

A large proportion of the studies reviewed are concerned with increasing compliance with influenza immunization among elderly patients through various means (Larson et al, 1979; Mullooly, 1987; Hutchinson, 1989; Leirer et al, 1989; McDowell et al, 1990, Barton et al, 1990; Wakefield, 1990; and Hutchinson et al, 1991). Vaccination rates were generally increased by these efforts. Barton found a significant difference between physician visit rates among compliers and non-compliers. Wakefield found that educational promotion did not increase compliance levels significantly in his study population. Hutchinson and Shannon found no significant difference in compliance levels between those who had and had not been reminded by postcard to receive a vaccination.

The generally high compliance rates seen in several of the swine influenza studies are attributed to the extensive efforts of the National Influenza Immunization Program (suspended in December, 1976). This program was a large scale campaign in the U.S. to immunize individuals against

the perceived threat of the swine flu in 1976.

The literature points to several factors significantly associated with influenza vaccination compliance. These factors include race other than white, higher education and income levels, vaccination the previous year, physician recommendation of vaccination and multiple visits to the physician. In the studies where gender was found to be a significant factor, females had higher levels of compliance than did males. History of taking preventive health care measures were found in some cases to be significantly associated with compliance. Subjects' fear of the risks of the vaccine versus its efficacy affected compliance levels in several studies.

A great range of compliance levels were seen in the various studies. The swine influenza immunization studies showed high rates of vaccination in general (22.0 to 69%). Several of the more recent studies also found varying rates of compliance (19.5 to 56.0%). Several of the samples could not be considered representative of the entire elderly population because of their sample selection and indeed some of the studies included subjects from all adult age groups. In most cases compliance levels remained between 20% and 30%.

Chapter Three

Methods

<u>Study Area.</u>

Lansing (pop = 122,700) is the capital of Michigan and is situated in the northeast corner of Ingham County (Figure 2). The population of Lansing comprises approximately 45% of the population of Ingham County. The elderly population (aged 65 years or older) of Lansing is 12,443, and comprises 10% of the total city population (Figure 3). The total black population of Ingham County is 21,905 and 79% of the total black population of Ingham County resides in the City of Lansing, Ingham County. The black elderly population of Lansing is 1,165 (9% of the total black population and .1% of the total population of Lansing). Table 1 shows detailed demographic data on Ingham County and Lansing, MI.

Lansing is divided into 50 census tracts (Figure 4). Census tracts were considered to be eligible for consideration in the study if 10% of the elderly population which resided in that tract were black (Figure 5). Of 15 such census tracts, seven were selected for field study (Figure 6). All census tracts in which over 25% of their elderly population were black were selected for field study (Tracts 5, 15, 16, 36.01). A well known government subsidized apartment complex for social security recipients, Riverfront Apartments, is situated in Tract 13, therefore it was selected for field study. Tract 37 was selected at
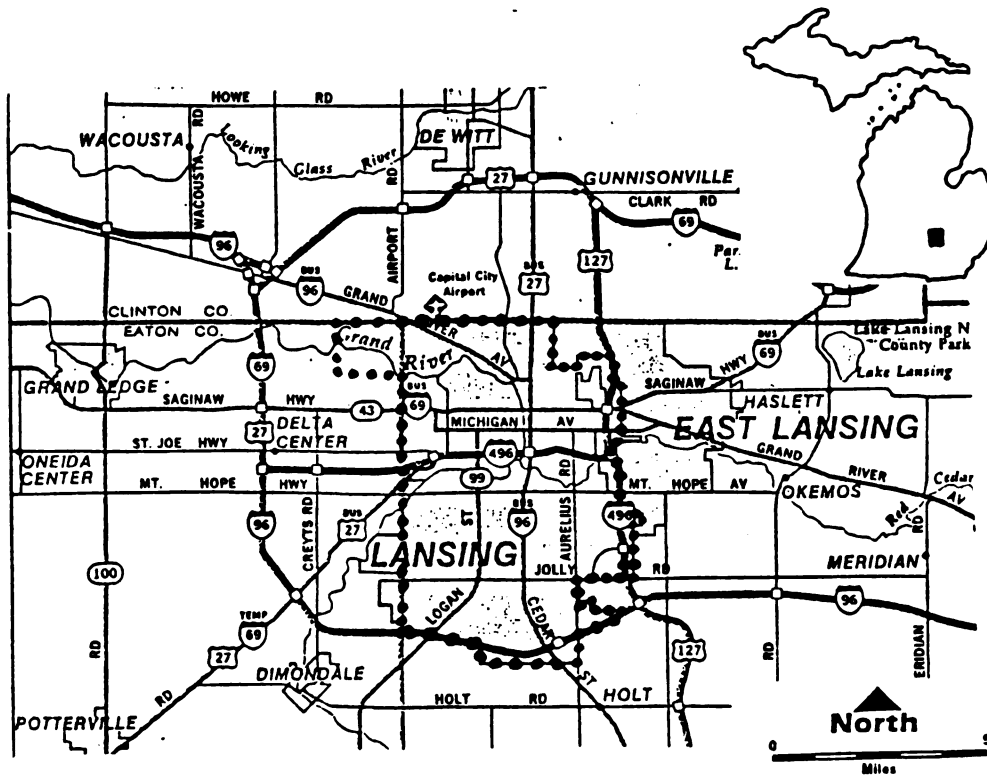
Figure 2. Map. Lansing, Michigan.

ELDERLY POPULATION DISTRIBUTION

Figure 3. Total Distribution of Elderly Residents

TABLE 1

DEMOGRAPHIC DATA
INGHAM COUNTY AND LANSING, MICHIGAN

	Ingham County	Lansing
Total Population	281,912	122,700
Total Black Pop	27,837	21,905
(% of total pop)	(9%)	(18%)
Total White Pop	223,705	91,545
(% of total pop)	(79%)	(75%)
Total Population 65 yrs +	24,376	12,443
(% of total pop)	(9%)	(10%)
Total Male 65+	9,342	5,848
(%pop 65+)	(38%)	(47%)
Total Female 65+	15,034	6,596
(%pop 65+)	(61%)	(53%)
Total Black Pop 65+	1,203	1,165
(%pop 65+)	(.4%)	(9%)
Male	476	425
(%Black 65+)	(40%)	(37%)
Female	727	730
(%Black 65+)	(60%)	(63%)
Total White Pop 65+	22,779	10,780
(%pop 65+)	(8%)	(60%)
Male	11,077	3,922
(%white 65+)	(49%)	(36%)
Female	11,702	6,858
(%white 65+)	(51%)	(64%)

LANSING CENSUS TRACTS
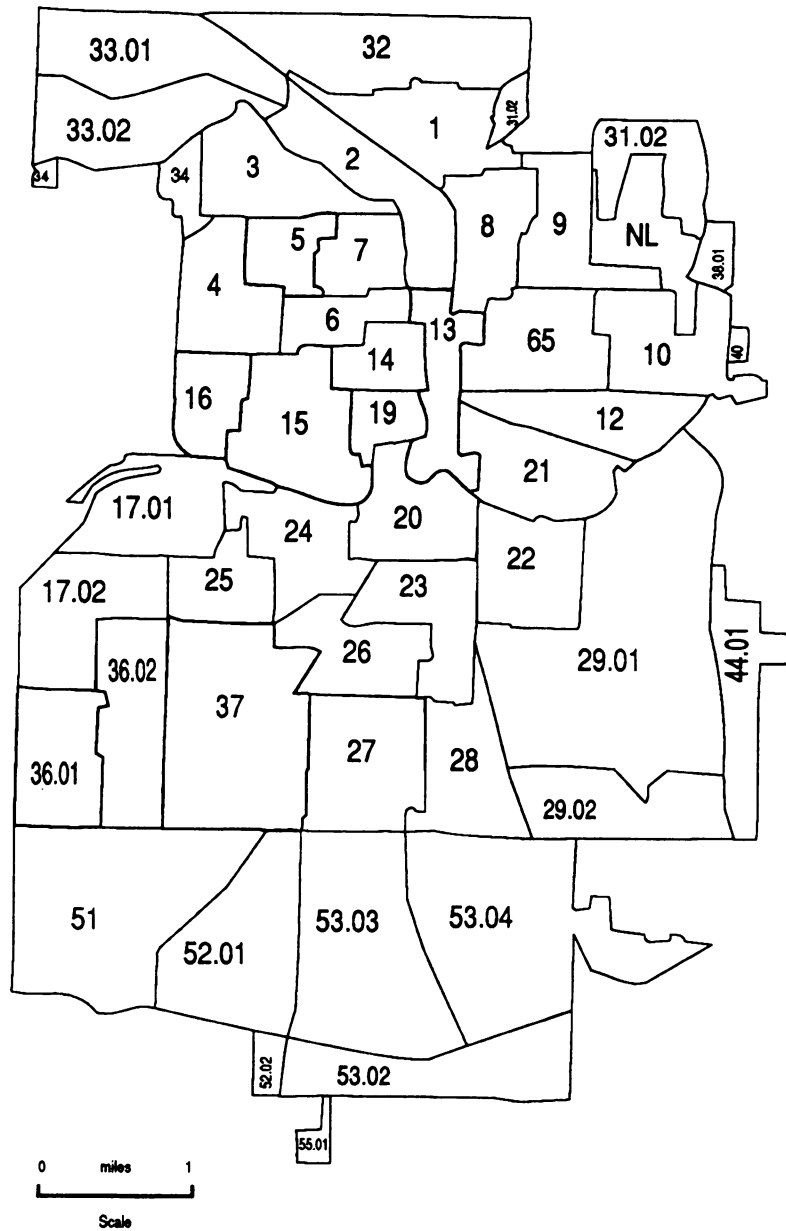
Figure 4. Map. Census Tracts, Lansing, Michigan

BLACK ELDERLY
POPULATION DISTRIBUTION

Figure 5. Proportions of Elderly Residents Who are Black
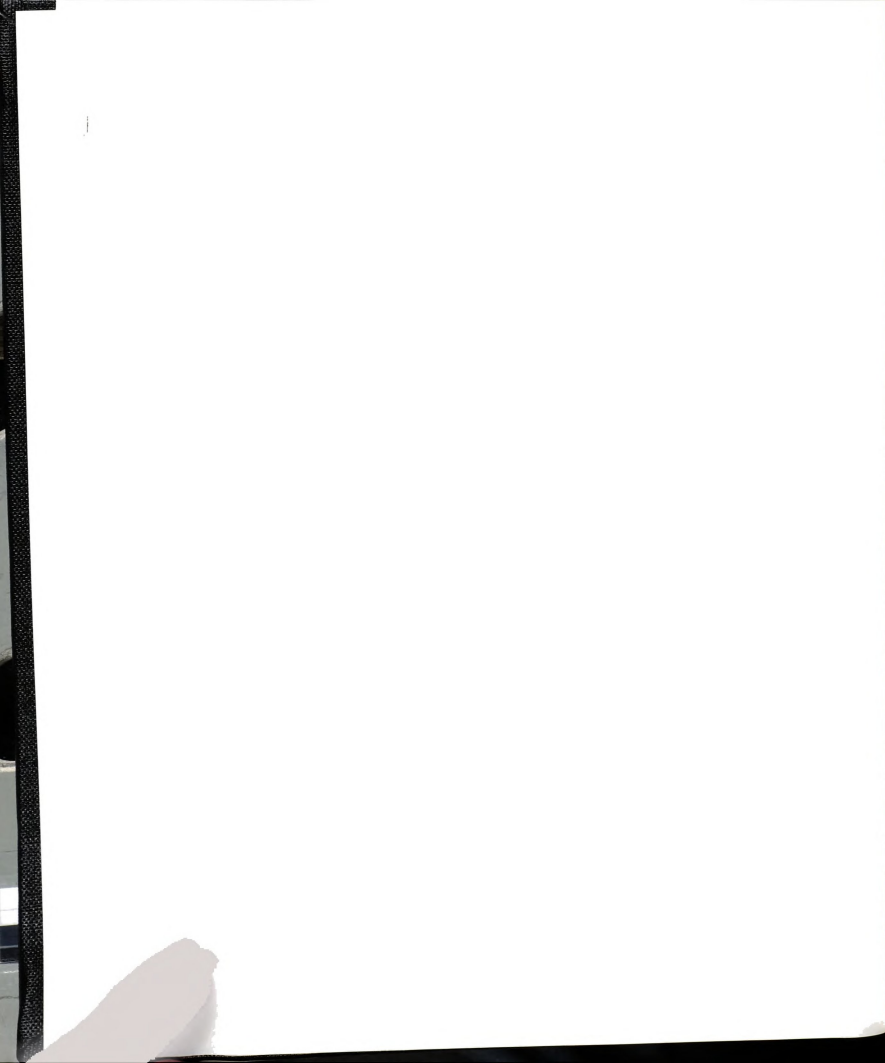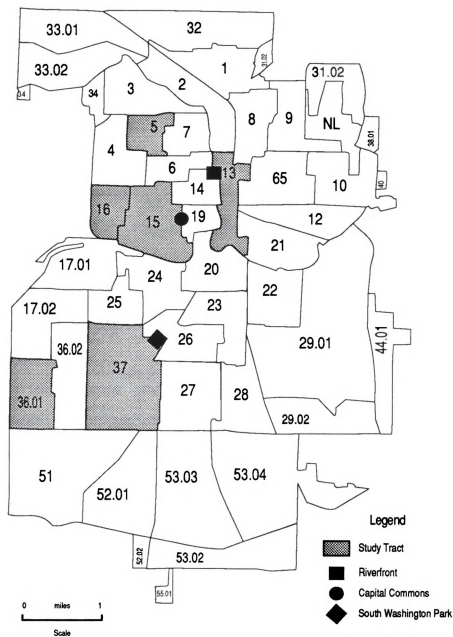
STUDY AREA

Figure 6. Map. Study Area

random for field study. Table 2 shows selected characteristics of the census tracts included in the study area.

Pre-test of the survey instrument.

The survey instrument was pretested by conducting 5 interviews. Four of the interviews were conducted at a local senior citizens center. The fifth interview was conducted with the help of a Lansing resident who is not a senior citizen. Problems with the form and content of several questions became evident during the pretest. After the pretest, the investigator decided to include a question concerning whether the subject lived alone. One of the pre-test subjects was married and her spouse lived in a nursing home. Also, the questions concerning income were modified to include four sources.

The Survey.

Subjects were contacted through a door-to-door survey. The investigator knocked on every door on every street of a selected tract. If the resident was at home and reported being aged 65 years or older, he or she was asked if they would be willing to participate in a short interview (Appendix A). If the subject was willing, he or she was asked to read and sign the consent form (Appendix B). The interview began after the reading of the consent was completed (Appendix C). Appendix D shows the percentage of responses to the survey questions.

TABLE 2

SELECTED DEMOGRAPHIC VARIABLES
for the Study Area

Variable			Tract #			
	5	13	15	16	36.01	37
Total Population	2,070	1,620	2,583	1,273	4,312	6,508
% Female	52.3	51.8	52.9	53.3	51.2	51.9
% Black	43.4	15.5	64.8	77.2	43.9	14.2
%65 yrs and +	8.0	14.0	11.0	14.0	5.0	13.0
Household Income						
Median ($)	23,608	8,332	10,147	35,921	37,759	23,596
%Retirement Income	14.0	18.7	11.0	13.6	13.2	17.5
Mean($)	9,142	3,637	4,777	9,018	9,478	6,330
%SSI Income	22.6	43.4	22.3	33.6	15.5	25.2
Mean($)	7,338	5,413	6,912	10,712	7,036	7,614
Education						
< 12 yrs	27.7	37.1	43.3	27.1	20.4	25.8
12 yrs	36.6	32.9	13.3	11.4	29.9	31.2
13 -15 yrs	29.0	22.4	24.2	40.2	35.7	13.1
16 yrs and +	6.0	7.6	19.2	21.3	14.0	10.7
All Residents						
% <Poverty Level	28.0	54.0	51.0	13.0	16.0	24.0

For the purposes of this study, the investigator wished to consider only black and white residents of Lansing. Two residents who appeared to be Hispanic were interviewed. The data gathered in these two interviews were not used in the analysis.

Four apartment complexes were included in the study area: Capital Commons (Tract 14), River Front (Tract 13), South Washington Park (Tract 37) and Somerset (Tract 37). The first three complexes are government subsidized housing for social security recipients (Figure 6). Somerset is a private apartment community for senior citizens. The resident manager at Capital Commons allowed the interviewer to conduct interviews freely within the building as did the manager of South Washington Park. Fifteen interviews were taken at Capital Commons (two Hispanic respondents were eliminated) and 10 interviews at South Washington Park. The resident manager of River Front asked the interviewer to attend the resident's council meeting and ask residents to sign a list if they wished to be interviewed. Thirty-three interviews were taken at River Front. The resident manager of Somerset distributed a letter to all residents asking them to contact her if they wished to be interviewed. One interview resulted from these efforts.

Upon leaving the dwelling, after the interview was completed, the investigator plotted the location of the house on a map along with a number to identify it. The interviews were conducted for the most part, from Monday to

Friday between the hours of 10am and 3pm. The general survey took place from November 1992 to May 1993.

Bias.

The sample gathered for this research may be biased in several ways. Subjects were not randomly selected, but were self-selected. The estimated response rate for the entire sample is 11%, based on the total elderly population (black and white) for the study area. Response rates for the individual tracts included in the study are as follows: Tract 5, 13.0%, Tract 13, 6.0%, Tract 15 17.0%, Tract 16, 15.0%, Tract 36.01, 21.0% and Tract 37, 5.0%. Characteristics of those residents who refused to be interviewed or were not interviewed for other reasons (e.g. were not at home) were impossible to measure due to inability to obtain information from residents who did not participate, therefore "volunteer" bias may be present in the sample. Subjects who are willing to let a stranger into their homes and discuss elements of their personal and medical history may have different characteristics from those who did not let the investigator interview them.

Houses that appeared in any way threatening (i.e. dog chained out front or in fenced-in front yard, suspected drug trafficking in or around house, abandoned houses) were passed by without attempt to ask for an interview. The individuals who live in houses that fit this description are underrepresented in the study.

Subjects who are not usually at home during the hours

or days that the survey was conducted are underrepresented in the study (i.e. those who are employed full time during the day, those who spend a lot of time at senior centers, those who live out of state during the winter). A large proportion of the non-black elderly population of Lansing was not considered in the study due to its focus on black elderly residents.

<u>Statistical Analysis</u>.

Chi-square (X^2) testing is used to analyze data with categorical variables to determine whether observed differences in proportions between study groups are statistically significant (Hennekens, 1987). In tests where expected frequencies in cells are < 5, Fisher's exact probability test is a better indicator of significance in 2X2 contingency tables, (Epi Info, 1990). In addition to the X^2 test (with Yate's correction for 2X2 contingency tables), Relative Risk (RR) and 95% Confidence Intervals (CI) will be calculated for 2X2 contingency tables to estimate the magnitude of the association between risk factors and vaccination status (Table 3).

Relative risk (RR) is an estimate of the magnitude of the association between the risk factor (eg. gender) and the outcome (immunization) (Hennekens, 1987). A relative risk of 1.0 indicates that the incidence of the outcome in the risk groups (2X2 contingency tables) are identical and there is no association between the risk factor and the outcome in the data. A value greater than 1.0 indicates a positive

Table 3

Formulas

Chi Square

Outcome

	a	b	a+b
	c	d	c+d
	a+c	b+d	T*

$$X^2_{(df)} = \sum \frac{(|O-E|-1/2)^2}{E}$$

$$X^2 = \frac{(ad-bc)^2 (T)}{(a+b)(c+d)(a+c)(b+d)}$$

T*=a+b+c+d

Relative Risk

$$RR = \frac{a/(a+b)}{c/(c+d)}$$

95% Confidence Interval

$$CI = \frac{a/(a+b)}{c/(c+d)} \times \exp[\pm z(1/a + 1/b + 1/c + 1/d)]$$

---

association and a value less than 1.0 indicates a negative association between risk factor and outcome.

The confidence interval (CI) has several functions in the interpretation of statistical significance between risk factor and outcome (Hennekens, 1987). The CI delineates the range within which the true magnitude of effect lies with some measure of certainty. If the null value of the RR (1.0) lies within a 95% CI, the p value is greater than .05 and no significant association exists. Conversely, if the null value does not lie in the 95% CI, then the p value is less than .05 and the association is statistically significant. Another function of the CI is denoting the amount of variability in the estimate and measuring the effect of sample size. The wider the CI, the greater the variability in the estimate of the effect and the smaller the sample size. A wide CI implies that the sample size is too small to have sufficient statistical power to exclude chance as an explanation of the results.

All statistical calculations were performed by the Epi Info, Version 5, program for personal computers (Epi Info, 1990).

Chapter Four

Results

Descriptive Findings of the Total Sample.

A total of 203 interviews were conducted. Of these, six subjects were eliminated from the following analysis. Two subjects were Hispanics and four were under age 65. One subject who did not know if she was vaccinated in 1991 was eliminated from consideration in the study. The total number of eligible subjects was 196.

Table 4 shows the proportions of subjects possessing characteristics or variables in the entire sample of subjects and in a breakdown of subjects by race and gender. A majority of the subjects were female (n=135, 68.5%). Black subjects (n=113) totalled 42.6%.

Total immunization compliance for the sample was 56.3% (N=111). Locations of houses and their compliance status are shown (Figure 7). Black subjects had a compliance rate of 49.4%, white subjects, 61.9%, female subjects, 51.1%, and male subjects, 68.9%. Over 55.0% percent of the subjects who were vaccinated reported that they were vaccinated in their physicians office and 22.7% at the ICHD (Figure 8). Over 15.0% of respondents said they had been vaccinated at special immunization clinics (i.e., union local hall, at their apartment complex, at the Elk's club). The Other category included such places as Veteran's Administration Hospitals in Battle Creek and Ann Arbor.

Subjects who reported receiving and influenza vaccination in

TABLE 4

TOTALS FOR ENTIRE SAMPLE

Proportions of characteristics in the total sample, blacks, whites, females and males.

Characteristic	Total	B	W	F	M
N=	196	83	113	135	61
Vaccination Compliance	56.3	49.4	61.9	51.1	68.9
Past Vaccination	70.1	63.9	74.3	64.7	85.0
Future Vaccination	56.0	51.8	59.3	51.1	67.2
Physician Recommendation	53.8	57.8	49.6	51.1	57.4
Regular Checkups	80.0	79.5	76.6	80.0	78.7
Number of Checkups					
None	21.4	21.7	21.2	20.7	23.8
$\leq$ 1 per year	20.9	16.9	23.9	22.2	18.0
2-6 per year	41.8	42.2	41.6	37.8	50.8
1-2 per month	15.8	19.3	13.3	19.3	8.2
Type of Dwelling					
House	70.0	80.2	64.3	65.4	83.3
SSI Apts	28.0	19.3	35.7	34.1	16.4
Apt or Duplex	1.5	2.4	0.9	1.4	1.6
Insurance Coverage					
Medicare B	100.0	100.0	100.0	100.0	100.0
Private	68.0	63.9	71.7	65.2	75.4
HMO	12.0	4.8	17.7	11.1	14.8
Employment Status					
Employed	8.0	8.4	8.0	5.9	13.1
Retired	83.0	81.9	83.2	77.8	93.4
Homemakers	12.0	9.6	15.0	18.5	-
Marital Status					
Married	37.0	34.9	38.1	25.2	62.3
Single/Divorced	16.0	13.3	18.6	16.3	16.4
Widowed	47.0	51.8	43.4	58.5	21.3
Live Alone	48.0	39.8	54.9	57.0	29.5
Volunteer	40.0	36.1	40.7	39.3	37.7
Can Drive	60.0	54.2	62.8	46.7	86.9
Own Auto	62.0	59.0	64.6	51.1	86.9
Have Driver	50.5	54.2	47.8	60.0	29.5
Special Transportation	22.0	19.3	23.9	26.7	11.5

Table 4 (cont.)

Rides Bus	18.4	22.9	15.0	17.8	19.7
Attend Church	69.0	85.5	55.8	72.8	59.0
Attend Senior Program	16.0	20.5	13.3	20.7	6.6
Member of Social Club	26.0	26.5	24.8	24.4	27.9
Member AARP	55.0	47.0	59.3	48.1	67.2
Tract 5	12.7	14.5	11.5	13.3	11.5
Tract 13	7.6	1.2	12.4	9.6	3.3
Tract 15	24.4	33.7	17.7	26.7	19.7
Tract 16	14.2	27.7	3.5	12.6	16.4
Tract 36.01	21.8	16.9	25.7	20.0	26.2
Tract 37	19.3	6.0	29.2	17.8	23.0
Source of Income					
SSI	100.0	100.0	100.0	100.0	100.0
Pension	63.8	67.5	61.1	56.3	80.3
Investments	49.5	39.8	56.6	42.2	65.6
Earnings	13.8	12.0	15.0	8.9	24.6
Other	5.6	6.0	5.3	5.9	4.9

IMMUNIZATION COMPLIANCE
1991
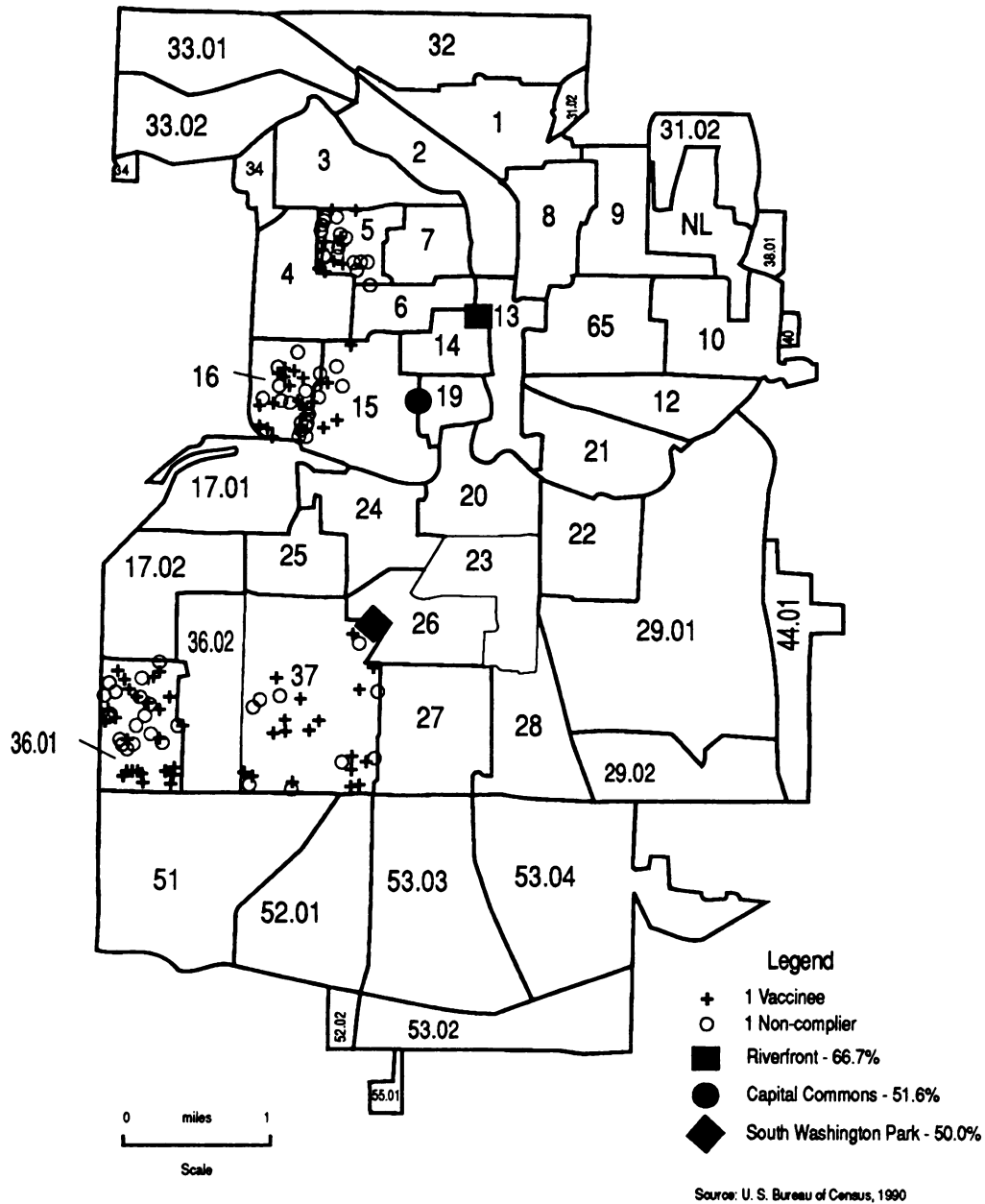
Figure 7. Map. Immunization Compliance in the Study Area.
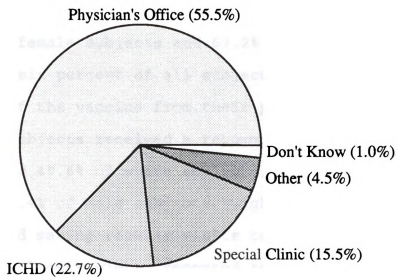
Figure 8. Proportions of immunization by vaccination locations.

the past totalled 70.1%. Over 64.0% of black subjects
reported having a past vaccination, as did 74.3% of white
subjects, 64.7% of female subjects, and 85.0% of male
subjects. Subjects who said they intended to receive an
influenza immunization in the future made up 56.0% of the
sample (6.6% did not know if they would receive one in the
future). Over 51% of black subjects intended to receive a
vaccination in the future, as did, 59.3% of white subjects,
59.3%, 51.1% of female subjects and 67.2% of male subjects.

Over fifty-six percent of all subjects received a
recommendation of the vaccine from their physician. Over
57.0% of black subjects received a recommendation from their
physician, as did 49.6% of white subjects, 51.1% of female
subjects, and 57.4% of male subjects. Eighty percent of all
subjects reported making regular visits to their doctor.
Almost 80.0% of black subjects reported regular medical
checkups as did 76.6% of white subjects, 80.0% of females,
and 78.7% of males.

The frequency of doctor visits among all the subjects
and for each of the race and gender groups are shown (Table
5). The categories of doctor visits are as follows: None,
subjects reported that they never made visits to the doctor;
$\leq$ 1 per year, subjects reported they had an annual check-up
or one every two years; 2-6 per year; and 1-2 per month.

All subjects reported being covered by Medicare. Sixty-
eight percent of all subjects reported carrying a
supplemental private insurance. Almost 64.0% of black

TABLE 5

Proportions of Frequencies of Medical Checkups among Subjectsand Respective Immunization Compliance

#of Visits	%ofTotal	%of B	%of W	%of F	%of M
None	21.4	21.7	21.2	20.7	23.0
≤ 1 per year	20.9	16.9	23.9	22.2	18.0
2-6 per year	41.8	42.2	41.6	37.8	50.8
1-2 per mo	15.8	19.3	13.3	19.3	8.2

Compliance

#of Visits	Total	B	W	F	M
None	38.1	33.3	41.7	35.7	42.9
≤ 1 per year	61.0	35.7	74.1	53.3	81.8
2-6 per year	63.4	60.0	66.0	56.9	74.9
1-2 per mo	58.1	56.3	60.0	53.8	80.0

subjects reported carrying private insurance, as did 71.7%
of white subjects, 65.2% of female subjects and 75.4% of
male subjects. Twelve percent of all subjects were members
of a Health Maintenance Organization (HMO). Less than 5.0%
of black subjects reported being HMO members, as did 17.7%
of white subjects, 11.1% of female subjects, and 14.8% of
male subjects.

Proportions of all subjects and those of the race and
gender groups by census tract are shown (Table 4). The
largest proportion of subjects were interviewed in Tract 15.
The largest proportion of black subjects were interviewed in
Tract 15, that of white subjects in Tract 37, that of female
subjects in Tract 15 and that of males subjects in Tract
36.01. The smallest proportion of subjects was interviewed
in Tract 13. The smallest proportion of black subjects was
interviewed in Tract 13 (n=1), that of white subjects in
Tract 16, that of females in Tract 13, and that of males in
Tract 13.

Employment and marital status of subjects are shown
(Table 4). The proportion of subjects who reported living
alone totalled 48.0%. Nearly 40.0% of black subjects
reported they lived alone, as did 54.9% of white subjects,
57.0% of female subjects and 29.5% of male subjects.

Subjects reported number and relationships of household
members. Over 42.0% of all subjects lived with a spouse,
30.0% with their children (grown or otherwise), 12.4% with
their grandchildren, 3.0% with a sibling, and 5.8% with

others (in-laws, friends, significant others). Several of the subjects were raising their grandchildren single-handedly. Many subjects lived with various combinations of these relations.

Forty percent of all subjects reported they perform some type of volunteer work. Volunteer work was classified into types: hospital, church, neighborhood, which included such activities as driving a neighbor or friend around, running errands for the same, and performing various volunteer functions in one's apartment complex such as running the store, and community work, which included such activities as involvement in a political campaign, working at a senior citizen center, and work at the Red Cross. Distribution of volunteer work by type for all subjects is shown (Figure 9).

The various modes of transportation used by the subjects are shown (Table 4). Sixty percent of subjects reported that they drove and 62% owned at least one automobile. Over fifty percent of subjects reported that they had a friend or relative that drove for them. Only 18% of subjects reported ever using the city bus transportation system (none for their primary mode of transportation). Twenty-two percent of subjects reported using Spectran or the Dean Transportation (special transportation services provided on a call-in basis to the disabled and those $\geq$ 65 years).

Subjects responded to questions about their church
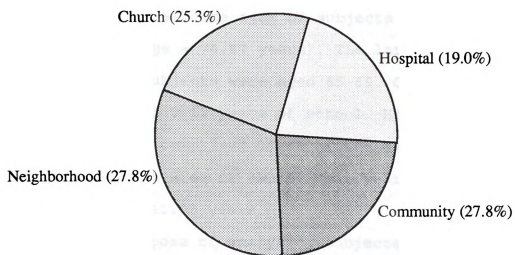
Figure 9. Proportion of volunteer work by type.,

attendance, social activities and attendance at senior citizen centers (Table 4) Fifty-five percent of all subjects were members of the American Association of Retired Persons (AARP). Appendix E contains a complete listing of the churches respondents attended (and corresponding compliance rates).

The distributions of age groups, education levels and income level of all subjects and the race and gender groups are shown (Table 6). The ages of subjects ranged from 65 to 99 years (mean age = 74.87 years). The largest proportion (29.1%) of all subjects were aged 65-69. Over 45% of all subjects attended 0-11 years of school. High school graduates (only) comprised 26.4% of the sample and 11.7% were college graduates or above. Mean years of education for this sample was 11.08 years.

For the purpose of analysis, subjects were grouped into income levels based on the amount of their annual income and number of family members (U.S. Department of Commerce, 1991). The income levels are as follows: Low, < $10,000 per year and one or more dependents, $10,000 to $15,000 per year and 2 or 3 dependents; Medium, $10,000 to $15,000 per year and 1 dependent, or $15,000 to $30,000 per year and 3 dependents; Medium High, $21,000 to $42,000 per year and 1 dependent, or $30,000 to $42,000 per year and 2 dependents; and High, $75,000 tp $145,000 per year and 1 or 2 dependents. The large break in amounts of income between Medium High and High income levels is due to the break in

TABLE 6

DISTRIBUTION OF AGE, EDUCATION AND INCOME
for the total sample, and black, white, female and
male subjects(%COMPLIANCE)

==

Age Group	%ofTotal (compliance)	B	W	F	M
65-69 years	29.1(61)	24.1(61)	32.7(62)	20.7(57)	47.5(66)
70-74	24.0(51)	28.9(50)	20.4(52)	28.9(46)	13.1(75)
75-79	22.4(50)	25.3(38)	20.4(61)	21.5(45)	24.6(60)
80-84	11.7(74)	10.8(56)	12.4(86)	14.1(74)	6.6(75)
85+	12.8(52)	10.8(44)	14.2(56)	14.8(40)	8.2(100)

==

Educ. Level	%ofTotal	B	W	F	M
0-6 years	7.1(67)	12.0(55)	3.5(100)	7.4(64)	6.6(75)
7-11	38.3(54)	41.0(42)	36.3(63)	41.5(49)	31.1(68)
12	26.5(50)	20.5(41)	31.0(54)	29.6(43)	19.7(75)
13-15	16.8(64)	15.7(62)	17.7(65)	13.3(44)	24.6(87)
16	6.1(58)	3.6(67)	8.0(56)	5.2(86)	8.2(20)
17+	5.1(70)	7.2(67)	3.5(75)	3.0(100)	9.8(50)

==

Income Level	%ofTotal	B	W	F	M
Refused	16.3(65)	18.1(63)	15.0(67)	15.6(57)	18.0(82)
Low	37.6(49)	42.2(42)	32.7(56)	45.2(41)	18.0(85)
Medium	35.2(56)	32.5(42)	37.2(64)	30.4(55)	45.9(59)
Med-High	10.7(73)	4.8(100)	15.0(67)	8.1(88)	16.4(57)
High	1.0(100)	2.4(100)	0.0(-)	0.7(100)	1.6(100)

==

the distribution of the subjects' reported income. Over
83.0% (n=162) of subjects responded to the question about
annual household income (16.2% refusal rate). Household
income ranged from $3,000.00 to $145,000 per year (median=
$8,700).

Chi-square Analysis.

Chi-square (X^2) analyses were performed to compare the
rates of immunization compliance according to demographic
characteristics, census tract of residence, immunization
history and future intent regarding vaccination, visits to
the physician, recommendation of vaccine by the physician,
and the other variables surveyed. In the cases where df=3,
"Don't Know" is included in the X^2 analysis along with "yes"
and "no" in response to the question, "did you have an
immunization last year" or "do you intend to have an
immunization in the future?". Because the RR is incalcuable
for contingency tables df>2, the X^2 statistic is included in
the written results (not in the tabulated results).

The strongest association with compliance with
influenza immunization was found based on past history of
influenza immunization (n=194) (Relative Risk [RR]=3.74, 95%
CI=2.18, 6.43, p<.000). [Three subjects did not know if they
had received a past vaccination for influenza and were
eliminated from consideration in this test.] Those who had
an influenza vaccination in the past were more likely to
have been vaccinated in 1991.

Respondents whose physician had recommended that they

be vaccinated were more likely to have been vaccinated in 1991 (RR=2.18, 95% CI=1.62, 2.95, p<.000) (Table 7). Intent to have an influenza vaccination in the future was significantly associated with compliance (p<.000, df=2, X^2=113.55). Medical checkups were significantly associated with vaccination compliance (RR=1.52, 95% CI=1.02, 2.27, p=.03). The number of checkups a subject had in a year was associated significantly with compliance (p=.05, df=3, X^2= 7.75). Chi-square for linear trend was performed on the number of check-ups variable and no significant trend was found. Females had a significantly lower rate of immunization compliance (51.1%) than did males (68.9%) (RR=.74, 95% CI= .59, .94, p=.03).

Analysis of Factors among Black Subjects.

Table 8 shows significant findings among black subjects. Among black subjects (n=79, 6 subjects did not know if they had a past immunization and were eliminated from this test), history of past immunization was significantly associated with immunization compliance (RR= 2.80, 95% CI=1.80, 4.36, p<.000). Black subjects who had been immunized in the past were more likely to have been vaccinated in 1991. Black subjects who had a recommendation of the vaccine from their physician had higher compliance levels (68.8%) than those who did not (RR=2.40, 95% CI-1.51, 3.82, p<.000). Black subjects who intend to receive an influenza immunization in the future (n=75) may have higher compliance rates (81.4%, RR=13.02, 95% CI-3.30, 50.21,

TABLE 7

CHI SQUARE ANALYSIS
2 X 2 Contingency Table Results

===

RISK FACTOR	% WITH FACTOR	%COMPLIANCE	RR	95%CI
FEMALE	68.5	51.1*	.74	.59, .95
BLACK	42.6	48.8	.80	.61, 1.04
HOUSE(N=193)	70.1	57.2	1.04	.79, 1.37
DR RECOMMEND.	52.8	76.0*	2.18	1.62, 2.95
PAST SHOT(N=194)	70.1	72.3*	3.74	2.18, 6.43
CHECKUPS	79.7	60.9*	1.52	1.02, 2.27
PRIVINSURANCE	68.0	57.5	1.05	.80, 1.37
MEMBER HMO	12.2	70.8	1.30	.97, 1.73
EMPLOYED	8.1	62.5	1.11	.75, 1.66
RETIRED	82.7	56.8	1.02	.73, 1.41
HOMEMAKER	12.7	48.0	.83	.54, 1.27
LIVE ALONE	48.2	54.7	.94	.73, 1.20
DRIVE?	59.4	57.8	1.05	.82, 1.35
CAR	62.4	59.8	1.17	.89, 1.52
DRIVER	50.3	55.6	.96	.75, 1.23
BUS	18.3	52.8	.92	.66, 1.29
SPECTRANSP	21.8	51.2	.88	.64, 1.21
ATTEND CHURCH	68.5	57.5	1.05	.80, 1.37
ATTEND SR CTR	16.2	56.3	.99	.71, 1.38
SOCIAL CLUB	25.9	54.0	.94	.70, 1.26
VOLUNTEER	39.1	55.3	.96	.75, 1.24
AARP MEMBER	54.3	59.4	1.11	.87, 1.43
PENSION	64.0	56.8	1.01	.78, 1.30
INVESTMENTS	49.7	59.8	1.12	.87, 1.43
EARNINGS	13.7	70.4	1.29	.98, 1.71
OTHER	5.6	72.4	1.31	.89, 1.92

* Significant @ p≤ .05

TABLE 8

Significant Results of Chi-Square Analysis of Factors
Related to Compliance among Black Subjects

```
==================================================================
RISK FACTOR    % WITH FACTOR    %COMPLIANCE    RR    95%CI
------------------------------------------------------------------
------------------------------------------------------------------
DR RECOMMEND.       60.0           68.8*       2.40  1.51, 3.82
PAST SHOT(N=79)     67.1           69.8*       2.80  1.80, 4.36
FUTURE SHOT(N=75)   53.2           81.4       13.02  3.30,50.21
------------------------------------------------------------------
```
* Significant @ p$\leq$ .05
Future shot result is unreliable: CI very wide

p<.000). The very wide confidence interval indicates that this result is unreliable.

Analysis of Factors Among White Subjects.

Table 9 shows significant differences in compliance rates among white subjects. White subjects who reported receiving an influenza immunization in the past (n=112) had a significantly higher rate of compliance (73.8%, RR=2.95, 95% CI=1.53, 5.68, p<.000). White subjects who had a recommendation from their physician to take the vaccine had a higher compliance rate (82.1%, RR=1.95, 95% CI=1.41, 2.71, p<.000). White subjects who intended to have an influenza vaccination in the future (n=108) had a higher compliance rate (94.8%, RR=7.71, 95% CI=3.38, 17.57, p<.000). The wide confidence interval indicates the significance of this result is unreliable.

Analysis of Factors among Female Subjects.

Analysis of factors among female subjects (n=135) yielded significant differences based on the following factors: past immunization (64.2%, RR=4.94, 95% CI=2.46, 9.93, p=.000); doctor recommendation of vaccine (51.5%, RR=2.19, 95% CI=1.49, 3.22, p=.000) and membership in an HMO (11.1%, RR=1.68, 95% CI=1.23, 2.31, p=.04) (Table 10). Intent to receive an immunization in the future was significantly associated with compliance (53.9%, RR=10.60, 95% CI=4.57, 24.62, p=.000), however the wide CI indicates that this result is unreliable.

TABLE 9

Significant Results of Chi-Square Analysis of Factors
Related to Compliance Among White Subjects
===

RISK FACTOR	% WITH FACTOR	%COMPLIANCE	RR	95%CI
DR RECOMMEND.	49.6	82.1*	1.95	1.41, 2.71
PAST SHOT(N=112)	75.0	73.8*	2.95	1.53, 5.68
FUTURE SHOT(N=108)	62.0	94.0	7.71	3.38,17.57

----
* Significant @ p≤ .05
Future shot result unreliable: CI very wide

TABLE 10

Significant Results of Chi-Square Analysis of Factors
Related to Compliance among Female Subjects
===

RISK FACTOR	% WITH FACTOR	%COMPLIANCE	RR	95%CI
DR RECOMMEND.	51.5	69.6*	2.19	1.49, 3.22
PAST SHOT(N=134)	64.2	72.1*	4.94	2.46, 9.93
FUTURE SHOT(N=128)	53.9	89.9	10.60	4.57,24.62
HMO	11.1	80.0*	1.68	1.23, 2.31

----
* Significant @ p≤ .05
Future shot result unreliable: CI very wide

Analysis of Factors among Male Subjects.

A significant association with compliance among male subjects was found based on physician recommendation of vaccine (57.4%, RR=2.09, 95% CI=1.32, 3.33, p=.0003) (Table 11). Intent to receive a future immunization was significantly associated with compliance (74.5%, RR=6.15, 95% CI=1.69, 22.29, p=.000), however the extremely wide confidence interval renders this result unreliable.

Analysis of Factors between Male and Female Subjects.

Because vaccination compliance was found to be significantly associated with gender in this study, all the variables were analyzed with X^2 analysis between male and female subjects (Table 12). Many significant associations were found. Male subjects had significantly higher levels of past compliance and intent to receive an immunization in the future.

Male subjects were significantly more likely to live in a house and were less likely to live in SSI apartments than were female subjects (X^2=6.91, df=2, p=.03). Male subjects were more likely to have retired from an occupation (X^2=6.14, df=1, p=.01).

Female subjects were more likely to be in the low income group and less likely to be in the higher income groups than male subjects (n=162, analysis was performed without considering those subjects who refused to answer the income question) (X^2=14.14, df=2, p=.0008). Male subjects were significantly more likely to have a pension as a source

TABLE 11

Significant Results of Chi-Square Analysis of Factors
Related to Compliance among Male Subjects
==

RISK FACTOR	% WITH FACTOR	%COMPLIANCE	RR	95%CI
DR RECOMMEND.	57.4	88.6*	2.09	1.32, 3.33
FUTURE SHOT(N=55)	74.5	87.8	6.15	1.69,22.59

----

* Significant @ $p \leq$ .05
Future shot result unreliable: CI very wide

TABLE 12

Significant Results of Chi-Square Analysis of Factors
between Male and Female Subjects

```
===================================================================
VARIABLE      %of MALES(N=61)  %of FEMALES(N=135)    p=
-------------------------------------------------------------------
-------------------------------------------------------------------

HOUSE           83.3              65.4              .01
SENIOR APTS.    16.7              34.6              .01

PAST SHOT       85.0              64.7              .006
FUTURE SHOT     67.2              51.1              .02

RETIRED         93.0              78.2              .01

INCOME(N=160)
LOW             26.5              55.0              .003
MEDIUM          59.2              37.0
MED-HIGH        14.3               7.2

PENSION         78.7              56.3              .004
INVESTMENTS     65.5              42.2              .004
EARNINGS        24.6               8.9              .006

CAN DRIVE       86.9              46.7              .000
OWNS AUTO       86.9              51.1              .000
HAS DRIVER      29.5              60.0              .000
SPECTRANSP      11.5              26.7              .03

%MARRIED        62.3              25.2              .000
%SINGLE         16.4              16.3
%WIDOWED        21.3              58.5

LIVES ALONE     29.5              57.0              .0006
%FAMILY=2       55.7              31.9              .002
%FAMILY=3+      14.8              11.9

AGE
65-69 yrs       47.5              20.7              .001
70-74 yrs       13.1              28.9
75-79 yrs       24.6              21.5
80-84 yrs        6.6              14.1
85+              8.2              14.8

SENIOR PROGRAM   6.6              20.7              .02
MEMBER AARP     67.2              48.1              .02
-------------------------------------------------------------------
```

of their income (X^2=9.49, df=1, p=.002) and also were more likely than female subjects to have wage earnings (X^2=7.45, df=1, p=.006) and savings or investments as a source of income (X^2=8.25, df=1, p=.004).

Male subjects were much more likely to be able to drive (X^2=26.49, df=1, p<.000) and own a car (X^2=21.38, df=1, p<.000) than were female subjects. Males were also less likely to use Spectran or Dean Service or have someone who drove for them (X^2=4.81, df=1, p=.03).

Marital status differed significantly by gender (X^2=28.14, df=2, p<.000). Female subjects were more likely to be widowed (58.5%) than male subjects (21.3%). Male subjects were more likely to be married (62.3%) than female subjects (25.2%). Female subjects were more likely to live alone (57.0%) than were male subjects (29.5%).

Age differed significantly by gender (X^2=18.38, df=4, p=.001). The majority of male subjects (47.5%) were aged 65-69 years. The largest proportion of female subjects (28.9%) were aged 70-74 years.

Male subjects were significantly less likely to attend a senior citizen center (6.6%) than were females subjects (20.7%, X^2=5.16, df=1, p=.02) and more likely to be a member of the AARP (67.2%) than were female subjects (48.1%, X^2=5.41, df=1, p=.02).

Analysis of Factors between Black and White Subjects.

Table 13 shows significant findings between black and white subjects. A significantly larger proportion of black

TABLE 13

Significant Results of Chi-Square Analysis of Factors
between Black and White Subjects

```
================================================================
VARIABLE        % of BLACKS      % of WHITES       p=
                (N=83)           (N=113)
----------------------------------------------------------------
HOUSE             80.2             64.3             .03
SENIOR APTS.      19.3             35.7             .03

HMO MEMBER         4.8             17.7             .01

INCOME(N=162)
LOW               53.0             38.5             .05
MEDIUM            40.9             43.8
MED-HIGH           6.1             17.7

INVESTMENTS       39.8             56.6             .03

CHURCH            85.5             55.8             .0000
----------------------------------------------------------------
```

subjects (80.2%) lived in single family houses than did white subjects (64.3%,X^2=9.27, df=3, p=.03). Black subjects also had a significantly lower rate of residency in a SSI apartment complex (28.6%) than did white subjects (71.4%).

Black subjects were members of an HMO at a much lower rate (4.8%) than were white subjects (17.7%, X^2=6.24, df=1, p=.01).

Black subjects were more likely to be in the low income group (53.0%) than were white subjects (38.5%) (n=162, X^2=6.01, df=2, p=.05). White subjects were in the medium-high income group at a higher rate (17.7%) than were black subjects (6.1%). All the subjects (n=3) in the high income group were black. A larger proportion of white subjects had savings and investments as a source of income (56.5%) than did black subjects (39.8%, X^2=4.80, df=1, p=.03).

Black subjects attend church at significantly higher rates (85.5%) than do white subjects (55.8%, X^2=18.28, df=1, p<.000).

Analysis of Census Tracts.

Data were analyzed among census tracts. X^2 analysis requires at least 5 expected observations per cell (Clark and Hoskings, 1986) in contingency tables in order for the results to be considered valid. For 2X2 contingency tables of factors within census tracts, Fisher's Exact test results were used to determine statistical significance in the case of <5 expected observations. In the case of 2XN contingency tables (N > 3) this
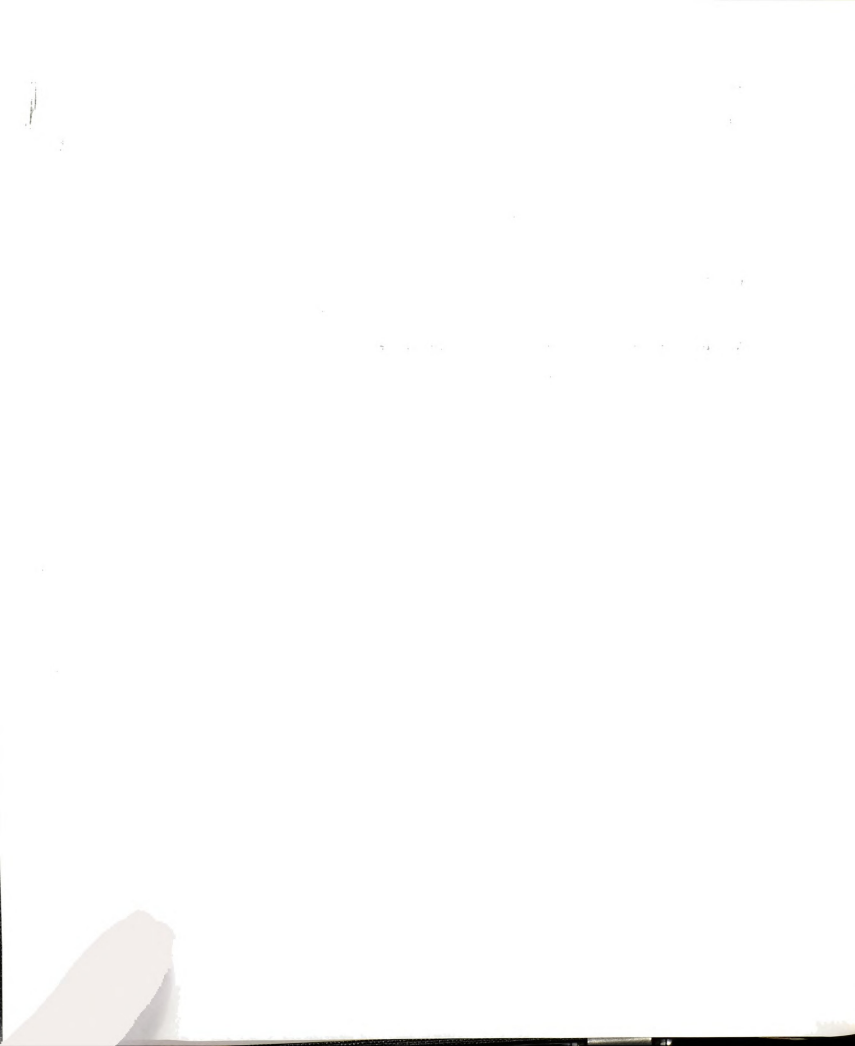
statistic is sensitive to very small expected values and experiences artificial increases if expected values fall below 5 in very many classes (Clark and Hoskings, 1986).

Compliance rates of census tracts and of the race and gender groups within census tracts are shown (Table 14). Compliance levels did not differ significantly among census tracts included in the study area. Table 15 shows significant results of this analysis.

Significant differences were found between census tracts in the following variables: race (X^2=48.42, df=5, p<.000), presence or absence of medical checkups (X^2=15.43, df=5, p=.009), private insurance coverage (X^2=25.62, df=5, p=.0001), marital status (X^2=28.49, df=10, p=.002), whether a subject lived alone and the number of family members (X^2=28.65, df=10, p=.002), ability to drive, ownership of an automobile, use of special transportation services (X^2=41.60, df=5, p<.000), pension (X^2=30.08, df=5, p<.000), and savings or investments (X^2=16.42, df=5, p=.005). The results in age group and income level between tracts is unreliable due expected frequencies less than 5.

These same data were also analyzed separately by gender and race groups. Because the data were further stratified, sample sizes became smaller, again introducing the problem of validity of the X^2. Cases of unreliable significance are indicated in the following tables.

Table 16 shows significant differences among white subjects between census tracts. Significant differences were

TABLE 14

Compliance Rates of Census Tracts

Tract#	Total	B	W	F	M
5	56.3	50.0	53.8	33.3	100.0
13	66.7	100.0	64.3	61.5	100.0
15	50.0	50.0	50.0	44.4	66.7
16	64.3	60.9	100.0	58.8	80.0
36.01	53.5	28.6	65.5	55.6	50.0
37	60.5	40.0	63.6	58.3	64.3

TABLE 15

Significant Results of
Chi-Square Analysis of Variables Among Census Tracts

VARIABLE	5 N=25	13 N=15	15 N=48	16 N=27	36.01 N=43	37 N=38	p=
% BLACK	48.0	6.7	58.3	85.2	32.6	13.2	.000
CHECKUPS	88.8	86.7	70.8	85.2	93.0	63.2	.009
PRINSURANCE	84.0	66.7	41.7	81.5	83.7	65.8	.0001
%MARRIED	36.0	13.3	20.8	44.4	53.5	42.1	.002
%SINGLE/DIV.	12.0	33.3	33.3	14.8	6.3	5.3	
%WIDOWED	52.0	53.3	45.8	40.7	41.9	52.6	
LIVES ALONE	36.0	86.7	62.5	33.3	37.2	47.4	.002
%FAMILY = 2	48.0	13.3	29.2	37.0	55.8	39.5	.001
%FAMILY = 3+	16.0	0.0	6.3	29.6	11.6	13.2	
CAN DRIVE	52.0	40.0	41.7	70.4	79.1	63.2	.003
OWNS AUTO	60.0	33.3	37.5	74.1	88.4	68.4	.000
SPECTRANSP	4.0	60.0	43.8	3.7	7.0	21.0	.000
PENSION	80.0	26.7	41.7	77.8	81.4	65.8	.000
INVESTMENTS	52.0	46.7	25.0	55.6	62.8	60.5	.005
AGE GROUP							
65-69 yrs	20.0	40.0	22.9	18.5	51.2	21.1	.000
70-74 yrs	32.0	13.3	29.2	18.5	20.9	23.7	
75-79 yrs	20.0	20.0	22.9	40.7	23.3	10.5	
80-84 yrs	8.0	13.0	10.4	3.7	2.3	31.6	
85+	20.0	8.0	28.0	20.0	4.0	20.0	
INCOME							
REFUSED	32.0	0.0	16.7	11.1	18.6	13.2	.000
LOW	24.0	53.3	68.8	37.0	7.0	31.6	
MEDIUM	36.0	46.7	14.6	33.3	46.5	44.7	
MED-HIGH	8.0	0.0	0.0	3.7	2.3	0.0	

TABLE 16

Significant Results of Chi-Square Analysis of
Variables by Census Tracts among White Subjects

===

VARIABLE (%)	5 N=13	13 N=14	15 N=20	16 N=4	36.01 N=29	37 N=33	p=
PRIVATE INSURANCE	92.3	64.3	35.0	75.0	89.7	72.7	.0009
RETIRED	69.2	92.9	70.0	75.0	75.9	100.0	.02
HOMEMAKERS	30.8	0.0	15.0	25.0	27.6	3.0	.03
MARRIED	38.5	14.3	10.0	25.0	62.1	45.5	.0004
SINGLE\DIV	15.4	35.7	50.0	25.0	3.4	6.1	
WIDOWED	46.2	50.0	40.0	50.0	34.5	48.5	
LIVE ALONE	46.2	85.7	85.0	25.0	41.4	42.4	.002
FAM. MEMBER=2	38.5	14.3	15.0	25.0	55.2	45.5	.001
FAM. MEMB=3+	15.4	0.0	0.0	50.0	6.9	12.1	
CAN DRIVE	53.8	42.9	40.0	50.0	82.0	72.7	.02
AUTO OWNERS	69.2	35.7	30.0	50.0	86.2	78.8	.0001
HAS DRIVER	69.2	64.3	65.0	50.0	31.0	36.4	.05
SPECIAL TRANSPORTATION	7.7	57.1	55.0	0.0	10.3	12.1	.000
PENSION	76.9	21.4	25.0	100.0	82.8	69.7	.000
INVESTMENTS	61.5	50.0	20.0	75.0	69.0	66.7	.01
AGE GROUP							
65-69 yrs	7.7	42.9	35.0	0.0	51.7	24.2	
70-74 yrs	30.8	14.3	20.0	0.0	17.2	24.2	
75-79 yrs	23.1	14.3	25.0	50.0	27.6	9.1	
80-84 yrs	15.4	14.3	5.0	0.0	0.0	27.3	
85+	23.1	14.3	15.0	50.0	34.0	15.2	
EDUCATION LEVEL							
0-6 yrs	15.4	0.0	5.0	0.0	3.4	0.0	
7-11 yrs	15.4	26.6	50.0	0.0	24.1	54.5	
12 yrs	30.8	42.9	15.0	25.0	41.4	27.3	
13-15 yrs	38.5	28.6	15.0	0.0	17.2	9.1	
16 yrs	0.0	0.0	15.0	25.0	6.9	9.1	
16+ yrs	0.0	0.0	0.0	50.0	6.9	0.0	
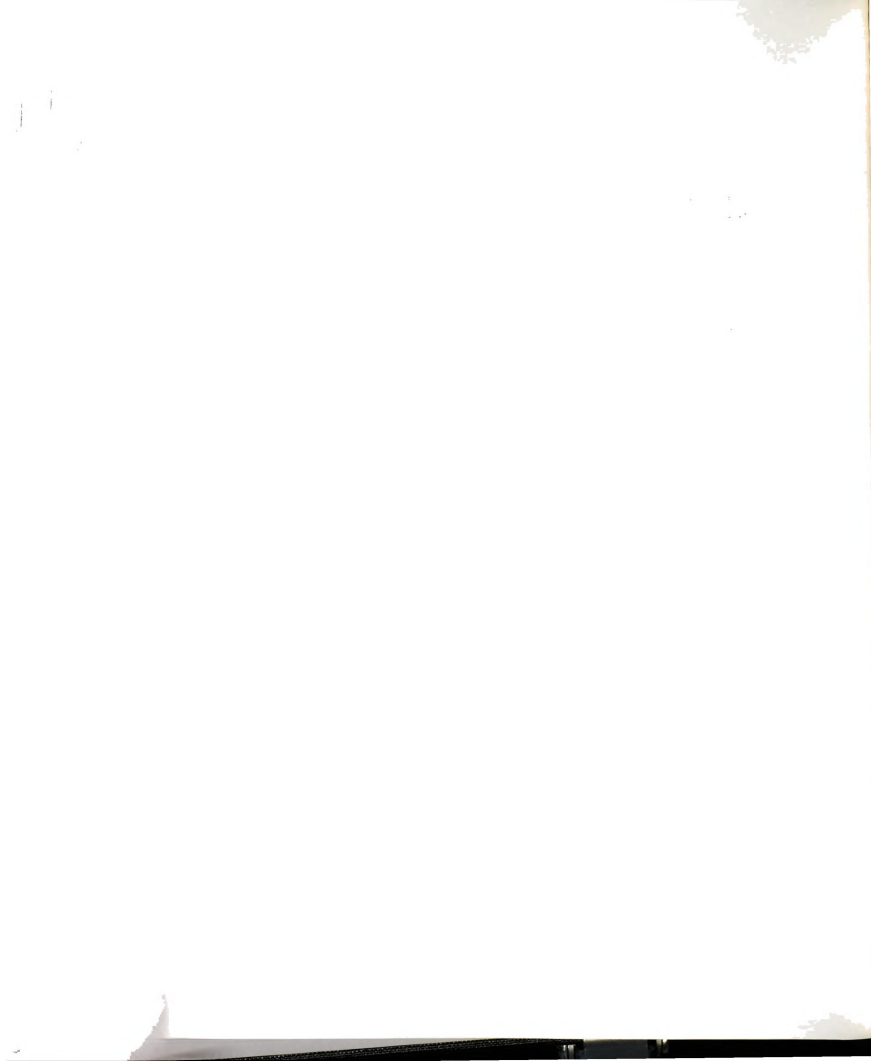
found among white subjects between census tracts in the following variables: private insurance (X^2=21.01, df=5, p<.000), retired (X^2=13.21, df=5, p=.05), homemaker (X^2=12.60, df=5, p=.03), marital status (X^2=31.60, df=10, p=.0005), whether a subject lived alone and number of family members (X^2=28.88, df=10, p=.001), ability to drive (X^2=13.60, df=5, p=.02), ownership of an automobile (X^2=24.90, df=5, p=.0001), having a driver (X^2=11.29, df=5, p=.05), use of special transportation services (X^2=27.73, df=5, p<.000), pension (X^2=30.89, df=5, p<.000), and savings and investments as a source of income (X^2=15.00, df=5, p=.01). Although significance could not be determined beyond a reasonable doubt due expected cell frequencies <5 in the age group and level of education variables, the proportions of subjects are presented for visual interpretation.

Table 17 shows the associations revealed between black subjects among census tracts. The significance of these findings is unreliable due to low expected cell frequencies in many of the categories. The obvious visual differences in rates between tracts could not be verified by a valid X^2 statistic due to small sample sizes and expected cell frequencies. One black subject was interviewed in Tract 13 and the data gathered in this interview cannot be meaningfully compared to that of the other tracts. Immunization compliance was comparatively low in Tract 36.01 among black subjects, as was history of immunization and intent to have one in the future.

TABLE 17

Significant Results of Chi-Square Analysis of
Variables by Census Tracts among Black Subjects
==

VARIABLE (%)	5 N=12	13 N=1	15 N=28	16 N=23	36.01 N=14	37 N=5	p=
FEMALE	66.7	100.0	82.1	60.9	64.3	80.0	
COMPLIANCE	50.0	100.0	50.0	60.9	28.6	40.0	
DRRECOMMEND.	50.0	100.0	64.3	56.5	57.1	40.0	
PASTSHOT(N=82)	58.3	100.0	64.3	81.8	35.7	80.0	
FUTURESHOT(N=65)	63.6	0.0	63.0	65.0	27.3	60.0	
CHECKUPS	91.7	100.0	64.3	87.0	100.0	40.0	
PRINSURANCE	75.0	100.0	46.4	82.6	71.4	20.0	
EMPLOYED	16.7	0.0	14.3	4.3	0.0	0.0	
RETIRED	83.3	100.0	78.6	87.0	85.7	60.0	
MARRIED	33.3	0.0	28.6	47.8	35.7	20.0	
SINGLE\DIVORCE	8.3	0.0	21.4	13.0	7.1	0.0	
WIDOWED	58.3	100.0	50.0	39.1	57.1	80.0	
LIVE ALONE	25.0	100.0	46.4	34.8	28.6	80.0	
FAM. MEMBER=2	58.3	0.0	39.3	39.1	57.1	0.0	
FAM. MEMB=3+	16.7	0.0	10.7	26.1	21.4	20.0	
CAN DRIVE	50.0	0.0	42.9	73.9	71.4	0.0	
OWNS AUTO	50.0	0.0	42.9	78.3	92.9	0.0	
DRIVER	58.3	100.0	60.7	43.5	35.7	100.0	
SPECTRANSP	0.0	100.0	35.7	4.3	0.0	80.0	
SENIOR PROG	8.3	100.0	14.3	21.7	21.4	60.0	
PENSION	83.3	100.0	53.6	73.6	78.6	40.0	
INVESTMENTS	41.7	0.0	28.6	52.2	50.0	20.0	
AGE GROUP							
65-69 yrs	33.3	0.0	14.3	21.7	50.0	0.0	
70-74 yrs	33.3	0.0	35.7	21.7	28.6	20.0	

Table 17 (cont.)

75-79 yrs	16.7	100.0	21.4	39.1	14.3	20.0
80-84 yrs	0.0	0.0	14.3	4.3	7.1	60.0
85+	16.7	0.0	14.3	13.0	0.0	0.0

EDUCATION LEVEL

0-6 yrs	16.7	0.0	10.7	17.4	0.0	20.0
7-11 yrs	41.7	100.0	46.4	34.8	28.6	60.0
12 yrs	16.7	0.0	14.3	17.4	42.9	20.0
13-15 yrs	8.3	0.0	25.0	17.4	7.1	0.0
16 yrs	0.0	0.0	3.6	4.3	7.1	0.0
16+ yrs	16.7	0.0	0.0	8.7	14.3	0.0

INCOME(N=68)

LOW	44.4	0.0	76.2	50.0	8.3	80.0
MEDIUM	55.6	100.0	23.8	35.0	66.7	20.0
MED-HIGH	0.0	0.0	0.0	10.0	16.7	0.0
HIGH	0.0	0.0	0.0	0.0	5.0	0.0

Table 18 shows significant differences between female subjects among census tracts in the following variables: race (X^2=31.45, df=5, p<.000), presence or absence of medical checkups (X^2=12.36, df=5, p=.03), private insurance (X^2=18.04, df=5, p=.003), ownership of an automobile (X^2=21.50, df=5, p=.0007), use of special transportation (X^2=25.18, df=5, p=.0001), and a pension as a source of income (X^2=14.66, df=5, p=.01). The significance of age group, education levels and income levels is unreliable due to low expected cell frequencies in many cases.

Proportions of factors present in males were analyzed among census tracts. Seven male subjects were interviewed in Tract 5 and two male subjects were interviewed in Tract 13. The number of low expected cell frequencies casts suspicion on the validity of any significant findings. Table 19 shows significant differences between male subjects among census tracts based on race (X^2=19.53, df=5, p=.002) and use of special transportation services (X^2=18.53, df=5, p=.003).

Data were analyzed within census tracts. Except in the case where the X^2 statistic was deemed valid beyond a reasonable doubt (p≤ .05 and a relatively narrow 95% CI), no determination could be made about the validity of some of these results when the data were stratified by census tract. Significant results that exhibit extremely wide confidence intervals should be interpreted with caution. In some cases, significance was indicated by a p-value at or below .05, however the CI was very wide. The width of the CI indicates
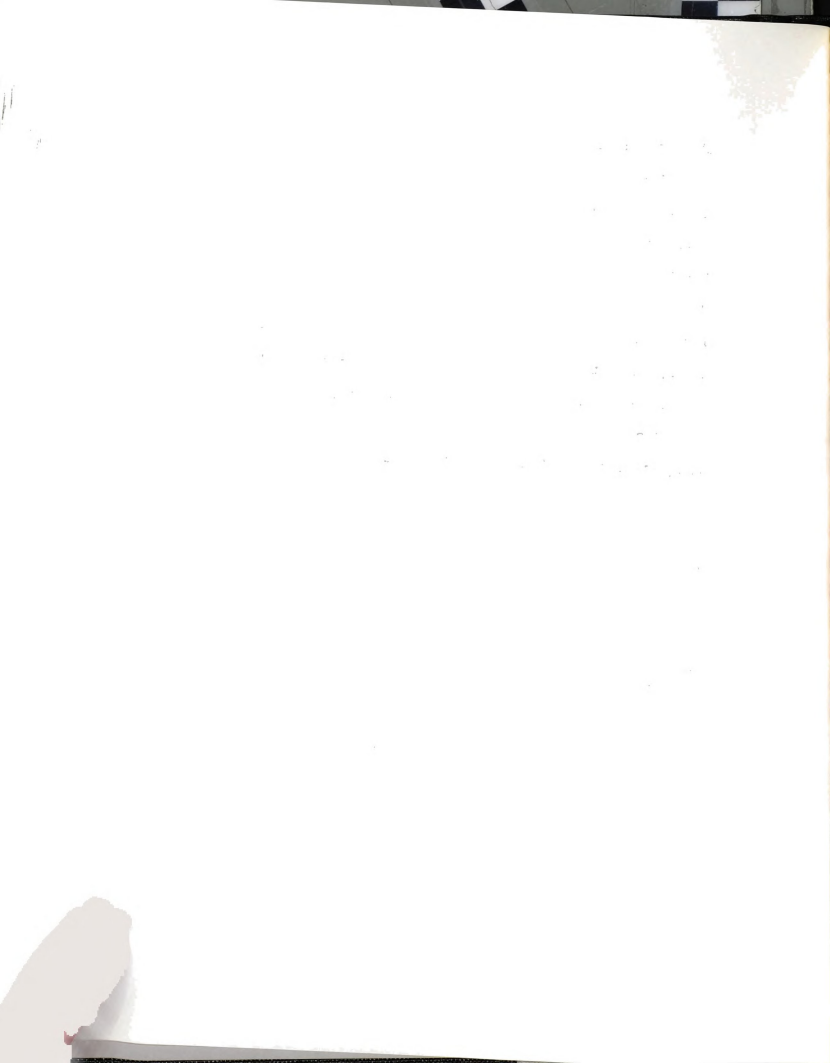
TABLE 18

Significant Results of Chi-Square Analysis of
Variables by Census Tracts for Female Subjects

==

VARIABLE (%)	5 N=18	13 N=13	15 N=36	16 N=17	36.01 N=27	37 N=24	p=
BLACK	44.4	7.7	63.9	82.4	33.3	16.7	.000
CHECKUPS	83.3	92.3	75.0	88.2	92.6	58.3	.03
PRINSURANCE	77.8	61.5	38.9	76.5	85.2	66.7	.002
LIVE ALONE	38.9	92.3	66.7	35.3	44.4	66.7	.005
FAM. MEMBER=2	44.4	7.7	27.8	35.3	48.1	20.8	.006
FAM. MEMB=3+	16.7	0.0	2.8	29.4	14.8	12.5	
OWNS AUTO	50.0	23.1	30.6	64.7	81.5	54.2	.0006
SPECTRANSP	5.6	61.5	44.4	5.9	11.1	29.2	.0001
PENSION	72.2	30.8	38.9	70.6	74.1	54.2	.01
AGE GROUP							
65-69 yrs	11.1	30.8	13.9	17.6	40.7	12.5	
70-74 yrs	38.9	15.4	30.6	17.6	33.3	29.2	
75-79 yrs	16.7	23.1	22.2	52.9	22.2	0.0	
80-84 yrs	11.1	15.4	13.9	0.0	0.0	41.7	
85+	22.2	15.4	19.4	11.8	3.7	16.7	
EDUCATION LEVEL							
0-6 yrs	22.2	0.0	8.3	11.8	3.7	0.0	
7-11 yrs	33.3	38.5	52.8	29.4	25.9	58.3	
12 yrs	22.2	38.5	13.9	23.5	51.9	33.3	
13-15 yrs	16.7	23.1	19.4	11.8	7.4	4.2	
16 yrs	0.0	0.0	5.6	11.8	7.4	4.2	
16+ yrs	5.6	0.0	0.0	50.0	3.7	0.0	
INCOME(N=114)							
LOW	41.7	53.8	89.7	56.3	13.6	50.0	
MEDIUM	58.3	46.2	10.3	25.0	54.5	40.9	
MED-HIGH	0.0	0.0	0.0	18.8	27.3	9.1	
HIGH	0.0	0.0	0.0	0.0	4.5	0.0	

TABLE 19

Significant Results of Chi-Square Analysis of Variables
by Census Tracts among Male Subjects

==

VARIABLE (%)	5 N=7	13 N=2	15 N=12	16 N=10	36.01 N=16	37 N=14	p=
BLACK	57.1	0.0	41.7	90.0	31.3	7.1	.002*
MARITAL STATUS							
MARRIED	71.4	50.0	41.7	60.0	68.8	71.4	.007
SINGLE\DIV	0.0	50.0	58.3	10.0	6.3	0.0	
WIDOWED	28.6	0.0	0.0	30.0	25.0	28.6	
CAN DRIVE	100.0	100.0	50.0	100.0	93.8	92.9	.002
OWNS AUTO	85.7	100.0	58.3	90.0	100.0	92.9	.04
SPECTRANSP	0.0	50.0	41.7	0.0	0.0	7.1	.003*
PENSION	100.0	0.0	50.0	90.0	93.8	85.7	.002
SAVINGS	85.7	100.0	25.0	60.0	75.0	78.6	.02
# OF CHECKUPS							
NONE	0.0	50.0	41.7	20.0	12.5	28.6	.05
≤ 1 PER YEAR	42.9	0.0	8.3	10.0	6.3	35.7	
2-6 PER YEAR	42.9	0.0	50.0	70.0	62.5	35.7	
1-2 PER MONTH	14.3	50.0	0.0	0.0	18.8	0.0	

* significant at $p \leq$ .05

the effect of the sample size on the stability of the estimate. A wide CI (with a small sample size) implies an increased variability in the estimate of the effect, (Hennekens, 1987).

Tables 20-25 show proportions of risk factors in the various groups of subjects and their corresponding compliance rates for each census tract in the study.

In Table 20, results of X^2 analysis of proportions of factors in subjects and compliance rates are shown for Tract 5 (n=25) for all subjects interviewed in Tract 5 and for a breakdown by race and gender. Total vaccination compliance in Tract 5 was 52%. Compliance rates differed significantly between females and males (RR=.33, 95% CI=.17, .64, p=.01). Female subjects in Tract 5 were less likely to have received an influenza immunization in 1991. Those subjects who intended to receive an influenza immunization in the future had significantly higher rates than those who did not (X^2=18.63, df=2, p<.000), however small expected cell frequencies in the classes of subjects who did not intend to or did not know if they would receive one render this result unreliable. Four percent of subjects reported being members of an HMO (compliance = 100%).

Immunization compliance among black subjects (n=12) in Tract 5 was 50%. Black females in this group had a significantly lower compliance rate than did black males (25% and 100%, respectively; RR=.25, 95% CI=.08, .83, p=.03).

TABLE 20

Proportion of Factor in Subjects/% **Immunization Compliance**
in Tract 5 for total, race and gender groups.**

Factor (%)	Total n=25	B n=12	W n=13	F n=18	M n=7
Compliance(%)	**56.3**	**50.0**	**53.8**	**33.3**	**100.0**
Female	72/33*	67/25*	76/40	100/33	-
Male	28/100	33/100	23/100	-	100/100
Black	48/50	100/50	-	44/25	57/100
White	52/54	-	100/54	56/40	43/100
House	100/52	100/50	100/54	100/33	100/100
SSI	-	-	-	-	-
Apt.	-	-	-	-	-
Duplex	-	-	-	-	-
Dr Recommend.	48/58	50/67	46/50	44/38	57/100
Past Shot	64/81	58/86	69/78*	50/67*	100/100
Future Shot	52/92	58/88	46/100	33/83*	100/100
Checkups	88/55	92/55	85/55	83/33	100/100
Priv Insurance	84/57	75/67	92/50	78/36	100/100
HMO	4/100	-	92/50	6/100	-
Employed	12/67	17/100	8/0	6/0	29/100
Retired	76/53	83/50	56/69	67/25	100/100
Homemaker	20/60	8/100	31/50	28/60	-
Married	36/67	33/75	39/60	22/25	71/100
Single	12/0	8/0	15/0	17/0	-
Widowed	52/54	58/43	46/67	62/46	29/100
Age Group					
65-69 yrs	20/60	33/75	8/0	11/0	43/100
70-74 yrs	32/38	33/50	31/25	39/29	14/100
75-79 yrs	20/40	17/0	23/67	17/0	29/100
80-84 yrs	8/100	0/ -	15/100	11/100	-
85+ yrs	20/60	17/50	67/23	22/50	14/100
Education Level					
0-6 yrs	16/50	17/ -	15/100	22/50	-
7-11 yrs	28/29	42/40	15/0	33/17	14/100
12 yrs	24/50	17/50	31/50	22/25	29/100
13-15 yrs	24/67	8/100	39/50	17/33	43/100
16 yrs	-	-	39/60	-	-
17+ yrs	8/100	17/100	-	6/100	14/100
Live Alone	36/33	25/33	46/33	39/14	29/100
Live w/1	48/67	58/57	39/80	44/50	57/100
Live w/2+	16/50	17/50	15/50	17/33	14/100

Table 20 (cont.)

Refused	32/75	25/67	39/80	33/67	29/100
Low Income	24/17	47/20	15/0	28/0	14/100
Medium	36/44	33/75	39/40	39/29	29/100
Med High	8/100	-	8/100	-	29/100
High Income	-	-	-	-	-
Volunteer	48/67	42/80	54/57	39/43	72/100
Can Drive	52/69	50/83	54/57	33/33	100/100
Owns Auto	60/67	50/84	56/50	50/44	86/100
Has Driver	64/44	58/29	69/56	78/36	29/100
Rides Bus	20/60	25/33	15/100	17/33	29/100
Uses Spectran	4/0	-	8/0	6/0	-
Attend Church	72/61	83/61	62/62	67/42	86/100
Senior Center	16/50	8/0	23/67	17/33	14/100
Social Grp	0/80	17/100	23/67	17/67	29/100
Member AARP	56/57	-	54/57	50/33	71/100
Pension	80/55	83/60	77/50	72/31	100/100
Savings	52/61	42/60	62/62	39/29	86/100
Earnings	16/100	25/100	8/100	6/100	43/100
Other	-	-	-	-	-
No Church	28/25	25/0	39/40	39/14	14/100
Baptist	8/100	25/0	-	6/100	14/100
Methodist	-	-	-	-	-
Catholic	20/60	-	39/60	22/50	14/100
Lutheran	-	-	-	-	-
AME	-	-	-	-	-
Jehovah's Wit	-	-	-	-	-
COG	-	-	-	-	-
COGIC	-	-	-	-	-
COC	-	-	-	-	-
Presbyterian	12/100	17/100	8/100	11/100	14/100
Episcopal	-	-	-	17/0	-
Pentecostal	12/0	25/0	-	-	-
Non-Denomin.	8/50	8/100	8/0	6/0	14/100
Other	12/100	8/100	-	-	29/100

** % of subjects with the factor in regular type, %
compliance in bold type

*significant @ p≤ .05

White subjects (n=13) in Tract 5 had a compliance rate of 53.8%. Those subjects who had an influenza immunization in the past had a significantly higher level of compliance (78%, X^2=3.97, df=1, p=.02).

Female subjects (n=18) in Tract 5 had a compliance rate of 33.3%. Those who had a past immunization (67%, X^2=6.25, df=2, p=.005) and intended to receive one in the future (83%, X^2=3.97, df=1, p=.02) had significantly higher levels of compliance.

Male subjects (n=7) in Tract 5 had a 100% compliance rate with influenza immunization.

Table 21 shows results of X^2 for respondents residing in Tract 13 (n=15) and those for a breakdown by race and gender. Total vaccination compliance was 66.7%. All respondents resided in Riverfront Apartments. Single dwelling houses and apartments are located within Tract 13 in an area of approximately four blocks. This area is notorious for drug houses and prostitution and after inquiries to apartment managers and several friendly residents about numbers and location of elderly residents, that portion of Tract 13 was passed over for interviews. No reliable significant associations were found among subjects interviewed in Tract 13.

One black subject was interviewed in Tract 13 and reported being vaccinated. Compliance among white subjects (n=14) in Tract 13 was 64.3%. Two male subjects were interviewed and neither reported being vaccinated. Female
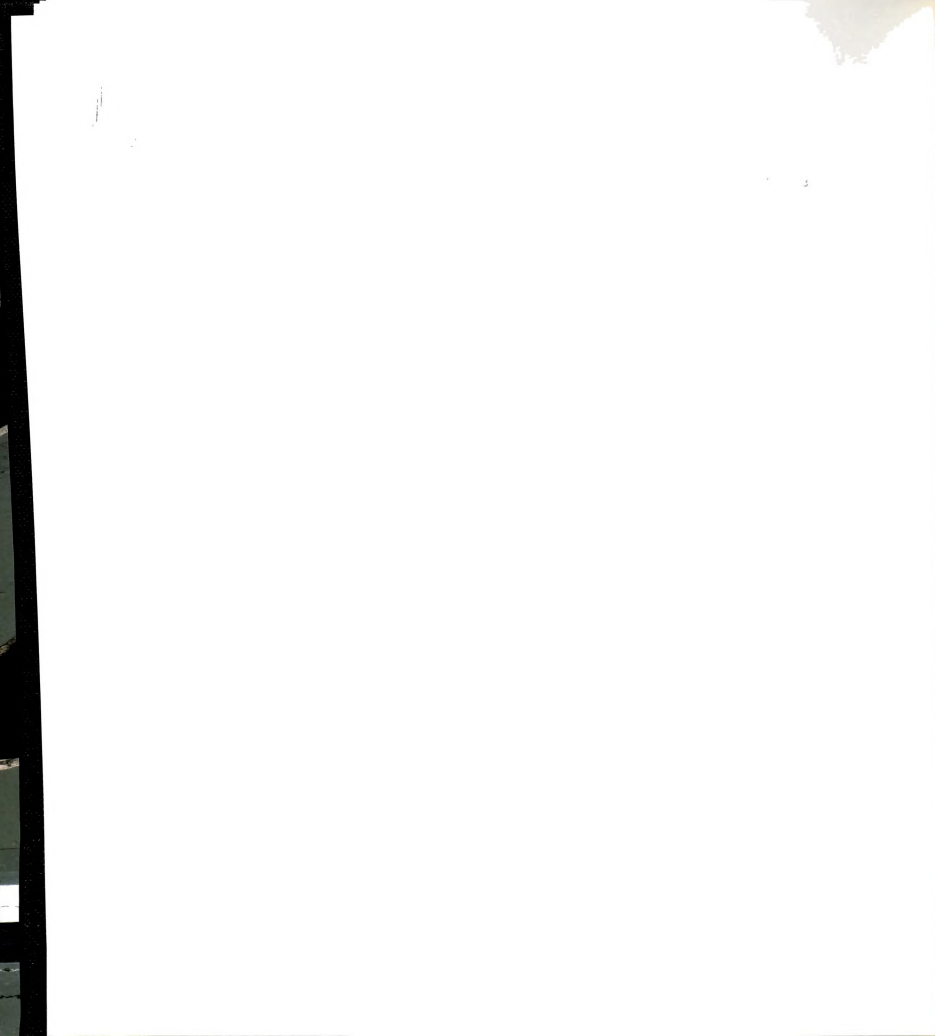
TABLE 21

**Proportion of Factors in Subjects/% Immunization Compliance
in Tract 13 for Total, Race and Gender groups****

Variable (%)	Total n=15	B n=1	W n=14	F n=13	M n=2
Compliance	**66.7**	**100.0**	**64.3**	**61.5**	**100.0**
Female	87/62	-	86/58	100/62	-
Male	13/100		14/100	-	100/100
Black	7/100	100/100	-	8/100	-
White	97/64	-	100/64	92/58	100/100
House	-	-	-	-	-
SSI	100/67	100/100	100/64	100/62	-
Apt.	-	-	-	-	-
Duplex	-	-	-	-	-
Dr Recommend.	60/89	100/100	57/88	54/86	100/100
Past Shot	67/80	100/100	64/78	62/75	100/100
Future Shot	60/100	-	64/78	54/100	100/100
Checkups	87/70	100/100	86/67	92/67	50/50
Priv Insurance	67/70	100/100	64/67	62/63	100/100
HMO	20/33	-	21/33	23/33	-
Employed	0/-	-	-	-	-
Retired	93/64	100/100	93/62	92/58	100/100
Homemaker	-	-	-	-	-
Married	13/100	-	14/100	8/100	50/100
Single	33/80	-	36/80	31/75	-
Widowed	53/50	100/100	50/43	62/50	50/100
Age Group					
65-69 yrs	40/83	-	43/83	31/75	100/100
70-74 yrs	13/50	-	14/50	15/50	-
75-79 yrs	20/67	100/100	14/50	23/67	-
80-84 yrs	13/50	-	14/50	15/50	-
85+ yrs	13/50	-	14/50	15/50	-
Education Level					
0-6 yrs	0/-	-	-	-	-
7-11 yrs	33/60	100/100	29/50	39/60	50/100
12 yrs	40/40	-	43/67	39/60	50/100
13-15 yrs	27/27	-	29/75	23/67	-
16 yrs	-	-	-	-	-
17+ yrs	0/-	-	-	-	-
Live Alone	87/62	100/100	86/58	92/58	50/100
Live w/1	13/100	-	14/100	8/100	50/100
Live w/2+	0/-	-	-	-	-

Table 21 (cont.)

Refused	0/-	-	-	-	-
Low Income	53/53	100/100	57/63	54/57	50/100
Medium	47/71	-	43/67	46/67	50/100
Med High	-	-	-	-	-
High Income	-	-	-	-	-
Volunteer	53/75	-	57/75	54/71	50/100
Can Drive	40/67	-	43/67	31/50	100/100
Owns Auto	33/80	-	36/80	23/67	100/100
Has Driver	67/60	100/100	64/56	69/56	50/100
Rides Bus	33/80	-	36/80	31/75	50/100
Uses Spectran	60/67	100/100	57/63	62/63	50/100
Attend Church	80/75	-	79/73	85/73	50/100
Senior Center	27/75	-	21/67	31/75	-
Social Grp	40/50	-	43/50	31/40	50/100
Member AARP	33/60	-	36/61	31/50	50/100
Pension	27/50	100/100	21/33	31/50	-
Savings	47/71	-	50/71	39/60	100/100
Earnings	13/100	-	14/100	8/100	50/100
Other	7/0	-	7/0	8/0	-
No Church	20/20	-	21/33	15/0	50/100
Baptist	13/100	-	14/100	15/100	-
Methodist	13/13	-	14/100	15/50	-
Catholic	33/60	-	36/60	31/50	50/100
Lutheran	7/100	-	7/100	8/100	-
AME	7/100	-	-	-	-
Jehovah's Wit	-	-	-	-	-
COG	-	-	-	-	-
COGIC	-	-	-	-	-
COC	-	-	-	-	-
Presbyterian	-	-	7/100	8/100	-
Episcopal	7/100	-	-	-	-
Pentecostal	-	-	-	-	-
Non-Denomin.	-	-	-	-	-
Other	-	-	-	-	-

** % of subjects with the factor in regular type, %
compliance in bold type

*significant @ p≤ .05

subjects (n=13) in Tract 13 had a 61.5% compliance rate.

Table 22 shows results for Tract 15 (n=48). Total vaccination compliance in the tract was 50%. Over 65.0% of respondents lived in Capital Commons Apartments. Thirty-one percent of subjects lived in single dwelling houses. Subjects who had a recommendation from their physician to receive a vaccination had significantly higher compliance (74%, RR=3.89, 95% CI=1.57, 9.66, p=.0004) as did those with a past immunization (67%, RR=5.00, 95% CI=1.35, 18.58, p=.002) and those who had checkups with their physician (62%, RR=2.88, 95% CI=1.02, 8.13, p=.03). Subjects who reported intent to receive an immunization in the future (85%) had a significantly higher rate of compliance, however, low expected cell frequencies indicate that this result is unreliable.

Black subjects (n=28) in Tract 15 had a compliance rate of 50.0%. Subjects who had received a recommendation from their physician of vaccination had significantly higher compliance (78%, X^2=12.60, df=1, p=.0004) as did those who reported receiving an immunization in the past (72%, RR=7.22, 95% CI=1.10, 47.40, p=.006). Subjects reporting intent to receive an immunization in the future had significantly higher compliance (82%, X^2=28.80, df=2, p<.000). These results are unreliable due to low expected cell frequencies and wide confidence intervals.

Female subjects (n=36) in Tract 15 had a compliance rate of 44.4%. These subjects had significantly higher

TABLE 22

Proportion of Factor in Subjects/% Immunization Compliance
in Tract 15 for total, race and gender groups**

Factor (%)	Total n=48	B n=28	W n=20	F n=36	M n=12
Compliance(%)	50.0	50.0	50.0	44.4	66.7
Female	75/44	82/51	39/65	100/44	-
Male	25/67	19/60	35/71	-	100/67
Black	58/50	100/50	-	64/48	42/60
White	42/50	-	100/50	36/39	58/71
House	31/53	58/50	5/100	33/50	25/67
SSI	65/52	41/64	65/47	64/44	67/75
Apt.	-	8/0	-	-	-
Duplex	4/0	-	-	3/44	8/0
Dr Recommend.	56/74*	67/78*	45/67	58/67*	50/100
Past Shot	69/67*	67/72*	75/60	64/65*	83/70
Future Shot	56/85		50/90	50/89*	75/78
Checkups	70/62*	63/65	80/63	75/52	58/100*
Priv Insurance	42/50	48/46	35/57	39/43	50/67
HMO	10/80	4/100	20/75	8/67	17/100
Employed	13/50	11/67	10/50	14/60	8/0
Retired	75/50	78/48	70/57	75/44	75/67
Homemaker	13/33	11/67	16/0	17/33	-
Married	21/70	30/63	10/100	14/60	42/80
Single	33/31	22/17	50/40	25/11	58/57
Widowed	46/55	48/62	40/50	61/55	-
Age Group					
65-69 yrs	23/64	24/60	35/43	14/60	5/67
70-74 yrs	29/57	28/52	20/75	31/55	25/67
75-79 yrs	23/36	26/38	25/40	22/25	25/67
80-84 yrs	10/60	11/44	5/100	14/60	-
85+ yrs	15/29	17/50	15/33	19/29	-
Education Level					
0-6 yrs	8/100	13/55	5/100	8/100	8/100
7-11 yrs	48/49	40/42	50/50	53/42	33/75
12 yrs	15/14	20/44	15/0	14/0	17/50
13-15 yrs	21/60	16/62	15/67	19/57	25/67
16 yrs	8/50	7/67	15/67	6/50	17/50
17+ yrs	-	7/10	-	-	-
Live Alone	63/47	44/50	85/47	67/42	50/67
Live w/1	31/57	41/55	15/67	28/60	33/50
Live w/2+	6/67	11/67	-	3/0	17/100

Table 22 (cont.)

Refused	17/38	22/50	5/0	19/43	8/0
Low Income	69/49	59/44	80/50	72/42	58/71
Medium	15/71	19/80	15/67	8/67	33/75
Med High	-	-	-	-	-
High Income	-	-	-	-	-
Volunteer	31/33	33/22*	25/60	39/39	17/0
Can Drive	42/40	44/42	40/38	39/36	50/50
Owns Auto	38/44	44/50	30/33	31/37	58/57
Has Driver	63/53	59/50	65/62	67/46	50/83
Rides Bus	23/46	22/50	20/50	25/44	17/50
Uses Spectran	77/48	33/44	55/55	44/44	42/60
Attend Church	63/53	78/52	40/63	72/50	33/75
Senior Center	10/60	15/50	5/100	14/60	-
Social Grp	20/30	30/25	10/50	25/33	8/0
Member AARP	44/48	41/46	50/51	42/47	50/50
Pension	42/40	52/43	25/40	39/36	50/50
Savings	25/33	30/38	20/25	25/33	25/33
Earnings	13/68	8/100	15/67	11/75	17/50
Other	13/83	-	15/67	11/75	17/100
No Church	38/46	17/43	75/48	36/31	75/67
Baptist	25/67	42/60	5/0	33/67	-
Methodist	2/100	-	5/100	3/100	-
Catholic	2/100	1/0	5/100	3/100	-
Lutheran	-	-	-	8/0	-
AME	8/0	15/33	-	3/0	8/0
Jehovah's Wit	2/0	3/50	-	3/100	-
COG	4/100	6/60	-	3/0	8/100
COGIC	2/0	5/25	-	-	-
COC	-	1/0	-	-	-
Presbyterian	-	2/100	5/100	-	-
Episcopal	-	-	-	-	-
Pentecostal	2/0	4/0	5/100	3/0	-
Non-Denomin.	2/100	2/100	-	3/100	-
Other	4/50	2/100	5/100	-	8/100

** % of subjects with factor in regular type, %
compliance in bold type

* significant @ p≤ .05

compliance based on a physician recommendation of the vaccine (67%, RR=5.00, 95% CI=1.33, 18.81, p=.005), a past immunization (65%, RR=8.48, 95% CI=12.6, 57.06, p=.003), intent to receive a future immunization (89%, X^2=28.80, df=2, p<.000). These results must be interpreted carefully due to wide CIs and low expected frequencies.

Male subjects (n=12) in Tract 15 had a compliance rate of 66.7%. No significant associations were found among these subjects.

Results are shown for Tract 16 (n=27) in Table 23. Total vaccination compliance in Tract 16 was 64.3%. Those subjects who intend to receive an immunization in the future had a significantly higher rate of compliance (88%, X^2=12.28, df=2,, p=.002), however low expected cell

Black subjects (n=23) in Tract 16 had a compliance rate of 60.9%. Subjects who intended to receive an immunization in the future had significantly higher compliance (85%, X^2=9.50, df=2, p=.009). Low expected cell frequencies indicate this result should be carefully interpreted.

White subjects (n=4) in Tract 16 had a compliance rate of 100.0%. Male subjects (n=10) in Tract 16 had a compliance rate of 80.0%.

Compliance of female subjects (n=17) in Tract 16 was 58.8%. Subjects who intended to receive a future immunization had a significantly higher level of compliance (89%, X^2=7.83, df=2, p=.02). The significance of this result is unreliable due to low expected cell frequencies.

TABLE 23

Proportion of Factor in Subjects/% **Immunization Compliance**
in Tract 16 for total, race and gender groups**

Factor (%)	Total n=28	B n=24	W n=4	F n=17	M n=10
Compliance(%)	**64.3**	**60.9**	**100.0**	**58.8**	**80.0**
Female	61/59	61/50	75/100	100/59	-
Male	39/80	32/78	25/100	-	100/80
Black	86/61	100/61	-	82/50	90/78
White	14/100	-	100/100	18/100	10/100
House	100/64	-	100/100	100/59	100/80
SSI	-	41/64	-	-	-
Apt.	-	-	-	-	-
Duplex	-	-	-	-	-
Dr Recommend.	57/75	57/69	75/100	59/70	60/83
Past Shot	82/73	82/67	100/100	77/69	90/79
Future Shot	61/88	55/85	100/100	53/89	80/88
Checkups	86/65	87/60	75/100	88/53	80/88
Priv Insurance	79/64	83/58	75/100	77/54	90/78
HMO	11/100	9/100	25/100	12/100	10/100
Employed	4/100	4/100	-	-	10/100
Retired	86/65	88/60	75/100	82/57	90/78
Homemaker	11/67	9/50	25/100	18/67	-
Married	46/75	48/73	25/100	35/67	60/83
Single	14/100	13/100	25/100	18/100	10/100
Widowed	39/46	39/33	50/100	47/	30/67
Age Group					
65-69 yrs	21/80	22/80	-	18/67	20/100
70-74 yrs	18/60	22/60	-	18/33	20/100
75-79 yrs	39/64	39/56	50/100	53/67	20/50
80-84 yrs	4/0	4/0	-	-	10/0
85+ yrs	18/80	13/67	50/100	12/50	30/100
Education Level					
0-6 yrs	14/75	17/75	-	12/50	20/100
7-11 yrs	29/38	35/38	-	29/40	30/33
12 yrs	18/80	17/75	25/100	24/75	10/100
13-15 yrs	14/50	17/50	-	12/0	20/100
16 yrs	7/100	4/100	25/100	12/100	-
17+ yrs	18/100	9/100	50/100	12/100	30/100
Live Alone	32/67	35/63	25/100	35/67	30/67
Live w/1	36/60	39/56	25/100	35/33	40/100
Live w/2+	32/75	26/67	50/100	29/80	30/67

Table 23 (cont.)

Refused	10/**100**	17/**100**	-	6/**100**	20/**100**
Low Income	36/**50**	52/**50**	25/**100**	53/**44**	10/**100**
Medium	32/**56**	17/**25**	25/**100**	24/**50**	50/**60**
Med High	14/**100**	9/**100**	50/**100**	18/**100**	10/**100**
High Income	7/**100**	4/**100**	-	-	10/**100**
Volunteer	50/**69**	52/**58**	50/**100**	59/**60**	30/**100**
Can Drive	71/**68**	74/**65**	50/**100**	53/**56**	100/**80**
Owns Auto	75/**65**	78/**61**	50/**100**	65/**55**	90/**78**
Has Driver	43/**58**	44/**50**	50/**100**	53/**56**	30/**67**
Rides Bus	18/**60**	17/**50**	25/**100**	24/**75**	10/**0**
Uses Spectran	4/**100**	4/**100**	-	6/**100**	-
Attend Church	82/**64**	87/**60**	50/**100**	88/**53**	70/**86**
Senior Center	21/**67**	22/**60**	25/**100**	35/**67**	-
Social Grp	36/**78**	30/**71**	50/**100**	29/**80**	40/**75**
Member AARP	54/**71**	44/**60**	100/**100**	53/**67**	50/**80**
Pension	79/**67**	74/**59**	100/**100**	71/**58**	90/**78**
Savings	57/**73**	52/**67**	75/**100**	53/**67**	60/**83**
Earnings	11/**100**	13/**100**	-	6/**100**	20/**100**
Other	4/**100**	4/**100**	-	6/**100**	-
No Church	18/**80**	13/**67**	50/**100**	12/**100**	30/**67**
Baptist	46/**62**	57/**62**	-	41/**43**	60/**83**
Methodist	11/**100**	-	50/**100**	12/**100**	-
Catholic	-	-	-	-	50/**100**
Lutheran	-	-	-	-	-
AME	10/**67**	13/**67**	-	12/**50**	10/**100**
Jehovah's Wit	4/**100**	4/**100**	-	6/**100**	-
COG	7/**50**	9/**50**	-	12/**50**	-
COGIC	4/**0**	4/**0**	-	-	-
COC	-	-	-	-	-
Presbyterian	-	-	-	-	-
Episcopal	-	-	-	-	-
Pentecostal	-	-	-	-	-
Non-Denomin.	-	-	-	-	-
Other	-	-	-	-	-

** % of subjects with factor in regular type, % compliance
in bold

* significant @ p≤ .05

In Tract 36.01 (n=43), vaccination compliance was 53.5% (Table 24). Subjects had significantly higher compliance based on doctor recommendation of vaccine (73%, RR=2.18, 95% CI=1.13, 4.21,p=.02), and past immunization (73%, RR=5.07, 95% CI=1.38, 18.65, p=.001). The relatively wide CI indicates unreliable significance. Intent to receive a future immunization differed among subjects, however the significance of the statistic is unreliable due to low expected cell frequencies (82%, X^2=17.12, df=2,p=.0002). Compliance rates between black (28.6%) and white subjects (65.5%) approached significance (p=.05119).

Black subjects (n=14) in Tract 36.01 had a compliance rate of 28.6%

White subjects (n=29) in Tract 36.01 had a compliance rate of 65.5%. These subjects had significantly higher compliance rates based on doctor recommendation of the vaccine (88%, RR=1.84, 95% CI=1.03, 3.29, p=.03) and intent to receive a future immunization (84%, RR=2.81, 95% CI=1.07, 7.38, p=.006).

Female subjects (n=27) in Tract 36.01 had a compliance level of 55.6%. These subjects also had significantly higher compliance based on past immunization (78%, RR=7.00, 95% CI=1.08, 45.16, p=.002) and intent to receive one in the future (87%, RR=5.60, 95% CI=1.44, 18.71, p=.001). These results are unreliable due to low expected cell frequencies and wide CIs.

Male subjects (n=16) in Tract 36.01 had a compliance

TABLE 24

Proportion of Factor in Subjects/% **Immunization Compliance**
in Tract 36.01 for total, race and gender groups**

Factor (%)	Total n=43	B n=14	W n=29	F n=27	M n=16
Compliance(%)	**53.5**	**28.6**	**65.5**	**55.6**	**50.0**
Female	63/56	64/22	62/72	100/56	-
Male	37/50	38/40	38/54	-	100/50
Black	33/29	100/29	-	33/22	31/40
White	67/66	-	100/66	67/72	69/55
House	100/54	100/29	100/66	100/56	100/50
SSI	-	-	-	-	-
Apt.	-	-	-	-	-
Duplex	-	-	-	-	-
Dr Recommend.	51/73*	57/50	48/88*	44/75	63/70
Past Shot	67/73*	36/60	83/75	67/78*	69/64
Future Shot	51/82	21/67	66/84*	56/87*	44/71
Checkups	93/53	100/29	90/67	93/56	94/48
Priv Insurance	84/53	71/30	62/90	85/57	81/46
HMO	12/60	-	17/60	11/100	13/0
Employed	5/50	-	7/50	4/100	6/0
Retired	76/53	86/25	76/68	67/56	100/50
Homemaker	21/56	7/0	28/63	33/56	-
Married	54/65	36/40	62/72	44/75	69/55
Single	5/50	7/0	3/100	4/100	6/0
Widowed	42/39	57/25	35/50	52/36	25/50
Age Group					
65-69 yrs	51/46	50/14	52/60	41/55	69/36
70-74 yrs	21/56	29/50	17/60	33/55	-
75-79 yrs	23/60	14/0	28/75	22/50	25/75
80-84 yrs	2/100	7/100	-	-	6/100
85+ yrs	2/100	-	3/100	4/100	-
Education Level					
0-6 yrs	2/100	7/0	3/100	4/100	-
7-11 yrs	26/55	21/0	24/86	26/43	25/75
12 yrs	42/56	43/33	41/67	52/57	25/50
13-15 yrs	14/50	7/100	17/40	7/0	25/75
16 yrs	7/67	7/100	7/50	7/100	7/0
17+ yrs	9/25	14/0	7/50	4/100	19/0
Live Alone	37/63	21/33	39/55	37/50	25/50
Live w/1	51/58	57/38	55/69	48/62	69/55
Live w/2+	12/40	21/0	7/100	15/50	7/0

Table 24 (cont.)

Refused	17/50	14/50	21/50	19/40	19/67
Low Income	7/67	7/0	7/100	11/67	-
Medium	47/47	57/13	41/75	44/50	50/50
Med High	26/55	14/50	31/56	22/67	31/40
High Income	2/100	7/100	-	4/100	-
Volunteer	40/59	29/50	40/64	37/70	44/43
Can Drive	79/53	71/20	83/67	70/58	94/47
Owns Auto	88/55	93/31	86/69	82/59	100/50
Has Driver	33/57	36/40	31/67	37/50	25/75
Rides Bus	16/57	21/33	14/75	11/33	25/75
Uses Spectran	7/33	-	10/33	11/33	-
Attend Church	70/53	93/23	59/77	70/53	69/55
Senior Center	14/50	21/33	10/67	15/50	13/50
Social Grp	26/46	29/0	24/71	26/57	25/25
Member AARP	28/58	64/22	76/72	63/65	86/50
Pension	81/57	79/27	83/71	74/60	94/53
Savings	63/59	50/29	70/70	56/67	75/50
Earnings	16/29	7/0	21/33	14/50	19/0
Other	5/50	7/0	3/100	7/50	-
No Church	33/57	7/100	44/54	30/63	38/50
Baptist	14/17	36/20	4/0	11/0	19/33
Methodist	9/75	-	14/75	7/50	13/100
Catholic	7/67	7/0	7/100	7/100	7/0
Lutheran	7/100	-	10/100	4/100	13/100
AME	7/33	21/33	-	7/50	7/0
Jehovah's Wit	-	-	-	-	-
COG	2/0	-	-	4/0	-
COGIC	2/0	7/0	-	4/0	-
COC	7/33	7/0	7/50	7/50	7/0
Presbyterian	2/0	-	-	4/0	-
Episcopal	-	-	-	-	-
Pentecostal	-	-	-	-	-
Non-Denomin.	2/100	-	3/100	4/100	-
Other	7/100	7/100	7/100	11/100	-

** % of subjects with factor in regular type, % compliance in bold type

*significant @ $p \leq .05$

level of 50.0%. No significant results were found for these subjects based on any factor.

Table 25 shows results for Tract 37 (n=38). Total vaccination compliance was 60.5%. Seventy-one percent of respondents resided in single family houses, 26.3% in South Washington Park Apartments and one subject (2.6%) in Somerset Senior Citizens Community. Subjects who had a recommendation from their physician to be vaccinated against influenza had significantly higher compliance (89%, RR=2.54, 95% CI=1.37, 4.72, p=.002). Subjects who intended to receive an immunization in the future had significantly higher compliance (96%, X^2=26.83, df=2, p<.000), however, because of low expected cell frequencies, this result is unreliable.

Black subjects (n=5) in Tract 37 had a compliance rate of 40.0%. Low expected cell frequencies diminished the reliability of any significant results.

Compliance for white subjects (n=33) in Tract 37 was 63.6%. White subjects had significantly higher compliance levels based on doctor recommendation of vaccine (82%, RR=2.66, 95% CI=1.38, 5.12), and intent to receive a future immunization (100%, X^2=25.80, df=2, p<.000).

Female subjects (n=24) in Tract 37 had a compliance rate of 58.3%. Females had higher compliance rates based on doctor recommendation (82%, RR=2.13, 95% CI=1.01, 4.47, p=.04) and past immunization (80%, RR=3.60, 95% CI=1.03, 12.54, p=.009). The relatively wide CI indicates unreliable

TABLE 25

Proportion of Factor in Subjects/% **Immunization Compliance**
in Tract 37 for total, race and gender groups**

Factor (%)	Total n=38	B n=5	W n=33	F n=24	M n=14
Compliance(%)	**60.5**	**40.0**	**63.6**	**58.3**	**64.3**
Female	63/58	80/50	61/60	100/58	-
Male	37/64	20/0	39/69	-	100/64
Black	13/40	100/40	-	50/22	7/0
White	87/64	-	100/64	83/60	93/69
House	71/63	40/0	75/68	54/62	100/64
SSI	26/50	60/67	21/43	42/50	-
Apt.	3/100	-	-	4/0	-
Duplex	-	-	3/100	-	-
Dr Recommend.	48/89*	40/50	49/94*	46/82*	50/100*
Past Shot	71/70	80/50	72/74*	63/80*	86/58
Future Shot	58/96	60/67	61/100*	58/93	57/100*
Checkups	63/71	40/50	67/73	58/71	71/70
Priv Insurance	66/60	20/0	73/63	67/56	64/67
HMO	18/71	20/0	18/83	13/100	29/50
Employed	11/75	-	12/75	4/100	21/67
Retired	95/61	60/33	100/66	92/59	100/64
Homemaker	5/0	20/0	4/0	8/0	-
Married	42/50	20/0	46/53	25/33	71/60
Single	5/100	-	7/100	8/100	-
Widowed	53/65	80/50	49/68	67/63	29/75
Age Group					
65-69 yrs	21/75	-	24/53	13/67	36/80
70-74 yrs	24/44	20/0	24/50	29/43	14/50
75-79 yrs	11/25	20/0	9/33	-	29/25
80-84 yrs	32/83	60/67	27/89	42/25	14/100
85+ yrs	13/40	-	15/40	17/25	7/100
Education Level					
0-6 yrs	3/0	20/0	-	-	7/0
7-11 yrs	55/71	60/67	55/72	58/71	50/71
12 yrs	26/40	20/0	27/44	33/25	14/100
13-15 yrs	8/100	-	9/100	4/100	14/100
16 yrs	8/33	-	9/33	4/100	14/0
17+ yrs	-	-	-	-	-
Live Alone	47/61	80/50	42/64	67/63	14/50
Live w/1	40/60	-	45/60	20/40	71/70
Live w/2+	13/60	20/0	12/75	13/67	14/50
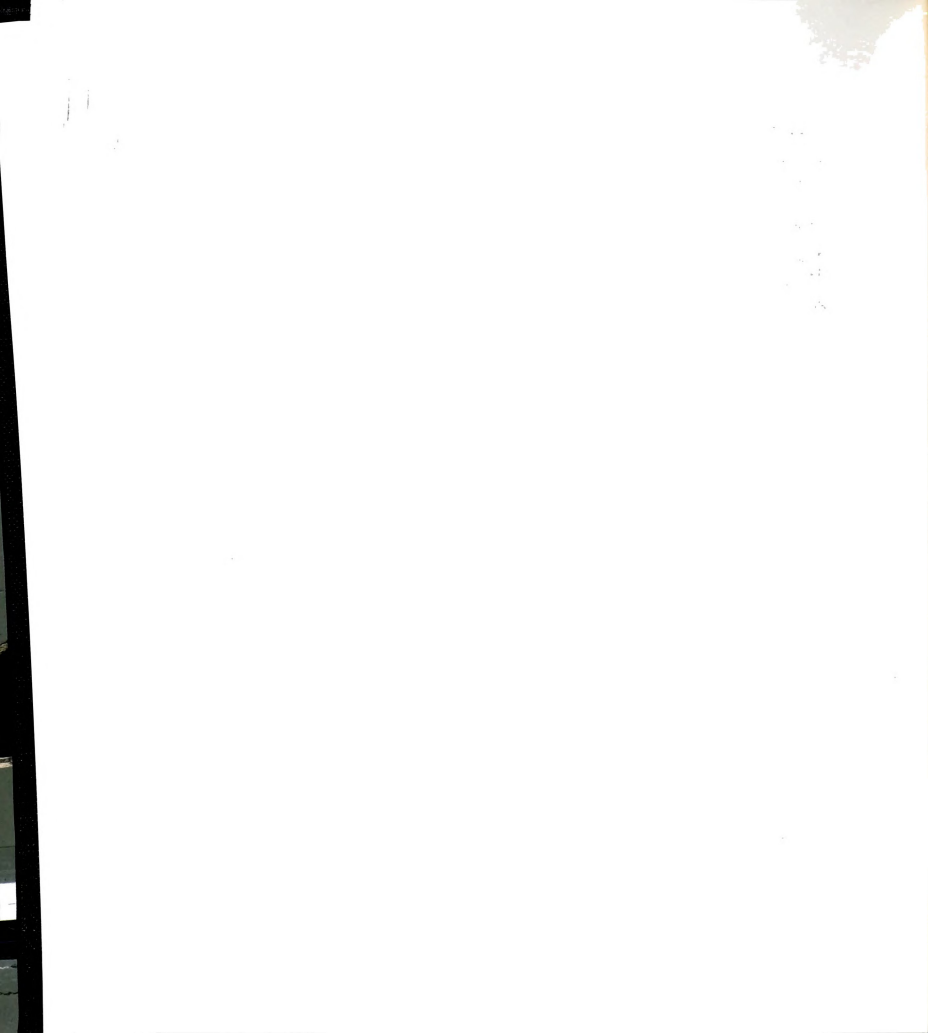
Table 25 (cont.)

Refused	13/80	-	15/80	8/50	21/100
Low Income	31/58	80/50	24/63	46/55	7/100
Medium	44/47	20/0	61/60	38/56	57/38
Med High	11/100	-	-	8/100	14/100
High Income	-	-	-	-	-
Volunteer	29/36	25/0	27/44	25/33	36/41
Can Drive	63/63		73/63	46/55	93/69
Owns Auto	68/65		79/65	54/62	93/69
Has Driver	45/65	100/40	36/75	63/67	14/0
Rides Bus	8/0	40/0	3/0	4/0	14/0
Uses Spectran	21/50	80/50	12/50	29/57	7/0
Attend Church	58/50	100/40	52/53	63/53	50/43
Senior Center	18/43	60/67	12/25	25/33	7/100
Social Grp	24/56	20/0	24/63	17/75	36/40
Member AARP	55/67	40/0	58/74	49/64	71/70
Pension	66/64	40/0	67/68	54/62	86/67
Savings	61/61	20/0	67/64	50/67	79/55
Earnings	13/80	-	15/80	4/100	29/75
Other	3/100	-	3/100	-	7/100
No Church	43/67	-	55/67	46/55	50/86
Baptist	11/25	60/33	3/0	13/33	7/0
Methodist	13/40	-	15/40	17/50	7/0
Catholic	11/75	-	12/75	8/100	14/50
Lutheran	11/75	-	12/75	8/100	14/50
AME	3/0	20/0	-	4/0	-
Jehovah's Wit	-	-	-	-	-
COG	3/100	-	3/100	-	7/100
COGIC	3/100	20/100	-	4/100	-
COC	-	-	-	-	-
Presbyterian	-	-	-	-	-
Episcopal	-	-	-	-	-
Pentecostal	-	-	-	-	-
Non-Denomin.	-	-	-	-	-
Other	-	-	-	-	-

** % of subjects with factor in regular type, %compliance in bold type

* significant @ $p \le$ .05

significance. Females who intended to receive a future immunization had significantly higher compliance (93%, $X^2=16.52$, df=2, p=.0003). This result must be cautiously interpreted due low expected cell frequencies.

Male subjects (n=14) in Tract 37 had a compliance rate of 64.3%. Compliance was significantly higher in males who had a doctor recommendation (100%, RR=3.50, 95% CI=1.08, 11.29, p=.01). The CI is rather wide and significance should be interpreted cautiously.

Hypothesis Testing.

The results of the X^2 test were used to test the null hypotheses put forth in the statement of problem.

Analysis of the data for the entire sample does not allow rejection of H_01 ($X^2=2.58$, df=1, p=.11), although the difference in compliance between black and white subjects approached significance within Tract 36.01 (p=.05119). No significant difference exists between the compliance rates between black and white subjects in the total sample or among census tracts.

H_02 cannot be rejected ($X^2=3.21$, df=5, p=.66). No significant difference exists in compliance rates between the census tracts observed in the study.

In the third case, the H_03 is rejected and the alternative hypothesis is accepted ($X^2=32.05$, df=1, RR=2.18, CI=1.62, 2.95, p<.000). Compliance rates of those subjects that received a recommendation from their physician to get a vaccination against influenza differ significantly

from the compliance rates of those who did not. The RR indicates that the association is a strong positive one. Further, the same results were obtained in Tracts 15, 36.01, and 37. These results strengthen the case for rejection of the null hypothesis.

$H_0 4$ is rejected and the alternative is accepted ($X^2=4.84$, df=1, RR=1.52, CI= 1.02, 22.7, p=.02). A significant difference exists in the compliance rates of those subjects who have regular check-ups and those who do not. The RR indicates that the association is a positive one. Further, the number of check-ups that a subject had per year was associated significantly with compliance ($X^2=7.75$, df=3, p=.05). Chi-square for linear trend was calculated for this risk factor and no significant linear trend in doctor visits was found. Compliance in Tract 15 also differed significantly according to absence or presence of checkups.

$H_0 5$ cannot be rejected ($X^2=4.19$, df=6, p=.65). No significant differences exist between the compliance rates of subjects of different levels of education.

$H_0 6$ cannot be rejected (N=162, $X^2=4.59$, df=2, p=.10). No significant differences exist between the compliance rates of subjects of different income levels.

$H_0 7$ can be rejected based on the finding that female subjects who are members of an HMO have a significantly higher compliance rate than females who are not. None of the other groups in the sample have significantly different compliance based on this factor, however.

Reasons for non-compliance.

Subjects who reported they were not vaccinated in 1991 were asked why (Figure 10). One third felt a vaccination for influenza was unnecessary. Twenty percent reported that they had become ill after receiving a past vaccination for influenza, 9.4% stated their physician had advised them not to take the vaccine (allergies to eggs or an existing medical condition). Subjects stated they hate needles (2.3%) and 2.3% said they did not know why they did not receive a vaccination. Over 35% of the subjects had various other reasons for non-compliance.

Subjects were asked if they intended to receive an influenza immunization in the future. A total of 55.8% intended to receive an influenza vaccination in the future and 6.6% of subjects did not know if they would receive one in the future. An interesting result was obtained when the reason given for not intending to be vaccinated were analyzed according to vaccination history (Figure 11). The largest proportion of those who had received a vaccination in the past do not consider receiving one in the future because they became ill after a past vaccination (59.0%). The largest proportion of subjects who had not received an influenza immunization in the past (after Other; 45.7%) felt that the vaccine was unnecessary (37%) (Figure 12).

Black subjects who did not comply with influenza immunization reported that they did not because of a
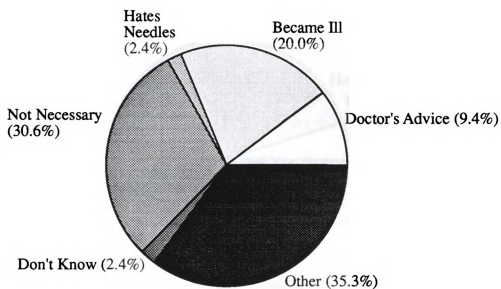
Figure 10. Reasons for non-compliance.
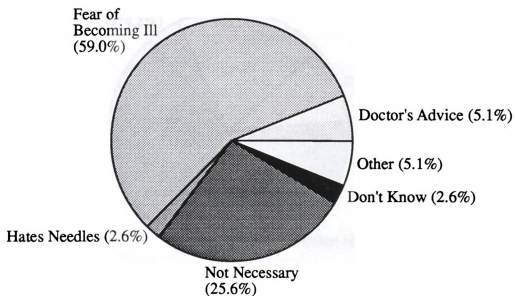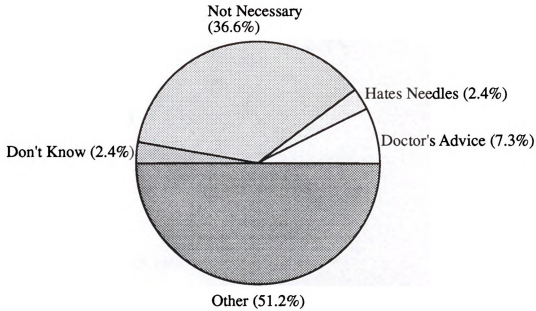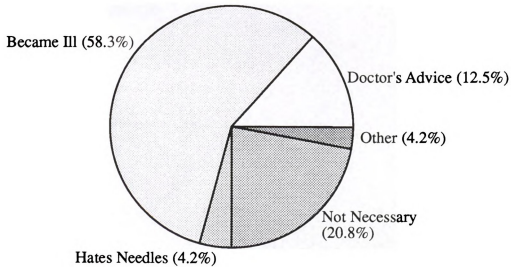

Figure 11. Reasons for non-compliance: subjects with history of vaccination.
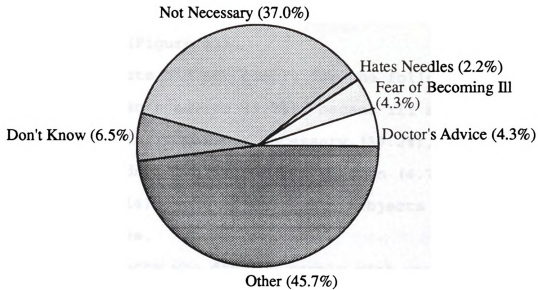
Figure 12. Reasons for non-compliance: subjects with no history of vaccination.
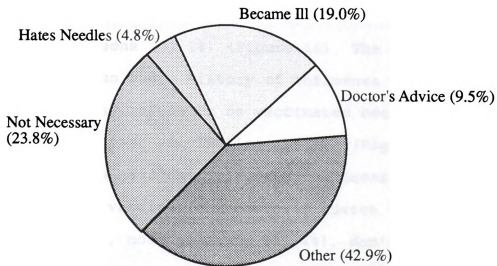
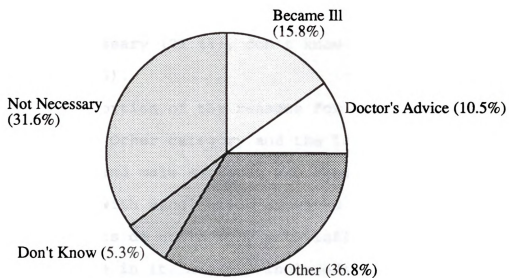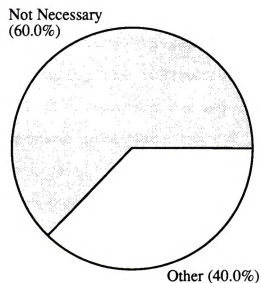Figure 13. Reasons for non-compliance: black subjects.

physician's advice (9.5%), they had become ill from a prior vaccination (19%), they hated needles (4.8%), they did not believe it was necessary (23.8%), and other miscellaneous reasons (42.9%) (Figure 13).

White subjects did not comply for the following reasons: physician's advice (9.3%), became ill after a prior shot (20.9%), felt it was not necessary (37.2%), did not know why they hadn't received a vaccination (4.7%) and other (27.9%) (Figure 14). None of the white subjects replied that they hated needles.

Female subjects who did not comply with vaccination gave the following responses as to why they did not receive an influenza vaccination: doctor's advice (9.1%), became ill (21.2%), hates needles (3.0%), not necessary (30.3%), don't know (1.5%) and other (34.8%) (Figure 15). Most females with no history of vaccination compliance felt that an influenza vaccination was unnecessary (36.6%) or did not comply for various other reasons (51.2%) (Figure 16). The majority of female subjects who had a history of influenza vaccination responded that they refuse to be vaccinated because they became ill from a past vaccination (58.3%) (Figure 17).

Male subjects gave the following responses to why they did not receive a vaccination: doctor's advice (10.5%), became ill (15.8%), not necessary (31.6%), don't know (5.3%) and other (36.8%) (Figure 18). Males with no history of immunization either believed vaccination was unnecessary
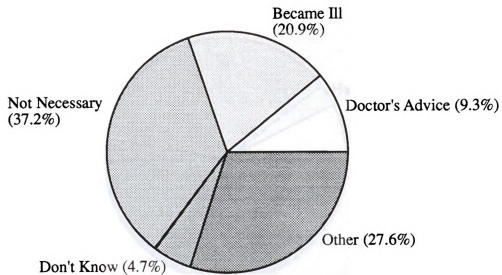
Figure 14. Reasons for non-compliance: white subjects.
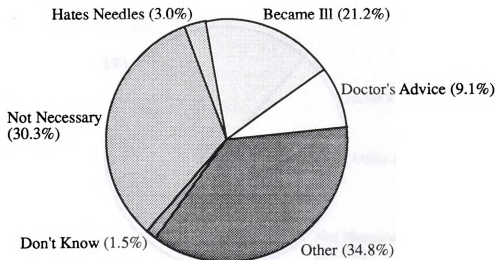
Figure 15. Reasons for non-compliance: female subjects.

Not Necessary
(36.6%)

Hates Needles (2.4%)

Doctor's Advice (7.3%)

Don't Know (2.4%)

Other (51.2%)

Figure 16. Reasons for non-compliance: female subjects with no history of vaccination.

Became Ill (58.3%)

Doctor's Advice (12.5%)

Other (4.2%)

Not Necessary
(20.8%)

Hates Needles (4.2%)

Figure 17. Reasons for non-compliance: female subjects with history of vaccination.

Figure 18. Reasons for non-compliance: male subjects.

Figure 19. Reasons for non-compliance: male subjects with no history of vaccination.

(60.0%) or had other reasons (40.0%) (Figure 19). Males with a history of immunizaton were not vaccinated for the following reasons: doctor's advice (14.3%), became ill (21.4%), not necessary (21.4%), don't know (7.1%) and other (35.7%) (Figure 20).

A large proportion of the reasons for non-compliance was placed in the Other category and the largest proportions of black, female and male subjects who reported that they had not complied with vaccination answered in this category.

Eight subjects do not comply with influenza because they don't believe in it. Answers included: "I just don't get them", "I don't like them", and "never have, never will get one". Seven subjects gave answers that indicated that getting an influenza vaccination just was not important to them. These could generally be placed in the "not necessary" category on the questionnaire. Typical responses included: "I forgot", "too lazy to ask for it", "too busy" and "never thought about it". Three subjects reported that they were ill or hospitalized during the influenza season. Two subjects stated that their physician had run out of the vaccine. Other responses included: "Heard people got sick", "Can't get around too well", "I have faith in God", "Let nature take its course", "My father was a chiropractor and I never was vaccinated", "It's too experimental ".
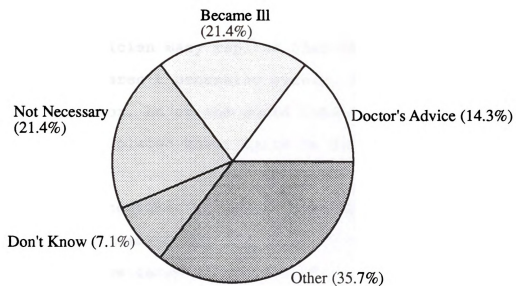
Figure 20. Reasons for non-compliance: male subjects with history of vaccination.

<u>Physicians of Subjects.</u>

Subjects were asked who was their regular physician. Over six percent said they had a physician, however the name and location of their physician was not ascertained during the interviews. The compliance rate for these subjects was 58.3%.

Six percent of subjects reported having no doctor. The compliance rate for this group was 16.7%. When asked why they had no physician many replied that they hadn't been sick in years, weren't generally sickly, and that if one went to the doctor, he or she would find something wrong. Several subjects placed their faith in God or natural remedies.

Appendix F contains a list of the physicians, the reported rate of recommendation of vaccine by each physician and the compliance rates of the subjects.

Several of the respondents (n=14, 7.0%) reported that their family physician was Dr. William Harrison. The compliance rate for subjects who were patients of Dr. Harrison was 42.9%, which is double the recent national trends for compliance. Dr. Harrison was the first black physician to practice in the Lansing area and retired in 1992. A majority of subjects who reported that they were patients of Dr. Harrison live in Tracts 15 and 16. All of the respondents who reported Dr. Harrison as their physician were black.

A number of subjects (6.6%) have physicians who

practice outside Lansing. The locations include E. Lansing, MI (just east of Lansing), Holt, MI (just south of Lansing), Ann Arbor, MI (Veteran's Administration Hospital), and Battle Creek, MI (Veteran's Administration Hospital). A number of subjects see physicians in Grand Ledge, MI (15 miles west of Lansing) and Eaton Rapids (10 miles south of Lansing). One respondent saw her physician in Olivet, MI, which is in southern Eaton County, MI. One respondent stated that his physician was in Chicago, IL and he made regular trips there to consult with him.

Medical Conditions of Subjects.

Many subjects (46.4%) volunteered information regarding their medical conditions to the investigator during the interviews. The various conditions were divided into the following categories: Hypertension, Cardio/Pulmonary, Diabetes/Renal, Arthritis/Osteoporosis, Cancer, and Other (including allergies, glaucoma, various surgeries unrelated to any of the above, and nervous conditions). A final category called Several included those subjects who reported having a cardio/pulmonary or diabetes/renal malady along with one or more conditions in the other categories. Table 26 shows the proportions of subjects who reported medical conditions and their respective compliances with influenza immunization.

Of those subjects who reported having only hypertension, 27.3% were vaccinated. Sixty percent of those reporting a cardio/pulmonary condition were vaccinated and

TABLE 26

Medical Conditions Reported by Subjects

Condition	N=	(% w/Condition)	%Compliance
No Condition	105	(53.6)	59.0
Hypertension	11	(5.6)	27.3
Cardio/Pulmonary	25	(12.8)	60.0
Diabetes/Renal	13	(6.6)	84.6
Arthritis/Osteo	6	(3.1)	33.3
Cancer	5	(2.6)	20.0
Other	17	(8.7)	58.8
Several	14	(7.1)	50.0

84.6% of those reporting diabetes or other condition were vaccinated. Twenty percent of those who were currently undergoing chemotherapy for a cancer condition were vaccinated. One such subject was not vaccinated due to their physician's advice; two subjects did not take the vaccine because they became ill from it in the past, and one subject was on chemotherapy and did not want the vaccine.

Discussion.

Compliance rates in this study were relatively high compared to recent national averages (MMWR, 1986; Fedson, 1990). Compliance among these subjects (56.3%) was higher than that of the elderly population of Ingham County in 1990 (51.5%) but lower than that in 1991 (68.3%) (ICHD, 1992). According to the report compiled by the ICHD (1992), 63% of medicare B vaccines were distributed by physicians and related health care providers. In this study, 80% of subjects reported medical checkups (p=.03), 53.8% reported that their physician had recommended they be vaccinated (p<.000), and 55% of those who reported being vaccinated said they received their vaccination at their physician's office. A simple visual inspection of the rates of recommendation of vaccine of each physician or clinic and the corresponding compliance rates shows a trend toward correlation (not significant) between these two factors (Appendix F). These facts underscore the importance of physicians in the high compliance rates of Ingham County and in this sample.

Immunization history, medical checkups and their frequency, and intent to receive a vaccination in the future were all significantly associated with compliance in the entire sample and among groups stratified by race, gender and census tract of residence. These findings are consistent with those reported in other studies (Ennis et al, 1976; Aho, 1979; MacPherson, 1980; McKinney and Barnas, 1989; Stehr-Green et al, 1990).

The most striking result of this study was the significant difference in compliance between male and female subjects. This result conflicts with many of the findings of other studies. MacPherson et al (1980) reported that elderly males had lower compliance. Monto and Ross (1979) reported that females had higher compliance. Aho (1979) reported that males had significantly higher rates than females and that this was contrary to findings of studies of utilization of health services at that time. The Behavioral Risk Factor Survey, however, did find that males had slightly higher levels of compliance than did females (MMWR, 1989). Several factors were considered and explored in this study to determine what effect they have on the compliance levels of the gender groups.

Immunization compliance among female subjects was significantly associated with a physician recommendation of vaccine, past immunization and membership in an HMO. HMOs promote preventive health care and the Bluecare Network in Lansing holds immunization clinics as a covered benefit to

its members. Almost 67.0% of these subjects received a recommendation of immunization from their doctor. This is a relatively high rate in comparison to that of female subjects as a whole (51.1%) and the entire sample (53.8%). The difference in compliance rates among female HMO members and non-members is directly linked to the high rate physician recommendations reported by female HMO members.

An interesting discovery was that 42.0% of female subjects who are HMO members received their vaccination at their physician's office, and 42.0% received theirs at the ICHD. Three of the 5 subjects who received their immunization at ICHD live in Tracts 36.01 and 37 which are nearer to the ICHD in distance than any of the other tracts. These subjects also reported owning automobiles and said they were able to drive. Perhaps the ICHD was more convenient in terms of location for them.

No significant difference was found between the compliance rates of black and white subjects in this study. This finding conflicts with those of other studies (Aho, 1979; MMWR, 1988; Sievert, 1989; MMWR, 1989; Stehr-Green, 1990). McKinney and Barnas (1989), however, reported that in their study, compliance was unrelated to age, gender or race.

Black and white subjects differed significantly in their proportions of those who were HMO members. The proportion of black subjects who were HMO members was 4.8%, and that of white subjects, 17.7%. Both these proportions

were relatively small. Compliance rates, however, did not differ between these two groups, in the sample as a whole, or between male and female subjects according to HMO membership.

Among male subjects, a doctor's recommendation was important for compliance. Both gender groups had doctor recommendation as a common factor that was significantly associated with compliance. Intent to receive a future immunization was probably important in both groups, however, small expected cell frequencies render these findings unreliable.

Among female subjects, history of compliance was a very important factor in terms of compliance and non-compliance. Indeed a large proportion (31.0%) of the reasons why females did not take an immunization in 1991 and did not intend to in the future was because they had become ill after a previous immunization.

Analysis of the differences in proportion of all the other variables between male and females subjects was performed in order to determine if any significant connections or differences were pertinent to level of compliance in either group.

Income and education levels did not appear to have a significant bearing on the vaccination compliance of these subjects either as a whole or broken down into to groups by gender, race and census tract of residence. Male subjects had significantly higher levels of income than female

subjects, however, white subjects also had higher levels of income than black subjects and no significant difference in compliance was found between the race groups.

Male subjects reported a significantly higher rate of automobile ownership and ability to drive than did female subjects. Ownership of a vehicle and ability to drive it might effect a subject's ability to get to the doctor on a frequent basis. Frequency of doctor visits was significantly associated with compliance in the total sample. Frequency of doctor visits is also significantly associated with owning a car, although no significant difference between frequency of doctor visits and compliance was found between male and female subjects.

Age also did not appear to effect compliance. This finding was confirmed in one study reviewed (McKinney and Barnas, 1989). A large proportion of subjects were aged 65-69 years. The majority of male subjects were aged 65-69 years. The ages of female subjects were more evenly distributed among the age groups (Table 6). In some cases, however, younger subjects may believe an immunization is unnecessary because of their age.

Male subjects predominately lived in single family houses, as did black subjects. No significant difference was found in the compliance levels of black and white subjects based on type of dwelling. It could be assumed that those living in houses might be more isolated socially or spatially from dissemination of information (even in the way

of casual conversation) about influenza vaccination than those who reside in senior apartment complexes and therefore would have lower compliance levels. Vaccination coverage, however, did not vary significantly according to type of dwelling in either group.

Black subjects report attending church in far greater proportions (85.5%) than do whites (55.8). This difference was highly significant (p=.0000) and indicates that perhaps churches would be a good location to reach black residents by setting up influenza immunization clinics in them.

Over 78.0% of subjects reported being regularly involved with church, a senior citizen center, a social club or some type of volunteer work. The immunization compliance for those that reported participation in these activities was 57.8%. Those that reported that they did not participate in any of these activities totalled 21.4%. The compliance for this group was 52.4%. Participation in one or more of these activities was not significantly associated with compliance. In this study, those who had more active social lives did not differ significantly in compliance from those that did not. Even those who volunteered at hospitals where immunizations are offered free of charge did not differ significantly in immunization compliance from those who performed other types of volunteer work.

The majority of male subjects were married (62.3%). The majority of female subjects were widowed (58.5%). Monto et al (1977) found that married subjects had higher compliance

rates. MacPherson et al (1980) found that single individuals had lower compliance rates. Fifty-seven percent of females reported living alone, as did 29.5% of male subjects, 54.9% of white subjects, and 39.8% of black subjects. Perhaps married male subjects are more apt to avail themselves of preventive health care because of the presence of supportive relationships in their households. Although black subjects reported a high rate of being widowed (51.8%), a relatively low proportion of them lived alone.

Males and females differed significantly in their rates of past immunization and intent to receive one in the future (Table 12). Females had lower rates of both factors than did males. This fact more than any other probably accounts for the lower rates of immunization among females in this study. It is interesting, however, that a doctor's recommendation of the vaccine did not differ significantly between groups, and would suggest that perhaps there exists a "hard core" of individuals among the female subjects that simply refuse to be immunized against influenza.

A large proportion of non-compliers, both male and female, felt that immunization against influenza was unnecessary. Others refused to receive a vaccination because they had a bad reaction in the past. These findings are consistent with those of Rundall and Wheeler (1979) and Aho (1979) who found perceived necessity and efficacy of the vaccine, and perceived risks of the vaccine to be positively associated with compliance.

Relatively few subjects used the Capital Area
Transportation Authority (CATA) for transportation, the
public transportation system of the Lansing area. Several
subjects felt the bus was inconvenient. In most cases,
subjects said that they had to walk too far to a bus stop,
that the bus near their residence would take them way out of
their way, or the bus schedules were inconvenient. Several
subjects did not feel they could get around well enough to
use the bus.

Anecdotal information given by subjects regarding their
medical conditions was taken by the investigator. Those who
reported having cardio\pulmonary conditions reported a 60.0%
rate of doctor recommendation of vaccine. Those who reported
diabetes or renal conditions reported an extremely high rate
of doctor recommendation (84.6%). The physicians of these
subjects appear to be aware of the necessity of vaccination
of these individuals. Those individuals who reported
hypertension or cancer had relatively low rates of doctor
recommendation, as did those who reported more than one
condition (Several category). Persons with hypertension are
monitored regularly by a physician, and these visits would
be excellent opportunities for education of the patients
about the benefits of immunization. As mentioned, this
information was anecdotal, and no statistical analysis was
or should have been performed, however, the information was
informative and interesting.

Census Tracts.

   Tract 13 had the highest overall compliance rate
(66.7%) (Table 14). Tract 16 had the highest compliance rate
among black subjects (60.9%) (one black resident was
interviewed in Tract 13 [100.0%] and reported being
vaccinated). Tract 36.01 had the highest compliance rate
among white subjects (65.5%). Tract 13 had the highest
female compliance rate (61.5%). Tract 5 had the highest male
compliance rate (100.0%).

   All of the subjects interviewed in Tract 13 lived in
Riverfront Apartments. Riverfront had an overall compliance
rate of 66.7%, Capital Commons, 51.6%, and South Washington
Park, 50.0%. The high compliance rate of the Riverfront
residents may be due to the fact that all of these
respondents were recruited from the Resident's Council
meeting. Perhaps some connection exists between active
participation in the council and immunization compliance.

   The significant difference in distribution of black
subjects among census tracts can be explained by the fact
that tracts were chosen specifically on the basis of their
racial makeup. The difference in income level among tracts
is explained by the distribution of household income among
tracts (Table 2). Tracts 13 and 15 are the least affluent in
terms of household income and have the highest proportion of
total residents living under the poverty level. In this
study they also have the largest proportions of low income
subjects (p=.000). Significant differences in age are also

explained by the demographic make-up of the tracts.

The proportions of subjects who reported regular medical checkups differed by census tract of residence. These proportions were all relatively high, however, Tract 37 had the lowest (63.2%).

Tract 15 had the significantly lowest proportion of subjects who carried private medical insurance. This tract also had the highest proportion of low income subjects. Tract 36.01 had the highest proportion of privately insured subjects and also the lowest proportion of low income subjects.

Tract 13 had the significantly highest proportion of subjects who lived alone. This result in not surprising since all subjects resided in Riverfront Apartments. The majority of those living in SSI apartments live alone. Tract 13 had the lowest proportion of subjects who owned cars or could drive. In spite of these significant factors, Tract 13 had the highest overall compliance rate of the tracts included in this study.

The only instance where a difference in compliance between black and white subjects even approached significance was within Tract 36.01 (Table 23). Table 16 shows significant results and those suspected of being significant for black subjects among census tracts. Tract 36.01 has the lowest (questionable significance due to low expected cell frequencies) compliance of all the tracts for blacks subjects. This is almost certainly due to the fact

that black subjects in Tract 36.01 have extremely low rates
of past immunization and intent to receive a vaccination in
the future (questionable significance due to low expected
cell frequencies). Rate of doctor recommendation (57.1%) is
not very low relatively and 100% of subjects reported
regular checkups. Tract 36.01 had the significantly highest
proportion of all the tracts of subjects reporting medical
checkups (93.0%). The black subjects in this tract as a
group were relatively young. Indeed among all tracts (Table
4) 36.01 had the highest proportion of subjects in the 65-69
years group (51.2%, p=.000). Fifty percent of black subjects
of 36.01 were in the 65-69 years age group (7.1% were 80
years and older). Of all the sample tracts, 36.01 has the
smallest proportion of elderly residents (5.0%) (Table 2).

Tract 36.01 has the highest proportion of residents
interviewed who were 65-69 years (51.2%). Perhaps because of
the relative youth of the overall proportion of elderly
residents who live in the tract, influenza immunizations are
not perceived as a priority or are not discussed among
neighbors. Subjects may not perceive themselves as "old" and
think they are not susceptible to the complications of
influenza. The high compliance of white subjects of that age
group within the tract (65.5%) would not, however be
explained in this manner. This theory would also be
contradicted by the fact that a large proportion of all of
the male subjects were 65-69 years and had relatively high
compliance. The majority of black subjects in this tract

were high school graduates (42.9%) and 14.3% had graduate education. Black subjects in Tract 36.01 were mostly medium income (66.7%) and had the highest proportion of medium-high income black subjects (16.7%) of all the tracts.

Thirty percent of black subjects in Tract 36.01 stated they felt immunization was unnecessary and 40.0% gave answers that indicate they are part of a "hard core" of individuals who have their minds made up and will not take a vaccination. The fact that a large proportion of these subjects had a recommendation from their physician underscores the probability that the low compliance in this group is due to perceived lack of necessity of the vaccine by the subjects or simple refusal to accept vaccination.

Tract 36.01 also had the lowest compliance rate for male subjects (50.0%, n=16). The relatively small number of males subjects must be considered when interpreting these results. The largest proportion of males (69%) in Tract 36.01 were in the 65-69 years age group and the subjects in this age group a 36% compliance rate. This rate was lowest among compliance rates for males among the all the census tracts. No significant differences in compliance were noted based on the factors known to be associated with higher compliance in this study, probably due to the number of male subjects. Proportions of subjects who had a doctor recommendation, a past immunization and reported regular medical checkups were relatively high. A relatively small proportion of subjects intended to receive an immunization

in the future. The reasons subjects gave for non-compliance were almost evenly split between believing it was not necessary and various other reasons ("forgot", "doctor ran out of the vaccine", "never thought about it" and "I'm against it because people got sick").

Tract 5 had the lowest compliance rate for female subjects (n=18, 33.3%) (Table 19). This tract also had the lowest compliance among black female subjects (25%). The difference in compliance between males and females was significant in this tract as was that between black male and female subjects. Male subjects (and black male subjects) had a compliance rate of 100%. Past immunization and intent to receive an immunization in the future was significantly associated with compliance for female subjects in Tract 5. Proportions of female subjects who reported a recommendation by their physician (44%), had a past immunization (50%) and intended to have one in the future (33%) were all relatively small. Eighty-three percent of female subjects reported having regular medical checkups. Low compliance in this tract can probably partially be attributed to the relatively low rate of physician recommendation. The reasons given by female subjects for not receiving an immunization reflect that most felt it was unnecessary, and many just refuse to consider having it.

Tract 15 had the lowest overall compliance rates of all the tracts (Table 21). This is probably attributable to the relatively low compliance of females within the tract

(44.4%). Also, older age groups had low compliance rates. This was true for subjects aged 75-79 years (36%) and those aged 85 years and older (29% in the entire tract sample; those aged 75-79 years (38%) and 80-84 years (44%) among black subjects; in the aged 65-69 years (43%) and 85 years and older (33%) among the white subjects; and in the 75-79 years age group (25%) among female subjects. Compliance was also relatively low among black (48%) and white (39%) female subjects. White (47%) and female (44%) subjects who lived in Capital Commons had relatively low compliance rates. The majority of these subjects reported that they felt immunization against influenza was unnecessary. This is especially alarming since 36.4% of these individuals were 85 years and older and highly susceptible to the complications of influenza. Perhaps these individuals would benefit from health education on this subject.

Lack of transportation did not seem to be a hindrance to vaccination compliance. Owning an auto and ability to drive were significantly associated with the number of medical checkups a subjects had. The fact that males had a significantly higher rate of automobile ownership and ability to drive may be indirectly linked to their significantly higher compliance. Income level was also significantly associated with auto ownership and males were significantly more affluent than females in this study. No significant difference was found between auto ownership and compliance and ability to drive and compliance, however.

The wide confidence intervals encountered in many of the preceding analyses of intent to receive a future immunization as a factor in immunization compliance can be considered probably significant after careful consideration of the data. Because associations appeared to be significant time and again throughout the analyses and because in each case the majority of those subjects who did not intend to have an immunization in the future, did not receive an immunization against influenza in 1991, it is probable that future intent is a significant factor in the compliance of these groups. Chance, however cannot be ruled out as a factor in this result.

Chapter Five

Conclusions and Recommendations

The evidence of this study overwhelmingly indicates that a history of immunization, a doctor recommendation of vaccine, and intent to receive a future immunization are strongly positively associated with vaccination compliance in this sample population. Ennis et al, 1976; Monto and Ross, 1979; Aho, 1979; Macpherson et al, 1980; McKinney and Barnas, 1989; and Stehr-Green et al, 1990 reported similar results. These factors held for the entire sample, and for numerous groups of subjects broken down by census tract of residence and race and gender groups. Medical checkups and their frequency were positively associated with compliance in the total sample, however frequency of medical checkups had no bearing on the results in the breakdowns by census tract, gender and race, perhaps due to small numbers of subjects.

This study also has suggested that relatively low compliance rates were probably due to low rates of physician recommendation of the vaccine and low rates of past immunization. A large proportion of those who did not comply with vaccination often were not aware of the necessity of being vaccinated. Others were set against being vaccinated because they had a reaction to a former vaccination.

Past immunization as a strongly significant factor indicates that patients in the habit of having an immunization probably will have one in the future,

especially if their physician suggests it. The majority of subjects (93.9%) reported that they had a doctor, and eighty percent made regular visits to him or her. Almost 42% of subjects made 2 to 6 checkups per year. These visits present opportunities for recommendations from physicians, as subjects verified (56.3%).

Immunization compliance within race and gender groups was significantly associated with past immunization, doctor recommendation and intent to receive an immunization in the future. These findings highlight the similarities between these groups and is convincing evidence that similar stimuli increase compliance within the groups, and among all subjects.

The Influenza Vaccination Demonstration Project in Ingham County appears to have been a success in this group of subjects. Vaccination coverage in this survey appears to be uniform over income and education groups.

Compliance among all subjects did not vary geographically in this study. This was also true for the subjects broken down by race and gender groups, which may have been a result of small sample sizes within census tracts. This fact underscores the success of the IVDP in getting subjects who live in predominately black census tracts vaccinated. The results of this study seem to suggest that vaccination rates of black residents may not be as low as suspected by the official at the ICHD.

<u>Recommendations to the Ingham County Health Department.</u>

The Ingham County Health Department (ICHD) seems to have successfully implemented the Influenza Vaccination Demonstration Project in Ingham County in this sample of residents. The U. S. Congress approved influenza vaccination as a covered benefit of Medicare B enrollees on May 1, 1993, to begin in the 1993-94 influenza season.

This study has shown that physicians play an important role in the high compliance rates of this sample population. ICHD should continue to focus their educational programs on the physicians in the area. If the general population of elderly people in Ingham County have high rates of medical checkups, this presents an important opportunity for contacts with elderly residents. Physicians should be informed that a simple recommendation can make a significant difference in the decision to receive a vaccination.

If vaccination differs significantly between males and females in Ingham County elderly residents, a plan must be devised to target female patients, especially those who have no immunization history or who report an unpleasant past experience with immunization.

This study shows that subjects who had a past influenza immunization were more likely to take one in the future. Emphasis should be placed on getting Ingham County elderly residents vaccinated the first time starting at age 65.

Subjects who visit their physician infrequently must be reached with information about the benefits of having a

vaccination against influenza. Medicare B enrollees who live in apartment complexes such as those described in this study would be much benefitted by having immunization clinics set up by ICHD in their buildings during the season for vaccinations.

Black subjects in this study live in single family houses at significantly higher rates than did white subjects. If this is true of the entire elderly black population, these individuals who live in single family houses also must be reached. Eighty-five percent of black respondents reported that they attend church. If black elderly residents of Ingham County also attend church at rates as high as those in this study, ICHD would do well to avail themselves of the assistance black churches could give them to reach black elderly residents, especially females. Acquiring the cooperation of the major black churches in Lansing, and especially actively involving the pastors would be a way to reach black residents who live in houses and have infrequent visits to the physician.

Large proportions of both black and white non-compliers believe the influenza immunization to be unnecessary. The ICHD would do well to point their efforts at education toward these individuals. These individuals did not appear adamant in their refusal to receive the vaccine, but are merely ignorant of the liabilities of not receiving it. Physicians could be instrumental in underscoring the benefits of having an influenza immunization, assuaging the

fears of those who have had reactions to the former live vaccines, and to repeat these messages to the hardcore non-compliers on a yearly basis.

ICHD may wish to consider compiling demographic information about elderly residents who are vaccinated and their census tracts of residence in order to more effectively target underrepresented groups and individuals for vaccination.

Recommendations for Further Research.

Several changes would make this study a more effective one. If addresses of elderly residents were available, a random sample, stratified based on race, income, gender, etc. would make the results of a study representative of the population. A much larger sample would facilitate an indepth analysis of risk factors and compliance within census tracts, and a more meaningful study of geographic variation could be performed. A study in which a random, proportionate, stratified sample of residents were interviewed in each of the 50 census tracts in Lansing might yield results which were representative of the urban population of Ingham County.

In future studies, subjects could also be questioned more thoroughly about non-compliance attitudes and behaviors in an attempt to discern ways of counteracting these attitudes against compliance with influenza immunization.

This study did not focus on the compliance behaviors of those who attend senior citizen centers. A study focussing

on these individuals may reveal different patterns and may present opportunities for locations for educational programs on influenza immunization.

The evidence of this study suggested that relatively low compliance in Tract 36.01 might be due to the relatively young age of the subjects interviewed and the small overall proportion of elderly residents residing in that tract. Future research could determine if influenza immunization compliance among census tracts in Ingham County differs significantly according to the proportion of elderly population residing in it and the factors associated with those differences.

APPENDICES

APPENDIX A

Introduction

Dear Lansing Resident,

As part of my masters degree in geography at Michigan State
University, I wish to conduct short personal interviews with
persons aged 65 years and older who are residents of the
City of Lansing, Ingham County. I will be gathering
information about whether you have received an influenza
vaccination and certain factors which may relate to this
subject.

ALL of the information gathered will be kept in the
strictest confidence and will not be associated with your
name or address.

The interview will take about 20 minutes of your time. I
will be conducting these interviews during the next two
months. Your participation in this project is completely
voluntary. If this time is inconvenient please feel free to
ask me to return at another time.

The following people can be contacted at the Department of
Geography at Michigan State University in order to confirm
that my request is a legitimate one.

Dr. Judy Olson, Chairperson   Dr. John M. Hunter,
Professor
Department of Geography, MSU   Department of Geography,
MSU
315 Natural Science Building   311 Natural Science
Building
East Lansing, MI 48824   East Lansing, MI 48824
517-355-4649   517-355-1685

Your cooperation is greatly appreciated.

Sincerely,

Karen D. Johnson-Webb
Graduate Student
Department of Geography
Michigan State University

Consent Form

1. I have freely agreed to take part in a scientific study being conducted by Karen Johnson-Webb, who is a graduate student in the Geography Department of Michigan State University, working under the guidance of Dr. John M. Hunter. I will be taking a survey that asks questions about whether I have received an influenza vaccination and other personal information about myself.

2. This survey has been explained to me, and I understand the explanation that has been given and what my role in the survey will be.

3. I understand that I am free to stop my participation in the survey at any time. I may refuse to answer any question. I understand that the expected length of the survey will be about 20 minutes.

4. I understand that the results of my participation in the survey will be kept in the strictest confidence, as will those of all other participants. All participants will remain anonymous in the reporting of results. Results will be made available to me at my request.

5. I understand that, at my request, I can receive additional explanation of this study after my participation is completed.

Signed _____

DATE:_____

IMMUNIZATION QUESTIONNAIRE

Tract#_____ Blkgrp#_____ Address_____
Gender F(1) M(2)
1.What is your race? B(0) W(1)
2.House(0) Apt(1) DupCondo(2) SSCom(3) Nursing Home(4)
3.Did you receive an influenza vaccination last year? 1 2
If no go to #6.
4.Where? Priv.Dr.(0) Hlth Dept(1) SpecClinic(2)_____
Other(3)_____. Name_____
5.Did your Dr. recommend that you get a flu shot? 1 2
6.What is the reason you did not receive a flu shot?
Dr.Advice(0) Became ill(1) Painful shot(2) Not necessary(3)
Don't know(4) Other(5)_____
7.Have you ever received a flu shot? 1 2
8.Do you plan to receive a flu shot in the future? 1   2
9. If not, why? 0   1   2   3   4
Other(5)_____
10.Do you visit the Dr. even when you are feeling well and
are not sick? 1 2
11.How often?_____
12.Where do you see the Dr? Priv.Dr.(0) HlthDept(1)
SpecClinic(2)
Other(3)_____
Name_____
13.Do you have any kind of health insurance? 1 2
14.What kinds? Medicare(0) Private(1) HMO(2) Other(3)
None(0)
15.Does it cover your medical expenses when you are sick?
None(0) All(1) Some(2) DK(3)
PERSONAL INFORMATION
16.How old were you at your last birthday?_____
17.What was the highest year of school you
completed?_____
18.Are you currently: mark all that apply.
Employed for wages(1)   Student(4)
Self-employed(2)   Homemaker(5)
Retired(3)
19.Are you:M(0)D(1)W(2)Sep(3)NeverM(4)Member unmarried
couple(5)?
20.Do you live alone? 1 2
21.How many people live with you?_____
Relationships? Spouse(0)__ Sibling(1)___ Child(2)__
Grandchild(3)___ Other_____
22.Are any of these individuals dependent on you for their
support? 1   2 How many?_____
23.Do you perform volunteer work? 1   2
Where?_____
24.Do you drive? 1   2
25.Do you own a car?   1   2

26.Is there someone who drives you where you need to go? 1
2
27.Do you ride the city bus? 1   2
28.Taxi or shuttle? 1   2
29.Do you attend church? 1 2 How often?_____/mo
Where?_____ 30.A senior center? 1 2 How often?_____/wk
Where?_____
31.Member of a social club or civic org? 1 2____/mo
Name_____ 32.Are you a member of the AARP? 1   2
Since_____
33.Source of your income? Pension(0) Saving/invest(1)
Earnings(3) SSI(4) Other(5)_____
34.How many persons contribute to this income?_____
35.How much is your income?_____/mo _____/yr

APPENDIX D

Responses to Questionnaire

Question#	Category	% of Responses
Tract#	5	12.7
	13	7.6
	15	24.4
	16	14.2
	36.01	21.8
	37	19.3
Gender	Female	68.5
	Male	31.5
1. Race	Black	42.6
	White	57.4
2. Type of dwelling	House	70.1
	Apt.	0.5
	Duplex	1.0
	SSI Apts.	28.4
3. Vaccinated in 1991	Yes	56.3
	No	43.1
	DK	0.5
4. Where vaccinated	Physician	55.5
	ICHD	22.7
	SpecClinic	15.5
	Other	4.5
	DK	1.0
5. Dr. recommend. of vaccine	Yes	52.8
	No	47.2
6. Reason not vaccinated	Dr.Advice	4.1
	Became ill	8.6
	Painful Shot	1.0
	Not Necessary	13.2
	DK	1.0
	Other	15.7
7. Vaccinated in the past	Yes	70.1
	No	28.9
	DK	1.0
8. Intend future vaccination	Yes	55.8
	No	37.6
	DK	6.6

9. Reason for no intention	Dr. Advice	2.0
	Became ill	12.7
	Painful shot	1.0
	Not Necessary	13.7
	DK	2.5
	Other	12.2

10. Regular medical checkups	Yes	79.7
	No	20.3

12. Physician office location	Private Dr.	89.3
	ICHD	2.0
	SpecClinic	0.5
	Other	2.5

13. Med. insurance	Yes	100.0

14. Type of insurance	Medicare	100.0
	Private	68.0
	HMO	12.2
	Other	0.0
	None	0.0

15. Coverage of medical costs	None	0.0
	All	26.5
	Some	23.0
	DK	7.1
	Most	43.4

16. Age

17. Education

18. Employment	Employed	8.1
	Self-employed	1.5
	Retired	82.7
	Student	1.5
	Homemaker	12.7

19. Marital status	Married	37.0
	Divorced	11.0
	Widowed	47.0
	Separated	0.0
	NeverMarried	5.1
	MemberUnmarCouple	0.5

20. Live alone	Yes	48.2
	No	51.8

21.	Members of Family	Spouse	48.2
		Sibling	3.0
		Child	30.7
		Grandchild	12.4
		Other	5.8
22.	Dependents	Yes	12.7
		No	86.6
23.	Volunteer	Yes	39.1
		No	60.9
24.	Drive	Yes	59.4
		No	40.6
25.	Own auto	Yes	62.4
		No	37.6
26.	Have a driver	Yes	50.3
		No	49.7
27.	Ride the bus	Yes	18.3
		No	81.7
28.	Use special transportation	Yes	21.8
		No	78.2
29.	Attend church	Yes	68.5
		No	31.5
30.	Attend senior center	Yes	16.2
		No	83.8
31.	Member of a social club	Yes	25.9
		No	74.1
32.	Member AARP	Yes	54.3
		No	45.7
33.	Income source	Pension	64.0
		Savings	49.7
		Earnings	13.7
		SSI	100.0
		Other	6.6
34.	# contributing to income		
35.	Amount of income		

Churches Attended

Church Name	N=	%
No Church	67	50.7
Union Baptist	13	69.2
Friendship Baptist	6	36.4
Holy Cross	6	71.4
Mt. Zion Baptist	6	80.0
St. Mary's	5	16.7
St. Casimir	4	66.7
Grace United Methodist	4	66.7
Westminster Presbyterian	4	40.0
Immaculate Heart	4	75.0
Original COG #2	4	75.0
Faith United Methodist	4	50.0
Bethlehem Lutheran	3	66.7
Holmes Rd. COC	3	33.3
Jehovah's Witness (Waverly)	3	100.0
St. Paul's Episcopal	3	0.0
Pentecostal Outreach Center	3	0.0
Christ United Methodist	2	0.0
Mt. Olive Baptist	2	50.0
Jehovah's Witness (West)	2	100.0
Central United Methodist	2	100.0
Grace Lutheran	2	50.0
Inner City Bible Church	2	50.0
Mt. Hope Church (Flags)	2	50.0
Macedonia Baptist	2	100.0
Paradise Baptist	2	50.0
Unity	2	100.0
Bethany Baptist	1	100.0
Central Free Methodist	1	100.0
Delta Haven Free Methodist	1	0.0
Immanuel Baptist	1	0.0
Evangel Methodist	1	0.0
Fellowship for Today	1	0.0
First Spiritual	1	100.0
First United Methodist	1	0.0
Galilee Baptist	1	50.0
Good Shepherd Lutheran	1	100.0
Gospel Assembly	1	0.0
West Lansing COG	1	100.0
Lansing Christian Center	1	100.0
Lively Faith	1	100.0
Living Word	1	0.0
Mask Memorial CME	1	100.0
Mt. Hope United Methodist	1	0.0
Church of the Nazarene	1	100.0
New Jerusalem	1	0.0
New Mt. Calvary Baptist	1	100.0

New St. Paul COGIC	1	100.0
Olivet Baptist	1	100.0
Penway COG	1	100.0
Pilgrim Rest Baptist	1	0.0
Plymouth Congregational	1	100.0
Redeemer Lutheran	1	100.0
Ressurection	1	100.0
Robinson Memorial COGIC	1	0.0
South Baptist	1	0.0
United Universalist	1	100.0
Zion Lutheran	1	0.0
Lansing COGIC	1	100.0
Out of Town	5	66.7

Physicians of Respondents

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Physician Name or Office Building	Number of Subjects	%Dr. Recommen.	%Immunization Compliance
No Physician	11	0.0	16.7
Ingham Medical Ctr.	25	47.8	65.2
Cedar St. HMO	16	64.7	64.7
Wm. Harrison	14	42.9	42.9
Ingham Professional Ctr.	9	37.5	62.5
Medical Arts Building	9	88.9	77.8
Medical Dental Building	9	62.5	75.0
St. Lawrence Hospital	7	66.7	66.7
MSU Clinical Center	7	57.1	57.1
901 E. Mt. Hope Ave.	6	60.0	60.0
Lansing Nephrology Grp.	6	60.0	60.0
1414 S. Pennsylvania Ave.	5	100.0	60.0
Lake Lansing Rd. HMO	4	66.7	66.7
Ingham Co. Health Dept.	4	50.0	75.0
Creyts Rd. HMO	3	33.3	100.0
Grand Ledge Clinic	3	33.3	33.3
Holt, MI	2	50.0	50.0
Family Medical Svcs.	2	0.0	0.0
Dr. C. Beals	2	100.0	100.0
Dr. R. Griswold	2	50.0	100.0
Dr. H. Roth	2	100.0	100.0
Dr. F. Hogan	2	0.0	0.0
Dr. C. Rapson	2	50.0	50.0
Dr. C. Dehlin	2	50.0	50.0
Dr. O. Graesser	2	50.0	0.0
Dr. J. Neuman	2	0.0	0.0
Dr. R. McElmurry	2	50.0	100.0
Eaton Rapids, MI	2	50.0	50.0
Battle Creek Vet. Admin.	2	0.0	0.0
E. Lansing, MI	2	0.0	0.0
Ann Arbor Vet. Admin.	1	100.0	100.0
Dr. E. Lopez	1	100.0	100.0
Sparrow Hospital	1	0.0	0.0
Lansing General Hospital	1	100.0	100.0
Black Child&Family Instit.	1	100.0	0.0
Dr. F. Breen	1	100.0	0.0
Dr. J. Chandler	1	0.0	0.0
Dr. A. Cheblis	1	100.0	100.0
Chicago, IL	1	100.0	100.0
Dr. B. Bingham	1	100.0	100.0
Dr. S. Daniels	1	0.0	0.0
Dr. R. Darios	1	100.0	100.0
Dr. P. Davenport	1	100.0	0.0
Dr. G. Gliniecki	1	0.0	100.0
Dr. F. Horvath	1	0.0	0.0
Okemos, MI	3	100.0	66.7

Olivet, MI	1	0.0	0.0
Dr. W. Page-Echols	1	0.0	0.0
Dr. L. Rawsthorne	1	0.0	100.0
Dr. R. Swenson	1	100.0	100.0
Not Ascertained	13	58.3	58.7

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