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Understanding Underinsurance in Ohio

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Understanding Underinsurance in Ohio

Culminating Experience for Masters in Public Health

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Abstract

Objectives: To determine the prevalence, predictors, and consequences of underinsurance in the state of Ohio.

Study Design: The investigators created the dependent variables Underinsured, Financial Stress, and Harder to get Health Care using the 2008 Ohio Family Health Survey (OFHS). The sample used for this study included 29,778 respondents, who were adults less than 65 years old and who were continuously insured for the past 12 months.

Results: The study categorized twenty-two percent of the sample respondents as underinsured because they were not able to obtain or delayed needed medical care because of an inability to pay in the past 12 months. A similar percentage reported experiencing financial stress (problems paying medical bills) and that it was harder getting health care compared to 3 years ago.

Conclusions: One in five sample respondents were underinsured. Almost sixty percent of those who are underinsured reported having financial stress. Nearly half of the underinsured found that it was harder to get needed healthcare compared to three years ago. The following variables increased the likelihood of being underinsured: older age, female sex, Black race, public and directly purchased insurance, less than a college education, income less than 300% of the federal poverty level, worsening health status, and special health care needs. The Patient Prevention and Affordable Care Act policies will likely target and impact underinsurance. Individual states such as Ohio will need to continue to describe those underinsured in order to target this group through health policy.
Understanding Underinsurance in Ohio

A limited number of studies have described those who are underinsured in the United States. Underinsured people are those who have health insurance, but cannot afford necessary health services due to an inability to pay for them. Researchers have traditionally given more attention to the prevalence and characteristics of those uninsured than of those underinsured. Politicians, who were proponents of health care reform during the 2009-10 health care debate, often cited the prevalence of those without health insurance in the United States as a reason for expanding public insurance options. However, being underinsured is more prevalent than being uninsured. The underinsured, similar to the uninsured, report increased financial stress from medical bills, and those underinsured are less likely to rate their insurance positively (Schoen, Collins, Kriss, & Doty, 2008). The purpose of this paper is to identify risk factors for underinsurance in adults. By better understanding underinsured populations, the government, public health, and the medical community should be able to identify those at risk and attempt to develop interventions to improve their access to health care. The Patient Protection and Affordable Care Act (PPACA) includes measures that may be able to address underinsurance. It is important that, with the implementation of the PPACA, we continue to measure the prevalence and outcomes of underinsurance in order to ensure that the PPACA is effectively protecting US citizens.

Preventing Underinsurance with the PPACA

Lavarreda, Brown, and Bolduc (2011) examined the underinsurance literature up to this point and argued that the Patient Protection and Affordable Care Act (PPACA) takes precautions to protect Americans from underinsurance while at the same time increasing the number of those insured. To address underinsurance, the PPACA has 1) increased preventative service coverage,
2) regulation of the provisions of insurance companies that lead to underinsurance, 3) creation of
plans with adequate benefits through the exchanges, 4) improving access to health services.

The PPACA requires all US citizens to have health insurance. The PPACA expanded
Medicaid to those with incomes of 133% of the federal poverty level. The PPACA expanded
private insurance through both mandating employer-based insurance and making health
insurance exchanges that are state-specific. The exchanges subsidize private health insurance for
those between 134% and 400% of the federal poverty level. As seen with the Massachusetts
health care reform’s graduated income system, the subsidies will ensure that families do not pay
more than a set percentage of their income for the minimum plans, preventing families from
underinsurance. Schoen, Doty, Robertson, and Collins (2011) predict that these income-based
PPACA policies will reduce the prevalence of underinsured US adults by 70%.

The PPACA also regulates the practices of insurance companies regarding denying
coverage. Prior to the PPACA, if a policyholder intentionally or unintentionally withheld health
status information from an insurance company when applying for a policy, the insurance
company was able to legally rescind, or deny, the policyholder’s coverage. In many states,
insurers could also legally rescind coverage for predisposing medical conditions. The PPACA
will allow for more government regulation of rescissions, or cancelations of health insurance
policies. Also, prior to the PPACA, one’s insurance policy could end due to a lifetime or annual
health care expenditure limit. The PPACA eliminates lifetime and annual limits. The PPACA
will also ban insurance companies from denying coverage to those with preexisting conditions.
The provisions of PPACA protect US citizens from underinsurance by the regulation of unfair
practices of insurance companies that deny coverage.
The 2010 health care reform, Patient Protection and Affordable Care Act (PPACA),

attempts not only to insure all US citizens, but also to ensure that all US citizens’ health

insurance coverage is adequate and does not result in financial stress.

**Research Questions**

1. What is the prevalence of underinsurance in Ohio?
2. What risk factors predict underinsurance?
3. How do private or public insurance influence the likelihood of underinsurance?
4. How do socioeconomic factors increase the likelihood of underinsurance?
5. Does having special health care needs increase the likelihood of being underinsured?
6. Does having a poor general health status increase the likelihood of being underinsured?
7. Are those underinsured more likely to report increased financial stress from medical bills?
8. Are those underinsured more likely to report that it is harder to get health care compared to 3
   years ago?
9. What are the policy implications of underinsurance?

**Review of Literature**

The Patient Protection and Affordable Care Act (PPACA) will increase the prevalence of

those who have health insurance. However, insuring more people may not ensure adequacy of

health care coverage. It is important to measure the prevalence of the underinsured in order to

monitor the effectiveness of health care reform. Compared to the many studies that have

described those who lack health insurance, there have been a limited number of studies that have

examined the impact of being underinsured in the United States (Kogan et al., 2010). Part of the

reason may be because of a lack of agreement on how to define or how to measure

underinsurance (Voorhees et al., 2008). Investigators have defined “underinsured” in many
ways in efforts to determine the prevalence of those with insurance but who are unable to receive important health services. The literature has defined and measured underinsurance in two broad categories: economic measures and experiential measures (Donelan, DesRoches, & Schoen, 2000).

**Economic Definition of Underinsured**

The literature describes an economic definition and measurement of underinsurance, comparing out-of-pocket costs to family income. The original definition of underinsurance as described in the literature is: the chance of incurring out-of-pocket costs greater than 10% of family income, if the subject were to attain medical expenses that only 1% of the population acquires by chance (Farley, 1985; Short & Banthin, 1995; Bashshur, Smith, & Stiles, 1993; Donelan et al., 2000).

Schoen et al. (2005; 2008; 2011) gathered data about personal health care expenses and compared them to the individual’s annual income, ultimately determining a numerical value for the underinsured. These studies expanded the definition of 10% of family income described in Short and Banthin (1995) to incorporate reported health care spending, deductibles, and income. Schoen et al. (2005; 2008; 2011) categorized the “underinsured” as those meeting at least one of the three of the following economic measurements: 1) having out-of-pocket medical expenses amounting to at least 10% of income, 2) for those below 200% federal poverty level, having expenses that equaled or exceeded 5% of income, or 3) having deductibles amounting to at least 5% of income. Schoen et al. (2005; 2008) included the measurement for those below 200% of the federal poverty level due to the use of the 5% threshold in the State Children’s Health Insurance Program (SCHIP) and in the RAND Health Insurance Experiment. Schoen et al.
(2005; 2008) included a deductible measure based on findings that those meeting this threshold are at risk of spending at least 10% of their income on out-of-pocket health expenses.

Abraham, Deleire, and Royalty (2010) shows that the most commonly used economic measure of underinsurance, the 10% out-of-pocket expenses compared to income threshold, does not account for moral hazard. The concept of moral hazard describes how those with more extensive health insurance coverage would be likely to consume more medical care because they are relatively more insulated from the cost. The authors describe a “reverse” moral hazard where those with less comprehensive health insurance are more likely to consume less medical care than those with more comprehensive health insurance. The 10% threshold likely underestimates the percentage of underinsured in those with less generous health insurance because those who have less generous insurance tend to spend less on medical care. Thus, the out of pocket expenses compared to income in those with limited health insurance remains equal to those with more generous health care coverage. Abraham et al. (2010) adjusts for moral hazard and demonstrates that the prevalence of underinsurance when adjusted for moral hazard increases by 20% from the unadjusted calculation.

**Experiential Definition of Underinsured**

Donelan, DesRoches, and Schoen (2000) described an experiential measure and definition for underinsurance. For this definition, the experiences of insured adults in accessing health care as well as in paying medical bills determine the prevalence of underinsurance (Donelan et al., 2000).

Recent studies used an experiential definition of underinsurance. Voorhees et al. (2008) used a self-reported questionnaire to survey adults in Colorado by asking questions to determine whether patients have experienced being unable to afford their prescribed health services. Most
recently, Kogan et al. (2010) used a self-reported survey questionnaire to collect national and state-specific data identifying experiences of insurance inadequacy to determine underinsurance in US children. Spears et al. (2011) also used a questionnaire designed to measure an experiential definition of underinsurance in children at primary care offices in the Greater Dayton, Ohio region. All 3 of these studies categorized subjects as “underinsured” if they were continuously insured in the past 12 months and if they reported experiencing indicators of underinsurance according to the respective study (Table 1.).

Table 1. *Indicators of Underinsurance*

<table>
<thead>
<tr>
<th>Study</th>
<th>Indicator of Underinsurance</th>
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| Voorhees et al. (2008) | Underinsured if answered “yes” to one or more questions. During the past 12 months:  
1. Did you delay seeking medical care because of trouble paying for it?  
2. Were you unable to see a specialist that you were referred to because of trouble paying for it?  
3. Were you unable to make an appointment with a regular doctor because of trouble paying for it?  
4. Were you unable to fill a recommended prescription because of trouble paying for it?  
5. Were you unable to receive a recommended colonoscopy to screen for colorectal cancer because of trouble paying for it?  
6. Were you unable to have any other test done that was recommended because of trouble paying for it?  
7. Were you unable to receive any other medical care because of trouble paying for it? |
| Spears et al. (2011) | Same as Voorhees study, but question about colonoscopy screening omitted because inappropriate for study sample (children).                                                                                         |
| Kogan et al. (2010) | Underinsured if answered “sometimes” or “never” to #1 or #2:  
1. Does the child’s health insurance offer benefits or cover services that meet his or her needs?  
2. Does the child’s health insurance allow him or her to see the health care providers he or she needs?  
Or underinsured if answered “yes” to #3 and “sometimes” or “never” to #4  
3. Not including health insurance premiums or costs that are covered by insurance, do you pay any money for the child’s health care?  
4. How often are these costs reasonable?                                                                                           |
Prevalence of Underinsurance

Blewett, Ward, and Beebe (2006) reviewed 24 studies examining underinsurance. They described that studies have estimated the prevalence of underinsurance to be as low as 4% and as high as 53%. The different definitions and measurements of underinsurance, the survey instrument utilized, the sample population, and the year the study took place may account for the great variation in results. This review of the underinsurance literature focuses on the results of the more recent studies to limit the timeframe in which the studies were conducted.

Underinsurance among adults. Studies of underinsurance in adults report differing results of prevalence of underinsurance. The Commonwealth Fund 2003 Biennial Health Insurance Survey, a national telephone survey, measured underinsurance using an economic definition (Schoen, Doty, Collins, & Holmgren, 2005). The authors found that 12% of US adults (age 19 to 64 years), nearly 16 million people, were underinsured. A follow-up study using the 2007 survey found that 20% of those continuously insured, 25.2 million people, were underinsured (Schoen et al., 2008). These findings show that the prevalence of underinsurance in the US increased by 60% from 2003 to 2007 (Schoen et al., 2008). A most recent follow-up study using the 2010 survey found that 22% of those continuously insured, accounting for 29 million people, were underinsured (Schoen, Doty, Robertson, & Collins, 2011).

In contrast, a Colorado practice-based research network, using a self-administered questionnaire to measure underinsurance using an experiential definition, found that 36% of adults surveyed were underinsured (Voorhees et al., 2008). The prevalence of underinsurance in adults in 2007 in the Schoen, Collins, Kriss, and Doty (2008) study (20%) is almost half the prevalence of underinsurance in 2008 compared to the Voorhees et al. (2008) study (36%).
**Underinsurance among children.** Recently, investigators have studied underinsurance in children as well. The Kogan et al. (2010) study utilized the “2007 National Survey of Children’s Health” together with the “State and Local Area Integrated Telephone Survey “data collection method to collect national and state-specific data. The study measured underinsurance using an experiential definition and determined that 22.7% of children in the United States were underinsured. Spears et al. (2011) created the “Medical Expenses for Children Survey,” adapted from the Voorhees et al. study, and used an experiential definition. The investigators administered the survey to the parents of children at primary care offices in the Greater Dayton, Ohio region, and found that 18% of study children were underinsured. Again there is a difference in the prevalence of underinsurance between the two studies- Kogan et al. (2010) reported 22.7% while Spears et al. (2011) reported 18%. However, this discrepancy is not as large as seen in the adult studies previously discussed. The two studies of childhood underinsurance both use an experiential definition and, thereby, estimate a comparable prevalence of underinsurance. On the other hand, one study of adult underinsurance utilizes an economic definition of underinsurance while the other utilizes an experiential definition. Consequently, the two adult studies have different estimates of underinsurance. Utilizing different definitions and measurements of underinsurance result in different estimations of the prevalence of underinsurance. It is important to consider these methods and potentially different results when examining risk factors of underinsurance as well.

**Risk Factors for Underinsurance**

**Insurance type.** In adults, a practice based research network in Colorado found that individuals with Medicare were less likely to be underinsured than adequately insured (P < .001) (Voorhees et al., 2008). The study found no statistically significant relationship between being
underinsured and being covered by Medicaid (P= 0.219). However, a national study found that
the underinsured are more likely to have public insurance (Schoen et al., 2008).

Studying children, Kogan et al. (2010), reported that those with private insurance were
twice as likely to be underinsured as children with public insurance. Spears et al. (2011) did not
find a significant statistical difference between insurance type and underinsurance in children.
However, Spears et al. (2011) reports that among households with incomes between $15,000 and
$34,999, the majority of underinsured parents had private insurance. In general, evidence from
child-specific studies suggests that having private insurance increases a child’s likelihood of
being underinsured.

Gender. Both studies conducted by Schoen et al. (2005, 2008) report that the proportion
of adult females who were underinsured was higher than the rate for adult males. However, the
percentage of underinsured males more than doubled, from 6% to 13%, between 2003 and 2007.
The percentage of females who were underinsured increased more modestly, 12% to 16%,
between 2003 and 2007 (Schoen et al., 2008). In Voorhees et al. (2008), female adults were 2.25
times more likely to be underinsured. Males were as likely to be adequately insured as
underinsured (OR= 1.00). From the two studies that analyzed gender differences, it appears that
females have a greater likelihood of being underinsured compared to males.

Income. Schoen, Doty, Collins, and Holmgren (2005) reported that adults who were
underinsured were more likely to have low incomes. When the study was repeated using the
2007 national survey, the investigators again demonstrated that having a low income ($20,000 to
$39,999) increases one’s risk of being underinsured. The proportion of underinsured in the
population has increased in the low-income category since 2003, compared to the proportion of
those uninsured and insured. Interestingly, the analysis of the 2007 data also found that the
proportion of underinsurance in higher income groups has increased significantly since 2003. The proportion of those underinsured has more than doubled in the $40,000 to $59,000 and $60,000 to $99,999 income categories.

Other studies have found that low income is a predictor of underinsurance. Voorhees et al. (2008), who used an experiential definition, found that among adults identified from ambulatory care practice clinics in Colorado, having lower incomes (<$25,000 and $25,000 to $49,999) increased an individual’s likelihood of being underinsured. In Spears et al. (2011), families with annual incomes between $15,000 to $34,999 were more likely to have underinsured children. Three studies found that low income is a risk factor for underinsurance.

Age. Using an experiential definition and state sample, Voorhees et al. (2008) described the underinsured adults as more likely to be between 18 and 39 years of age (OR= 6.18). On the other hand, Schoen et al.’s (2008) study demonstrates that being in the 19 to 29 age-group increases one’s chances of not having insurance rather than being underinsured. Schoen et al. (2008), using a national sample and an economic definition, found that being 50 to 64 years old increases one’s risk of being underinsured. The proportion underinsured in the 50 to 64 year old age category increased between 2003 and 2007. These studies have found differing results for the relationship between the risk factor “age” and underinsurance.

Race/Ethnicity. Voorhees et al. (2008) described the adult underinsured population in Colorado as more likely to be African American and Hispanic. Similarly, Schoen et al. (2008) reported that whites are less likely to be underinsured than African Americans and Hispanics. However, the proportion of underinsured white, non-Hispanic adults has increased between 2003 and 2007, closing the gap between whites, African Americans and Hispanics. In the Kogan et al. (2010) study, children who were non-Hispanic black, non-Hispanic other, and Hispanic were
more likely to be underinsured than adequately underinsured. Spears et al. (2011) found that underinsured children were more likely to be black, other races or multi-racial. Generally speaking, non-white racial and ethnic groups are more likely to be underinsured than whites, however, the Schoen et al. (2008) study suggests that underinsurance is beginning to affect more demographic groups in the U.S, including a greater proportion of whites, over time.

**Perceptions about One’s Health Care**

Schoen et al. (2008) found that both underinsured and uninsured populations reported increased financial stress from medical bills compared to adequately insured individuals. This study also found that adults who were underinsured or uninsured were significantly less confident in their ability to access quality healthcare. Furthermore, the underinsured group did not tend to rate their insurance positively (Schoen et al., 2008). These studies suggest that being underinsured causes stress and negative perceptions about one’s health care.

**General Health Status of the Underinsured**

Voorhees et al. (2008) described the adult underinsured group from ambulatory care practice clinics in Colorado as more likely to report having fair or poor health. Schoen et al. (2008) found that, in both 2003 and 2007, a greater percentage of those who reported that they were sicker were underinsured than those who reported that they were healthier.

Kogan et al. (2010) found that children with special health care needs were more likely to be underinsured than children who were adequately insured. Children were also more likely to have poor, fair, or good health when compared to very good or excellent health status than those who were adequately insured. In Spears et al. (2010), statistically more underinsured children reported to have poor, fair, or good health status (30%) when compared to those with very good (18.4%) or excellent (13%) health status.
Clearly, those underinsured are less likely to rate their general health status as very good or excellent. Those underinsured are also more likely to self-report being “sicker” and having special health care needs.

**Consequences of Underinsurance**

Voorhees et al. (2008) reported that when asked if their health had suffered because of not being able to afford the cost of any needed care, the adult underinsured group were more likely to report that their health had suffered compared to the insured group (OR= 79.21). Using the same question, Spears et al. (2011) reported that 35.5% of underinsured children’s health had suffered compared to 1.3% adequately insured children. In summary, studies have found an association between underinsurance and a respondent’s report that their “health has suffered.” Studies of both adult and child populations have described this association.

In a follow-up study Spears et al. (2012) also demonstrated that 16.2% of respondents reported that, compared to three years ago, it was harder to get medical care for their child.

**Synthesis and Discussion**

**Definition and measurement of underinsurance.** The major challenges of studying underinsurance involve fundamental steps: defining and measuring. Previous studies about the underinsured define and measure underinsurance in many different ways, resulting in a large variation in data about the prevalence of underinsurance. This review places studies of underinsurance into two broad categories: economic measurement and experiential measurement. The economic measurement, which analyzes out-of-pocket expenses compared to income, is the most objective measurement of underinsurance. However, in using an economic measurement, the researchers miss those without health problems, who have do not report significant recent health expenses, but would rate their health insurance as inadequate. The
experiential definition allows for the respondents to judge, based on their own circumstances, whether their health insurance has met their needs for financial access to services. Recent studies of underinsurance represent the discrepancies in definition and the variation in results.

The different definitions used for measuring underinsurance may account for differences in the prevalence of underinsurance among studies. The prevalence of underinsurance in adults in 2007 in the Schoen et al. (2008) study (20%) is almost half the prevalence of underinsurance in 2008 in the Voorhees et al. (2008) study (36%). The difference between these two studies may be explained by their differing definitions and measurements. The Schoen et al. (2008) study used an economic definition. Their findings underestimated the prevalence of underinsurance because the economic definition does not include those who have not had significant medical expenses recently, but would judge their health insurance to be inadequate based on experience. The Schoen et al. (2008) study also did not adjust for moral hazard. If the study adjusts for moral hazard, as suggested by the Abraham et al. (2010) study, the prediction of underinsurance would increase by 20%, increasing the Schoen et al. (2008) prediction of underinsurance to 24%. The sample utilized and means of collecting data may also account for differences in the prevalence of underinsurance. Voorhees et al. (2008) surveyed patients visiting the doctor, so their sample included a sicker population, who may be more likely to report being underinsured. It is reasonable to expect that Voorhees would have a greater estimate of underinsurance. Based on the difference in definition and measurement of underinsurance and collection of data, it is reasonable for the two studies to have different results. The Schoen et al. (2008) estimate of underinsurance represents a sample of relatively healthy US citizens whose underinsurance is not reflected entirely by out-of-pocket expenses or adjusted for moral hazard. The Voorhees et al. (2008) study, on the other hand represents a
sicker sample of the US population, who are more likely to be dissatisfied with their insurance. It is reasonable to assume that Schoen et al. (2008) underestimated the prevalence of underinsurance while Voorhees et al. (2008) overestimated the prevalence.

The difference in the prevalence of underinsurance between the two child-specific underinsurance studies is not as large. Kogan et al. (2010) reported the prevalence of underinsurance to be 22.7%, which is consistent with the Spears et al. (2011) report of 18%. Although the sample populations differed, Kogan et al. (2010) used a national sample while Spears et al. (2011) used a practice-based sample from the Greater Dayton, Ohio area, the discrepancy in results is not as large as seen in the adult studies previously discussed.

The Voorhees et al. (2008) and Spears et al. (2011) are more limited than the other studies because of their use of a convenience sample. A convenience sample is limited to a smaller geographic area and is less representative than the entire US population. The Voorhees et al. (2008) and Spears et al. (2011) studies surveyed those visiting primary care offices. Therefore, these studies’ samples are more likely to be sick than the general population. Further, those underinsured at primary care offices may be sicker than the general insured population of a region because they may have delayed seeking care. The underinsured, sicker patient may not have access to needed health services if the service is not fully covered by the patient’s insurance. This lack of access to health care may lead to debilitating consequences.

**Predictors of underinsurance.** Despite differences in the definition of underinsurance, geographic location of survey collection, and method of survey of between the Voorhees et al. (2008) and Schoen et al (2008), the studies have consensus about predictors of underinsurance. These studies help to describe those most at risk for being underinsured and may help for designing public policy to prevent underinsurance in those most at risk.
Kogan et al. (2010) and Spears et al. (2011) suggest that having private insurance may be a risk factor for underinsurance. As the cost of health care increases at a rate higher than inflation, those with private insurance, including employer-based insurance are subject to greater cost-sharing (Schoen et al., 2008). Because the cost of health care has been rising at a disproportionately greater rate than individuals’ incomes, employers have experienced strain in paying for their employees’ health insurance. To offset this financial strain, employers have been sharing the cost of insurance by increasing the deductibles or premiums for its employees. This cost sharing has caused financial strain for employees by increasing the health expenses (from deductibles and premiums) to income ratio. There are a great variety of private and employer-based health care plans available to policyholders. However, there is no standardization to ensure adequacy of health benefits and to ensure that the policyholder is not experiencing financial strain to obtain needed health services (Schoen et al., 2008).

The studies also demonstrate that low-income groups have an increased likelihood of being underinsured. In adults, the income groups most at risk of being underinsured are as follows: $20,000 to $39,999 (Schoen et al., 2008) and less than $25,000 and $25,000 to $49,999 (Voorhees et al., 2008). In Spears et al. (2011), families with annual incomes between $15,000 and $34,999 were more likely to have underinsured children. Schoen et al. (2008) has demonstrated the proportion of underinsurance in higher income groups since 2003 has increased significantly, which has resulted from the increase cost of health care relative to inflation. Evidently, the income gap is eroding and more Americans risk becoming underinsured.

Other predictors of underinsurance include gender, age, and race/ethnicity. According to Schoen et al. (2008) and Voorhees et al. (2008), females have an increased likelihood of being underinsured compared to males. However, Schoen et al. (2008) has also shown that the rate of
increase in prevalence of underinsurance has been greater in males than in females between 2003 and 2007. As the prevalence of underinsurance increases, underinsurance seems to be affecting more demographic groups than in the past.

Voorhees et al. showed that the adult underinsured group is more likely to be between 18 and 39 years of age. However, Schoen et al. (2008) demonstrated that being 50 to 64 years old increases one’s risk of being underinsured. The discrepancy in findings may be a result of the different definitions and measurements between the studies. Further, underinsurance may also be eroding age limits and extending to more Americans in general.

Underinsurance is also affecting more white Americans than in the past. The Schoen et al. study (2008) showed the prevalence of underinsured white, non-Hispanic adults has increased between 2003 and 2007, lessening the gap between whites, African Americans and Hispanics.

Although there remain demographic groups who are at higher risk of being underinsured, the cost of medical care relative to inflation has been increasing. As a result, more Americans are at risk of being underinsured.

**Rationale for proposed research.** Investigators have studied underinsurance in recent years using national and state-specific data. At this point, nobody has done similar research about the prevalence and predictors of underinsurance in Ohio using the 2008 Ohio Family Health Survey (OFHS). Ohio public health officials and policymakers need to understand underinsurance in Ohio to support the state’s evolving health care policies. The Patient Protection and Affordable Care Act (PPACA) will require many changes in provisions for health insurance and will increase the number of people insured at both the national and state level. Therefore, the results from the 2008 OFHS would be useful to understand Ohio’s baseline prior
to health care reform. It is important that underinsurance stays at the forefront of epidemiology studies on a statewide and national level in order to measure outcomes from health care reform.

This research will analyze underinsurance using similar methodology to that described in the literature. This study will use an experiential definition of underinsurance, based on the questions provided in the 2008 OFHS and the indicators of underinsurance utilized in other the other studies reviewed. Guided by the literature, this research will examine the association between insurance type, education, special health care needs, income, gender, age, and race/ethnicity and underinsurance. Results from this Ohio study will allow for comparison of the epidemiology of underinsurance with findings of national and other state-specific studies. This research will contribute to the body of literature describing underinsurance.

**Hypotheses**

1) The prevalence of underinsured is greater than the prevalence of uninsured.

2) Female gender increases the likelihood of being underinsured.

3) Less college increases the likelihood of being underinsured.

4) Black race increases the likelihood of being underinsured

5) Being 18-24 years old increases the likelihood of being underinsured.

6) Private insurance increase the likelihood of being underinsured.

7) Below 300% of poverty increase the likelihood of being underinsured.

8) Worsening health status increases the likelihood of being underinsured.

9) Those underinsured are more likely to report experiencing increased financial stress from medical bills.

10) Those underinsured are more likely to report it is harder to get health care compared to 3 years ago.
11) Those with special health care needs are more likely to be underinsured.

**Methods**

This study analyzed the questions asked in the 2008 Ohio Family Health Survey that address the experiences of underinsured individuals in order to define the variable of underinsurance and identify predictors of underinsurance. Investigators analyzed the data using the statistics program SPSS. The 2008 OFHS asked a number of questions regarding the individual’s experience obtaining recommended healthcare. This study used the information provided by these questions to create a dependent variable to measure whether the respondent was *underinsured*. The investigators also used questions in the survey to determine the dependent variables: *harder to get health care* and *financial stress*. This study calculated relative risk to measure the likelihood of one being underinsured, having difficulty obtaining health care compared to 3 years ago, or having financial stress when having certain demographic characteristics.

**The 2008 OFHS: Development, Sampling, Subjects/Participants and Data Collection**

The Ohio Department of Health and the Ohio Department of Jobs and Family services developed the 2008 Ohio Family Health Survey and contracted with Macro International, Inc. to conduct data collection. Macro International adapted the 2008 survey from the OHFS 2003-2004 questionnaire. Also, Macro International added questions from other survey instruments for the 2008 OHFS questionnaire in order to update the content. The questionnaire included two broad sections: adult subject and child subject (under 18 years old). The sections of the questionnaire asked about: health insurance type, health status, utilization of health, and access to health care.
The survey is a complex probability landline telephone and cell phone sample of the adult population of Ohio. The sampling plans for the landline telephone survey utilized a stratified, list-assisted random digit-dialing sample. The landline-sampling plan was based on the plan used by the 2004 OFHS. The investigators stratified the RDD sample by county. An oversampling method, similar to the 2004 OFHS method, allowed for ensuring representation of minorities. Survey Sampling International created a RDD sample for the cell phone survey. Two strategies were used for imputing variables: 1) hot-deck method for demographic variables and variables needed for weighting, and 2) multivariate stochastic regression imputation for socio-economic variables and insurance status.

The investigators weighted the survey in order to adjust for unequal probabilities of selection and the variance of estimates. In order to compute the weights, the investigators calculated the sampling weights, computed the post-stratification adjustments, and trimmed weights to remove outliers. The sampling weights adjusted for the variance in selection of households and oversampling of minority groups. Post-stratification ensures that the results from the survey are consistent with the population control totals, considering the following variables: county, age, gender, education, race/ethnicity and owning/renting a home. Post-stratification adjustments decrease biases due to non-response by constructing homogenous post-stratum cells. The adjustments also decrease non-coverage bias.

New Macro International interviewers undergo a two-day training and every Macro International interviewer undergoes weekly refresher training. The interviewers conducted phone interviews during August 2008 through January 2009. A randomly selected adult on the behalf of him or herself and on the behalf of a randomly selected child if applicable completed a survey. The investigators randomly selected households that had a landline telephone. Midway
through the survey time period, investigators surveyed a sample of cell phone users in order to include those residents of Ohio who do not have landline telephones. The sample included the total, non-institutionalized Ohioans of all ages (adult and child), residing in residential households. The study excluded from the sample children and adults who were: institutionalized, not residents for at least 30 days, did not live in a private residence in Ohio, were not sufficiently fluent in Spanish or English to be interviewed, or had physical or mental disabilities preventing their interview if an able proxy was not available. The investigators categorized participants as “adult” if they were at least 18 years old.

The interviewers administered the survey on weekday evenings from 5 PM to 9 PM, Saturdays from 10 AM to 7 PM, and 1 PM to 9 PM in English and Spanish to optimize response rates. Less than 20% of the session hours were also collected between 9 AM and 5 PM on weekdays, which led to the discovery that cell phone data collection is more effective midday. At the end of the interview period, interviewers had conducted one third of the weekday cell phone interviewing during midday. The adjusted response rate, defined by the Council of American Survey Research Organizations (CASROO) was 34.6%. 50,944 interviews were included in the data file.

**Measurement and Analysis**

This study analyzed the previously existing, public dataset without identifiers, “The Ohio Family Health Survey (OFHS) 2008.” After obtaining approval from Wright State University Institutional Review board, the investigators analyzed the data using SPSS. The investigators weighted the data using a strategy referred to in *Analyzing Complex Survey Data, 2nd* ed. (Lee & Forthofer, 2006). The investigators used a new variable that they created from the 2008 OFHS weight variable, called Relwgt. They created Relwgt by dividing the 2008 OFHS weight by the
mean weight. The Relwgt variable shifted the weight proportion back to the sample while maintaining sample size. The Relwgt variable allowed for significance testing for simple random samples but not complex probability samples (Lee & Forthofer, 2006). Although the 2008 OFHS is a complex probability sample, data analysis using the Relwgt produced calculations with a p-value of 0.001 or less, which is an acceptable level of significance for using the Relwgt with this data. The investigators used weighted sample sizes and percentages to represent the state of Ohio when analyzing the data reporting the results.

Using SPSS, the investigators calculated the dependent and independent variables among the adults less than 65 years old, who were insured continuously during the year, resulting in a total sample size of 29,778, representing 5,602,611 people in the state of Ohio when weighted. To ensure that the respondent was insured continuously all year, the investigators did not include the insured respondent in the sample if he or she did not answer “no months/was insured all year” to the question “During the past 12 months, how long were you without health insurance coverage” (b27days). The investigators created the dependent variable of underinsured using an experiential measurement, as described in the literature, and analyzing questions that address the experiences of being underinsured. Of the 5,602,611 million people in the weighted sample representing the state of Ohio, 1,203,201 people (21.5%) were underinsured. Examples of such questions from the OFHS 2008 include “In the past 12 months, have you not filled a prescription because of the cost” and “During the past 12 months, was there any time when you did not get any other health care that you needed.” For the specialist, prescription, and other health care variables, the respondent had to answer a sequence of questions in a certain pattern (f68c, nf68d_a to h, nf68e01a) in order to be included in the underinsured variable (Table 1). Twice in the survey, the respondent answered questions about inability to fill a prescription due to cost-
once directly and once in the sequence of questions. The investigators counted the respondent once for answering in the direct question and/or in the sequence question that they had an inability to fill a prescription due to cost (Table 1). The investigators then counted specialist, prescription, other health care, and delay in health care variables one time per respondent to compose the underinsured variable (Table 2).

Table 2. Defining the “Underinsured” Variable

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>OHFS 2008 Questions used to define variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist (SPSS Syntax variable- NeededSpecialistReason)</td>
<td>Only if answered “yes” to the following sequence question: SpecialistReason In the past 12 months, was there a time that you did not get (f68c) appointment or referral to a specialist (nf68d_a-h) because too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card (nf68e01a)?</td>
</tr>
<tr>
<td>Prescription (SPSS Syntax variable- f68b and PrescrReason)</td>
<td>If Answered “yes” to: f68b: - IN THE PAST 12 MONTHS, have you not filled a prescription because of the cost? Or if answered “yes” to the following sequence question: NeededprescrReason: In the past 12 months, was there a time that you did not get (f68c) medications/prescriptions (patches, pills, shots) (nf68d_a-h) because too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card (nf68e01a)? Removed overlap between f68b and Neededprescr into PrescrReason, so these respondents were not double counted for needing to fill a prescription.</td>
</tr>
<tr>
<td>Other health care (SPSS Syntax variable- OtherunderinsReason)</td>
<td>Only if answered “yes” to the following sequence question: In the past 12 months, was there that you did not get (f68c) needed doctor visit, checkup, or exam, medical supplies or equipment, care for other ailment or body part (nf68d_a-h) because of too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card (nf68e01a)?</td>
</tr>
<tr>
<td>Delay in Health care (SPSS Syntax Variable= B29B_B)</td>
<td>Only if answered “yes” to the following questions: b29b_b: In the past 12 months, did you delay or avoid getting care that you felt you needed but could not afford?</td>
</tr>
<tr>
<td>Underinsured (SPSS Syntax Variable= Underins)</td>
<td>Only if less than 65 years old and have insurance. Select cases if: age &lt; 65 and insrd_a =1 Those who were included in the Specialist, Prescription Other health care, and Delay health care variables were counted once in the Underinsured Variable.</td>
</tr>
</tbody>
</table>
The other dependent variables represent possible outcomes of underinsurance: *harder to get health care* and *financial stress*. For the question about ability to get health care compared to 3 years ago to create the *harder to get health care* variable, the investigators combined the responses “easier and stayed the same” due to little difference between the responses upon initial statistical analysis using the SPSS crosstabs function with the underinsurance variable (Table 3).

Table 3. *Defining the “Difficulty getting health care compared to 3 years ago” and “Financial Stress” Variables*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>OHFS 2008 Questions used to define variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harder to get health care (SPSS Syntax Variable= abilityhlth3yr)</td>
<td>f69 - Compared with 3 years ago, is getting the medical care you need becoming easier, harder, or has it stayed the same? Question was recoded into abilityhlth3yr to combine the responses “easier and stayed the same.”</td>
</tr>
<tr>
<td>Financial Stress (SPSS Syntax Variable= FinStress)</td>
<td>F70 - FinStress - During the last 12 months, were there times when you had problems paying or you were unable to pay for medical bills for yourself or anyone else?</td>
</tr>
</tbody>
</table>

The independent variables that the investigators studied represent demographic characteristics of the study population: *age, race, gender, income, education, insurance type, health status, special health care needs* (Table 4). The 2008 OFHS identified the variable *special health care needs* with a sequence of questions. More specifically, respondents had *special health care needs* if he/she answered that he/she needs or uses medications (not including vitamins or birth control), medical care, assistance for day-to-day activities, or special therapy because of any medical, mental health or health condition and if this condition has lasted or is expected to last for at least 12 months. After initial analysis of independent variables, the investigators grouped response categories together if the analysis suggested they were more appropriately combined than separated. The investigators calculated the prevalence of the each
independent variable among the insured respondents. They then calculated bivariate associations between independent variables and underinsured, harder to get health care, and financial stress.

Table 4: Defining the Independent Variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>OHFS 2008 Questions used to define variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>age_a - adult Age (calculated age variable: 18-24, 25-34, 35-44, 45-54, 55-64, 65+)</td>
</tr>
<tr>
<td>Gender</td>
<td>s15  Gender, imputed (Male, Female)</td>
</tr>
<tr>
<td>Income</td>
<td>h87_imp - poverty level (less than 300% FPL and 301% or more of FPL)</td>
</tr>
<tr>
<td>Education</td>
<td>Educ - Level of Education (less than high school, high school, some college, college graduate)</td>
</tr>
<tr>
<td>Race</td>
<td>Race4_a_imp - Race-ethnicity adult (White, Black/African American, Other race-ethnicity)</td>
</tr>
<tr>
<td>Insurance Type</td>
<td>i_type_a - Adult insurance type (calculated insurance type hierarchical variable: Public, Directly purchased, Job-based coverage, Other or unknown)</td>
</tr>
<tr>
<td>Health status</td>
<td>D30  In general, would you say your health is excellent, very good, good, fair, or poor? (excellent, very good, good, fair or poor)</td>
</tr>
<tr>
<td>Special health care needs</td>
<td>shcn_a - Adults with or without special health care needs (calculated variable: has special health care needs, does not have special health care needs). Computed variable using questions D31 and D31 a-m if: needs or uses medications (not including vitamins or birth control), medical care, assistance for day-to-day activities, or special therapy because of any medical, mental health or health condition and if this condition has lasted or is expected to last for at least 12 months</td>
</tr>
</tbody>
</table>

Results

Table 5 shows the distribution of the sample population by demographic characteristics. The investigators only included respondents who were continuously insured adults for 12 months and less than 65 years old. The investigators compared the percentages of the independent variables within the sample to 2008 Census data for the state of Ohio. The study sample was representative of the Ohio population for sex, income, age, education, and race distributions. Only about 3 percent of respondents were Hispanic or Asian (U.S. Census Bureau, 2008).
Of continuously insured non-elderly adults, about 15% percent of the respondents reported that their health status is fair or poor. The largest majority of the insured population, seventy-five percent, had job-based insurance coverage, 15% were covered by public insurance options, and 5% had directly purchased insurance. Nearly half of the insured respondents reported that they had special health care needs, which as described in the methods section, includes those who need medications, medical care, assistance, or therapy.

Table 5. Demographic characteristics among insured adults less than age 65

<table>
<thead>
<tr>
<th>Total number of cases</th>
<th>N=5,602,611</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>N   N  Pct</td>
</tr>
<tr>
<td>18 to 24</td>
<td>685,913 (12.2)</td>
</tr>
<tr>
<td>25 to 34</td>
<td>1,064,494 (19.0)</td>
</tr>
<tr>
<td>35 to 44</td>
<td>1,286,513 (23.0)</td>
</tr>
<tr>
<td>45 to 54</td>
<td>1,334,632 (23.8)</td>
</tr>
<tr>
<td>55 to 64</td>
<td>1,231,058 (22.0)</td>
</tr>
<tr>
<td>Sex</td>
<td>2,722,700 (48.6)</td>
</tr>
<tr>
<td>Male</td>
<td>2,879,782 (51.4)</td>
</tr>
<tr>
<td>Education</td>
<td>457,173 (8.2)</td>
</tr>
<tr>
<td>Less than High School</td>
<td>1,913,072 (34.2)</td>
</tr>
<tr>
<td>High School</td>
<td>1,427,973 (25.6)</td>
</tr>
<tr>
<td>College Graduate</td>
<td>1,789,546 (32.0)</td>
</tr>
<tr>
<td>Race</td>
<td>4,870,168 (86.9)</td>
</tr>
<tr>
<td>White</td>
<td>543,136 (9.7)</td>
</tr>
<tr>
<td>Black</td>
<td>189,307 (3.3)</td>
</tr>
<tr>
<td>Income as Percent of Federal Poverty Level</td>
<td></td>
</tr>
<tr>
<td>300% or less</td>
<td>2,456,316 (43.8)</td>
</tr>
<tr>
<td>Over 300%</td>
<td>3,146,295 (56.2)</td>
</tr>
<tr>
<td>Insurance Type</td>
<td>855,029 (15.3)</td>
</tr>
<tr>
<td>Public</td>
<td>4,211,719 (75.2)</td>
</tr>
<tr>
<td>Job-based coverage</td>
<td>292,348 (5.2)</td>
</tr>
<tr>
<td>Directly purchased</td>
<td>243,515 (4.3)</td>
</tr>
<tr>
<td>Health Status</td>
<td>1,208,845 (21.6)</td>
</tr>
<tr>
<td>Excellent</td>
<td>2,053,153 (36.7)</td>
</tr>
<tr>
<td>Very good</td>
<td>1,513,872 (27.0)</td>
</tr>
<tr>
<td>Good</td>
<td>606,469 (10.8)</td>
</tr>
<tr>
<td>Fair</td>
<td>214,287 (3.8)</td>
</tr>
<tr>
<td>Poor</td>
<td>2,919,144 (52.7)</td>
</tr>
<tr>
<td>Special Health Care Needs</td>
<td>2,622,949 (47.3)</td>
</tr>
<tr>
<td>Has Special Health Care Needs (needs medications, medical care, assistance, or therapy)</td>
<td></td>
</tr>
<tr>
<td>Does not have SHCN</td>
<td>2,919,144 (52.7)</td>
</tr>
<tr>
<td></td>
<td>2,622,949 (47.3)</td>
</tr>
<tr>
<td>Represents the weighted sample size and percent</td>
<td></td>
</tr>
</tbody>
</table>
Trends in Underinsured Adults in 2008

Measured by the five indicators of underinsurance and using weighted data to represent the state of Ohio, twenty-two percent or 1,203,201 of those continuously insured non-elderly adults in Ohio were underinsured during this study period. Table 6 shows the weighted sample size and percentage in parentheses for each indicator for the population of Ohio. Based on the literature, the investigators used five indicators to create the underinsured variable. The 2008 OFHS’s questions were worded in such a way that the investigators may have underestimated the percentage of underinsured. The majority of the underinsured met the criteria for being underinsured because they answered “yes” to a direct question. The direct questions were: Have not filled a prescription because of the cost in the past 12 months and delayed or avoided getting needed care that could not afford in the past 12 months. Because the respondents of the two direct questions contribute to the majority of the underinsured, it is possible that more respondents would have answered that they had not been able to see a specialist, obtain a prescription, or get other health care due to an inability to pay if they has been asked as direct questions. The investigators included these other three indicators about seeing a specialist, obtaining a prescription, or getting other health care in the underinsured variable if the respondent answered “yes” to a series of questions: in the past 12 months he/she (1) did not get an appointment to see a specialist, (2) did not get medications/prescriptions, or (3) did not get needed doctor visit, checkup, exam, medical supplies or equipment, or care for other ailment or body part (other medical care) because it was (1) too expensive or (2) the insurance plan restriction/rules or (3) because the doctor would not accept the medical card? Responses to these three combined contribute in total only 2.7% of responses in the underinsured measure. It is possible that if the survey asked the three questions more directly, more respondents would have
answered “yes” to them. For example, a direct question to be included in the underinsured variable about ability to see a specialist would have asked: “In the past 12 months, have you not seen a specialist because of cost?” These findings suggest that the study may have underestimated the prevalence of the underinsured because of the question wording.

Although the prevalence of other components comprising the underinsured variable were low, it is notable that 12% of the respondents responded “yes” to the direct question “In the past 12 months, have you not filled a prescription because of cost?” One in eight respondents is burdened by the cost of prescriptions. Among the health services that the underinsured are unable to obtain, the underinsured are most affected by the inability to obtain prescriptions.

Further, a similar prevalence of those reporting being underinsured also reported it was harder to get health care compared to 3 years ago and financial stress due to medical bills. Among the weighted sample of continuously insured adult Ohioans less than 65 years old, 1,048,849 respondents reported it is harder to get health care compared to 3 years ago, comprising 19% of the sample. Among the sample of non-elderly continuously insured adults weighted to represent the Ohio population, 1,252,034 (22%) insured adults less than 65 years old experienced financial stress. Compared to the 22% of Ohioans who reported being underinsured, a similar percent of Ohioans reported harder to get health care and financial stress.
Table 6. Study outcome measures

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the past 12 months:</td>
<td></td>
</tr>
<tr>
<td>Was there a time that you did not get appointment or referral to a specialist because too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card?</td>
<td>28,173 (0.5)</td>
</tr>
<tr>
<td>Have you not filled a prescription because of the cost?</td>
<td>684,157 (12.2)</td>
</tr>
<tr>
<td>Was there a time that you did not get medications/prescriptions (patches, pills, shots) because too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card?</td>
<td>6,179 (0.1)</td>
</tr>
<tr>
<td>Was there that you did not get needed doctor visit, checkup, or exam, medical supplies or equipment, care for other ailment or body part because of too expensive or insurance plan restriction/rules or doctor or dentist would not accept medical card?</td>
<td>93,780 (1.7)</td>
</tr>
<tr>
<td>Did you delay or avoid getting care that you felt you needed but could not afford?</td>
<td>834,647 (15.0)</td>
</tr>
<tr>
<td>Underinsured in study period</td>
<td>1,203,201 (21.5)</td>
</tr>
<tr>
<td>Compared with 3 years ago, is getting the medical care you need becoming harder?</td>
<td>1,048,849 (18.9)</td>
</tr>
<tr>
<td>During the last 12 months, were there times when you had problems paying or you were unable to pay for medical bills for yourself or anyone else?</td>
<td>1,251,034 (22.3)</td>
</tr>
</tbody>
</table>

Risks of being Underinsured (Table 7)

Table 7 shows the distribution of demographic characteristics for the three study outcome variables: underinsured, harder to get health care, and financial stress. Younger age, female gender, Black race/ethnicity, less education, low income, public and directly purchased insurance, worsening health status, and special health care needs are predictors for underinsurance. Most of these risk factors have logical explanations for why they would impede one’s ability to obtain needed health services due to an inability to pay. These factors are also predictors for the consequences for underinsurance: harder to get health care and financial stress.

Consistent with the fact younger age groups represent a healthier population that is likely still eligible for coverage by parent’s health insurance, this study’s younger respondents were less likely to be underinsured. Adults ages 25 to 64 were at most risk of being underinsured,
compared to younger age groups. The age distribution shows that the youngest respondents ages 18 to 24 were least likely to be underinsured at 14%. There was little difference in rates among respondents in all other age groups, as the underinsured ranged between 20% and 24% across the older age groups. Younger age provides protection from underinsurance. As women and non-whites races/ethnicities are predisposed to having lower incomes when compared to their counterparts in our society, being female and black were risk factors for being underinsured. Females were 50% more likely to be underinsured than males. Further, twenty-six percent of blacks were underinsured, compared to the 21% of whites who were underinsured. Females and blacks are most at risk of being underinsured.

One would expect that having less education and less income would affect earning potential and affect one’s ability to afford needed health services. Having less than a college education and an income less than 300% of the FPL were risk factors for underinsurance. Those with less than a high school education or some college were about 60% more likely to be underinsured than a college graduate. Adults with low incomes (below 300% of poverty) were at higher risk of being underinsured than adults with incomes above 300% of poverty (RR= 2.0). In this 2008 OFHS study, the parallel relationship between the income and education risk factors and being underinsured may be related to lower earning potential among those with less than a college education. Those with lower earning potential are less likely to obtain needed health services because of an inability to pay.

Despite Medicaid being fairly comprehensive health insurance, non-elderly adults with public insurance were more likely to experience underinsurance. However, consistent with the fact that directly purchased insurance can be expensive and not include comprehensive benefits; those with directly purchased insurance were more likely to be underinsured. About 31% of
those with public insurance and directly purchased insurance were underinsured, and 19% of respondents with job-based insurance coverage were underinsured. Public insurance and directly purchased insurance increased the risk of underinsurance (RR=1.6 and 1.5 respectively).

As expected, needing to consume more health services increases one’s risk for being underinsured. In this 2008 OFHS study, having worsening health status and special health care needs were predictors for being underinsured. As health status worsened, the percentage of each health status category among the underinsured increased. Among respondents with special health care needs (those who need medications, medical care, assistance, or therapy), more than one quarter were underinsured. Reflecting underinsurance indicators based on ability to pay, underinsurance rates were higher among adults requiring more medical care.

**Access to Care and Financial Burdens Experienced by Insurance Group (Table 7)**

Being underinsured increases the likelihood of financial stress and access barriers. Nineteen percent of respondents in the sample reported it was harder to get health care compared to three years ago. Twenty-two percent of the respondents reported difficulty paying medical bills (financial stress). The pattern of bivariate associations between the independent variables and the *harder to get health care* outcome was similar to the pattern of relationships between the independent variables and the *underinsured* outcome. The pattern was similar between the independent variables and the *financial stress* outcome as well.

Underinsured adults were more likely than those with more adequate insurance to experience issues with access to care. Forty-five percent of those underinsured reported it was harder to get health care compared to 3 years ago. Being underinsured nearly quadrupled the likelihood of reporting that it is harder to get health care (RR=3.8). Underinsured adults reported high rates of financial stress related to medical bills. Fifty-nine percent of those underinsured
experienced financial stress. Underinsured respondents experienced financial stress nearly five times more frequently than the adequately insured. In this sample it is likely that part of the financial stress and difficulty getting care was related to the 2008 recession in general underinsurance is identified as a problem with consequences impacting access to care and financial security.

Table 7. Bivariate associations: Risk factors and the ability to get adequate health care among insured adults less than 65 years old

<table>
<thead>
<tr>
<th>Overall Risk</th>
<th>Underinsured</th>
<th>Harder to get Health Care compared to 3 years ago</th>
<th>Financial Stress (problem paying medical bills)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pct RR</td>
<td>Pct RR</td>
<td>Pct RR</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24</td>
<td>13.6</td>
<td>16.3</td>
<td>15.5</td>
</tr>
<tr>
<td>25 to 34</td>
<td>22.6 1.7</td>
<td>18.7 1.1</td>
<td>25.1 1.6</td>
</tr>
<tr>
<td>35 to 44</td>
<td>23.3 1.7</td>
<td>18.5 1.1</td>
<td>25.4 1.6</td>
</tr>
<tr>
<td>45 to 54</td>
<td>23.4 1.7</td>
<td>20.2 1.2</td>
<td>22.6 1.5</td>
</tr>
<tr>
<td>55 to 64</td>
<td>20.8 1.5</td>
<td>19.4 1.2</td>
<td>20.2 1.3</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>25.8 1.5</td>
<td>21.2 1.3</td>
<td>27.0 1.5</td>
</tr>
<tr>
<td>Male</td>
<td>16.9</td>
<td>16.4</td>
<td>17.4</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>27.1 1.7</td>
<td>24.8 1.6</td>
<td>27.0 2.0</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>22.5 1.4</td>
<td>19.0 1.2</td>
<td>26.1 1.9</td>
</tr>
<tr>
<td>Some College</td>
<td>24.9 1.5</td>
<td>20.6 1.3</td>
<td>26.7 1.9</td>
</tr>
<tr>
<td>College Graduate</td>
<td>16.2</td>
<td>16.0</td>
<td>13.7</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>21.1</td>
<td>18.5</td>
<td>21.6</td>
</tr>
<tr>
<td>Black</td>
<td>26.1 1.2</td>
<td>21.6 1.2</td>
<td>29.7 1.4</td>
</tr>
<tr>
<td>Other race-ethnicity</td>
<td>19.2 0.9</td>
<td>20.4 1.1</td>
<td>18.9 0.9</td>
</tr>
<tr>
<td>Income as % of FPL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300% or less of FPL</td>
<td>29.7 2.0</td>
<td>23.2 1.5</td>
<td>33.0 2.4</td>
</tr>
<tr>
<td>301% or more of FPL</td>
<td>15.0</td>
<td>15.5</td>
<td>14.0</td>
</tr>
</tbody>
</table>
Table 7 Continued

<table>
<thead>
<tr>
<th>Insurance Type</th>
<th>Underinsured</th>
<th>Harder to get Health Care compared to 3 years ago</th>
<th>Financial Stress (problem paying medical bills)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>30.7</td>
<td>23.6</td>
<td>31.0</td>
</tr>
<tr>
<td>Directly purchased</td>
<td>29.1</td>
<td>32.4</td>
<td>22.0</td>
</tr>
<tr>
<td>Other or Unknown</td>
<td>21.5</td>
<td>19.4</td>
<td>22.0</td>
</tr>
<tr>
<td>Job-based coverage</td>
<td>19.1</td>
<td>17.0</td>
<td>20.6</td>
</tr>
<tr>
<td>Health Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair or Poor</td>
<td>42.5</td>
<td>30.0</td>
<td>43.8</td>
</tr>
<tr>
<td>Good</td>
<td>25.0</td>
<td>21.2</td>
<td>25.8</td>
</tr>
<tr>
<td>Very good</td>
<td>17.1</td>
<td>16.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Excellent</td>
<td>10.1</td>
<td>12.9</td>
<td>10.9</td>
</tr>
<tr>
<td>Special Health Care Needs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has Special Health Care Needs</td>
<td>28.1</td>
<td>21.8</td>
<td>28.3</td>
</tr>
<tr>
<td>Does not have SHCN</td>
<td>15.4</td>
<td>16.1</td>
<td>16.9</td>
</tr>
<tr>
<td>Underinsured</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequately Insured</td>
<td></td>
<td>11.7</td>
<td>12.3</td>
</tr>
<tr>
<td>Underinsured</td>
<td></td>
<td>44.9</td>
<td>59.1</td>
</tr>
</tbody>
</table>

* All p-values were less than 0.05

Discussion

This OFHS 2008 study’s experiential measurement, which predicts that the prevalence of underinsurance is 22% among the non-elderly adult continuously insured population, is a similar estimate to other studies (Schoen et al., 2008). Researchers may utilize this study’s measure with other state-administered surveys to better understand the impact of the provisions of the Patient Protection and Affordable Care Act (PPACA) that target the underinsured. PPACA policies such as expansion of Medicaid and the creation of health exchanges will vary among states in their implementation. It will be important to monitor the changes in the prevalence of the underinsured and the demographic characteristics of the underinsured in each state with the implementation of the PPACA.

Understanding the demographic characteristics of the underinsured allows for policymakers and public health officials to target those groups most at risk. This study suggests
that being older than 25 years old increases the likelihood of being underinsured. In the Schoen et al. (2008) study, older age was also a risk factor for being underinsured. This study demonstrates that in Ohio, 18 to 24 year olds who are generally healthier and may have been eligible for their parent’s health insurance in 2008 are less likely to be underinsured. The PPACA expands a dependent’s eligibility for parent’s health insurance to the age of 26 years old. This policy may help decrease the prevalence of the underinsured.

In this study and previous research, females are at higher risk for underinsurance (Schoen et al., 2005, 2008; Voorhees et al., 2008). The PPACA addresses this issue for by covering of preventative services for women (i.e. yearly gynecological exams, and requiring that all plans include maternity) (Brown, 2012). Because women are more likely to have lower incomes than men, women will benefit with the PPACA provision that extends Medicaid to 133% of the FPL (Brown, 2012). Targeting women’s health care needs will likely help improve rates of underinsurance.

This study shows that the non-elderly continuously insured adults with public insurance were more likely to be underinsured. Schoen et al. (2008) also found that the underinsured are more likely to have public insurance. Medicaid generally offers comprehensive health benefits, but not all providers accept Medicaid. Using this experiential variable, 80% of the underinsured met the criteria for being underinsured because they delayed needed care or were unable to obtain a needed prescription because of an inability to pay. Since the majority of the underinsured group had a financial reason for not obtaining a needed health service, the fact that many providers do not accept Medicaid does not account for the difference between public insurance and job-based insurance as risk factors for underinsurance. It is reasonable that more respondents covered by Medicaid reported an inability to pay because they are in a low-income
group with less discretionary income. They would be more likely to have trouble with co-
payments or medications or other services not covered by Medicaid than those with job-based
insurance. Also, they were perhaps more sensitive to the recession that started around the time
the survey was administered. This is an area of future research to determine what aspects of
Medicaid or other public insurance may not allow for comprehensive coverage and increase
one’s likelihood of being underinsured.

Health reform offers public insurance to more Ohioans, this will decrease the number
uninsured but it may increase the number insured with inadequate coverage. However, the
PPACA will not only increase the number of people with public insurance, but also those with
job-based coverage. The health care mandate will require employers to provide health insurance
for their employees. This mandate may ultimately protect people from underinsurance by
increasing the number of people insured by their employers (Lavarreda, Brown, & Bolduc,
2011). Employer-based insurance is a protective factor for underinsurance, according to this
2008 OFHS study. The PPACA’s creation of health insurance exchanges or subsidies will
prevent those with directly purchased insurance from spending beyond their means on their
health insurance, protecting this group from being underinsured as well (Lavarreda et al., 2011).

In this and prior studies worsening health status increases the risk of being underinsured
(Voorhees et al., 2008; Schoen et al., 2008; Kogan et al., 2010; Spears et al., 2010). The PPACA
will protect those with worsening health status and with special health care needs who are at
increased risk of being underinsured by preventing insurance companies from denying coverage
for those with pre-existing conditions. However, as was seen with the government’s extension of
CHIP to more children without increasing the provisions for health services for chronic
conditions, Medicaid will be extended to more people through the PPACA, but it will have
limited insurance policy provisions (Perrin, 2010). Many of the newly insured, especially those with worsening health status or chronic conditions who require more insurance provisions may be at risk of being underinsured (Perrin, 2010). The PPACA addresses this potential issue by providing states the ability to set up “health home” services for those with Medicaid to better coordinate and provide access to needed health services for those with chronic conditions (Medicaid’s New Health Home, 2011).

In both this and prior studies, low income is a risk factor for underinsurance (Schoen et al., 2008; Voorhees et al., 2008). With health policies that increase access to health insurance, it is important to protect those with lower incomes from increased cost-sharing to prevent underinsurance. Schoen et al. (2005) reports that political plans to increase cost sharing among employees within employer-based health plans will only increase the financial burden for employees and lead to greater underinsurance. The PPACA targets low-income groups by expanding Medicaid to 133% of the Federal Poverty Level (FPL), and it prevents underinsurance from cost-sharing by offering health exchanges or subsidies to up to 400% of FPL. Expanding Medicaid and offering subsidies should decrease the prevalence of underinsurance (Lavaerreda et al., 2011).

Underinsurance increases the likelihood of financial stress and difficulty to obtain care. Similarly, Schoen et al. (2011) reported that 52% of the underinsured had problems paying medical bills or medical debt in 2010. Underinsurance leads to consequences that can be prevented. Many of the policies of the PPACA will target the underinsured population and hopefully prevent financial stress and difficulty obtaining health care. A national study has been predicted that the prevalence of underinsurance will decrease by 70% with the PPACA income policies (Schoen et al., 2011). Other policies that would help the underinsured in Ohio include
improved prescription cost coverage based on the findings in this study that half of the
underinsured sample was unable to obtain needed prescriptions due to an inability to pay. Also,
programs to improve minority group’s access to health care will help prevent underinsurance in
these populations. This and other studies in both adults and children report that non-White races
are more likely to be underinsured than whites (Voorhees et al., 2008; Kogan et al., 2010;
Schoen et al., 2008). The PPACA policies improve the prevalence of underinsurance by
targeting high-risk groups, including low-income. States may want to consider additional
policies that improve prescription coverage and access to care for non-white minorities.

**Strengths and Limitations**

The 2008 OFHS study provides an understanding of underinsurance in Ohio using a
state-wide public data set. The results may be helpful for policymaker’s development of Ohio’s
health care guidelines, especially surrounding the Patient Protection and Affordable Care Act
(PPACA). Using an experiential definition of underinsurance the study describes risk factors
that affect underinsurance. These findings are comparable to previous underinsurance studies in
the literature. The large sample size enhances the probability of statistically significant results.

There are some limitations to this study. The data was collected in 2008, and may not
reflect current trends in Ohio. The survey was administered after the beginning of a national
economic recession. In 2012 the PPACA has already begun to be implemented and the trends in
underinsurance for 2012 are likely to be more optimistic. Also, this study does not adjust
relative risk calculations for possible confounders. A future study should examine the
relationship among variables using multivariate statistical methods to control for confounding
variables. Furthermore, because a previously collected public data set was used, the researcher
was not able to develop the questions asked and the method in which they were asked. As a
result, the question wording was not as precise as it could have been had the researcher helped to develop the questions.

**Future Directions**

This study describes those at risk of being underinsured. In a sample weighted to represent Ohio’s population, twenty-two percent or 1,203,201 non-elderly continuously insured adult Ohioans were underinsured. Underinsurance increases the likelihood of financial stress and difficulty to obtain care.

Researchers should analyze the 2008 OFHS and future OFHS studies to adjust for confounding variables by using multivariate statistical methods. With the changes that are already underway in the US health care system, it will be important for researchers to repeat this study of the underinsured with the 2010 OFHS and then the 2012 OFHS to continue monitoring the underinsured. As the PPACA is expected to decrease the prevalence of the underinsured by 70%, the demographics of the underinsured will likely evolve as the PPACA is implemented (Schoen et al., 2011). It will be important that public health officials and policymakers continue to identify those who are underinsured in Ohio by updating research and creating health care policies that prevent underinsurance.
References


### Domain #1: Analytic/Assessment
- Identify the health status of populations and their related determinants of health and illness (e.g., factors contributing to health promotion and disease prevention, the quality, availability and use of health services)
- Describe the characteristics of a population-based health problem (e.g., equity, social determinants, environment)
- Use variables that measure public health conditions
- Use methods and instruments for collecting valid and reliable quantitative and qualitative data
- Identify sources of public health data and information
- Recognize the integrity and comparability of data
- Identify gaps in data sources
- Adhere to ethical principles in the collection, maintenance, use, and dissemination of data and information
- Describe the public health applications of quantitative and qualitative data
- Collect quantitative and qualitative community data (e.g., risks and benefits to the community, health and resource needs)
- Use information technology to collect, store, and retrieve data
- Describe how data are used to address scientific, political, ethical, and social public health issues

### Domain #2: Policy Development and Program Planning
- Gather information relevant to specific public health policy issues
- Describe how policy options can influence public health programs
- Explain the expected outcomes of policy options (e.g., health, fiscal, administrative, legal, ethical, social, political)
- Gather information that will inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political)
- Describe the public health laws and regulations governing public health programs
- Identify mechanisms to monitor and evaluate programs for their effectiveness and quality
- Demonstrate the use of public health informatics practices and procedures (e.g., use of information systems infrastructure to improve health outcomes)

### Domain #3: Communication
- Communicate in writing and orally, in person, and through electronic means, with linguistic and cultural proficiency
- Participate in the development of demographic, statistical, programmatic and scientific presentations

### Domain #4: Cultural Competency – N/A

### Domain #5: Community Dimensions of Practice
- Demonstrate the capacity to work in community-based participatory research efforts
- Identify stakeholders
- Describe the role of governmental and non-governmental organizations in the delivery of community health services
- Inform the public about policies, programs, and resources

### Domain #6: Public Health Sciences
- Identify the basic public health sciences (including, but not limited to biostatistics, epidemiology, environmental health sciences, health services administration, and social and behavioral health sciences)
- Describe the scientific evidence related to a public health issue, concern, or, intervention
- Retrieve scientific evidence from a variety of text and electronic sources
- Discuss the limitations of research findings (e.g., limitations of data sources, importance of observations and interrelationships)
- Describe the laws, regulations, policies and procedures for the ethical conduct of research (e.g., patient confidentiality, human subject processes)
<table>
<thead>
<tr>
<th>Domain #7: Financial Planning and Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the local, state, and federal public health and health care systems</td>
</tr>
<tr>
<td>Describe the organizational structures, functions, and authorities of local, state, and federal public health agencies</td>
</tr>
<tr>
<td>Adhere to the organization's policies and procedures</td>
</tr>
<tr>
<td>Apply basic human relations skills to internal collaborations, motivation of colleagues, and resolution of conflicts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain #8: Leadership and Systems Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorporate ethical standards of practice as the basis of all interactions with organizations, communities, and individuals</td>
</tr>
<tr>
<td>Describe how public health operates within a larger system</td>
</tr>
<tr>
<td>Participate with stakeholders in identifying key public health values and a shared public health vision as guiding principles for community action</td>
</tr>
<tr>
<td>Identify internal and external problems that may affect the delivery of Essential Public Health Services</td>
</tr>
<tr>
<td>Describe the impact of changes in the public health system, and larger social, political, economic environment on organizational practices</td>
</tr>
</tbody>
</table>
ACTION OF THE WRIGHT STATE
UNIVERSITY
EXPEDITED REVIEW
Assurance Number: FW0002427

DATE: May 23, 2012
TO: Meaghan Ebetino, P.L., Student
FROM: B. Laurel Elder, Ph.D.
Chair, WSU Institutional Review Board
SUBJECT: WSU Institutional Review Board
Administrative Approval RE: Meaghan Ebetino, P.L., Student
SC# 4502 #1
'Identifying Predictors of Underinsurance in Adults'

This amendment was approved by RSP per Board Policy of May, 1994. This amendment does not contain significant changes nor does it impact on subject treatment/care. This amendment resulted from:

☐ Team Member Change ☐ Question Addition
☒ Procedure Addition ☐ Material/Strategy Change
☐ Procedure Removal ☐ Minor Correction

Comments:

Administrative approval was given for the following change: The P.I. intends to perform data analysis using the dependent variables for a Culminating Experience in the Masters of Public Health graduate program. After receiving approval for exemption by the IRB, this research was worked on previously during an independent study course with the intent of creating dependent variables for a culminating experience. Per request dated 5/21/12 from Meaghan Ebetino.

The Board will be notified of this action at the next regularly scheduled meeting.
Wright State University IRB
Modification/Amendment Request

Date: 5/21/12  WSU HSP/SC# 4502
Principal Investigator: Meaghan Ebetino  Phone: 513-543-4691  E-mail: Ebetino.2@wright.edu
Title of Research Project: Identifying Predictors of Underinsurance in Adults

1. Is the sponsor initiating the proposed amendment?  □ Yes  □ No
   If yes, provide the amendment number □ 2009

2. Mark all that apply:
   □ Administrative change (check appropriate box(es) from following list):
     □ Addition or deletion of study team members
     □ Addition of procedures that do not significantly increase risk to subjects
     □ Removal of research procedures resulting in a reduction in risk to subjects
     □ Addition of nonsensitive questions to unvalidated survey or interview procedure
     □ Addition of or revisions to recruitment materials or strategies
     □ Administrative changes (e.g. correction of spelling, grammar or typographical errors) to approved documents

   □ Protocol revision(s)
   □ Consent form revision(s)
   □ Other (specify) □

3. Describe modification/amendment (use/attach additional pages if necessary):
   After receiving approval for exemption by the IRB, this research was worked on previously during an independent study course with the intent of creating dependent variables for a culminating experience. Now, the P.I. intends to perform data analysis using the dependent variables for a Culminating Experience in the Masters of Public Health graduate program.

4. Will there be any increased risk, discomfort or inconvenience to the subjects?  □ Yes  □ No
   If yes, provide detailed explanation and justification as an attachment

5. Do you consider the requested changes to be □ Minor (minimal risk) or □ Substantive?

October 20, 2009