Non-Economic and Economic Factors in the Decision to Obtain a Pap Smear: The Case of Women Residents in the State of Florida

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Non-Economic and Economic Factors in the Decision to Obtain a Pap Smear: The Case of Women Residents in the State of Florida

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Abstract. In this unique study of the adult female population in the state of Florida, we found that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of women 18 years of age and older who were current smokers, while being an increasing function of the percentage of women 18 years of age and older with an annual income of $25,000 or more, the percentage of adult women under the age of 45 who take a multivitamin daily, the percentage of women age 18 and older who were high school graduates with at least some college education as well, and the percentage of adult women who were classified as leading a sedentary lifestyle. It also appears that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of the women 18 years of age and older who were overweight. Based on these findings, certain preliminary general public policy implications are offered in the concluding section of the study.

1. Introduction

In recent years, a number of studies have addressed public health and related health economics issues using *regional* data. For example, the study by Fulop, Kopetsch, and Schope (2011) investigates the role of geographic distance in determining "catchment areas" of medical practices in Germany. Using state-level data for the 50 states of the U.S., Bopp and Cebula (2009) examine state variations in hospital expenditures. A study by Cebula, Smith, and Alexander (2010) investigates, again using state-level data, the impact of cigarette excise taxation on cigarette consumption. In another study, Cebula (2010) adopts state-level data to empirically investigate the "small firms hypothesis" regarding the purchase of private health insurance.

McNamara (2007) addresses state-level rural public health policies. Indeed, a number of studies have focused on various dimensions of rural public health and rural public health policy (Asirvatham, 2009; Shields, Mushinski, and Davis, 2009; Fannin and Barnes, 2009). Focusing on a single state, Mason, Toney, and Cho (2011) investigate the health trajectories of Hispanics in Utah vis-à-vis what has been documented in states having large Hispanic populations. They also investigate whether non-Mormon groups in Utah have a less positive health status than Mormons in the state. The study by Wyneen (2009) deals with the issue of using out-of-county health care facilities in the Mississippi Delta, again focusing on a single state. Jintanakul and Otto (2009) focuses on the state of Iowa in identifying factors influencing choice of hospital by rural residents. In the study by Ona, Hudoyo, and Freshwater (2007), the focus changes to the effects of hospital

closure in rural environments in three states in the South.

As a *de facto* extension of the above literature, there have also been studies (single state-level or other regional data) that attempt to identify risk factors that play a role in the public's decisions to undertake simple, indeed routine, tests that could be used to detect serious health problems and reduce morbidity. One prime example is the Pap test, which is used to help detect cervical cancer. A woman's decision to delay or avoid obtaining a Pap smear is presumably based on myriad factors. Certain studies suggest that even considerations of a woman's body size, i.e., being "overweight," may be a predictor of delay or avoidance of a Pap smear (Drury and Louis, 2002; Ferrante, Chen, Crabtree, and Wartenberg, 2007; Fontaine, Heo, and Allison, 2001; Wee, McCarthy, Davis, and Phillips, 2000).

The existing literature on the relationship of cervical cancer screening, in the form of a Pap smear, to body weight (being overweight) and other factors has focused much more on *national* population datasets than on *state*-level datasets (Calle, Rodriquez, Walker-Thurmond, and Thun, 2003; Ferrante, Chen, Crabtree and Wartenberg, 2007; Fontaine, Heo, and Allison, 2001; Katz and Hofer, 1994; Wee, McCarthy, Davis and Phillips, 2000). These studies provide potentially useful inferences and insights from the perspective of the national level; however, they may be somewhat limited in usefulness in that they do not address distinctive or unique demographic, economic, psychological, and social circumstances, issues, or needs that vary from one state to another. The present study focuses explicitly on the state of Florida, which has not been thusly studied heretofore, and it seeks to identify potential factors (as represented in the state of Florida), including that of being overweight, that may influence an adult woman's decision to obtain a Pap smear test.

2. Statement of the problem

Cancer among women is a major public health problem in the U.S. Cervical cancer is the third most common female reproductive cancer in the United States and the most common form of female reproductive cancer worldwide. It is estimated that over 11,000 new cases of cervical cancer will occur this year in the U.S., with over 3,800 women projected to die from the disease (American Cancer Society, 2008). Brown, Lipscomb, and Snyder (2001) estimated the treatment costs for cervical cancer to be in excess of $2 billion dollars per year in the U.S. alone.

Preventive screening to check for changes in the cervix before symptoms occur is critical to a woman's gynecological health. Developed in the 1930s, the Pap smear has become the most widely used cancer-screening test in the world. Between 1955 and 1992, the rate of cervical cancer mortality decreased by 74% (ehealthmd, 2011). Pap smears have been recognized as one of the most effective cancer screening tools ever created. Early diagnosis of abnormal cells has been the key to effective treatment of cervical cancer.

No one as yet knows definitively why one woman contracts cervical cancer and another does not. What is known is that women with particular risk factors or characteristics are more likely than others to develop cervical cancer. The Alliance for Cervical Cancer Prevention (2003; 2004) has reported the following risk factors for developing cervical cancer: lack of Pap smear testing, chlamydia infection, dietary deficiencies, a weakened immune system, the presence of certain strains of the human papillomavirus (HPV), cigarette smoking, use of birth control pills, diethylstilbestrol (DES) exposure, family history of cervical cancer, age, and multiple pregnancies. Arguably, of these factors, one of the most important of these risk factors is *not having a Pap smear*. Women who adhere to screening guidelines are much less likely to develop cervical cancer than women who don't have the test as recommended, simply because they could get early treatment for precancerous states.

Cervical cancer is a preventable and treatable condition. However, low screening participation rates continue to concern health care advocates (Welch, Miller, and James, 2008). According to a recent study, women who have not obtained a Pap smear within the recommended three year period were 2.52 times more likely to be diagnosed with cervical cancer than women who had been screened regularly; in addition, those women who delayed screening also quadrupled the chances of being diagnosed with advanced cervical cancer when compared to women who had been screened regularly (Wee, Phillips, and McCarthy, 2005; Welch, Miller, and James, 2008). Thus, delaying or avoiding a Pap smear can put a woman in the precarious position of being diagnosed at a time when treatment is not a promising option.

A woman's decision to delay or altogether avoid obtaining a Pap smear is presumably based on a variety of economic, psychological, social, and other factors. Interestingly, as noted above, research suggests a woman's body size may well influence delay

or avoidance of a Pap smear. Overall cancer incidence rates have been shown to rise with increasing body size (Calle, Rodriquez, Walker-Thurmond, and Thun, 2003). This is especially important and relevant to this study because, as Ogden, Carroll, Curtin, McDowell, Tabak, and Flegal (2006) have found, overweight and obesity prevalence rates have been soaring in the U.S. over the past few decades.

At the risk of redundancy, it is observed that, interestingly, nearly all of the related research focuses on *national* trends in cervical screening rather than on such trends from data on the *state* level. Indeed, state level data for only one state, Missouri, have heretofore been investigated using formal empirical techniques (Simoes et al., 1999). Given that federal funding is often presented for state disbursement, it would be especially relevant for states to have targeted information on cervical screening behavior and thus be better equipped to address state level needs. Thus, the literature reveals a valuable, yet largely unexplored, goal of investigating state-based cervical screening behavior.

3. An eclectic model

The present study uses public data collected from January, 2007 through December, 2007 among adult females in the state of Florida. Data, which were obtained from the Florida Department of Health (2007a; 2007b), are available by county and at the state level. The total sample size of adult women in the state of Florida is 24,441. Each of the 67 counties had at least 500 adult respondents. For the purposes of the present study, the dependent variable to be focused on is denoted PAP, the percentage of women 18 to 44 years of age within each county in the state of Florida who have had a Pap smear in the past year.

The independent variable reflecting a woman's being overweight is the percentage of overweight women within each county in the state of Florida, i.e., those with a body mass index (BMI) of at least 25 kg/m^2 but less than 30 kg/m^2. That is, a key research question being investigated by this study is whether a woman's being overweight makes her self-conscious or creates some other real or imaginary psychological or other barrier that discourages her from obtaining a Pap smear. Thus, among other things, we ask the question "What is the impact of the incidence of overweight adult women (within the state of Florida with a BMI $\geq$ 25 kg/m^2 but less than 30 kg/m^2) on the percentage of adult women (18 to 44 years of age) who have had a Pap smear in the past year?"

Based on previous studies (Calle, Rodriquez, Walker-Thurmond, and Thun, 2003; Drury and Lewis, 2002; Ferrante, Chen, Crabtree and Wartenberg, 2007; Fontaine, Heo, and Allison, 2001; Katz and Hofer, 1994; Wee, McCarthy, Davis and Phillips, 2000), the following explanatory/independent variables are considered in the study for the state of Florida:

AOW = Percentage of the women 18 years of age and older within each county in the state of Florida in 2007 who were overweight, i.e., $25 \leq BMI < 30$;

AS = Percentage of women 18 years of age and older within each county in the state of Florida in 2007 who were current smokers;

AIN25PLUS = Percentage of women 18 years of age and older within each county in the state of Florida in 2007 with an annual income in 2007 of $25,000 or more;

AVIT = Percentage of adult women under the age of 45 within each county in the state of Florida in 2007 who take a multivitamin daily;

AWED = Percentage of women age 18 and older within each county in the state of Florida in 2007 who were high school graduates with at least some college education as well; and

ASEDEN = Percentage of adult women within each county in the state of Florida in 2007 who were classified as leading a sedentary lifestyle.

For the interested reader, Table 1 provides the descriptive statistics for the variables in the model. In addition, Table 2 provides the correlation coefficients among the independent variables; clearly, there are no issues of multicollinearity.

Table 1. Descriptive statistics.

Variable	Mean	Standard Deviation	95% Confidence Interval
AIN25PLUS	139.869	12.4993	136.88 – 142.86
AOW	30.1313	4.83965	28.97 – 31.29
AS	20.891	4.9008	19.72 – 22.06
ASEDEN	29.0925	6.19363	27.61 – 30.57
AVIT	51.1821	12.709	48.14 – 54.22
AWED	58.5313	8.45323	56.51 – 60.55
PAP	69.7576	6.75774	68.14 – 71.38

Table 2. Correlation matrix.

	AIN25PLUS	AOW	AS	ASEDEN	AVIT	AWED	PAP
AIN25PLUS	1	0.1062	0.1534	-0.0298	-0.0113	0.3472	0.4524
AOW		1	0.0346	0.0036	-0.1111	0.1487	-0.1950
AS			1	0.2119	-0.0143	0.0011	-0.1198
ASEDEN				1	-0.1809	-0.0013	0.0272
AVIT					1	-0.0719	0.2984
AWED						1	0.5571
PAP							1

4. The OLS estimation

The following multivariate linear regression equation for the 67 counties of the state of Florida for the year 2007 was estimated by ordinary least squares (OLS):

$$PAP = a_0 + a_1 AOW + a_2 AS + a_3 AIN25PLUS + a_4 AVIT + a_5 AWED + a_6 ASEDEN + u \quad (1)$$

In equation (1), a_0 is the constant term, and the terms a_1 through a_6 are the coefficients, while u is the stochastic error term. The other terms in equation (1) are defined in Section 3 above.

Estimating equation (1) by OLS, adopting the White (1980) heteroskedasticity correction, yields the following results:

$$PAP = \underset{}{24.9} - \underset{(-3.24)}{0.349}\ AOW - \underset{(-2.06)}{0.239}\ AS + \underset{(2.76)}{0.159}\ AIN25PLUS + \underset{(3.02)}{0.184}\ AVIT + \underset{(4.76)}{0.414}\ AWED + \underset{(2.38)}{0.152}\ ASEDEN, \quad (2)$$

$R^2 = 0.58$, $df = 60$, $F = 13.83$

where terms in parentheses are t-values.

In equation (2), the null hypothesis H_0: the population coefficient = 0 can be rejected at the 95 percent confidence level for variables AS (p = .0437) and ASEDEN (p = .0205) and can be rejected at the 99 percent confidence level for the remaining variables, namely AOW (p = .0020), AIN25PLUS (p = .0076), AVIT (p = .0037), and AWED (p = 0.0000). In addition, the R^2 value of 0.58 implies that the estimation provided in equation (2) explains nearly three-fifths of the variation in the dependent variable, PAP. Finally, the F-statistic of 13.83 rejects the null hypothesis at the 99 percent level, attesting to the overall statistical strength and dependability of the model.

Thus, it appears that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of women 18 years of age and older within each county in the state of Florida in 2007 who were current smokers (AS), while being an increasing function of the percentage of women 18 years of age and older within each county in the state of Florida in 2007 with an annual income in 2007 of $25,000 or more (AIN25PLUS), the percentage of adult women under the age of 45 within each county in the state of Florida in 2007 who were taking a multivitamin daily (AVIT), the percentage of women age 18 and older within each county in the state of Florida in 2007 who were high school graduates with at least some college education as well (AWED), and the percentage of adult women within each county in the state of Florida in 2007 who were classified as leading a sedentary lifestyle (ASEDEN). Finally, it also appears that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of the women 18 years of age and older within each county in the state of Florida in 2007 who were "overweight."

The result for the education variable AWED is compatible with the study by Katz and Hofer (1994), where greater educational attainment is found to be likely to yield greater caution with respect to one's health. Furthermore, the result for the variable AIN25PLUS is consistent with the studies by Katz and Hofer (1994) and Welch, Miller, and James (2008), which find that as a woman's income increases, so does the likelihood of being screened for cervical cancer. The finding for the smoker variable AS suggests that smokers are less risk averse than non-smokers (Cebula, Smith, and Alexander, 2010) and hence are more likely to avoid a Pap smear exam. By contrast, the finding for the variable AVIT suggest that women who systematically take a daily multivitamin are more concerned about their health and hence would, by analogy, be more concerned about the prospects of cervical cancer and therefore more inclined to have Pap smear testing. Finally, the result for the variable ASEDEN seemingly *might suggest* that those with a more sedentary lifestyle may also have the advantage of having more time so that scheduling a Pap smear might be easier.

Interestingly, the finding above for the variable AOW is compatible in principle with the *national* research studies that suggest that a woman's body size may well influence delay or avoidance of a Pap smear (Drury and Louis, 2002; Ferrante, Chen, Crabtree and Wartenberg, 2007; Fontaine, Heo, and Allison, 2001; Wee, McCarthy, Davis and Phillips, 2000).

5. Conclusions

In this first-time-ever such study of the adult female population in the state of Florida, we find that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of women 18 years of age and older who were current smokers, while being an increasing function of the percentage of women 18 years of age and older with an annual income of $25,000 or more, the percentage of adult women under the age of 45 who take a multivitamin daily, the percentage of women age 18 and older who were high school graduates with at least some college education as well, and the percentage of adult women who were classified as leading a sedentary lifestyle. Finally, it also appears that the percentage of the women 18 to 44 years of age within each county in the state of Florida in 2007 who had received a Pap smear during the past year was a decreasing function of the percentage of the women 18 years of age and older who were overweight.

Among the policy implications of this study is the need to decrease the smoking behavior of the adult female population. Cebula, Smith, and Alexander (2010) are among those who argue for a new, innovative state cigarette tax, including a tax on nicotine and tar contents in tobacco products. It also would be helpful for policymakers in the state to take substantive steps to reduce unhealthy diets and lifestyles that lead to a woman's being overweight. In both cases, public education might be of value, although harsher taxation of tobacco products might also be a useful as a revenue-generating policy.

Similarly, the public in Florida needs to be made more aware of the value of increased education levels and higher graduation rates and perhaps provided greater/easier access to such opportunities. To assist in cases of low income, it would be in the public's best interests and the government of Florida's best interest to have public funding absorb the entire cost of Pap smear testing for the financially challenged. Policymakers have multiple alternatives by which to improve women's Pap smear participation.[1]

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[1] In closing, it is observed that this study may have several limitations related to the data. First, the database is a self-reported telephone survey and may be prone to error with regard to socio-demographic and weight information. Second, the accuracy of self-reports may be influenced by imperfections in the recall of recent cervical cancer screening. Third, people without telephones or people who use cell phones only were not surveyed, thereby limiting potential information that could have been gathered within the studied socio-demographic cohort.

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