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Impact of Health Care Coverage and Other Socio-Demographic Variables on the Follow-Up of Cervical Cancer Screening Among Colombian Women

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IMPACT OF HEALTH CARE COVERAGE AND OTHER SOCIO-DEMOGRAPHIC VARIABLES ON THE FOLLOW-UP OF CERVICAL CANCER SCREENING AMONG COLOMBIAN WOMEN

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ABSTRACT

In Colombia, cervical cancer is the most common cancer among women with incidence (36.4/100,000) and mortality rates (18/100,000) much higher than those of the U.S. (7.7 and 2.3 respectively). About 70% of the Colombian population has health care coverage (HCC) through the subsidized regime (SR) which serves the poorest persons and the contributory regime (CR) which serves the working population. Our goal was to determine the role that HCC plays in cervical cancer screening follow-up among Colombian women.

A population-based cross-sectional study of 24,717 women between the ages of 18 and 49, using the 2005 Demographic and Health Survey was conducted. In our study, cervical cancer screening follow-up was measured by obtaining Pap smear results and having a follow-up of abnormal results.

Nearly 4% of women did not seek their results and 5.4% sought their results but did not obtain them. Approximately 17% of women did not have a follow-up of abnormal results. Women without HCC and those in the SR were less likely to obtain Pap smear results than women in the CR, even after adjusting for socio-demographic factors (ORa:0.51; 95%CI:0.42,0.62 and ORa:0.68; 95%CI:0.56,0.84, respectively). Similar results were found for follow-up of abnormal results (ORa:0.71; 95%CI:0.54,0.95 and ORa:0.75; 95%CI:0.57,0.98, respectively). However, given the extent of confidence

intervals, findings for follow-up of abnormalities need to be interpreted with caution. Other variables associated with both obtaining results and follow-up of abnormalities were geographic region, perceived health status, and health care visits within the last year. The main barriers women listed for not obtaining results were: institution did not return the results and that they were not interested in the results. The main barriers for not having a follow-up of abnormalities were: laziness/lack of interest, lack of economic resources, fear.

At least in the short term, universal HCC for all women may not be realistic. However, we can start improving cervical cancer prevention services for those enrolled in the SR. Based on previous literature, some of the barriers in the health care system in Colombia appear to be of an administrative nature. Educational strategies addressing the importance of timely follow-up are also important.

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LIST OF ABBREVIATIONS

ASCUS	Atypical Squamous Cells of Undetermined Significance
AGCUS	Atypical Glandular Cells of Undetermined Significance
ARS	*Administradoras de Régimen Subsidiado* (Subsidized Regime Administration)
CDC	Centers for Disease Control and Prevention
CIN	Cervical Intraepithelial Neoplasm
ECC	Endocervical Curettage
EPS	*Entidades Promotoras de Salud* (Health Promoter Company)
ESS	Empresas Solidarias De Salud (Health Supportive Entities)
GDP	Gross Domestic Product
HCC	Health Care Coverage
HIV	Human Immunodeficiency Virus
HGSIL	High-grade Squamous Intraepithelial Lesions
HPV	Human Papilloma Virus
IARC	International Agency for Research on Cancer
IDPs	Internally Displaced Persons
ISS	*Instituto de Seguros Sociales* (Social Security Institute)
LGSIL	Low-grade Squamous Intraepithelial Lesions
OR	Odds ratio

ORa	Odds ratio adjusted
ORu	Odds ratio unadjusted
PID	Pelvic Inflammatory Disease
SCC	Squamous Cell Carcinomas
SISBEN	*Sistema de Identificación de Beneficiarios de Subsidios Sociales* (Selection System of Beneficiaries for Social Programs)
THE	Total Health Expenditure
VIA	Visual Inspection with Acetic Acid
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

There are 500,000 new cases of cervical cancer each year in the world. Fifty-five percent of these women will die, and 85% of these deaths will be in the developing world.[1] Cervical cancer is the second most common cancer among women worldwide, including many developing areas of the world.[1]

In Colombia, the third most densely inhabited country in Latin America, cervical cancer is the most common cancer among women. In 2002, this Latin American country had an age-standardized incidence rate of 36.4/100,000 and a mortality rate of 18.2/100,000.[1] Differences, compared to the rates in the United States, are striking. The age-standardized incidence for the same year in the United States was 7.7/100,000 and the mortality rate was 2.3/100,000.[1]

There is no doubt that primary prevention is the best approach to control most diseases. In the case of cervical cancer, cytological screening (secondary prevention) as mentioned by WHO, "has been one, and probably the most successful, of several public health measures introduced for the prevention of cancer".[2]

Cytological screening, commonly known as Pap smear, was introduced in Colombia in the early 1970s. However, in 2005, the National Demographic and Health Survey reported that 14% of women never had a Pap smear. Only 48% of women who had a Pap smear had it once a year, 22% had it rarely, and 13% had been screened only once in their lifetime.[3] Not knowing about the test was not the reason for not having a

Pap smear as 99% of the women reported that they knew that they should have this screening test. Thirty-two percent of the women mentioned procrastination as the main reason for not having the test, followed by fear (30%), embarrassment (17%), not feeling sick (15%), not believing that it is important or necessary (7%), and lack of money (5%).[3]

In Colombia, Pap smear results are not sent by mail, women are required to pick them up at the clinic or laboratory. According to the same survey, around 92% of the women who had a Pap smear obtained their results. Approximately nine percent of the women had abnormal test results, and 17% of those with abnormal test results did not return for follow-up.[3] Around one third of women who did not return for follow-up expressed procrastination as the reason, and 25% did not get a follow-up for lack of money.

Primary, secondary, and tertiary prevention of cervical cancer is supported by governmental policies in Colombia, and most of the activities related to prevention are mandatory. However, the Colombian health care system is still very disorganized and women face various problems when getting diagnosed and treated depending on the presence and type of health care coverage.

With this background in mind, the decision to follow-up can be seen as the result of complex processes where both structural (such as, cost, paper work, and long waiting time) and personal barriers (such as, education, income, and embarrassment) can play a role. The goal of this study is to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening among Colombian women. Follow-up of cervical cancer screening is defined, in this study, as the actions that Colombian women

need to take after a Pap smear test in order to know the results and have a diagnosis when necessary.

Background and Setting

Colombia

Geography and Demography

Colombia, with a population of 41,317,128,[4] lies in the northwestern part of South America, and among Latin American countries has the largest population after Brazil and Mexico.[5] In terms of geographic area, Colombia is about the size of Texas and California combined.[6]

Colombia has a diverse topography that divides its territory into four major geographic regions: the *Andes* which is delineated by the Andes mountain range that crosses the country from South to North; the Caribbean consisting of the lowlands on the Caribbean coast; the Pacific region with its tropical rainforest; and the *Orinoquía* and *Amazonia* in the east of the country, with flat grasslands and the Amazon rainforest.

The population of the country is concentrated mainly in the Andes region, with approximately 95% of the people living in the western part of that mountainous system.[7] Furthermore, according to the 2005 census, the capital of Colombia, Bogotá (situated in the Andes), has 6,776,009 residents that account for 16.4% of the population in the country.[4] On the other hand, the region of the *Llanos* and *Amazonia* represents about 54% of the territory, but contains less than three percent of the population.[5]

Approximately 72.7% of the population lives in urban areas.[8] Migration from rural to urban areas has been constant with urban population increasing 17% in the last 50 years. This reflects the change from agriculture to other activities and displacement due to violence brought on by internal conflicts and insurgent groups.[7] Ninety-six percent of the population has access to electricity, almost 80% have access to a sewage system.[4] Although 86.5% of the population (30-50% in rural areas)[7] have access to drinking water, 30% do not have access to drinking water of good quality.[9]

Approximately ten percent of the total population is illiterate (7.4% and 20% in urban and rural areas, respectively).[4] Primary school enrollment rate is 82.7% for males and 83.7% for females.[8] By 2005, the mean number of years of education for women 15 to 49 years of age was 8.6, 3% did not have formal education, 23% had finished high school, and 20% had some college education.[3]

Between 80% and 90% of the population are Roman Catholic and the rest are Protestants. The official language is Spanish, and only Amerindian inhabitants speak native languages. Although Colombia does not systematically collect information about race, nearly 58% of the population is *Mestiza* (descents of white and Amerindians), approximately 20% are whites, 14% are mulattos (black and white ancestry), four percent are black, three percent are *Zambo* (black and Amerindian ancestry), and although there are almost 100 different Amerindian groups, only one percent of the country's population is Amerindian.[7, 10] Blacks and mulattoes live mostly in the Caribbean and Pacific regions, *Mestizos* and whites reside mainly in the Andes region, and Amerindians are usually located in isolated areas around the country.[7]

Economy, Government, and Political Situation

Economy

Colombia produces a variety of agricultural products such as coffee, flowers, bananas, palm oil, rice, tobacco, corn, sugarcane, and cocoa beans, among others. It also has energy resources and minerals, for instance coal, copper, emeralds, gas, gold, hydropower, and petroleum. There are industries such as textiles, food processing, oil, garments, chemicals, beverages, cement and gold. The country exports some of these raw and processed products, and imports others including: industrial and transportation equipment, consumer goods, chemicals, paper products, and fuel.[11]

The per capita Gross Domestic Product (GDP) for Colombia in 2005 was US$2,673 as compared to US$42,000 in the United States.[12] That same year, the public debt was estimated to be 49.5% of the GDP.[11] Moreover, around 49% of the population lives below the poverty line,[11] and the Gini coefficient (0.58), a measure of income inequality (zero: perfect equality, one: perfect inequality), reflects big inequalities, which occur particularly in urban areas.[3] Unemployment rates have fluctuated considerably in the last years, estimated at approximately 10% in 1996, almost 21% in 2000,[3] and 12.9% in 2006.[13]

Government

Colombia is a multiparty democracy with a central government, and three branches: executive (President-head of government), legislative (bicameral Congress), and judicial (Supreme Court, Constitutional Court, Council of State, and Superior Judicial Council). The country has 32 administrative divisions (departments), and Bogotá

-district capital. The Caribbean region has 8 departments, 4 departments constitute the Pacific region, 12 the Andes, 4 the *Orinoquía*, and 4 the *Amazonía*.

Political Situation

Even though Colombia has had a democratic government for more than a century, internal conflicts have been constant. In fact, the last 50 years have been marked by continued armed conflict.

The work of the health care sector has also been affected by conflict. Health care workers, especially in rural areas, are sometimes forced to provide services to armed groups and may be targeted because they have been seen "helping the enemy". These workers suffer from assassinations, kidnapping, or displacement from their work places. In some areas affected by the conflict, the armed groups have also blocked the provision of medical supplies and have interfered with public health initiatives, such as vaccination campaigns. As a consequence, many rural citizens experience greater difficulty receiving adequate health care locally, and in many cases have been forced to travel long distances to obtain it.[14]

Socio-Cultural Issues and Women

Violence and economic instability are bringing an array of serious social problems that have been faced primarily by women and children. Some of these issue are societal discrimination against women and indigenous people, violence against women, child abuse, trafficking of women and girls, child labor and child prostitution, and displacement of rural populations.[7]

In Latin America, despite the rising frequency of female-headed households, the structure of the typical family is patriarchal. This has contributed to women's

subordination and perceived inferiority[15] and furthers the double standard surrounding women's and men's sexuality that has been present for quite some time.[16] For example, until 1974 female adultery but not male adultery constituted grounds for separation.[17]

Basic Health Indicators, Health Policy, Health Care System and Coverage

Basic Health Indicators

Life expectancy at birth in 2004 was 68 and 77 years for males and females respectively. The lower life expectancy for men is in part a reflection of their higher adult mortality (226/1,000 versus 93/1,000 for women) due largely to violent deaths.[18] In 2004, the infant mortality rate was 18/1,000, and the under-five mortality rate was 24/1,000 for boys and 17/1,000 for girls.[18] Infant mortality is higher in rural areas and among children of women with little to no education.[3]

Colombia has one of the highest mortality rates in the world due to homicide. By 2002, homicide in Colombia was the first cause of mortality with a rate of 84.6/100,000 inhabitants,[19] as compared to 2.9 in high income countries and 10.1/100,000 in low and middle income countries.[20] Heart disease is the second cause of mortality in the Colombian population followed by stroke, respiratory diseases, diabetes, and motor vehicle accidents.[18]

In 2005, the fertility rate was 2.4 (2.1 and 3.4 in urban and rural areas) and about 94% of deliveries were attended by physicians.[9] Even though the fertility rate is not high, and a large percentage of deliveries are attended by physicians, the maternal mortality ratio is quite high (84.4/100,000[9] live births compared to 17/100,000[21] live births in the United States). The main causes are eclampsia; complications during pregnancy, delivery and post-partum; abortion, and hemorrhage.[22] The use of contraceptive methods by

women of reproductive age is 56.4%. However, for sexually active women this ranges from 78% to 81%.[9]

Health Policy

In 2004 the total health expenditure (THE) as a percentage of the GDP was 7.8, and the THE per capita was US$170 ($568 international dollar rate- hypothetical unit of currency that has the same purchasing power that the U.S. dollar).[23] In terms of human capital, the ratio of physicians and registered nurses was 129 and 239/100,000 inhabitants respectively[9] as compared to 279.8/100,000 physicians and 807.4/100,000 registered nurses in the United States.[24]

Before health care reform in 1993, the health care system was characterized by inefficient and poorly targeted subsidies, and strong market segmentation. Consequently only about 20% of the population benefited from adequate health care coverage through private insurance. Accessing the public health care system before 1993 was not easy. It was mainly financed by public funds and out-of-pocket expenses, and most benefits went to those in the middle and high income brackets. Additionally, the low income population paid proportionately more out-of-pocket expenses than others for services received at both public and private facilities.[25]

Before 1993, the private health care sector played an important role in the health care sector. According to 1992 estimates, although only 20% of the population carried private insurance, almost half of all hospitalizations and health-related interventions took place within private sector facilities and institutions.[25]

By 1993, public dissatisfaction with health care had reached a critical level, and a health care sector reform was mandated by Law 100. This law created the General Health

and Social Security System. This system encompassed coverage for occupational risks, a broad pension plan, complementary social services, and the health and social security system, which included all public health programs. The Law also established basic investment priorities for the municipalities: 25% to health; 30% to education; 20% to drinking water; five percent to physical education, recreation, culture and sports; and the remaining 20% at the discretion of the mayor.[26]

Health Care System and Coverage

Regarding the health sector component of the reform package, two important characteristics can be noted. First, with this reform lawmakers intended to provide health care for all Colombians, particularly the poor. Secondly, the law created a new system for financing and delivering health care through structured competition made up of two health care coverage regimes: the contributory and the subsidized. Under the contributory model, employees would select a provider network with the cost split between employees and employers. Contrastingly, the poor would not be required to make contributions and would be covered under the subsidized regime. The subsidized regime would receive financing from a portion of the contributions paid into the contributory regime. Both regimes would have a basic benefits packages and the contributory regime would include all levels of care. The subsidized regime, however, would be supplemented with services provided by the public sector and supported by existing subsidies. According to the law, at some point, both regimes would offer the same services.[25] In order to benefit the more vulnerable groups, enrollment in the subsidized regime gives priority to children, single mothers, the elderly, the handicapped, and the chronically ill.[25]

In summary, the health care system in Colombia has two main regimes for financing and delivering health care. The subsidized regime which serves the poorest and the contributory regime which serves the working population, their families, and the retirees.

Health Care System and Coverage Today

Ten years after the reform, about 70% of the population had some kind of health insurance.[9] Insurance coverage increased from 60% to 81% for high income individuals, and from 9% to 48% for the low income groups.[25]

Currently, Health Promotion Entities (EPS, Spanish acronym) are in charge of enrollment of the population in the contributory regime. There are around 30 EPS, and beneficiaries are free to choose any of them. Some EPS are private and some are public, the main public EPS is the Social Security Institute (ISS, Spanish acronym).[27] Before the health care reform in 1993 some companies enrolled various government employees (Army/Police, ECOPETROL, teaching professionals, and Foncolpuertos), after the reform they were allowed to continue and are known as Entities Adapted to the System, technically these companies have populations enrolled in the contributory regime. However, they are considered to be part of a special regime.[27]

The Administrator Entities of the Subsidized Regime (ARS, Spanish acronym) are in charge of the enrollment of the population in the subsidized regime. Among these companies are the Health Supportive Entities (ESS, Spanish acronym), some EPS with special authorization, and Family Compensation Funds. The EES are specially focused on remote areas and small municipalities.[27]

Even though the reform has contributed to increased health care coverage, the system needs improvement. The country still has approximately 13 million people without health care coverage, and disparities between low income and high income individuals are present. For instance, low income individuals face relatively higher mortality rates than high income individuals.[7] Due to higher demand, another challenge is the quality of services, which needs to be improved particularly for the subsidized regime. Decentralization of health systems at the local and intermediate level has not been well coordinated. Institutions have worked in isolation and there has not been an adequate transfer of financial and technological resources.[26] Moreover, corruption in the health sector is widespread. Evasion of monetary contributions and misappropriation of funds are common.[7]

The snapshot of the country presented above provides a basic understanding of the context of this study and attempts to help the reader to better comprehend some of the factors, such as the demographics characteristics of the population and the health care system in Colombia that can influence follow-up of cervical cancer screening in Colombia.

Cervical Cancer

Incidence and Mortality

Cervical cancer is the second most common cancer among women worldwide, and in many developing areas of the world such as the Caribbean, Central America, South-Central Asia, and many parts of Africa it is the most frequent.[1]

In Colombia, cervical cancer is the most common cancer among women, and its incidence is higher than the incidence in all of South America. In 2002, the age-

standardized incidence and mortality rates in South America were 28.6/100,000 and 12.9/100,000 respectively, and in Colombia were 36.4/100,000 and 18.2/100,000.[1] Even though in the last three decades the incidence of cervical cancer has been decreasing in Colombia (Figure 1), when these rates are compared with rates in developed countries, like the United States, the differences are overwhelming. For the same time period, in 2002, the United States' incidence rate was 7.7/100,000 and mortality rate was 2.3/100,000.[1, 28]

Figure 1 also reflects incidence gaps that can be found within a country. In the United States for example, the incidence of cervical cancer among Hispanics is higher than for non-Hispanic white women. According to the U.S. National Cancer Institute, for the period between 2000 and 2003 the incidence of cervical cancer among Hispanics was 14.2/100,000 as compared to 7.3/100,000 among non-Hispanic white women.[29]

But the gaps are not seen by only race or ethnicity. Cervical cancer incidence and mortality are higher among low income and low educated women regardless of their race or ethnicity.[30, 31] In the United States, the incidence rates among Hispanics and non-Hispanic whites were 83% and 97% higher in high poverty census tracts as compared to low poverty census tracts.[3] Further, the incidence was almost two times higher in low education census tracks than in high education census tracks.[3] These findings agree with worldwide studies. Based on a pooled analysis of 57 studies, Parikh and colleagues found that there was an increased risk of almost 100% between rich and poor women for the development of invasive cervical cancer.[4]

In Colombia, the cervical cancer age-specific incidence rate has a peak among women 60 to 64 and 75 or over.[32] Additionally, incidence and mortality rates are higher in developing regions.[33]

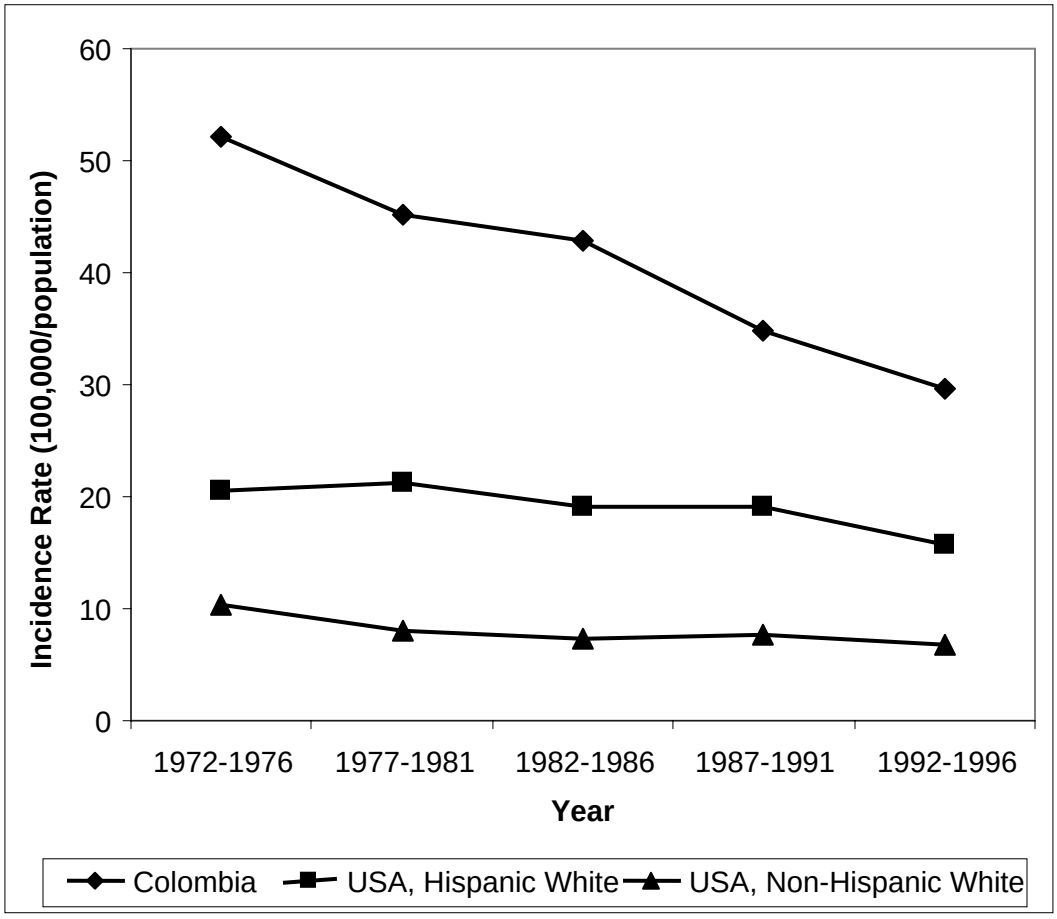


Figure 1. Cervical cancer age standardized incidence rate (world) Age: 0-85+[34]

The significance of cervical cancer is also assessed by the impact of the disease in societies. Women affected by this disease are usually in their productive years, often taking care of offspring or elderly relatives. Losing life quality or life itself affects the economy of the countries, and this is even more critical in developing regions. Worldwide, cervical cancer accounts for approximately 2.7 million years of life lost among women between 25 and 64, and only 0.3 million of these losses occur in more

developed countries.[35] In Latin America and the Caribbean, cervical cancer is the most significant cause of years of life lost.[35]

Governments, health care systems, and individuals invest large amounts of resources in diagnosing and treating a preventable disease such as cervical cancer. In the United States a woman diagnosed with cervical cancer spends, on average, between $20,000 and $26,000 U.S. dollars.[36, 37] Estimates in five developing countries (India, Kenya, Peru, South Africa, Thailand), found that the cost of diagnosis and treatment of invasive cervical cancer per person may vary from $1,445 to $4,658 U.S. international dollars.[38] Those estimates do not take into account indirect costs such as, time lost at work and child care costs. Accordingly, it is suggested that some estimates greatly exceed the direct medical costs associated with cervical cancer.[37] In the United States, the total estimated direct medical costs associated with cervical cancer are between $300 and $400 million and the indirect costs between $1.3 and $1.9 billion.[37, 39]

Etiology

The etiology of cervical cancer has been one of the most important findings on the cancer arena in the last 25 years. In the 1980's and 1990's molecular and laboratory studies associated certain types of Human Papilloma viruses (HPV) as a causal agent of cervical cancer.[40-42] Currently, approximately 200 types of HPV have been identified, and it has been found that approximately 40 of those affect the anogenital tract.[43] The multicenter case-control studies done by the World Health Organization's International Agency for Research on Cancer (IARC) provide a classification of the oncogenicity of the different HPV types. Fifteen HPV types are considered high risk (16,18,31,33,35,39,45,51,52,56,58,59,68,73, and 82); HPV 26,53, and 66 are probable

high risk types; and 12 HPV types are low risk (6,11,40,42,43,44,54,61,70,72,81, and CP6108).[44] HPV infection is sexually transmitted and is very common among sexually active individuals. Worldwide, the age standardized prevalence for any HPV is 26% in sub-Saharan Africa, 14% in South America, 9% in southeast Asia, and 5% in Europe.[45] Two to 44% of sexually active women have asymptomatic HPV infection.[46] There are regional variations, but HPV 16 is the most common type worldwide. The second most common types in Asia, South America, and Europe are 33, 58, and 31 respectively.[45]

Retrospective and prospective epidemiologic studies have shown indisputably strong evidence for the association between HPV and cervical cancer.[47] It is well established that the principal cause of cervical cancer is the infection associated with high risk types of HPV.[48, 49] Analysis from a large number of tumor specimens around the world have shown that HPV DNA is present in at least 95% of invasive cervical cancers.[48-50] Human Papilloma Virus 16, and 18 are found in approximately 65% of invasive cervical squamous cell carcinomas (SCC), and cervical adenocarcinomas around the world.[51] It has been found that in many cases, genital HPV infection is intermittent, and women who develop persistent, long term infections with oncogenic types of HPV have an increased risk of cervical intraepithelial neoplasm (CIN).[52-54] According to a review by Bosch and Muñoz, numerous case control studies show that the odds ratios for the association between HPV and cervical cancer go from 10 to 100 and even higher.[55]

It is suggested that certain viral characteristics of the HPV, such as viral load, play a role in carcinogenesis. Many studies point to a relationship between the level of HPV DNA and oncogenic lesions, and the persistency of HPV infections.[47, 56-63] For instance, Tirado-Gomez et al., found that there is a significant trend with the increase of the viral

load and invasive cervical cancer, with odds ratios from 46.6 for low viral load, to 250.7 for intermediate, and 612.9 for high load.[63]

It has been suggested that there are certain cofactors that play a role in cervical tumorigenesis, and that HPV infection alone may not be sufficient for the development of cervical cancer. Cofactors that have been identified or are currently being studied are high parity (i.e., seven or more pregnancies), long term use of oral contraceptives (i.e., five or more years), cigarette smoking, infections with Chlamydia Trachomatis and Herpes Virus type 2, co-infection with HIV, nutritional factors, and host susceptibility traits.[47, 55, 64-67]

Cervical Cancer Screening

The most widely used screening test for the early detection of cervical cancer is the cervical smear, introduced by George Papanicolaou in 1941.[68] It is well established that screening for cervical cancer along with adequate treatment can achieve important reductions in incidence and mortality rates.[69] The experience of Nordic countries is a good example of the association between the proportion of the population screened and declining cervical cancer incidence and mortality rates. Countries such as Finland and Iceland that started screening during 1960s saw sharp reductions of cervical cancer, whereas Norway and Denmark that started later (1980), or more gradually, did not see that reduction until later.[70] The reduction of cervical cancer incidence in Colombia in the seventies coincides with the introduction in the country of Papanicolaou smear (Pap smear) in the early seventies.

Despite the fact that the Pap smear has been a remarkable tool for the prevention of cervical cancer, it has a false-negative rate between 15% and 25% for detecting

cervical dysplasia.[71, 72] Sampling error is responsible for almost two thirds of false-negative results, and detection error accounts for the rest.[73] According to a systematic review by Nanda et al., based on the least biased estimates, sensitivity of the test range from 30% to 87%, and specificity range from 86% to 100%.[73]

In the 1990s, in an attempt to reduce the number of false-negatives, new techniques such as the liquid-base sampling technology was developed. With this technique the sample is collected in the same way as in the traditional Pap smear, but the sampling device is placed in a liquid medium, and then analyzed using specific techniques such as Thin-Prep™ (Cytyc Corp., Boxborough, MA)or AutoCyte PREP™ (TriPath Imaging, Burlington, NC). AutoCyte PREP has shown an improvement of 31% in the detection of dysplasias and invasive cancer.[74] There has also been a reduction of 39% on "unsatisfactory" slides and 44% fewer "satisfactory but limited by" reports.[75]

Moreover, to reduce detection error, and therefore to increase the sensitivity of the Pap smear, computer-assisted image analysis and artificial intelligence for screening or re-screening have been introduced through AutoPap System (Neopath,Inc. Redmond,VA), and PapNet (PapNet, NetMed Inc, Columbus, OH).[73, 75]

In regards to the frequency that Pap smear test should be performed to effectively prevent cervical cancer, quantitative studies have demonstrated that after one normal Pap smear among women aged 35 to 64, screening once every three to five years accomplishes about the same effect as screening every year.[70]

Given the role of HPV in the development of cervical cancer, HPV DNA testing would be a logical test to identify women that need aggressive versus conservative treatment and/or follow-up. In a recent study by Goldie et al., it is reported that screening

women once, at age 35, or twice, at 35 and 40 years, with a HPV DNA test can achieve more cost-effective reductions in cancer than the conventional Pap smear.[8]

In developing countries many of these techniques or systems are difficult to implement due to low resources. Therefore, researchers have looked for other alternatives such as the visual inspection with acetic acid application (VIA). This technique can be performed by trained health workers, and have shown to have either slightly more sensitivity and less specificity, or comparable sensitivity and specificity with those of cytology.[38, 76-78] Goldie et al., reported the sensitivity between 60% and 90% and the specificity between 66% and 96% for VIA.[8]

Finally, the current guidelines for screening of cervical cancer vary as to whether or not we are talking about low-resource settings. The World Health Organization (WHO) recommends that countries with limited resources should try to screen every woman between the ages of 35 and 40 years of age with the Pap smear once in her lifetime.[70] And, when more resources are available, screening should take place every ten years, and then every five years for women 35 to 55 years of age.[70] If resources are available, and 80% of women aged 35-40 have been screened once, women aged 30 to 60 should be screened every ten years, and then every five years.[70] Screening younger women is recommended only when the earlier targets are achieved. Screening women younger than 25 has not shown major benefits.[70]

In the United States, the latest guidelines from the U.S. Preventive Services Task Force recommend that screening with Pap smear should begin within 3 years of the beginning of sexual activity or at the age of 21, and if tests are normal should be done at least every three years until the age of 65.[79] According to the American Cancer Society,

screening should be done every year with the regular Pap test or every 2 years using the newer liquid-based Pap test. Beginning at age 30, women who have had 3 normal Pap test results in a row may get screened every 2 to 3 years. Another option for women over 30 is to get screened every 3 years with either the conventional or liquid-based Pap test, plus the HPV DNA test.[80]

In Colombia, the target for screening is sexually active women 25 to 69 years of age. If screening is normal two consecutive years, subsequent Pap tests must be performed every three years if they continue to be normal.[81]

Follow-up of Cervical Cancer Screening

Worldwide, in developed and developing countries, rates of nonadherence with follow-up of abnormal Pap smear results are not consistently collected.[82] According to a review conducted by Khanna and colleagues, the rates vary from less than 10% to more than 40%.[82]

In Colombia, once the Pap smear is performed, women are asked to return to the clinic or laboratory to obtain their results. If results are abnormal, they are asked to have a follow-up visit where they are informed of necessary follow-up or treatment. In the United States, on the other hand, women do not need to go back to obtain the results of the test. They will either receive a letter or phone call telling them to continue regular screening or to have a follow-up visit if abnormalities are found. Some providers do not even contact women if results are normal.

In Colombia, it is recommended that regardless of the result of the Pap smear test, health care providers should call the women to inform them that the results have arrived. However, results are not given by phone. If results are abnormal and patients cannot be

reached by phone after two attempts within five days, a domiciliary visit is recommended.[81] Nevertheless, current practice does not follow these recommendations. Calling every woman to let her know that the result arrived is virtually impossible in most places. Even calling or visiting women with an abnormal result is, in numerous cases, very difficult to accomplish given the limited personnel, incomplete medical records (e.g. not reporting of phone number or address), patients' frequent changes of place of residency and phone number, and high cost of calling to mobile phones, which are rapidly becoming the only phone number many people have.[83, 84]

To summarize, in the Colombian context, in order to know the results of cervical cancer screening and have a diagnosis when necessary, women will need to comply with two behaviors. One is to obtain the results of the test, and the second is to have a follow-up visit when results of the test are abnormal.

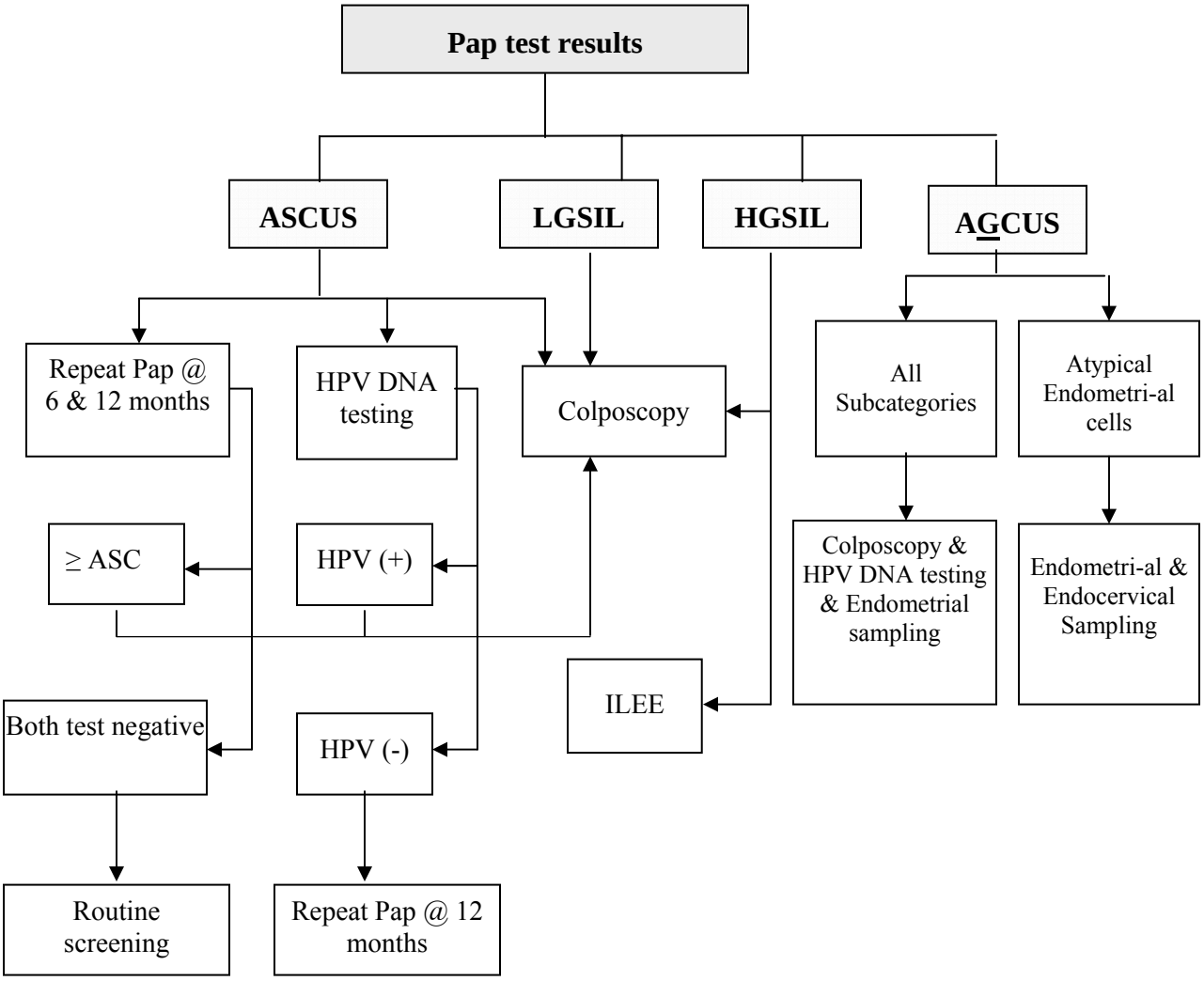
Follow-up of Abnormal Pap smear Results

Figure 2 depicts the algorithm for follow-up of abnormal results in the United States. The management of Atypical Squamous Cells of Undetermined Significance (ASCUS) for women 20 and older includes any of the following strategies: HPV DNA testing for high-risk types, repeat Pap smear, or colposcopy. Women with ASCUS who have a negative HPV test can be followed up with a Pap smear at 12 months. Those with HPV positive test should be referred to colposcopy. When a program of repeat Pap smear is used for managing women with ASCUS, Pap smears should be performed at 6-month intervals until two consecutive negative results are obtained. If abnormalities are found a colposcopy is recommended, if both test are normal, women can return to routine screening.[85]

Women with Low-Grade Squamous Intraepithelial Lesions (LGSIL) are recommended to have a colposcopy. An immediate loop electrosurgical excision or colposcopy with endocervical assessment is indicated for managing women with High-Grade Squamous Intraepithelial Lesions (HGSIL). Colposcopy with endocervical sampling and HPV testing is recommended for women with all subcategories of Atypical Glandular Cells of Undetermined Significance (AGCUS). It is recommended that women with atypical endometrial cells are evaluated with endometrial and endocervical sampling. Based on colposcopy outcomes different treatment options are available.[85]

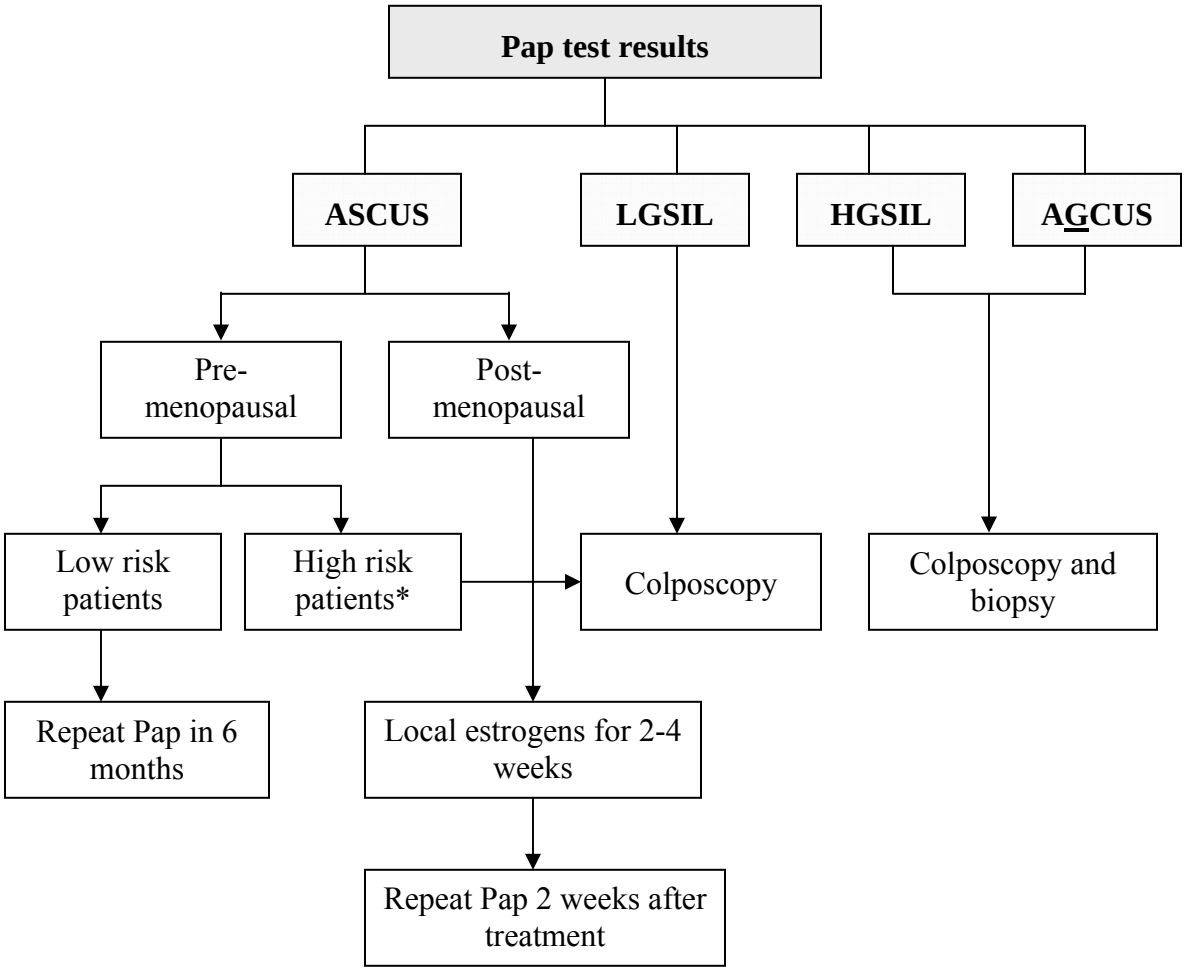
Guidelines for follow-up of abnormal results in Colombia are depicted in Figure 3. The management of ASCUS is guided by whether the woman is pre or post-menopausal, if she is pre-menopausal and has low risk is given medical treatment if indicated, and a new Pap was performed 6 months later. If she is pre-menopausal and has high risk, a colposcopy is indicated. High risk women are: 35 and older without previous Pap, previous Pap more than 3 years ago, with history of HPV or Intraepithelial Lesions, difficult follow-up, sexual activity onset before 17-18 years of age, with multiple partners, or immunosuppressed. Post-menopausal women will receive local estrogens during 2 to 4 weeks and a colposcopy 2 weeks after the treatment.[81] Women with LGSIL will have a colposcopy, and women with HGSIL or AGCUS will have a colposcopy and a biopsy of exocervix and endocervix.[81] Colposcopy and biopsy results will define the treatment options.

Figure 2. Guidelines for follow-up of abnormal Pap test results in the United States[85]



ASCUS= Atypical Squamous Cells of Undetermined Significance
LGSIL= low-grade Squamous Intraepithelial Lesions
HGSIL= High-grade Squamous Intraepithelial Lesions
AGCUS= Atypical Glandular Cells of Undetermined Significance
ILEE= Immediate Loop Electrosurgical Excision

Figure 3. Guidelines for follow-up of abnormal Pap test results in Colombia[81]



*Women: 35 and older without previous Pap, previous Pap more than 3 years ago, with history of HPV or Intraepithelial Lesions, difficult follow-up, sexual activity onset before 17-18 years of age, with multiple partners, immunosuppressed.

Cervical Cancer Screening and Health Care Coverage

Resolution 412 of February 25, 2000 established that the contributory and subsidized regimes administrators are required to take actions to prevent cervical cancer. This resolution also defined the technical norms and clinical guidelines for early detection and treatment of cervical cancer. In regards to diagnosis and treatment, except

for minimum periods of enrollment for certain services in the contributory regime, there are no differences between the contributory and subsidized systems. In both health care regimes, colposcopy and biopsy do not have co-pays; and surgical treatments, chemotherapy, and radiotherapy are included in the benefits. Women without any health care coverage who are unable to pay, may receive government subsides if available.[81]

In the contributory regime, women can access the Pap smear free of charge four weeks after enrollment. In the subsidized regime there is no minimal waiting period of enrollment.[81] If a patient in the contributory regime needs chemotherapy or radiotherapy, she needs to have been enrolled for 100 weeks and 52 weeks to qualify for surgical treatment.[81] If she has not participated for the required number of weeks, she needs to pay a percentage of the total cost.[81] Women in the subsidized regime do not need a minimum number of weeks.[81] If a woman is enrolled for 6 months or more and losses her job, her coverage will continue 4 or 12 more weeks depending on how long she was enrolled.[81] Regardless of the presence and type of health care enrollment, specialist referrals and non-oncologic surgeries have co-pays based on a sliding scale.[81]

There is disarray in the health care system in Colombia. Even though there is vast knowledge about cervical cancer and its prevention, hundreds of Colombian women suffer every year from this disease, in part because of lack of screening and follow-up. For example, after getting the Pap smear women may need to make a minimum of three visits to the physician just to get a diagnosis. It can also be seen that women who undergo a colposcopy in one place may be referred to another place for a biopsy. The process could easily take 6 months.[83, 84] A lack of providers, long lines, waiting for authorizations from the ARS or EPS may also be part of the problem.[83, 84] The solution to the high

incidence and mortality of cervical cancer in Colombia is not a simple one. The goal of this study is to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening among Colombian women.

Review of the Literature

To facilitate achieving of the goal of this study, relevant literature was researched to identify studies that examined factors, predictors, or barriers associated with follow-up of cervical cancer screening among Hispanics in the U.S. and in Latin America.

In December 2007 PubMed searches, unrestricted by year, were conducted to identify articles exploring follow-up of cervical cancer screening results among Hispanics/Latinas. Fifty citations were found, search terms used and the number of citations obtained under each term are listed in Table 1. Related links of retrieved articles were also accessed. Only papers in English and Spanish were included in the search. Articles were included if they discussed factors associated with follow-up of cervical cancer screening among Hispanics/Latinas. Articles were excluded if they focused on: cervical cancer treatments, adherence to specific treatments, and interventions that did not assess factors associated with follow-up. To facilitate the search these initial inclusion and exclusion criteria were determined by looking at the titles and abstracts of the articles. Fifteen studies met the initial inclusion criteria. An update of this search was done in February of 2009 and no new articles meet the inclusion criteria.

Afterwards, Journal Storage (JSTOR), another database, was searched using the same terms and inclusion and exclusion criteria used in the PubMed search. This search generated 119 articles. After checking the inclusion and exclusion criteria, only two of the citations had not been identified earlier using PubMEd. SCIELO, an online library

hosted by the Pan American Health Organization that contains public health journals from Latin America and Spain were also searched using the same terms. No new articles were found.

Table 1. Summary of PubMed Search Strategy.

	Search Term	*Retrieved by PubMed*
#1	Hispanic	20,559
#2	Latino or Latina	15,987
#3	#1 OR #2	22,034
#4	"Mexican American"	2,207
#5	#3 OR #4	22,544
#6	"vaginal smears"	17,497
#7	Papanicolaou	5,013
#8	"Pap smear"	2,355
#9	"cervical cancer"	17,739
#10	"cervical cancer screening"	1,933
#11	#6 OR #7 OR #8 OR #9 OR #10	35,469
#12	"Follow-up"	629,310
#13	"Abnormal Pap"	524
#14	Adherence	51,130
#15	#12 OR #13 OR #14	677,211
#16	#11 AND #15	4,165
#17	#5 AND #16	59
#18	#17 AND following limits: English,Spanish,humans	55

In total, 17 articles were identified and reviewed in full. The initial inclusion and exclusion criteria were corroborated. Additionally, studies in which the results did not distinguish between Hispanics and other populations were excluded. Bibliographies of the retrieved articles were also accessed. Only four manuscripts met the inclusion and exclusion criteria. Standard data on study design and results were extracted from each of these studies, then summarized and organized by year of publication (Table 2).

All the literature found on follow-up of cervical cancer screening corresponded to Hispanics in the U.S. Publications on the topic of Colombia or other Latin American

countries were not found. Therefore, the knowledge on factors associated with follow-up of cervical cancer screening in Hispanics is based on the findings of Hispanics in the U.S. The following section, along with the summary table (Table 2) provides an overview of the findings that will serve as the basis for the conceptual model of the study.

The other three studies were quantitative. In 2001 Cardin et al., a study with a larger sample size did not find significant associations between follow-up of abnormal results and Latino ethnicity.[86] Similarly, in 2002, among a sample of insured women, Nelson et al., found that there were no associations between delays in care for abnormal Pap smears and race or ethnicity.[87] In general, women who delayed care had more fatalistic views about cancer, and endorsed more misconceptions about cervical cancer.[87]

Finally in 2004, Breitkopf et al., explored the potential barriers to follow-up in a group of women who were seeking routine gynecologic care.[88] The barriers mentioned by the Hispanic women in the sample were embarrassment and an absence of a support system, family, or children. The primary limitation of this study is that it did not explore barriers in a group of women with current abnormal results. It instead asked for potential barriers in the event of an abnormality. Even though these women were not included based on a current abnormality, 60% of them have had an abnormal Pap smear result.

Women in the United States

The information regarding follow-up among Hispanics is limited. Thus, a 2007 summary is presented for the findings of a systematic review paper of barriers to follow-up care for abnormal Pap smears in the U.S. for all race/ethnicities.[89]

Table 2. Factors Associated with Follow-Up of Cervical Cancer Screening Among Hispanics in the U.S.

AUTHOR/JOURNAL	STUDY DESIGN/YEAR	SAMPLE SIZE AND TARGET POPULATION	RESULTS
Hunt et al.[90]	Descriptive, qualitative	N=11 Low-income Mexican-American women 40 and older who had at least one abnormal Pap test	**Motivators to receive follow-up for abnormal Pap test:** • Knowledge of recommendations for screening • Encouragement/support from family and friends • Wanting reassurance of being healthy • Wanting to take care of self • Low-cost/free services • Clinic easy to get to • Reminders • Professional, efficient, and courteous staff • Female practitioners for pelvic exams **Barriers to receive follow-up for abnormal Pap test:** • Not wanting bad news • Clinic scheduling difficulties • Staff leaving phone and written English messages • Time issues • Staff giving mixed messages about seriousness of abnormal results • Male practitioners for pelvic exams • Dirty, unpleasant clinic
Cardin et al.[86]	Retrospective 02-96/08-2000	N=1,216 women referred for evaluation of abnormal Pap smears Hispanics 60.6% African Am.35.9% Other 3.5%	• African American women were 53% less likely to accept an appointment and 45% less likely to show up for the appointment than Hispanics. • Factors such as age, co-existence of a sexually transmitted disease, number of prior referrals, type of patient visit, and health center attended were no statistically significant associated with follow-up among Hispanic women.

Table 2. (continued)

AUTHOR/JOURNAL	STUDY DESIGN/YEAR	SAMPLE SIZE AND TARGET POPULATION	RESULTS
Nelson et al.[87]	Retrospective 10-98/10-99	N=733 women aged 18 or older with an abnormal Pap smear (all women had health insurance) Hispanics 51% White 24% African Am.13% Asian 12%	Respondents who agreed that "a woman can tell if she has cervical cancer without going to the doctor" and "a woman needs a Pap smear only with abnormal bleeding", and had more fatalistic views about cancer were more likely to delay care. Delays were not independently associated with race and ethnicity.
Breitkopf et al.[88]	Cross-sectional. Face to face interviews 05-2001/08-2001	N=120 low-income women aged 25-50 years who presented for routine gynecologic care. African Americans, Hispanics, White (n=40 each group)	**Motivators to follow-up:** Hispanic women mentioned that the opinion of the mother, followed by the opinion of "mate or spouse" encouraged follow-up. Also, taking care of oneself to live longer and benefit others. **Barriers**: Hispanics mentioned absence of a support system, family, or kids, and embarrassment.

The review includes 14 analytical and 12 experimental peer-reviewed studies published between 1990 and 2005. Results are presented according to women characteristics, psychosocial factors, and health care characteristics.

Women's Characteristics

Age: Younger and older women were less likely to receive follow-up care.[91]

Race/ethnicity: In general, African American women were less likely to adhere to follow-up care than White women.[86, 92-94] Only two studies found that Hispanics were significantly less likely to adhere to follow-up than white and African American women.[94, 95]

Place of residence: Living in an urban area was significantly associated to nonadherence,[95] whereas, proximity to clinic was not.[96]

Education: Only one out of five studies investigated that addresses the association between education and follow-up found that women with less than high school education were less likely to return for follow-up care.[94]

Tobacco use: The association between smoking and follow-up is not clear. One study shows that nonsmokers are more likely than smokers to not delay follow-up,[97] but another study shows that there is no differences between smokers and nonsmokers.[98]

Income/insurance/cost of follow-up: Results are contradictory in this area. Some of the studies reported that women with higher income[99] or private insurance[94, 96, 100] were more likely to adhere to follow-up. In contrast, a study found that, as compared to women with insurance, women with no insurance were more likely to have a follow-up visit in six months.[101]

Knowledge of Pap test: Knowledge about the Pap test was positively associated with adherence to follow-up.[87, 102-104]

Lesion severity: Women with less severe lesions were less likely to adhere to follow-up recommendations.[92, 95, 96]

Psychosocial Factors

Psychological barriers: Intervention studies addressing barriers such as fear of finding cancer, worries about examination/treatment, and fertility concerns, resulted in significant differences in adherence. Women in intervention groups were more likely to adhere to follow-up than women in control groups.[93, 102, 104, 105]

Social support: Women with a live-in relationship[106] or those with any type of social support[103] were more likely to follow-up within four to six months than those without social support.

Health Care Characteristics

Patient involvement/communication: Discussion of follow-up options and communication between clinicians and patients were associated with follow-up.[91, 107]

Healthcare facility/clinician specialty: A study reported that clinics with colposcopy on-site had higher follow-up adherence rates.[107] Another study showed that there were no differences between public hospitals and private practice in terms of follow-up.[108]

In conclusion, it is evident that demographic, individual, and healthcare system factors influence the follow-up of abnormal Pap tests. This is a rather complex relationship and is often inconsistent. Results about the influence of race, income, health insurance and age on Pap smear follow-up contradict each other. On the other hand,

findings regarding lesion severity, psychosocial factors, and patient communication have shown to be more consistent.

There is limited research about factors associated with follow-up of cervical cancer screening among Hispanics in the U.S., but there are numerous studies that explore factors associated with cervical cancer screening among Hispanics. Even though screening and follow-up are two different behaviors, the literature shows that both have factors in common. A summary of the findings on cervical cancer screening among Hispanics is presented below.

Factors Associated with Cervical Cancer Screening

The literature shows that cervical cancer screening is affected by structural, cultural, personal, and socio-economic factors.

Women with lower income have been found to be less likely to get screened than women with higher income. In the United States, poverty level is based on family income and size. Approximately 71% of women below 200% of poverty level get Pap smears versus 86.9% of women above 200% of poverty level.[109] There are also differences by education level, 64.9% of women without high school had a Pap smear within the past three years as compared to 75.9% and 86.2% of women with high school, and some college or more, respectively.[109] Similarly, 66.6% of uninsured women had a Pap smear within the past three years as compared to 86.4% of insured women.[109]

Hispanics in the United States

Structural, cultural, and personal factors also impact cervical cancer screening. It has been suggested that these issues act synergistically rather than in isolation.[110] Cultural

and personal factors associated with cervical cancer screening among Hispanics in the U.S. include: procrastination, embarrassment, fatalism, fear that cancer was diagnosed, fear of the exam, lack of symptoms, acculturation, literacy, knowledge about cervical cancer screening, partner's opposition, putting family's needs above one's own, marital status, and age.[111-164] For example, getting a Pap smear is higher among married women than single women and decreases with age, especially after 50 years of age when the need for reproductive health care reduces.[123, 134, 135, 151]

Structural factors included: lack of transportation, language barriers, hours of service, staff attitudes, lack of cultural understanding by staff, isolation, lack of health insurance, lack of usual source of care, and lack of continuity of care.[111-165]

Hispanics in Latin America

Twelve studies were found when examining factors associated with cervical cancer screening among women in Colombia and Latin America. Five conducted in Colombia,[166-170] two in Mexico,[171, 172] one each in Chile,[173] Nicaragua,[174] and Cuba[175],and one multicenter study[176] (Bolivia, Peru, Mexico, Kenya, South Africa). Further, a review of 5 qualitative studies[177] conducted in Venezuela, Ecuador, Mexico, El Salvador and Peru. The factors associated with cervical cancer screening in Latin America were very similar to those found for Hispanics in the U.S.

In regards to Colombia, the cultural and personal factors associated with Pap smear were: age, marital status, education, having a health care visit within the last year, presence and type of health care coverage, putting family needs first, embarrassment, fear of pain, partner's opposition, and lack of social networks, particularly for victims of displacements. Additionally, families of single young women are not supportive of

cervical cancer screening because single women are not supposed to have any sexual activity. Therefore, gynecological exams are perceived as unnecessary.[166-170]

Three qualitative studies conducted in low and medium income women showed similar results.[166, 170, 178] Discomfort or pain, fear of finding cancer, embarrassment, poor services from health care providers, long lines, a large amount of paperwork to get service, and long waiting time to get results ranging from weeks to months were all barriers to regular screening.[166, 170, 178]

According to Lucumi and Gómez, Colombian women appear not to follow the same pattern of screening according age and marital status as Hispanics in the U.S. Separated/divorced or widowed women or women over 50 years of age are not less likely to get screened than younger or married women.[167]

Regarding structural and socio-economic factors, women with health care coverage and regular source of care were more likely to have had a Pap smear within the last three years (OR=1.63, CI: 1.04-2.54 and OR=1.99, CI: 1.27-3.11, respectively).[167] Further, Castro-Jiménez reported that women who use a family planning method that requires a health care visit were more likely to have a Pap smear than women who do not use those methods(OR=1.4, CI: 1.2-1.7).[169]

A recent publication that analyzed the Demographic and Health Survey of 2005 in Colombia, found that women with no health care coverage versus women enrolled in the contributory regime were more likely not to have a Pap smear within the last three years (OR=2.18, $p < 0.01$). Similarly, women in the subsidized regime were more likely not to have a Pap smear in the past three years versus women enrolled in the contributory regime (OR=1.58, $p < 0.01$). No living children versus having living children (OR=2.05, p

<0.01), and no health care visit during the last year as compared to having a visit (OR=3.14, p <0.01) were also associated with whether women were screened. When analyzing the wealth index (measure of the socio-economic level in terms of assets or wealth) it was found that women in the categories poor, medium, rich, and very rich as compared to women in the very poor category were less likely not to have had a Pap smear within the past three years (OR= 0.81, 0.76, 0.68, and 0.55, respectively; p <0.01). Further, women 35 to 44 years of age were less likely not to have a Pap smear as compared to women 25 to 34 years of age (OR=0.83, p <0.01). Finally, women with a college education compared to those with elementary or less education, and women not currently pregnant were also less likely not to have a Pap smear in the previous three years (OR= 0.83, p: 0.02, and OR= 0.76, p <0.01, respectively).[168]

Factors Associated with Follow-up of Other Screening Tests

In Colombia, after the Pap smear is performed, women must return to the clinic or laboratory to obtain their result. Because this is not standard practice in most countries, and because no research exploring obtaining Pap smear results in Colombia or elsewhere was found, research on similar results-seeking behaviors for other type of tests was searched. The most similar literature is about HIV test result seeking behavior. Literature about follow-up of other screening tests such as mammography was searched as well.

Even though cervical cancer and HIV/AIDS are two different conditions, they share some similarities. Both conditions result from viruses that can be sexually transmitted, and both have the potential to cause death. While screening tests for both take little time to administer, in neither case are results usually available the same day. For many people, taking either test can be embarrassing. HIV because of the stigma

associated with the disease and Pap smear because of the intimacy of the process. Among the major differences, we can mention that if detected early, cervical cancer can be cured whereas HIV/AIDS can only be managed. Given the lack of available research about obtaining Pap smear results, we will compare our findings with the literature for obtaining HIV test results in the United States.

In the United States, according to the National Health Interview Survey, 12.5% of individuals who received HIV testing do not return for their results.[179] Age, ethnicity, symptoms at the time of the test, self-initiation of the test, fear of results, and apathy have been mentioned as factors associated with obtaining HIV test results.[180-183]

Galvan and colleagues found that with increases in age the proportion of women obtaining their HIV results was higher.[180] Other studies have not found associations with age.[179, 182]

Hightow et al., reported that African Americans were less likely than whites to return for their results., Also, individuals with symptoms of sexually transmitted infections were less likely to obtain their HIV test results than those without symptoms at the time of the test.[182] As mentioned by some researchers these individuals may be afraid of a positive diagnosis, and avoid seeking the result.[181, 184, 185] In fact, a study by Sullivan and colleagues reported that 25% of individuals at high risk for HIV infection reported fear of test results as a barrier for obtaining their result.[185]

Various HIV studies reported that individuals for whom the test was compulsory, required, or suggested by health care professionals were significantly less likely to seek their results than those who had a self-initiated test.[179, 186, 187]

Only one of the studies found HCC to be associated with obtaining HIV tests results. Lazebnik and colleagues reported that among a sample of adolescents at a free clinic, those with private insurance were more likely to return for their results than those who did not have private insurance.[183]

Breast cancer is the most common cancer and the second cause of death in women in the United States.[188] Given the relevance of this cancer and the limited information found for the follow-up of abnormal cervical cancer screening in the literature, studies regarding follow-up of abnormal mammograms were also explored. Approximately 10% to 15% of women having a mammogram in the United States have findings that require further diagnostic studies, and it is estimated that between 9% to 50% of these women do not return to complete the diagnostic testing.[189-191] Among the factors associated with follow-up of abnormal mammograms are age, ethnicity, education, health status, and insurance.

Strzelczyk and Dignan found that black and Hispanic women were less likely than white women to adhere to follow-up. They also reported that younger, less educated, and uninsured or underinsured women were lees likely to have a follow-up.[190]

Yabroff and colleagues reported that women who reported fair or poor health status were less likely to have a follow-up than those with excellent or very good health. In bivariate analyses, they also found that women without insurance and those who had public insurance were less likely to have a follow-up than women with private insurance.[191]

Allen et al., in a qualitative study found that dissatisfaction in the way the results were communicated, perceived disrespect from the providers to the women, anxiety and fear of cancer were associated with delays in follow-up of abnormal mammograms.[192]

Health Care Coverage, Cervical Cancer Screening and Follow-Up

One of the factors consistently found to be associated with cervical cancer screening is health care coverage and that it is not only having insurance but what type of insurance. This section will review the association between health care coverage and cervical cancer screening and follow-up. Studies conducted in Latin America and then studies conducted in the United States will be summarized.

In Colombia, Piñeros and colleagues reported that women who did not have any health care coverage, and those in the subsidized regime were 2.18 and 1.58 times, respectively, more likely not to have had a Pap smear in the last three years compared to women in the contributory regime.[168]

Lucumi and Gómez found that after adjusting for socio-economic confounders, Colombian women with health care coverage were more likely to have had a Pap smear within the past three years than women without health care coverage (OR= 1.63, CI: 1.04-2.54).[167] They concluded, based on their results, that there are two potential strategies to increase cervical cancer screening: to increase the enrollment of women in the health care system and to provide comprehensive cervical cancer preventive services.[167]

In a study conducted in Mexico by Lazcano-Ponce et al., women with access to social security healthcare coverage reported more frequent use of the Pap test compared

with women without access (Mexico city OR= 1.7, CI: 1.4-2.0; Oaxaca OR= 2.2, CI 1.8-2.7).[164]

Numerous studies have shown the association of health care coverage and cervical cancer screening in the United States. Behbakht et al., reported that women who have never had a Pap smear were more likely not to have health insurance as compared to women ever having a Pap smear (OR= 3.9, CI 1.6-9.7).[193]

Rodríguez et al., analyzed the 1998 California Women's Health Survey and reported that the factor most strongly associated with low utilization rates of cervical cancer screening after adjusting for socio-demographic factors was lack of health insurance (OR= 2.05, CI 1.53-2.76).[130] In a sample representative of the U.S. adult population age 18 and older, Carrasquillo and Pati found that health insurance was the factor most strongly associated with cervical cancer screening, even after adjusting for socio-demographic factors, usual source of care, lack of trust in providers, not treated with respect/dignity (OR= 0.49, CI 0.32-0.75 for uninsured versus privately insured women).[194]

When examining the 1998 National Health Interview Survey, Selvin and Brett reported that after usual source of care, health insurance was the strongest factor associated with recent Pap smear among Hispanics and non-Hispanic whites (private health insurance versus no insurance: OR= 2.56, CI: 1.40-4.70 and OR= 1.83, CI: 1.35-2.49, respectively).[128] Similarly, non Hispanic white women with Medicaid were more likely to have a recent Pap smear than women without insurance (OR= 2.33, CI: 1.40-3.87). Among Hispanics the association was not statistically significant.[128]

Examining data from the 2000 National Health Interview Survey, Hewitt et al., found that not having health insurance was associated with lower rates of Pap test among women 25 to 64 years of age (OR= 0.54, CI: 0.43-0.67).[195] Likewise, Hiatt et al., stated that one of the strongest predictors of lack of Pap smear was not having insurance or only having public insurance (i.e. Medicare/MediCal) compared to private health insurance after adjusting for socio-demographic characteristics (OR= 0.5, CI: 0.3-0.8 and OR= 0.6, CI: 0.4-0.9 respectively).[196]

Coughlin et al., analyzing the data from the 2002 Behavioral Risk Factor Surveillance System (BRFSS) reported that having health insurance coverage versus not having it was one of the strongest variables associated with having a Pap smear in the past three years, after adjusting for socio-demographic characteristics (OR= 2.09, CI: 1.86,2.34).[197]

Health care coverage has also been associated with cancer stage at diagnosis and cancer survival. Morgan et al., reported, after adjusting for race, age, and stage of cancer, that women with cervix, ovary or uteran cancer, with private insurance were less likely to die than women with public insurance (RR= 0.50, CI: 0.31-0.78).[198] In a study by Ferrante et al., age, marital status, and insurance type were the only variables in multivariable analysis to be significantly associated with late stage diagnosis.[199] Women having commercial health maintenance organization insurance were less likely to have a late-stage cervical cancer diagnosis as compared with commercial fee-for-service insured women (OR= 0.54, CI: 0.30-0.96).[199] Women with any kind of health insurance were also less likely to have a late-stage cervical cancer diagnosis as compare to women uninsured (OR= 1.60, CI: 1.07-2.38).[199]

Health care coverage is also one of the socio-demographic factors associated with follow-up of abnormal Pap smears. The review by Eggleston et al., reported a number of studies[94, 96, 100] that showed an association between insurance and follow-up. The authors categorized the strength of this association by looking at the range of point estimates-OR/HR as moderate (OR/HR ranging from 1.5 to 3.0, or from 0.33 to 0.67).[89] Marcus et al., found that women without health insurance were less likely to return for follow-up care than women with insurance coverage (31.9% vs. 21.6, $p < 0.001$).[94] Melnikow et al., reported that women without health insurance were less likely to adhere to follow-up than women with insurance after adjusting for socio-demographic factors (HR= 0.43, CI: 0.20-0.93).[96] Finally, Peterson et al., reported that women with Medicaid insurance were more likely than women with private insurance to have inadequate follow-up (OR 1.9, 95% CI 1.01-3.5).[100]

Summary of Factors Associated with Cervical Cancer Screening and its Follow-Up

Table 3 provides a summary of the factors associated with cervical cancer screening and its follow-up. As shown in Table 3, there are a number of factors that coincide when comparing screening and follow-up. Age, education, income, health insurance, knowledge about the Pap test, embarrassment, social support, fatalism, and male providers performing pelvic examinations were found to be factors associated with both cervical cancer screening and follow-up. Given that the information about follow-up on Hispanics is limited, it may be relevant to include factors associated with screening when examining the factors associated with follow-up.

The barriers that Colombian women face in the health care system to get cervical cancer screening, such as long lines, numerous authorizations and paper work, poor

service, and lack of coordinated care about who provides and pay for certain services, vary based on whether the woman is enrolled in the health care system and what kind of health care coverage she has.[83, 84, 168] The presence and type of health care coverage has been one of the most important factors associated with cervical cancer screening in Colombia,[167, 168] and that has been associated with cervical cancer screening[128, 130, 164, 193-199] and follow-up[94, 96, 100] in other populations.

Study Goal

The goal of this study is to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening among Colombian women. Follow-up of cervical cancer screening is defined in this study as the actions that Colombian women need to take after a Pap smear test in order to know their results and have a diagnosis when necessary. It was measured through two variables related to the latest Pap smear test a woman had. The first one measures whether or not a woman obtained the results of the Pap smear test, and the second one measures if a woman had a follow-up visit after an abnormal Pap smear test result among those who obtained their results.

In order to address our goal there are three aims in this study. The first is to assess the association between Health Care Coverage (HCC) and obtaining Pap smear results among Colombian women who have had a Pap smear. The second is to assess the association between HCC and follow-up of abnormal Pap smear results among Colombian women who obtained their Pap smear results. And the third is to describe the reasons for not following-up cervical cancer screening that women mentioned.

Table 3. Comparison of Factors Associated with Cervical Cancer Screening and Follow-up among Hispanics in the United States and in Latin America.

FOLLOW-UP CERVICAL CANCER SCREENING		CERVICAL CANCER SCREENING	
Hispanics in the U.S.	**All women in the U.S.**	**Hispanics in the U.S.**	**Hispanics in Latin America**
Women's characteristics • Cervical cancer knowledge *Psychosocial factors* • Embarrassment • Not wanting bad news • Time issues • Fatalism • Absence of a support system, family, or kids *Health care characteristics* • Clinic scheduling difficulties • Staff leaving phone and written English messages • Staff giving mixed messages about seriousness of abnormal results • Male provider • Dirty, unpleasant clinic	*Women's characteristics* • Age • Education • Income • Race/ethnicity • Health insurance • Place of residence • Tobacco use • Knowledge of Pap test • Lesion severity *Psychosocial factors* • Fear cancer diagnosis • Worries about examination/treatment • Fertility concerns • Social support *Health care characteristics* • Patient involvement/communication • Healthcare facility/clinician specialty • Cost of follow-up	*Women's characteristics* • Age • Education • Income • Marital status • Health insurance • Presence/lack of symptoms • Literacy • Knowledge of Pap test • Transportation • Language barriers • Isolation *Psychosocial factors* • Embarrassment • Fear cancer diagnosis • Putting family needs first • Procrastination • Fatalism • Fear of the exam • Acculturation • Partner's opposition *Health care characteristics* • Regular source of care • Continuity of care • Hours of service • Staff attitudes • Cultural understanding by staff • Male provider	*Women's characteristics* • Age • Education • Income • Marital status • Health insurance and type of insurance • Place of residence • Presence/lack of symptoms • Live children/Pregnancy *Psychosocial factors* • Embarrassment • Putting family needs first • Fear of pain • Partner's opposition • Social support *Health care characteristics* • Regular source of care • Poor services from health care providers • Long lines • A lot of paperwork to get service • Long waiting time to get results • Health care providers do not give explanation of procedures

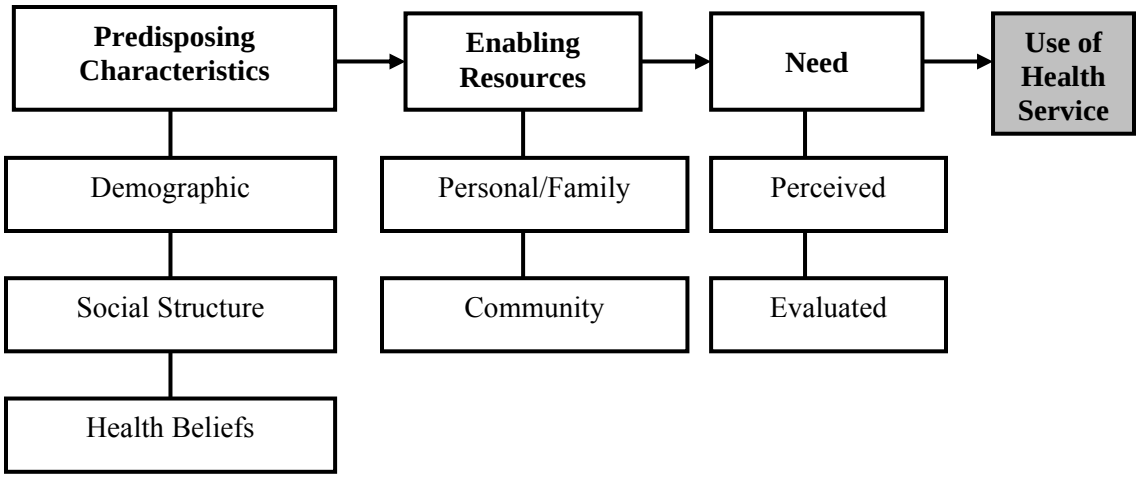
CHAPTER 2

RESEARCH QUESTIONS AND HYPOTHESES

Conceptual Framework

The Behavioral Model proposed by Andersen[200] served as the conceptual framework for this study. The model was developed in the late 1960s, and since then it has been applied and revised by several different authors.[134, 200-202] The initial behavioral model (Figure 4) proposes that the use of health services is a function of the predisposition to use services, the factors which enable or impede use, and the need for care.

Figure 4. The Behavioral Model (1960S) by Andersen[200]



According to Andersen, each component in the model might be considered an independent contributor to predict use. However, he also states that the model might

suggest an explanatory process or causal ordering where the predisposing factors might be exogenous, some enabling resources are necessary but not sufficient, and there must be some need for use of health services to occur.[200]

The predisposing characteristics are inherent to a person, and encompass demographic factors, social structure and health beliefs Health beliefs are attitudes, values, and knowledge that people have about health and health services.[200]Demographic factors, such as gender and age are usually biological imperatives for the use of certain services. Social structure has been traditionally measured using education, occupation, and ethnicity, these measures "determine the status of a person in the community, his or her ability to cope with presenting problems and commanding resources to deal with these problems, and how healthy or unhealthy the physical environment is likely to be."[200]

Enabling resources can either facilitate or hinder access to health care. Health facilities and personnel must be available, and people must have the means and initiative to get the services in order to access care. Therefore, community and personal resources play an important role. Income, health insurance, and a regular source of care have been used as measures of enabling resources.[200]

The last component of the model is the need for services, which can be perceived or evaluated. Perceived need is the person's perception of his/her own health status and the need for services. Evaluated need represents professional judgment about people's health status and their need for medical care.[200]

The model can also shed light on whether access to health care is equitable.[200] When predisposing characteristics or need are the factors associated with differences in

access, the health care system is considered equitable. On the other hand, when enabling factors explain the differences, the system is considered inequitable.[200] For instance if education is the only factor associated with access, the health care system is considered equitable. However, if out of pocket payments or place of residency are the factors associated with access, the system is considered inequitable.

The Behavioral Model has been used to explain the use of cervical cancer screening in Hispanics in the United States,[134, 201] and to explain other health care seeking behaviors such as prenatal care in Latin American countries.[202] Rather than test the model, the proposed study will explore the association between follow-up to cervical cancer screening and demographics, social structure, personal/family resources, and perceived and evaluated need for use of health services. In this study the demographic characteristic used was age. Marital status, education of the woman and her partner, woman's occupation, and number of children were part of the social structure. In regard to personal/family resources the following factors were considered: wealth index, out of pocket payment of Pap smear. For community resources the following were considered: place of residency, geographic mobility, and geographic region. Perceived need for use of health services, perceived health status, having seen a health care provider in the last year, and current pregnancy were examined. Finally, evaluated need for the use of health services, diagnosis of a sexually transmitted infection during the last 12 months and being hospitalized in the last 12 months were examined. A detailed explanation of each variable is found in the research methods of this proposal.

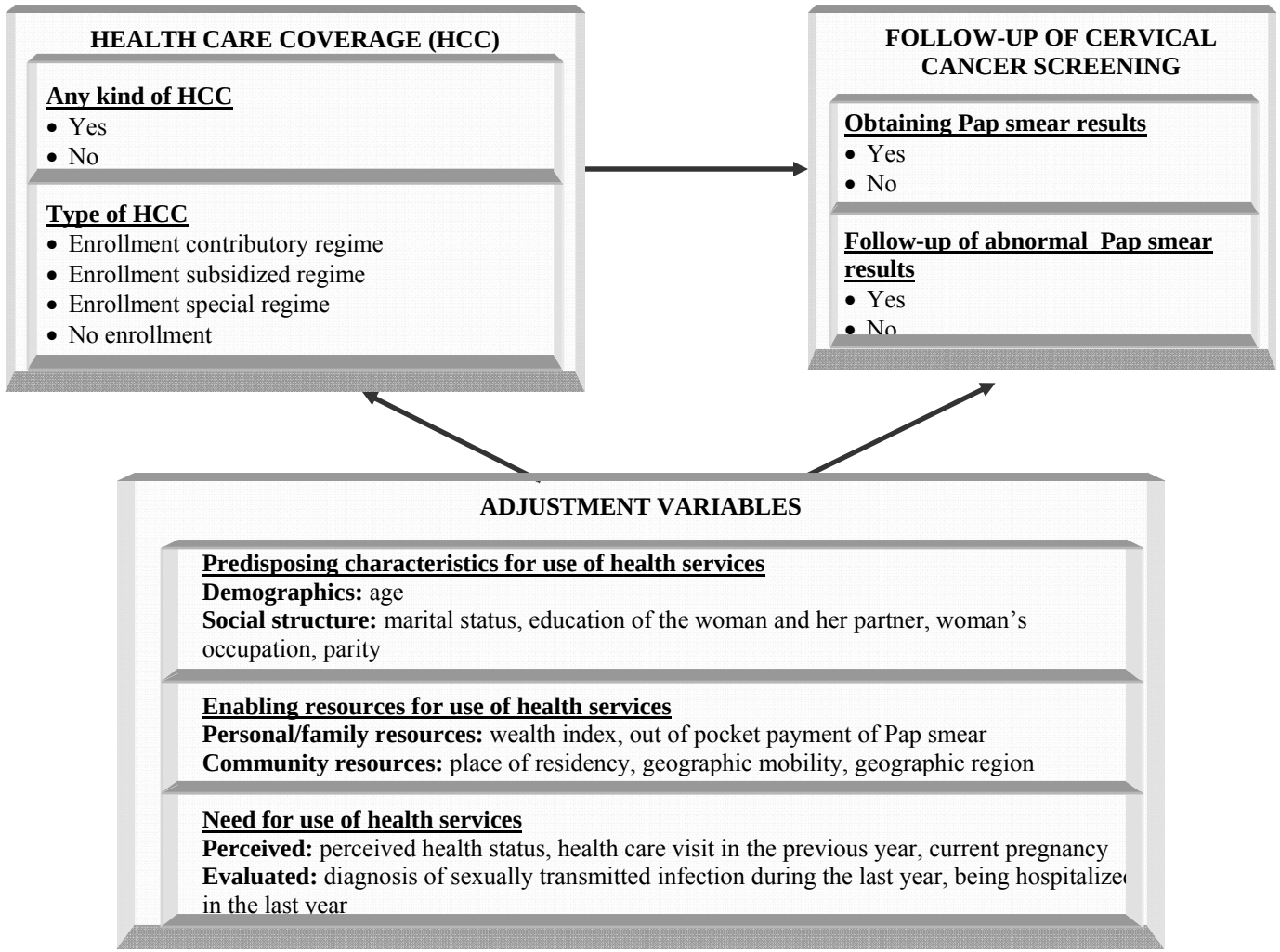


Figure 5. Conceptual Model Depicting Hypothesized Association between Independent, Dependent, and Adjustment Variables

Figure 5 shows the hypothesized associations between the independent, dependent and adjustment variables. The arrows in the model denote hypothesized associations and not causal pathways. It is conceptualized that follow-up of cervical cancer screening, measured as obtaining Pap smear results and follow-up of abnormal Pap smear results, is dependent on the presence and type of health care coverage (HCC). Because the adjustment variables are potentially associated with both the independent and dependent variables, they were controlled for when the relationship between the independent and dependent variables was explored.

In order to reduce possible bias introduced by the design of the survey, in which the status and type of HCC reported at the time of the interview may not be the same as the status and type of HCC at the time of obtaining Pap smear results or having a follow-up of abnormal Pap smear results, stratified analyses within the framework of the Behavioral Model by the time of Pap smear test will be conducted.

Research Aims, Questions, and Hypotheses

The goal of this study was to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening among Colombian women. The goal was reached through three specific aims.

Specific Aim 1: The first aim was to assess the association between HCC and obtaining Pap smear results among Colombian women who had a Pap smear. To address this aim there were three research questions with their respective hypotheses.

Research Question 1: Are women with any kind of HCC more likely to obtain Pap smear results compared to women with no HCC?

H_{01}: There is no difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC.

H_{a1}: There is a difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC.

If we failed to reject the null hypothesis stated above, we proceeded to research question two. If we rejected it, hypothesis two was tested.

H_{02}: There is no difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a2}: There is a difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Research Question 2: Does the likelihood of obtaining Pap smear results differ by the type of HCC?

H_{03}: There is no difference in the likelihood of obtaining Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system.

H_{a3}: There is a difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system.

If we failed to reject the null hypothesis stated above, we proceeded to research question three. If we rejected it, hypothesis four was tested.

H_{04}: There is no difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a4}: There is a difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the

health care system as compared to those enrolled in the contributory regime of the health care system after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Research Question 3: Does the likelihood of obtaining Pap smear results differ by the type of HCC if the screening took place in the past year versus more than 1 year ago?

H_{05}: There is no difference in the likelihood of obtaining Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago.

H_{a5}: There is a difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago.

If we failed to reject the null hypothesis stated above, we went on to Specific Aim two and research question four. If we rejected it, hypothesis six was tested.

H_{06}: There is no difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year or more than 1 year ago after

adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a6}: There is a difference in the likelihood of obtaining Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year or more than 1 year ago after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Specific Aim 2: The second aim was to assess the association between HCC and follow-up of abnormal Pap smear results among Colombian women who obtained their Pap smear results. To answer this aim there were three research questions with their respective hypotheses.

Research Question 4: Are women with any kind of HCC more likely to have follow-up of abnormal Pap smear results compared to women with no HCC? This research question was answered by testing the following hypotheses.

H_{07}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC.

H_{a7}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC.

If we fail to reject the null hypothesis stated above, we will answer research question five. If we reject it, hypothesis eight was tested.

H_{08}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a8}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Research Question 5: Does the likelihood of having follow-up of abnormal Pap smear results differ by the type of HCC?

H_{09}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the

subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system.

H_{a9}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system.

If the null hypothesis stated above was rejected, then hypothesis ten was tested.

H_{010}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a10}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months,

current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Research Question 6: Does the likelihood of having follow-up of abnormal Pap smear results differ by the type of HCC if the screening took place in the past year versus more than 1 year ago?

H_{011}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago.

H_{a11}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago.

If the null hypothesis stated above was rejected, then hypothesis twelve was tested.

H_{012}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment

of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

H_{a12}: There is a difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system if the screening took place in the past year versus more than 1 year ago after adjusting for age, marital status, education of the woman and her partner, woman's occupation, parity**,** wealth index, out of pocket payment of Pap smear, place of residency, geographic mobility**,** geographic region, perceived health status, having seen a health care provider in the last 12 months, current pregnancy**,** diagnosis of a sexually transmitted infection during the last 12 months, and being hospitalized in the last 12 months.

Specific Aim 3: The third aim was to describe the reasons women mentioned for not following-up after cervical cancer screening. This aim was reached with six research questions. We did not test any hypotheses in this aim because it is a descriptive aim.

Research Question 7: What are the reasons women listed for not obtaining Pap smear results?

Research Question 8: Do the reasons women listed for not obtaining Pap smear results differ by whether they have any HCC or no HCC?

Research Question 9: Do the reasons women listed for not obtaining Pap smear results differ by the type of HCC they have (contributory, subsidized, special regimes, or no enrollment)?

Research Question 10: What are the reasons women listed for not having a follow-up of abnormal Pap smear results?

Research Question 11: Do the reasons women listed for not having a follow-up of abnormal Pap smear results differ by whether they have any HCC or no HCC?

Research Question 12: Do the reasons women listed for not having a follow-up of abnormal Pap smear results differ by the type of HCC they have (contributory, subsidized, special regimes, or no enrollment)?

CHAPTER 3

RESEARCH METHODS

Demographic and Health Survey

Demographic and Health Surveys (DHS) are nationally-representative household surveys conducted around the world with large sample sizes (usually between 5,000 and 30,000 households). DHS surveys provide data for a wide range of indicators in the areas of population, health, and nutrition. The DHS project was initiated by the U.S. Agency for International Development (USAID). Since 1985, the DHS program has conducted over 200 surveys in 75 countries. Usually, DHS surveys are conducted every 5 years in each country. In Colombia, the implementing organization of the survey is Profamilia, a private non-profit organization established in 1965 and affiliated with the International Planned Parenthood Federation. At the national level, Profamilia is the most important private institution to provide reproductive, sexual health, and family planning programs; globally, it is the second most important.

In Colombia the first survey was conducted in 1985, and five surveys have been conducted since. The present study uses the 2005 survey. The survey has national coverage with rural and urban representation by departments, 16 sub-regions, and six regions (Atlántica, Oriental, Bogotá, Central, Pacífica, y Amazonía y Orinoquía). The survey collected information on:[3]

- Household characteristics and household's member's demographic information.

- Demographic and health related information (contraception, sexual health, maternal and child health, nutrition, knowledge about sexually transmitted infections, and domestic violence) on women 13 to 49 years of age, and if applicable, demographic information about her partner, and all the sons and daughters less than five.
- Information on Pap smear and mammography history in women 18 to 69 years of age who have ever had sexual intercourse.
- Anthropometric measures of all available household's members.

The 2005 Colombian DHS sample was multistage, probabilistic, stratified, and within clusters of the non-institutionalized population. The design was probabilistic because each unit of the studied universe had a known probability of selection greater than zero. The clusters had different categories, the primary sampling units (PSUs) are formed by a municipality, or a combination of two or more (if less than 7,000 inhabitants). The secondary sampling units (SSUs) are blocks in the urban area, and census tracks in rural areas. The tertiary sampling units (TSUs) are the segments of contiguous households (approximately 10) selected in each SSU.[3]

Before the selection, the PSUs were stratified or classified in similar groups within each department based on a set of variables: population of the head of the municipality, percentage urban/rural, life conditions index, geographical vicinity, and average size of the stratum. With the multistage sampling the PSUs were selected first, then the blocks and rural sections, the third stage was the selection of the segments, and the last stage consisted of the selection of households within each segment. Each stage had its own probability and was selected randomly.[3]

The sample included 37,211 households, located in 3,935 segments. The segments were distributed in 200 municipalities probabilistically chosen out of all the municipalities in the country. Therefore, the sample represented 99% of the Colombian rural and urban population. A total of 41,344 women 13-49 years old, and 9,756 50-69 years of age were interviewed.[3] The survey was interviewer-administer by trained personnel. The interviewers conducted the survey at each household and the information was entered directly into Personal Digital Assistants (PDAs).[203]

Research Methods

Study Design

The study's research questions were answered through secondary analysis of the 2005 DHS from Colombia.[3] The study was a population-based cross-sectional survey.

Study Sample

Figure 6 shows a flow chart with the sample size for the study. A total of 157,840 individuals from 37,211 households were interviewed. Girls and women 13 years of age or older participated in the individual questionnaire (N=41,344). Girls and women younger than 18 years of age (N=7,675), and those 18 years o age or older who have never had sexual intercourse (N=2,388) did not participate in the supplementary section about cervical and breast cancer screening. Of the sexually active women 18 to 49 (n=31,281) who answered the cervical cancer screening section, 25,709 ever had a Pap smear, and 489 women did not have information about Pap smear status. Women with a

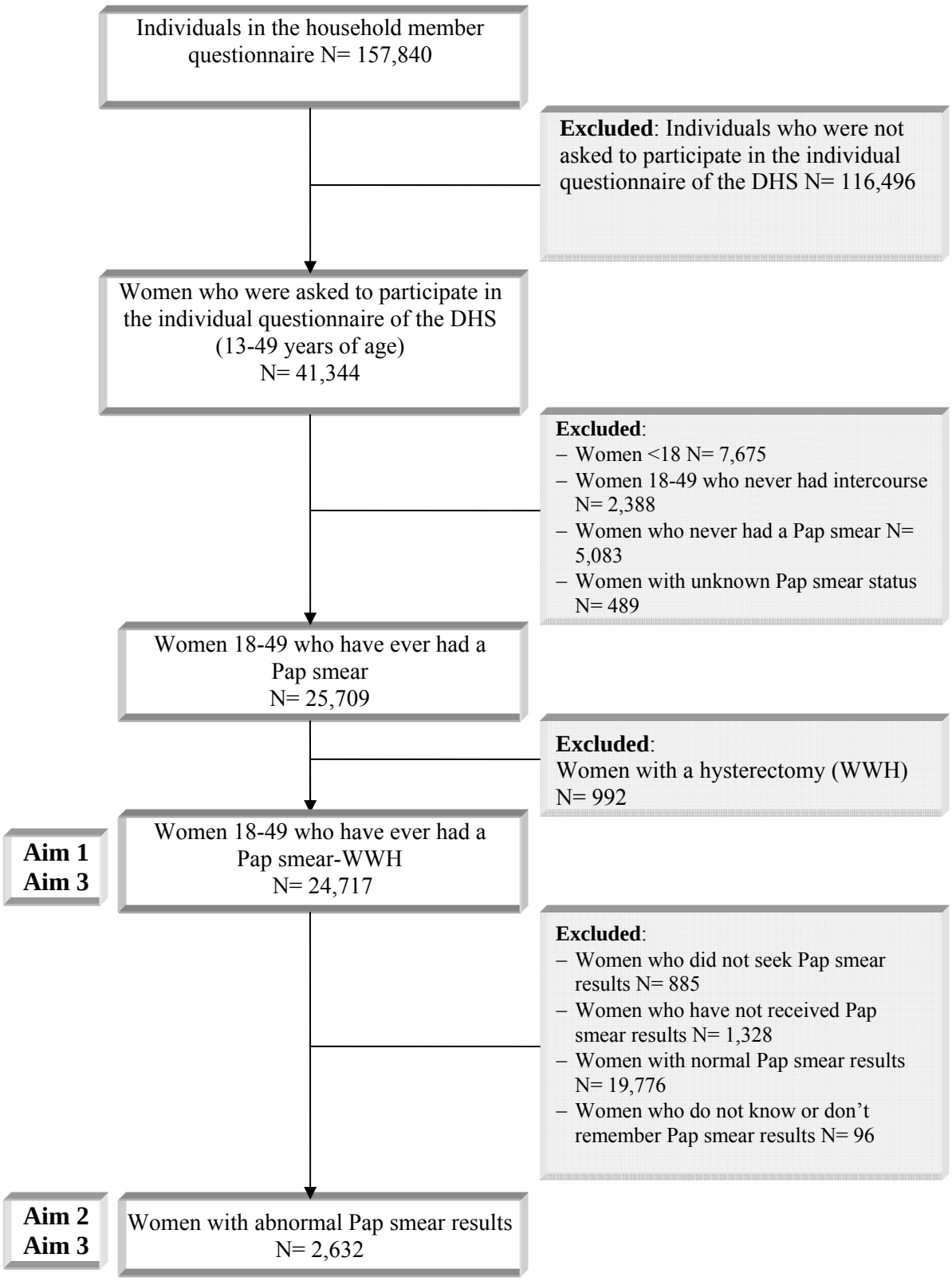


Figure 6. Sample Size

hysterectomy (N=992) were excluded from the analysis using two questions (Q# v215: Time since last menstrual period, and Q# s343: Main reason not using a contraceptive method). Therefore, the sample size to answer Aims One and part of Three was 24,717.

Further, to be able to answer Aim Two and part of Three, the following were excluded: women who did not seek their Pap smear results (N= 885), women who have not yet received their results (N= 1,328), women with normal results (N= 19,776), and women who do not know or do not remember their results (N= 96). The first two exclusions were done using question s909: Did you pick up the result of your last Pap smear? The last two used question s910: What was the result of the last Pap smear? Therefore, the sample size to answer aims two and part of three was 2,632.

In summary, women who did not answer the individual questionnaire, girls under 18 years of age, women who have never had sexual intercourse, women who have never had a pap smear, and women with a hysterectomy were excluded. The sample size for Specific Aim One and part of Aim Three is 26,717 women 18 to 49 years of age who ever had a Pap smear. The sample size for Specific Aim Two and part of Aim Three is 2,632 women who obtained their results and had an abnormality.

Power Analysis

Power analysis to test the study hypotheses used the PS: Power and sample size calculation software.[204] The power analysis identifies the ability of the test to correctly reject the null hypothesis when it is actually false, and also identifies differences between two groups when such differences truly exist. For example, to identify whether women in the contributory regime are more likely to get follow-up of abnormal Pap smears

compared to women in the subsidized regime when such a difference in follow-up truly exists between the two groups.

For the power analysis calculations the following assumptions were made: alpha (α) was set at the conventional level of 0.05. Piñeros et al., showed that the distribution of health care coverage categories among women 25 to 49 years of age from the DHS is as follows: no enrollment-27.2%, contributory regime-40%, and subsidized regime-30%.[168] Therefore, it is assumed that approximately 802 women are enrolled in the subsidized regime. There is no information about the proportion of women stratified by health care coverage who had follow-up, thus, this estimate is based on the percentage of cervical cancer screening. Piñeros et al., also reported that 17% of women in the contributory regime (our referent group) did not get a Pap smear within the last three years.[168]

Power calculations were performed for anticipated odds ratios ranging from 1.25 to 2.50. Tables 4 and 5 present calculations for hypotheses within Specific Aim Two, which represent the more conservative estimates, that is, the sample size that was used to answer the hypotheses within Specific Aim Two is the smallest. The sample size for Specific Aim One is bigger. Power calculations for hypotheses within Aim One, are found in Appendix A.

Table 6 shows sample size calculations for Specific Aim Two. These analyses confirmed that with 717 women with no HCC, odds ratios of 1.45 or larger can be detected with 80% power. If study results have bigger odds ratios, a smaller sample size would achieve 80% power.

Table 4. Power Analysis for Hypotheses Related to Follow-Up of Abnormal Pap Smear Results (Any HCC Vs. No HCC).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05	0.05
Number of cases (i.e., uninsured women)	n	728	728	728	728	728	728
Probability of exposure (i.e., likelihood of **non** follow-up) among controls (i.e., insured women)	P_0	0.17	0.17	0.17	0.17	0.17	0.17
Ratio of insured women and uninsured	m	2:1	2:1	2:1	2:1	2:1	2:1
Hypothesized odds ratio of exposure (non follow-up) among cases (uninsured women) relative to controls (insured women)	ψ	1.25	1.35	1.40	1.50	1.75	2.0
Power	$1-\beta$	0.47	0.75	0.83	0.94	0.99	1.0

Table 5. Power Analysis for Hypotheses Related to Follow-up of Abnormal Pap Smear Results (contributory Vs. subsidized).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05	0.05
Number of cases (i.e., women in the subsidized regime)	n	802	802	802	802	802	802
Probability of exposure (i.e., likelihood of non follow-up) among controls (i.e., women in the contributory regime)	P_0	0.17	0.17	0.17	0.17	0.17	0.17
Ratio of women in the contributory and subsidized regimes	m	1:1	1:1	1:1	1:1	1:1	1:1
Hypothesized odds ratio of exposure (non follow-up) among cases (women in the subsidized regime) relative to controls (women in the contributory regime)	ψ	1.25	1.40	1.45	1.50	1.75	2.50
Power	$1-\beta$	0.40	0.76	0.84	0.90	0.99	1.0

Table 6. Sample Size Calculations for Hypotheses Related to Follow-up of Abnormal Pap Smear Results.

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05	0.05
Power	$1-\beta$	0.80	0.80	0.80	0.80	0.80	0.80
Probability of exposure (i.e., likelihood of **non** follow-up) among controls (i.e., insured women)	P_0	0.17	0.17	0.17	0.17	0.17	0.17
Ratio of insured women and uninsured	m	1:1	1:1	1:1	1:1	1:1	1:1
Hypothesized odds ratio of exposure (non follow-up) among cases (uninsured women) relative to controls (insured women)	ψ	1.25	1.45	1.50	1.75	1.85	2.0
Number of cases (i.e., uninsured women)	n	2042	717	599	307	252	197

Post-hoc Power Analysis

Post-hoc power analyses using the PS software[204] were performed after results from the data analyses were obtained. Parameters and power calculation results for Specific Aim One, obtaining the results of Pap smear results, are shown in Table 7. Type I error or α was set at 0.05, probability of exposure, ratio of controls and cases, and number of cases were calculated for each outcome as shown in Table 7. Power was calculated for crude and adjusted odds ratios. The required sample size to obtain 80% power given the observed parameters was also calculated. Stratified analyses according to the time of Pap smear test were conducted and power calculations for those who obtained a Pap smear within the previous year are presented as well.

Table 7. Post-hoc Power Analysis for obtaining Pap Smear Results.

	P_0	m	n	Crude OR	Power	Adj. OR	Power	Required n for 80% power
No HCC vs. Any HCC	0.031	3:1	6829	0.63	0.99	0.66	0.99	2231
Subsidized Vs. Contributory	0.020	1:1	8416	0.48	0.99	0.68	0.89	2379
No HCC vs. Contributory	0.020	1:1	6829	0.42	0.99	0.51	0.99	1857
Pap Smear last year								
No HCC vs. Any HCC	0.025	3:1	3609			0.58	0.97	1997
Subsidized Vs. Contributory	0.017	1:1	5299			0.65	0.78	5626
No HCC vs. Contributory	0.017	1:1	3609			0.44	0.96	2158

α= 0.05
P_0= Probability of exposure (e.g., likelihood of non follow-up) among controls (e.g., women in the contributory regime)
m= Ratio of controls (e.g., women in the contributory regime) and cases (e.g., women in the subsidized regime)
n= Number of cases (e.g., women in the subsidized regime)

The study had enough power (≥78%) to identify differences in the likelihood of obtaining Pap smear results based on HCC, if such differences truly exist. For instance,

women without HCC were 0.51 times less likely to obtain their results than women in the contributory regime, the power to conclude this was 99%. Therefore, we can safely conclude that this difference truly exists because the likelihood of committing Type II error was only 1% (Table 7).

Parameters and power calculation results for Specific Aim Two, follow-up of abnormal Pap smear results, are shown in Table 8. All power calculations for this aim were less than 80%. For instance, women without HCC were 0.88 times less likely to obtain their results than women with HCC. However, the association was not statistically significant. We cannot safely conclude that the difference does not truly exist because the likelihood of committing Type II error was 83% (Table 7). Consequently, results for Specific Aim Two need to be interpreted with caution.

Table 8. Post-hoc Power Analysis for Follow-up of Abnormal Pap Smear Results.

	P_0	m	n	Crude OR	Power	Adj. OR	Power	Required n for 80% power
No HCC vs. Any HCC	0.153	3:1	788	0.78	0.51	0.88	0.17	1515
Subsidized Vs. Contributory	0.129	1:1	978	0.70	0.69	0.75	0.51	1348
No HCC vs. Contributory	0.129	1:1	788	0.64	0.77	0.71	0.59	904
Pap Smear last year								
No HCC vs. Any HCC	0.142	3:1	456			0.73	0.43	1029
Subsidized Vs. Contributory	0.115	1:1	663			0.67	0.55	1139
No HCC vs. Contributory	0.115	1:1	456			0.55	0.70	571

α= 0.05
P_0= Probability of exposure (e.g., likelihood of non follow-up) among controls (e.g., women in the contributory regime)
m= Ratio of controls (e.g., women in the contributory regime) and cases (e.g., women in the subsidized regime)
n= Number of cases (e.g., women in the subsidized regime)

Data Structure

The Colombian DHS dataset was available in English. Data was available in three SPSS files. For the proposed study, complete data for 24,717 women was extracted and analyzed. All 24,717 records (women 18 to 49 years of age who had a pap smear) were used to answer research Aims One and Three, where the association between HCC and obtaining Pap smear results was assessed. Among these 24,717 women there were 2,632 with abnormal Pap smear results. Their records were used to answer Aim Two (to assess the association between HCC and follow-up of abnormal Pap smear results). Selection of eligible cases and variables of interest from the three data files is described in detail in the Data Analysis section.

Study Variables

To answer the research questions and to test the proposed hypotheses, some variables were used as available (not modified) while others were recoded or computed as appropriate. Table 9 lists all the variables that were used in this study. The variables are described in the following passages.

Dependent Variables

Follow-up of cervical cancer screening- Follow-up of cervical cancer screening was defined in this study as the actions that Colombian women need to take after a Pap smear test to know their results and have a diagnosis when necessary. It was measured through two variables related to the latest Pap smear test a woman had. The first one measures whether a woman obtained the results of the Pap smear test, and the second one

measures if a woman had a follow-up visit after abnormal Pap smear test results among those who obtained their results.

Obtaining Pap smear results: As part of the survey, women who have had sexual intercourse were asked if they had had a Pap smear and then were asked if they obtained their results. This last question was used to create the study variable. The variable was dichotomous: yes (reference category) and no. Women who answered that they have looked for the result but not yet received it, were analyzed together with women who answered yes. This is because our main purpose was to capture the women's seeking behavior, rather than provider's compliance.

Follow-up of abnormal Pap smear results: Women who obtained the results of the Pap smear test were asked if the results were normal or not. Then, women with abnormal results were asked if they went for a follow-up visit, this question was used as the study variable. The variable was dichotomous: yes (reference category) and no.

Independent Variables

The independent variables include Health Care Coverage (HCC) as the main independent variable and a set of adjustment variables.

Health care coverage- For the purpose of this investigation, the HCC variable was assessed in two ways: the presence of HCC and the type.

Any kind of HCC**:** Participants in the survey were asked if, at the time of the interview, they had any HCC and what kind of HCC they had. The variable was created based on HCC type and only had two categories, any HCC (reference category) and no HCC.

Type of HCC**:** Participants in the survey were asked if, at the time of the interview, they had any HCC and what kind of HCC they had. The possible answers to that question were: Social Security Institute (ISS, Spanish acronym), Health Promotion Entities (EPS), Subsidized Regime Administration (ARS), Supportive Company, Army/Police, ECOPETROL, teaching professionals, Foncolpuertos, no enrollment, and don't know. For this variable, women were grouped in four categories according to the regime they belong to: no enrollment; special regime: Army/Police, ECOPETROL, teaching professionals, and Foncolpuertos; subsidized regime: ARS and Supportive Company; and contributory regime (reference category): ISS and EPS. Women who answer "don't know" were analyzed as missing. After looking at frequencies and preliminary analyses, the special and contributory regime were collapsed. These two regimes had similar estimates, and only 3.5% of the sample was enrolled in the special regime.

Adjustment Variables

Predisposing Characteristics for the Use of Health Services

Demographics

According to the Andersen model, demographic characteristics are biological imperatives that influence the use of services.[200] The only demographic characteristic available was age.

Age- Women were asked how old they were (age in years they have reached). Interviewers had to compare this answer with a previous question that asked for the participant's birthday. If any inconsistency was found, it had to be corrected. Initially, the variable was analyzed as continuous. After examination of the distribution of the data,

responses were analyzed with the following interval categories: 18-19, 20-24, 30-34, 35-39, 40-44, 45-49.

Social Structure

Based on the Andersen model, social structures are characteristics inherent to a person but are not biological imperatives. That is, they are influenced by external factors.[200] Marital status, education of the woman and her partner, woman's occupation, and parity were included under this construct

Marital status- Women were categorized into single, married, living with someone, and separated/ divorced/ widow. This variable was created using question v501 (current marital status).

Woman's education- This variable has four categories: none/preschool, elementary, high school/technical, college/graduate. It was computed using question S106n (level of education completed).

Partner's education- This variable has the same categories as the woman's education variable (none/preschool, elementary, high school/ technical, college/graduate) and a category to reflect women without a partner. It was computed using question s804n (husband's level of education completed) and question v701 (partner's education level). Question v707 helped to determine partners with no education. Partner's education was included as an adjustment variable. First, because the literature shows an association between follow-up and social support and that includes support from the partner.[88, 90]

Table 9. Independent, Dependent, and Adjustment Variables.

Variable Name	Question items (including original question number)	Variable Values	Variable Type
	DEPENDENT VARIABLE		
Obtained results	909. Did you pick up the result of your last Pap smear?	1. No 2. Yes (Ref.)	Dichotomous
Follow-up abnormalities	911. Did you go for a new appointment for treatment? *Note*: previous question was: "What was the result of the last Pap smear? If the answer was: abnormal, they were asked 911.	1. No 2. Yes (Ref.)	Dichotomous
	INDEPENDENT VARIABLES		
HCC type	39. Are you enrolled in or are beneficiary of a company of the Health and Social Security System? If yes, which company?	1. No enrollment 2. Contributory and special regime (Ref.) 3. Subsidized regime	Nominal
HCC presence	Variable created based on HHC type variable	1. No HCC 2. Any HCC (Ref.)	Nominal
Adjustment Variables			
Age	104. How old are you? Age in years reached _____	1. 18-19 years 2. 20-24 years 3. 25-29 years 4. 30-34 years 5. 35-39 years 6. 40-44 years 7. 45-49 years (Ref.)	Nominal
Marital status	601. Are you currently married or living with someone? If "YES", married or living with someone? 602. Have you been married or have lived with someone? 605. What is your current marital status?	1. Single (Ref.) 2. Married 3. Living with someone 4. Separated/divorced/widow	Nominal

Table 9. (Continued)

Variable Name	Question items (including original question number)	Variable Values	Variable Type
Woman's education	105. Did you ever attend school, or college? 106. What was the last year of approved studies?	1. None/Preschool 2. Elementary 3. High school/Technical 4. College/Graduate (Ref.)	Nominal
Partner's education	804. What was the last year of studies that your (last) spouse/partner approved?	1. None/Preschool 2. Elementary 3. High school/Technical 4. College/Graduate (Ref.)	Nominal
Woman's occupation	807. Besides working at home, currently do you have other job? 812. What is your current occupation? IF SHE HAS HAD SEVERAL JOBS, ASK: What was your occupation in your last job?	1. Not working (Ref.) 2. Professional/Technical job 3. Non-professional/non-technical job	Nominal
Parity	208. How many children have you had? IF HAVEN'T HAD ANY LIVE BORNS, WRITE "00"	1. No children 2. One child 3. Two children 4. Four children 5. Five children 6. Six or more children (Ref.)	Nominal
Wealth index	Variable already computed in the database	1. Very poor 2. Poor 3. Medium 4. Rich 5. Very rich (Ref.)	Nominal
Out of pocket	908. When you got the last Pap smear, did you have to pay? IF THE ANSWER IS "YES". Did you pay all or just a portion?	1. Pay all 2. Partial pay 3. Didn't pay anything (Ref.)	Nominal
Residency	6. Area	1. Capital, large city 2. Small city 3. Town 4. Rural (Ref.)	Dichotomous

Table 9. (Continued)

Variable Name	Question items (including original question number)	Variable Values	Variable Type
Geographic mobility (length of stay)	826. Have you lived in one place or more than one since January, 1999? 829. In what month and year did you come to live (NAME OF MUNICIPALITY OF THE INTERVIEW)? Date interview 826. Have you lived in one place or more than one since January, 1999?	1. 0-12 months current place 2. 13-36 months current place 3. 37-77 months current place 4. Have lived only in one place (Ref.)	Nominal
Geographic region	Variable already computed in the database	16 sub-regions (See APPENDIX C for a complete list)	Nominal
Perceived health status	41. How do you believe your general health is?	1. Excellent/very good 2. Good 3. Fair/Bad (Ref.)	Nominal
Health care visit	311. Currently, are you or your husband doing something or using any method to postpone or avoid getting pregnant? 335. Where did you get (METHOD), the last time? 347. In the past 12 months did you have any health care visit?	1. Yes 2. No (Ref.)	Dichotomous
Current pregnancy	226. Are you currently pregnant?	1. Yes 2. No/Don't know (Ref.)	Nominal
STI last 12 months	1024. Have you been diagnosed with any sexually transmitted infection during the last 12 months?	1. Yes 2. No (Ref.)	Dichotomous
Hospitalized last 12 months	51. During the last 12 months, has somebody in this household being hospitalized?	1. Yes 2. No (Ref.)	Dichotomous

Table 9. (Continued)

Variable Name	Question items (including original question number)	Variable Values	Variable Type
Reasons not obtaining results	913. Why did not pick up the result of the last Pap smear?	1. Afraid to be told that have cancer 2. You felt maltreated/ offended when got the test 3. You don't care about the result 4. With the test you are sure you are not getting cancer 5. The institution where you did the test did not give it to you 6. Other	Nominal
Reasons not going new appointment	912. Why you didn't go to the new appointment?	1. They didn't explain it was important 2. Believed that could wait 3. Didn't know what to do 4. Didn't believe in the result 5. Fear/Fright 6. Laziness/carelessness 7. Lack of resources 6. Other	Nominal
Number of months since last Pap smear	v008. Date of interview S905m. Month last cytology S905y. Year last cytology	1. 0-12 months 2. 13 or more months	Dicothomous

Ref.=Referent group

Second, some studies show an association between education level and follow-up,[89] and one study showed an association between partner's education and cervical cancer screening.[171] Therefore, it was expected that a more educated partner may be more supportive of follow-up than a partner with little or no education.

Woman's occupation- This variable has three categories: homemaker, professional/ technical job, non-professional/ non-technical job. The variable was computed using two questions, question v731 (worked in the last 12 months?) and question v716 (respondent's occupation). Only women working at the time of the interview or that had worked in the past year were assigned an occupation. Women who mentioned an occupation but had not worked the previous year or were not working at the time of the interview were put in the not working category. The same criteria applies to women who did not know their occupation, which was only eight women.

Parity- Women were asked how many children they have had (the answer could be zero). Initially, the variable was analyzed as continuous. After examining the distribution of the data, the variable was divided into seven categories (no children, one child, two children, three children, four children, five children, six children or more). This variable was included for several reasons. First, in Colombia, women without children are more likely not to have a Pap smear.[168] Since there was no information about follow-up of cervical cancer screening in Colombia, this variable was taken into account. Second, Hispanics tend to put family needs first[166] which can result in delayed care or alternatively to being motivated to get follow-up to stay healthy for their children. A study from Breitkopf et al., mentioned absence of kids as a barrier to getting follow-up.[88] Therefore, having children may be associated with follow-up.

Enabling Resources for Use of Health Services

Personal/Family Resources

Andersen states that people must have the means to get services in order to access care.[200] Therefore, wealth index and out of pocket payment of Pap smear were used as personal or family resources.

Wealth index- This variable, already in the dataset, had five categories: very poor, poor, average, rich, and very rich. This is an index developed by the World Bank.[3] The methodology has been applied to the countries that have participated in the second, third, and fourth round of the DHS. The DHS does not collect consumption or income data, but it has very detailed information on the household's physical characteristics and access to a variety of goods and services. The index measures the socio-economic level in terms of assets or wealth in the interviewed households, instead of income or expenditures.[3] The list of household characteristics and household goods that were used to develop the index include live-in domestic servants, agricultural workers, kind of drinking water, type of toilet, if toilet is shared, kind of cooking fuel, type of flooring material, and number of members per sleeping room.

The index was constructed using principal components analysis to generate a weight for each household item and household characteristic. The individuals in each household are assigned the household's standardized wealth index score. This allows the generation of wealth population quintiles: very poor, poor, average, rich, and very rich. It has been documented that the use of wealth/asset information can be used as a suitable indicator of economic status.[205]

Out of pocket payment of Pap smear- The variable was used as it was in the dataset with the following categories: pay all, partial pay, didn't pay anything. Women were asked if they had to pay for their last Pap smear, and if so, if the payment was partial, or total. Cost has been associated with follow-up of abnormal cervical cancer screening.[89] It was expected that women who have to pay for their Pap smear may also have to pay for follow-up, and that may deter them from getting the necessary follow-up. Therefore, out of pocket payment of Pap smear may be associated with follow-up of abnormal results.

Community Resources

According to Andersen, health facilities and personnel must be available to access services.[200] Place of residency, geographic mobility, and geographic region was used under this category. These two variables can be used as a proxy for availability of resources (i.e., rural vs. urban), and knowledge that women have about the availability of those resources.

Place of residency- A variable already in the dataset was used (Q v134, de facto place of residence). The variable had four categories: capital/large city, small city, town, and countryside. According to the DHS code book, urban areas are classified into large cities (capital cities and cities with over 1 million population), small cities (population over 50,000), towns (other urban areas), and all rural areas are assumed to be countryside.[206] Place of residency has been associated with follow-up of abnormal Pap smear results.[89] It was expected that women living in rural or isolated areas would have more difficulty getting to the facilities for follow-up of cervical cancer screening.

Geographic mobility- Geographic mobility was measured through questions which ascertain geographical moves. Women were asked if they had lived in one or more places since January, 1999. If they had lived in more than one place they were asked the date since they have lived at the place of the interview (municipality). The variable was divided in four categories: have lived in the place of the interview less than 12 months, between 13 and 36 months, between 37 and 77 months, and if the person has lived in only one place in the previous five years. It is intuitive that, most of the time, when people are new to a place they have little or no knowledge about where to go for health care and they experience a lack of social networks and support.[207] A study by Skaer and colleagues showed that among Latina immigrants in the U.S., the amount of time they lived in the U.S. was associated with rates of cervical cancer screening.[144] Consequently, how long a woman has been living in the same place may have an effect on whether she complies with follow-up of cervical cancer screening, as was the case with the cervical cancer screening test.

Geographic region- A variable reflecting the subregion where women live. This was already in the dataset and it had 16 categories:

- Guajira, Cesar, Magdalena
- Barranquilla (Metropolitan area)
- Atlántico without Barranquilla, San Andres, northern Bolivar
- Southern Bolivar, Sucre, Córdoba
- Santander, Santander del Norte
- Boyacá, Cundinamarca, Meta
- Bogota (without Soacha)

- Medellín (metropolitana area)
- Antioquia without Medellín
- Caldas, Risaralda, Quindío
- Tolima, Huila, Caquetá
- Cali (Metropolitan area)
- Valle without Cali or coastal zone
- Cauca and Nariño without coast
- Pacific Coast: Chocó, Coastal zone of Valle, Cauca and Nariño
- Orinoquía and Amazonía: Arauca, Casanare, Guainía, Vichada, Amazonas, Putumayo, Guaviare, Vaupés.

These sub-regions have been used in the Colombian DHS with some modifications since 1990. These sub-regions reflect geographical and cultural similarities, and the sample of the survey was selected based on these 16 sub-regions. Including this variable has the purpose of accounting for some of these similarities, for the availability of resources within sub-regions, as well as for clustering of the sample.

Need for Use of Health Services

The last component of the Andersen model is the need for services, which can be perceived or evaluated.[200]

Perceived Need for Use of Health Services

According to Andersen, perceived need is the person's perception of his/her own health status and need for services.[200] Three variables were used under this construct: perceived health status, health care visit within the last year, and current pregnancy.

Perceived health status- This variable was collapsed into three categories: excellent/very good, good, fair/bad. Interviewees were asked what they believed was their general health. Lack of symptoms has been mentioned as a barrier to seeking cervical cancer screening[140, 141, 171] and it is reasonable to think that if women do not feel ill, they may also think that follow-up is not necessary.

Health care visit within the last year- A variable that reflected a health care visit within the last year was created using three questions. The survey asked women if they had a health care visit within the last year, if they were using any family planning method and what kind of method, and the date of the last Pap smear. The new variable was dichotomous (yes and no), and it was computed as follow: if women had not obtained an IUD, sterilization or Norplant within the previous 12 months; answered that they did not have a health care visit within 12 months; and did not have a Pap smear within the previous 12 months, they were categorized as not having had a health care visit. On the other hand, if women reported a health care visit within the past 12 months; or if they got an IUD, sterilization or Norplant within the previous 12 months; or had a Pap smear in the preceding 12 months, they were categorized as having had a health care visit within the last 12 months. The use of certain contraceptives put women closer to the health care system (especially reproductive health services) because the methods either need to be provided by health care professionals or because women are advised to get regular check-ups to make sure there are no problems with the method (i.e., displacement of the intrauterine device). The question about a health care visit during the last 12 months was combined with the question about the use of certain contraceptive methods within the past 12 months because some women may not consider a family planning visit as a health

care visit and may answer that they have not had any visit (in this case 184 women getting Norplant, sterilization or IUD in the previous year, answered they did not had a health care visit). Controlling for the presence or absence of a health care visit is important because it is known that a regular source of health care is a major predictor of various health care behaviors including cervical cancer screening.[118, 128, 134, 142, 152, 163, 167, 168]

Current pregnancy- This variable was used as it was in the database. Women were asked if they were currently pregnant, the answers were yes, no/do not know. This question was included as an adjustment variable because pregnancy generally brings women closer to the health care system, and it has been shown to be associated with cervical cancer screening among Colombian women. Pregnant women were more likely to get screened.[168]

Evaluated Need for Use of Health Services

According to Andersen, evaluated need represents professional judgment about people's health status and their need for medical care.[200] Two available variables, diagnosed with a sexually transmitted infection and a hospitalization in the last 12 months, represent a health professional assessment of the woman's health, and as such, they was included in the analyses.

Sexually transmitted infection in the last 12 months- Women were asked if they were diagnosed with a sexually transmitted infection within the last year. This was analyzed as a dichotomous variable. Women who answered "don't know" (n=5) were collapsed with those who answered "no". Women with a sexually transmitted infection

diagnosis may be also more likely to get reproductive health care follow-up. For instance, chlamydial and gonoccocal infections can cause pelvic inflammatory disease (PID). Women with PID need close follow-up. According to the Centers for Disease Control and Prevention (CDC), patients who test positive for STIs need to be retested approximately three months after treatment.[208] Additionally, the CDC recommends that during a pelvic examination for STI screening, a Pap smear should be performed or recommended.[208] In Colombia the guidelines recommend that women with genital warts are screened for cervical cancer.[209]

Hospitalized last year- The survey had information on whether the interviewee was hospitalized within the last 12 months. This was also analyzed as a dichotomous variable (yes and no).

Women were asked about their health care coverage at the time of the interview. This may differ from the status of health care coverage at the time of the Pap smear test or obtaining of Pap smear results, especially if the test was taken long time ago. In order to reduce possible errors associated with this limitation, stratified analysis for reduced models by the time of the last Pap smear were conducted. In order to conduct these analyses, a new variable with the time measured in months since the last Pap smear was computed.

Number of months since last Pap smear- In the survey, women were asked the month and year of the last Pap smear. With this information and the date of the interview the number of months since the last Pap smear was calculated. Then, this continuous variable was divided into 4 categories. Zero to 12 months, 13 to 24 months, 25 to 36 months, and more than 37 months. Results of parsimonious models stratified according to

these categories were difficult to interpret and some of the categories within variables did not have enough numbers to obtain estimates. Therefore, it was decided to have two strata, one for those who had a Pap smear within the previous year, and those who had it 13 or more months ago.

Variables to be Used for Specific Aim Three

Two additional variables were used for these analyses: reasons for not obtaining Pap smear results, and reasons for not having a follow-up after abnormal Pap smear result.

Reasons for not obtaining Pap smear results- Women who did not obtain Pap smear results were asked why they did not. Women had to choose one option among a list of reasons or to state another reason if none of the options matched hers. The possible options were: "afraid to be told that I have cancer, felt maltreated/offended when I got the test, I don't care about the result, with the test you are sure you are not getting cancer, the institution where you did the test did not give it to you, and other."

Reasons for not having a follow-up after abnormal Pap smear result- Women with abnormal Pap smear results who did not go for follow-up were asked why they did not go for a new appointment. Women had to choose one option among a list of reasons or to state another reason if none of the options matched hers. The possible options were: nobody explain it was important, believed that she could wait, she didn't know what to do, she didn't believe in the result, fear/fright, laziness/carelessness, lack of resources, and other.

Data Analysis

Data Preparation- The first step was to create a duplicate of the original datasets (household member questionnaire, and individual questionnaire). The duplicates were used to perform all the analyses. To facilitate the merging of the datasets and the analyses, variables in each duplicate file that were not relevant to the study were deleted. For example, all the questions related to pregnancy (except the question regarding current pregnancy), partum, post-partum, breastfeeding, child feeding, and domestic violence were deleted.

For each subject, both datasets had common identifiers that were used to merge the files. Four variables were used: the first one was the cluster number (v001), the next one was the household number (v002), then the respondent's line number (v003), and finally the ultimate area unit (v004). The two data sets were sorted in ascending order using these variables and then the files were merged. Then the frequencies for the variable "CASEID" were run and duplication of identifiers were not found. The duplicate of the "individual questionnaire" was saved with a new name (cervical), this file was the parent file which was used to merge the data from the "household member questionnaire". Cases from the household member questionnaire with no information in the individual questionnaire were deleted.

Prior to the selection of eligible cases, a back-up copy of the parent data file was created. Frequencies on question s904 (Have you ever gotten a Pap smear?) were run, and compared to the original data set (individual questionnaire) and no differences were found. Then, only women who have gotten a Pap smear (Q#s904=1) were kept (N=25,709). All other cases (N=15,635) were deleted from the file (Q# s904=0 or

missing). Then, frequency distributions for this question were performed again and no errors were found. Next, frequencies for question v215 (when did your last menstrual period start?) and question s343 (what is the main reason for not using a contraceptive method?) were run. Those who answered hysterectomy (n=992) were deleted from the file and frequency distributions were performed again, no errors were found. Duplicated variables and other variables with no information were deleted.

Data cleaning and editing- Once the data file had the eligible women, a back-up copy of the file was created. Frequency distributions for each variable were examined. Central tendency (mean, median, mode, and range) and data dispersion (standard deviations) measures were carried out for continuous variables (age and parity). The data was examined for impossible and implausible values (e.g. out of range and biologically impossible values), no such values were found. New variables were created and old variables were retained. Categorical variables were computed and transformed accordingly with the description provided in Appendix B and the study variables section (page 67). All new variables were assigned proper variable and value labels, decimal places, and variable type. Frequency analysis was performed and compared to original frequencies to rule out and correct any possible coding errors. A back-up of this file was saved.

Statistical Analysis

The statistical package, SPSS version 16,[210] was used for the analyses of the proposed study.

Univariate analyses- The first step of the analyses was to perform descriptive (univariate) analysis. For continuous variables, age and parity, measures of central

tendency and variation (mean, median, range, and standard deviation) were calculated. All other variables are categorical and proportions were calculated.

Bivariate analyses- Bivariate analyses of all independent, adjustment, and dependent variables were performed. Obtaining Pap smear results and follow-up of abnormal Pap smear results were examined for each category of HCC and adjustment variables. Likewise, adjustment variables were examined for each category of HCC. To identify significant relationships in the cross-tabulations mentioned above, the chi-square procedure was used. The relationships between parity and age with the dependent and independent variables was analyzed using independent sample t-test (equal variance not assumed). Statistical significance was assessed at $p<0.05$. Post-hoc analyses for chi-square were conducted using standardized Pearson residuals. Standardized Pearson residuals are the z-scores of the differences between the actual frequencies and the expected frequencies.[211] Using a significance of 0.05, the critical value for a standardized residual is ±1.96.

Correlation analyses were conducted to identify potential multicollinearities between adjustment variables. Categorical and continuous variables were analyzed by Spearman's rank and Pearson correlations respectively. If $r>0.70$, the variables were considered to be strongly correlated, indicating multicollinearity. Correlation analyses showed that none of the variables was strongly correlated. Therefore, none of the adjustment variables was excluded as a result of multicollinearity. Those with a p-value less than 0.10 in the bivariate analyses were included in multivariable analyses.

Multivariable analyses- Multivariable logistic regression analyses was used to determine the odds of follow-up of cervical cancer screening (obtaining Pap smear results

and follow-up of abnormal Pap smear results) by HCC categories and adjustment variables. Odds ratios indicated the direction and strength of the associations between the independent and the dependent variables, and 95% confidence intervals indicated the variability in the associations. The mathematical model for logistic regression is described below.

$$\text{logit}(p) = \ln\left[\frac{p_i}{1-p_i}\right] = \alpha + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + \varepsilon_i$$

Where *p* is the binomial-outcome variable indicating the probability of the follow-up behavior, α is the constant, β is the regression coefficient, *x* are the independent and adjustment variables, *i* indexes are the study subjects, and ε is the error term. The model for the study aim one and two is below.

$$\ln\left[\frac{p}{1-p}\right] = \alpha + \beta_1 x_{\text{i HCC}} + \beta_2 x_{\text{i adjustment variables}} + \varepsilon_{\text{i}}$$

In the case of Specific Aim One, *p* denotes the probability of obtaining Pap smear results. For specific aim 2, *p* indicates the probability of follow-up of abnormal Pap smear results. Analyses for Aim One included all the cases in the data set. Analyses for Aim Two included only women with abnormal Pap smear results (N=2,632).

A two-tailed test with $p<0.05$ was used to determine the statistical significance of the results. For all the estimates 95% confidence intervals were computed as well. The formula for the confidence intervals is shown below:

$$95\%\ \text{CI} = e^{(\beta \pm 1.96 \times \text{SE}(\beta))}$$

Linear trends were assessed for ordinal variables in multivariable models. Each variable of interest was entered into the adjusted model as a continuous variable instead

of an ordinal variable. This procedure gave us only one odds ratio for that variable instead of one odds ratio for each category, thus, allowing us to assess if there was a linear trend. If the p-value for the variable was less than 0.05, then, the trend was statistically significant. Direction of the association was assessed by looking at the estimated odds ratio. Odds ratios greater than one indicated that as the variable of interest increased, the association with the dependent variable also increased and vise versa.

Three different types of logistic regression models were run. The first type was unadjusted models (bivariate models) for the two levels of follow-up of cervical cancer screening (obtaining Pap smear results and follow-up of abnormal Pap smear results), the two levels of HCC (any kind and type), and then for each of the adjustment variables. The second type was full models for the two levels of follow-up of cervical cancer screening. HCC regardless of its significance and all adjustment variables that had $p<0.10$ in bivariate analyses were entered in the model. Finally, a reduced/parsimonious model for the two levels of follow-up of cervical cancer screening was run adjusting for variables that had $p<0.05$ in the full model. HCC was used in the adjusted models irrespective of its statistical significance.

The method "Enter" was used to build the models. The unadjusted models tested the null hypotheses that there is no difference in follow-up of cervical cancer screening between the different levels of HCC. Null hypotheses were rejected and full models were built to test the hypotheses that there is no difference in follow-up of cervical cancer screening between the different levels of HCC after adjusting for other socio-demographic factors. Reduced/parsimonious models were built to identify the adjustment variables that have a strong ($p<0.05$) probability of influencing the association between

HCC and follow-up. Since HCC was our main independent variable it was forced into the models.

Human Subjects

The study protocol involved secondary data analyses of the 2005 DHS dataset from Colombia. The dataset was requested from the administrator of the DHS in the United States. The dataset did not contain any names or numbers of identification documents. After the dissertation committee approved the protocol, "Category 4 Exemption" (Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects) was requested from the Institutional Review Board for Human Use (IRB) of the University of Alabama at Birmingham. The IRB determined that the project qualified as Not Human Subjects Research (Appendix B).

CHAPTER 4

RESULTS

The hypotheses of this study were tested through the analysis of the 2005 Demographic and Health Survey from Colombia. The results are presented in two sections based on the two dependent variables of the study: obtaining Pap smear results and follow-up of abnormal Pap smear results.

Obtaining Pap Smear Results

This section presents the socio-demographic characteristics of the women who had a Pap smear (N=24,717) stratified by whether they obtained their results (n=23,832, 96.4%) or not (n=885, 3.6%). Results of the multicollinearity analysis are also presented, followed by the results of the multivariable analysis by HCC status and HCC type.

Socio-demographic Characteristics

Comprehensive information about socio-demographic characteristics stratified by whether women obtained their results is presented in Table 10. Statistically significant differences between those who obtained and did not obtain their results were assessed for each variable by using Pearson $\chi 2$ for categorical variables and *t*-Test for continuous variables. Statistically significant results ($p<0.05$) based on chi-square tests were further analyzed using post-hoc analyses. The following results present only statistically significant differences based on the post-hoc analyses.

Age- Women in the sample were 18 to 49 years of age with a mean age of 33.8 years (SD=8.42). Despite a statistically significant difference in mean age between women who obtained and did not obtain their Pap smear results, this difference was so small, it has no practical significance (33.7 vs. 33.02 years). When examining age categories, women 18 to 24 years of age were less likely to obtain their results than women in other age categories.

HCC- Approximately 30% of the women did not have any health care coverage. Among those who had coverage, 47.9% and 47.2% were enrolled in the contributory and subsidized regime, respectively. Only 4.9% were enrolled in the special regime, and they were analyzed together with women in the contributory regime. The proportion of women without health care coverage was higher among those who did not obtain their results than among those who obtained it (37.3% vs. 27.4%). The same pattern was observed for those enrolled in the subsidized regime. Among women who did not obtain their results the proportion of women enrolled in this regime was higher as compared to women who obtained their results (40.3% vs. 33.9%).

Marital status- Approximately 66% of women were living with someone or married (39.2% and 27.3%, respectively). The proportion of married women was higher among those who obtained their results than for those who did not (27.4% vs. 25.0%). There were no statistically significant differences among the other categories.

Women's education- About half of the women (53.6%) had high school or technical education, 11.8% had college or graduate education, 31.6% finished elementary school, and only 3% did not have any education or preschool only. Women were more educated than their partners, with 40.4% of their partners having less than elementary

school education or no education, versus 34.3% of women with less than elementary school. The proportion of women with less than or equal to elementary school education was higher among those who did not obtain their results than among women who obtained them. Conversely, the proportion of women with high school education or more was higher among those who obtained their results than among those who did not. The same pattern was found for partner's education.

Women's occupation- About 70% of women in the sample were working, most of them (54.9%) in non-professional or non-technical jobs. The proportion of women in professional or technical jobs was significantly higher among those who obtained their results than among those who did not. On the other hand the proportion of women in non-professional or non-technical jobs was higher among those who did not obtain their results than among women who obtained them.

Parity- The median number of children was 2 (mean: 2.39, SD: 1.801). Despite a statistically significant difference in parity between women obtaining or not their results, this difference was small and had no practical significance (2.38 vs. 2.75).

Wealth index- This index measures the socio-economic level in terms of assets or wealth in the interviewed households, instead of income or expenditures.[3] According to this index 39.5% of the women were very poor or poor, 23.8% were average and 36.6% were rich or very rich. There was a higher proportion of very poor and poor women among those who did not obtain their results than among those who did (54.1% vs. 39.1%). On the other hand, the proportion of rich and very rich women was higher among those who obtained their results than among those who did not (37.1% vs. 15.4%).

Pap smear payment- Most of the women (77.0%) did not pay for their Pap smear and the proportion was higher among those who did not obtain their results (84.7% vs. 76.7%). The proportion of women who pay for their Pap smear was higher among those who obtained their results (19.9% vs. 11.8%).

Place of residency- Approximately one third of women (35.1%) lived in a small city (population between 50,000 and 1 million inhabitants), 14.7% lived in a capital city or a city with a population greater than 1 million, the remaining lived in other urban and rural areas. The percentage of women living in a large or capital city and in the rural area was higher among those who did not obtained their Pap smear results than among women who obtained them. On the contrary, women living in small cities or towns were more likely to obtain their results.

Geographic mobility- Most of the women have lived in only one place in the previous five years (80.7%). The proportion of women who have lived in the same place less than one year was higher among those who did not obtain their results (8.8% vs. 6.6%).

Geographic region- It was found that women living in certain regions of the country such as Boyacá, Cundinamarca, Meta, Pacific Coast, and Bogota were more likely not to obtain their results. On the other hand, women living in regions such as Southern Bolivar, Sucre, Cordoba, Santanderes, and the metropolitan area of Cali were more likely to obtain their results.

Perceived health status- The majority of women (73.4%) perceived their health as excellent, very good or good. The proportion of women who stated that their perceived

health status was fair or bad was higher among those who did not obtain their results than among those who did (38.2% vs. 26.3).

Health care visit last year- Most of the women (85.1%) had a health care visit in the previous 12 months. The proportion of women who had a health care visit was higher among those who obtained their results than among those who did not (85.5% vs. 73.9%).

The proportion of pregnant women at the time of the interview, with a diagnosis of a sexually transmitted disease or with a hospitalization in the previous 12 months did not differ according to whether they obtained or not their results.

In summary, women who did not obtain their results had no health care coverage or were enrolled in the subsidized regime as compared to women who obtained their results. Moreover, compared to women who obtained their results, women who did not obtain their results were less educated and poorer; were working in non-professional or non-technical jobs and living in large cities or the countryside; had lived less than a year in the place of the interview; reported fair or bad health status; and did not have a health care visit in the previous 12 months.

Multicollinearity Analyses for Socio-demographic Characteristics

Results of correlation analysis (See Table 11) show that even though most of the correlations were statistically significant they were very weak. Only a few showed a moderate correlation. Women's education showed a statistically significant correlation with partner's education (r=0.51) and wealth index (r=0.47), and was inversely correlated with parity (r=-0.44). Partner's education and wealth index were also correlated (r=0.40). As expected, parity was positively correlated with age (r=0.46). Based on these analyses multicollinearity was not found.

Table 10. Socio-Demographic Characteristics of Colombian Women who have had a Pap Smear Stratified by Obtaining Pap Smear Results Status.

	All (N=24,717)	Obtained (N=23,832)	Didn't obtain (N=885)	P-value
Health care coverage[1]				
No enrollment	6829 (27.72%)	6500 (27.36%)	329 (37.34%)	**<0.0001**[2]
Any enrollment	17809 (72.28%)	17257 (72.64%)	552 (62.66%)	
Health care coverage				
No enrollment	6829 (27.72%)	6500 (27.36%)	329 (37.34%)	**<0.0001**[2]
Subsidized regime	8416 (34.16%)	8061 (33.93%)	355 (40.30%)	
Contributory/special regime	9393 (38.12%)	9196 (38.71%)	197 (22.36%)	
Age				
Mean (Standard deviation)	33.75 (8.424)	33.77 (8.406)	33.02 (8.873)	**0.010**[3]
Median (range)	34.00 (18-49)	34.00 (18-49)	32.00 (18-49)	
18-19	690 (2.79%)	650 (2.73%)	40 (4.52%)	**0.001**[2]
20-24	3538 (14.31%)	3388 (14.22%)	150 (16.95%)	
25-29	4407 (17.83%)	4263 (17.89%)	144 (16.27%)	
30-34	4494 (18.18%)	4320 (18.13%)	174 (19.66%)	
35-39	4470 (18.08%)	4328 (18.16%)	142 (16.05%)	
40-44	3869 (15.65%)	3752 (15.74%)	117 (13.22%)	
45-49	3249 (13.14%)	3131 (13.14%)	118 (13.33%)	
Marital status				
Single	3378 (13.67%)	3251 (13.64%)	127 (14.35%)	**0.054**[2]
Married	6737 (27.26%)	6525 (27.38%)	212 (24.95%)	
Living with someone	9680 (39.16%)	9301 (39.03%)	379 (42.82%)	
Separated/divorced/widow	4922 (19.91%)	4755 (19.95%)	167 (18.87%)	

[1] 79 women did not know their health care coverage status
[2] Pearson $\chi 2$
[3] *t*-Test (two-tailed)

Table 10. (Continued)

	All (N=24,717)	Obtained (N=23,832)	Didn't obtain (N=885)	P-value
Woman's education				
None/Preschool	734 (2.97%)	692 (2.90%)	42 (4.75%)	**<0.0001**[2]
Elementary	7815 (31.62%)	7445 (31.24%)	370 (41.81%)	
High school/Technical	13252 (53.61%)	12840 (53.88%)	412 (46.55%)	
College/Graduate	2916 (11.80%)	2855 (11.98%)	61 (6.89%)	
Woman's occupation				
Not working	7525 (30.44%)	7248 (30.41%)	277 (31.30%)	**0.002**[2]
Professional/technical job	3623 (14.66%)	3530 (14.81%)	93 (10.51%)	
Non-prof./non-technical job	13569 (54.90%)	13054 (54.78%)	515 (58.19%)	
Parity				
Mean (Standard deviation)	2.39 (1.801)	2.38 (1.789)	2.75 (2.060)	**<0.0001**[3]
Median (range)	2.00 (0-16)	2.00 (0-16)	2.00 (0-14)	
No children	2868 (11.60%)	2783 (11.68%)	85 (9.60%)	**<0.0001**[2]
One child	5488 (22.20%)	5304 (22.26%)	184 (20.79%)	
Two children	6384 (25.83%)	6193 (25.99%)	191 (21.58%)	
Three children	4773 (19.31%)	4600 (19.30%)	173 (19.55%)	
Four children	2473 (10.01%)	2370 (9.94%)	103 (11.64%)	
Five children	1298 (5.25%)	1237 (5.19%)	61 (6.89%)	
Six or more children	1433 (5.80%)	1345 (5.64%)	88 (9.94%)	

Table 10. (Continued)

	All (N=24,717)	Obtained (N=23,832)	Didn't obtain (N=885)	P-value
Wealth index				
Very poor	3891 (15.74%)	3660 (15.36%)	231 (26.10%)	
Poor	5895 (23.85%)	5647 (23.69%)	248 (28.02%)	**<0.0001**[2]
Average	5887 (23.82%)	5693 (23.89%)	194 (21.92%)	
Rich	5081 (20.56%)	4957 (20.80%)	124 (14.01%)	
Very rich	3963 (16.03%)	3875 (16.26%)	88 (9.94%)	
Pap smear payment				
Didn't pay anything	19032 (77.00%)	18282 (76.71%)	750 (84.75%)	**<0.0001**[2]
Partial pay	838 (3.39%)	807 (3.39%)	31 (3.50%)	
Pay all	4847 (19.61%)	4743 (19.90%)	104 (11.75%)	
Place of residency				
Capital, large city	3634 (14.70%)	3478 (14.59%)	156 (17.63%)	
Small city	8688 (35.15%)	8452 (35.46%)	236 (26.67%)	**<0.0001**[2]
Town	6948 (28.11%)	6720 (28.20%)	228 (25.76%)	
Rural	5447 (22.04%)	5182 (21.74%)	265 (29.94%)	
Geographic mobility				
0-12 months at current place	1658 (6.71%)	1580 (6.63%)	78 (8.81%)	
13-36 months at current place	1604 (6.49%)	1541 (6.47%)	63 (7.12%)	**0.055**[2]
37-77 months at current place	1500 (6.07%)	1445 (6.06%)	55 (6.21%)	
Have lived in only one place	19955 (80.73%)	19266 (80.84%)	689 (77.85%)	
Geographic region				
Guajira, Cesar, Magdalena	2159 (8.73%)	2091 (8.77%)	68 (7.68%)	**<0.0001**[2]
Barranquilla (MA)	954 (3.86%)	926 (3.89%)	28 (3.16%)	
Atlántico, San Andres, Northern Bolivar	1157(4.68%)	1125 (4.72%)	32 (3.62%)	
Southern Bolivar, Sucre, Córdoba	1781 (7.21%)	1746 (7.33%)	35 (3.95%)	
Santander, Santander del Norte	1404 (5.68%)	1368 (5.74%)	36 (4.07%)	
Boyacá, Cundinamarca, Meta	1979 (8.01%)	1876 (7.87%)	103 (11.64%)	
Medellín (MA)	834 (3.37%)	802 (3.37%)	32 (3.62%)	
Antioquia without Medellín	767 (3.10%)	733 (3.08%)	34 (3.84%)	
Caldas, Risaralda, Quindío	2254 (9.12%)	2172 (9.11%)	82 (9.27%)	
Tolima, Huila, Caquetá	2332 (9.43%)	2262 (9.49%)	70 (7.91%)	
Cali (MA)	747 (3.02%)	735 (3.08%)	12 (1.36%)	

Table 10. (Continued)

	All (N=24,717)	Obtained (N=23,832)	Didn't obtain (N=885)	P-value
Geographic region (Continued)				
Valle without Cali or coast	843 (3.41%)	823 (3.45%)	20 (2.26%)	
Cauca and Nariño without coast	1395 (5.64%)	1349 (5.66%)	46 (5.20%)	
Pacific Coast	883 (3.57%)	836 (3.51%)	47 (5.31%)	
Bogota	1689 (6.83%)	1587 (6.66%)	102 (11.53%)	
Orinoquía and Amazonia	3539 (14.32%)	3401 (14.27%)	138 (15.59%)	
Perceived health status				
Excellent/very good	2862 (11.58%)	2776 (11.65%)	86 (9.72%)	**<0.0001**[2]
Good	15282 (61.83%)	14781 (62.02%)	501 (56.61%)	
Fair/Bad	6573 (26.59%)	6275 (26.33%)	298 (33.67%)	
Health care visit last year				
Yes	21032 (85.09%)	20378 (85.51%)	654 (73.90%)	**<0.0001**[2]
No	3685 (14.91%)	3454 (14.49%)	231 (26.10%)	
Current pregnancy				
Yes	1006 (4.07%)	972 (4.08%)	34 (3.84%)	0.786[2]
No	23711 (95.93%)	22860 (95.92%)	851 (96.16%)	
STI diagnosis last year				
Yes	322 (1.30%)	316 (1.33%)	6 (0.68%)	0.128[2]
No	24395 (98.70%)	23516 (98.67%)	879 (99.32%)	
Hospitalization last year				
Yes	2506 (10.14%)	2426 (10.18%)	80 (9.04%)	0.282[2]
No	22211 (89.86%)	21406 (89.82%)	805 (90.96%)	

Table 11. Correlation Analyses of Socio-demographic Characteristics of Colombian Women who have had a Pap Smear.

	1[1]	2	3	4[1]	5	6	7	8
1. Age	1.0	**-0.19**	**-0.07**	**0.46**	**0.06**	**0.04**	**0.12**	**0.14**
2. Woman's education	**-0.19**	1.0	**0.51**	**-0.44**	**0.47**	**0.03**	**-0.02**	**-0.21**
3. Partner's education	**-0.07**	**0.51**	1.0	**-0.20**	**0.40**	0.01	-0.01	**-0.17**
4. Parity	**0.46**	**-0.44**	**-0.20**	1.0	**-0.33**	**-0.05**	**0.04**	**0.19**
5. Wealth index	**0.06**	**0.47**	**0.40**	**-0.33**	1.0	**0.04**	**0.06**	**-0.22**
6. Pap smear payment	**0.04**	**0.03**	0.01	**-0.05**	**0.04**	1.0	**-0.02**	0.00
7. Length stay	**0.12**	**-0.02**	-0.01	**0.04**	**0.06**	**-0.02**	1.0	0.00
8. Health status	**0.14**	**-0.21**	**-0.17**	**0.19**	**-0.22**	0.00	0.00	1.0

[1]Pearson correlation. All other variables: Spearman's rank correlation
Bold: $p<0.05$

Unadjusted Logistic Regression Models

In the bivariate logistic regression models (Table 12 and Table 13) it was found that almost all the variables were associated with the outcome variable (obtaining Pap smear results). Marital status, current pregnancy, STI diagnosis and hospitalization in the last 12 months were the only variables not associated with obtaining Pap smear results.

HCC- Women without health care coverage were less likely than women with health care coverage to obtain their results (ORu (Odds ratio unadjusted)=0.63, 95%CI: 0.55,0.73). Therefore, the null hypothesis - H_{01}; There is no difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC; was rejected. When looking at health care coverage type, women enrolled in the subsidized regime were less likely to obtain their results than women in the contributory regime (ORu=0.48, 95%CI: 0.40,0.58). When women with no enrollment were compared with those in the contributory regime we saw a similar association (ORu=0.42, 95%CI: 0.35,0.50). Therefore, the null hypothesis H_{03}; there is no difference in the likelihood of obtaining Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system; was rejected.

Age- The only statistically significant difference was found for women 18 to 19 years of age. These women were 0.61 (95%CI: 0.42,0.89) times less likely to obtain their results than women 45 to 49 years of age.

Education- It was observed that women with less than college or graduate education were less likely than women with college or graduate education to obtain Pap smear results. Women with no education or only preschool were 65% less likely than

women with college or graduate education to obtain their results. Similarly, women with elementary school or high school/technical education were 57% and 33%, respectively, less likely than women with college or graduate education to obtain the results. A similar trend, except for high school/technical education, was observed with partner's education.

Woman's occupation- Women in professional or technical jobs were more likely to obtain their results than women who did not work (ORu=1.45, 95%CI: 1.14,1.84). There was no difference between women in non-professional or non-technical jobs compared to those who did not have a job.

Parity- Women without children or with four or fewer children were more likely than women with six or more children to obtain their results.

Wealth index- Women with an average wealth index and those who were very poor or poor were significantly less likely than very rich women to obtain their Pap smear results. Additionally, the odds ratios increased with increases in wealth going from 0.36 for very poor women, to 0.52 for poor women and 0.67 for women in the average category. There was no statistically significant difference between rich and very rich women (ORu=0.91, 95%CI: 0.69,1.20).

Pap smear payment- Women paying 100% of the Pap smear test were more likely than women who did not pay anything to obtain their results (ORu=1.87, 95%CI: 1.52,2.30). The association was not significant for women who had a partial payment.

Place of residency- Women living in small cities and towns were more likely than women living in rural areas to obtain their results (ORu=1.83, 95% CI: 1.53,2.19 and ORu=1.51, 95% CI: 1.26,1.81, respectively). There was no statistically significant difference between women living in rural areas, and capital and large cities.

Geographic mobility- When compared to women who have lived in only one place in the previous five years, women who have lived less than a year at the place of the interview were less likely to obtain their results (ORu=0.72, 95% CI: 0.57,0.92).

Geographic region- Women living in South Bolivar, Sucre, Cordoba, Santander, Santander del Norte, and Valle without the coast were significantly more likely than women in the Orinoquía and Amazonia to obtain their results. On the other hand, women living in Boyacá, Cundinamarca, Meta, and Bogotá were less likely to obtain their results as compared to women living in the Orinoquía and Amazonia.

Perceived health status- Women who perceived an excellent/very good, or good health status were more likely (53% and 40%, respectively) to obtain their Pap smear results than women who reported fair/bad health (95%CI: 1.20,1.96 and 95%CI: 1.21,1.62, respectively)

Health care visit last year- Women who had a health care visit in the last 12 months were two times more likely than women who did not have a health care visit to obtain their results (ORu=2.08, 95% CI: 1.79,2.43).

In summary, in unadjusted analyses, health care coverage status and type, age, education, woman's occupation, parity, wealth index, Pap smear payment, place of residency, geographic region, perceived health status, and health care visit within the last year were associated with obtaining Pap smear results.

Table 12. Logistic Regression Analyses Indicating Obtaining of Pap Smear Results by Health Care Coverage Status among Colombian Women.

	Unadjusted Model			Full Model (p<0.10)[4]			Reduced Model (p<0.05)[5]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Health care coverage									
No enrollment	0.63	0.55-0.73	**<0.0001**	0.67	0.57-0.78	**<0.0001**	0.66	0.56-0.76	**<0.0001**
Any enrollment	Ref.			Ref.			Ref.		
Age			**0.001**			**<0.0001**			**<0.0001**
18-19	0.61	0.42-0.89	**0.009**	0.52	0.34-0.79	**0.002**	0.53	0.35-0.80	**0.002**
20-24	0.85	0.67-1.09	0.199	0.71	0.53-0.95	**0.022**	0.72	0.54-0.96	**0.025**
25-29	1.12	0.87-1.43	0.386	0.95	0.72-1.25	0.705	0.96	0.73-1.25	0.754
30-34	0.94	0.74-1.19	0.584	0.84	0.65-1.08	0.177	0.85	0.66-1.09	0.194
35-39	1.15	0.90-1.47	0.274	1.12	0.86-1.44	0.405	1.13	0.87-1.46	0.351
40-44	1.21	0.93-1.57	0.153	1.19	0.91-1.54	0.208	1.19	0.92-1.55	0.187
45-49	Ref.			Ref.			Ref.		
Marital status			**0.055**			0.232			
Single	Ref.			Ref.					
Married	1.20	0.96-1.50	0.107	1.25	0.96-1.63	0.100			
Living with someone	0.96	0.78-1.18	0.687	1.24	0.97-1.58	**0.085**			
Separated/divorced/widow	1.11	0.88-1.41	0.375	1.32	1.01-1.73	**0.043**			
Woman's education			**<0.0001**			0.100			
None/Preschool	0.35	0.24-0.53	**0.003**	0.68	0.42-1.10	0.113			
Elementary	0.43	0.33-0.57	**<0.0001**	0.74	0.52-1.06	**0.096**			
High school/ Technical	0.67	0.51-0.87	**<0.0001**	0.90	0.65-1.24	0.507			
College/ Graduate	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 79 (0.3%) women who did not know their health care coverage status.
[4] Adjusted for variables with a p-value <0.10 in the unadjusted models.
[5] Adjusted for variables with a p-value <0.05 in the full model.

Table 12. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Partner's education			**<0.0001**						
None/Preschool	0.48	0.32-0.72	**<0.0001**						
Elementary	0.52	0.38-0.69	**<0.0001**						
High school/Technical	0.75	0.55-1.01	**0.056**						
College/Graduate	Ref.								
Woman's occupation			**0.002**			0.323			
Not working	Ref.			Ref.					
Professional/technical job	1.45	1.14-1.84	**0.002**	0.81	0.61-1.07	0.139			
Non-prof./non-technical job	0.97	0.83-1.12	0.676	0.94	0.80-1.10	0.411			
Parity			**<0.0001**			0.094			**0.042**
No children	2.14	1.58-2.91	**<0.0001**	1.72	1.15-2.56	**0.008**	1.61	1.12-2.32	**0.010**
One child	1.89	1.45-2.45	**<0.0001**	1.55	1.12-2.14	**0.008**	1.59	1.17-2.18	**0.003**
Two children	2.12	1.64-2.75	**<0.0001**	1.56	1.16-2.10	**0.003**	1.64	1.23-2.20	**0.001**
Three children	1.74	1.34-2.26	**<0.0001**	1.31	0.98-1.74	**0.070**	1.37	1.03-1.82	**0.031**
Four children	1.51	1.12-2.02	**0.006**	1.25	0.92-1.70	0.147	1.29	0.95-1.74	0.104
Five children	1.33	0.95-1.86	**0.099**	1.19	0.84-1.68	0.324	1.21	0.86-1.71	0.273
Six or more children	Ref.			Ref.			Ref.		
Wealth index			**<0.0001**			**<0.0001**			**<0.0001**
Very poor	0.36	0.28-0.46	**<0.0001**	0.40	0.28-0.57	**<0.0001**	0.37	0.28-0.50	**<0.0001**
Poor	0.52	0.40-0.66	**<0.0001**	0.56	0.42-0.76	**<0.0001**	0.54	0.41-0.71	**<0.0001**
Average	0.67	0.52-0.86	**0.002**	0.70	0.53-0.93	**0.014**	0.69	0.53-0.90	**0.007**
Rich	0.91	0.69-1.20	0.493	0.91	0.68-1.21	0.502	0.90	0.68-1.19	0.467
Very rich	Ref.			Ref.			Ref.		

Table 12. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Pap smear payment			**<0.0001**			**<0.0001**			**<0.0001**
Didn't pay anything	Ref.			Ref.			Ref.		
Partial pay	1.07	0.74-1.54	0.725	1.16	0.80-1.69	0.430	1.17	0.81-1.70	0.409
Pay all	1.87	1.52-2.30	**<0.0001**	1.80	1.45-2.24	**<0.0001**	1.82	1.46-2.26	**<0.0001**
Place of residency			**<0.0001**			0.901			
Capital, large city	1.14	0.93-1.40	0.204	0.85	0.46-1.55	0.596			
Small city	1.83	1.53-2.19	**<0.0001**	0.99	0.78-1.27	0.951			
Town	1.51	1.26-1.81	**<0.0001**	1.05	0.82-1.34	0.708			
Rural	Ref.			Ref.					
Geographic mobility			**0.056**			0.683			
0-12 months current place	0.72	0.57-0.92	**0.008**	0.86	0.67-1.10	0.230			
13-36 months current place	0.87	0.67-1.14	0.319	0.97	0.74-1.28	0.854			
37-77 months current place	0.94	0.71-1.24	0.662	0.95	0.71-1.26	0.710			
Lived only in one place	Ref.			Ref.					
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	1.25	0.93-1.68	0.142	1.32	0.95-1.82	**0.094**	1.31	0.97-1.77	**0.080**
Barranquilla (MA)	1.34	0.89-2.03	0.162	1.24	0.65-2.35	0.518	1.08	0.71-1.64	0.726
Atlántico, San Andres, Northern Bolivar	1.43	0.97-2.11	**0.075**	1.22	0.80-1.86	0.347	1.24	0.84-1.85	0.281
Southern Bolivar, Sucre, Córdoba	2.02	1.39-2.95	**<0.0001**	2.32	1.55-3.48	**<0.0001**	2.33	1.58-3.45	**<0.0001**
Santander, Santander del Norte	1.54	1.06-2.24	**0.023**	1.38	0.93-2.07	0.112	1.33	0.91-1.94	0.140
Boyacá, Cundinamarca, Meta	0.74	0.57-0.96	**0.023**	0.76	0.56-1.02	**0.066**	0.73	0.56-0.95	**0.020**
Medellín (MA)	1.02	0.69-1.51	0.933	0.77	0.44-1.35	0.360	0.66	0.44-0.99	**0.047**
Antioquia without Medellín	0.87	0.60-1.28	0.494	1.13	0.75-1.72	0.552	1.11	0.75-1.64	0.619
Caldas, Risaralda, Quindío	1.07	0.81-1.42	0.612	0.96	0.70-1.31	0.787	0.92	0.69-1.22	0.566
Tolima, Huila, Caquetá	1.31	0.98-1.76	**0.069**	1.50	1.08-2.08	**0.016**	1.45	1.08-1.96	**0.015**
Cali (MA)	2.49	1.37-4.51	**0.003**	2.09	0.92-4.77	**0.080**	1.71	0.94-3.14	**0.080**
Valle without Cali or coast	1.67	1.04-2.69	**0.034**	1.44	0.87-2.36	0.154	1.38	0.85-2.24	0.192
Cauca and Nariño without coast	1.19	0.85-1.67	0.316	1.16	0.79-1.69	0.442	1.09	0.77-1.54	0.616
Pacific Coast	0.72	0.51-1.01	**0.060**	1.01	0.69-1.47	0.964	1.00	0.70-1.43	0.987
Bogota	0.63	0.49-0.82	**0.001**	0.53	0.28-1.01	**0.055**	0.44	0.33-0.58	**<0.0001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		

Table 12. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Perceived health status			**<0.0001**			**0.018**			**0.015**
Excellent/very good	1.53	1.20-1.96	**0.001**	1.21	0.93-1.56	0.157	1.21	0.94-1.57	0.140
Good	1.40	1.21-1.62	**<0.0001**	1.25	1.07-1.46	**0.005**	1.25	1.07 -1.46	**0.004**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	2.08	1.79-2.43	**<0.0001**	1.94	1.65-2.28	**<0.0001**	1.97	1.67-2.32	**<0.0001**
No	Ref.			Ref.			Ref.		
Current pregnancy									
Yes	1.06	0.75-1.51	0.726						
No	Ref.								
STI diagnosis last year									
Yes	1.97	0.88-4.43	0.101	1.96	0.87-4.43	0.107			
No	Ref.			Ref.					
Hospitalization last year									
Yes	1.14	0.90-1.44	0.270						
No	Ref.								

Table 13. Logistic Regression Analyses Indicating Obtaining of Pap Smear Results by Health Care Coverage Type among Colombian Women.

	Unadjusted Model			**Full Model (p<0.10)[1]**			**Reduced Model (p<0.05)[2]**		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Health care coverage			**<0.0001**			**<0.0001**			**<0.0001**
No enrollment	0.42	0.35-0.50	**<0.0001**	0.52	0.42-0.64	**<0.0001**	0.51	0.42-0.62	**<0.0001**
Subsidized regime	0.48	0.40-0.58	**<0.0001**	0.69	0.56-0.86	**0.001**	0.68	0.56-0.84	**<0.0001**
Contributory/special regime	Ref.			Ref.			Ref.		
Age			**0.001**			**0.001**			**0.006**
18-19	0.61	0.42-0.89	**0.009**	0.55	0.36-0.83	**0.005**	0.68	0.47-0.99	**0.047**
20-24	0.85	0.67-1.09	0.199	0.73	0.55-0.98	**0.039**	0.89	0.69-1.14	0.359
25-29	1.12	0.87-1.43	0.386	0.97	0.74-1.28	0.829	1.12	0.87-1.44	0.390
30-34	0.94	0.74-1.19	0.584	0.85	0.66-1.10	0.219	0.94	0.74-1.20	0.637
35-39	1.15	0.90-1.47	0.274	1.13	0.87-1.46	0.352	1.21	0.94-1.55	0.143
40-44	1.21	0.93-1.57	0.153	1.19	0.92-1.55	0.190	1.24	0.95-1.61	0.112
45-49	Ref.			Ref.			Ref.		
Marital status			**0.055**			0.275			
Single	Ref.			Ref.					
Married	1.20	0.96-1.50	0.107	1.20	0.92-1.57	0.176			
Living with someone	0.96	0.78-1.18	0.687	1.21	0.94-1.54	0.132			
Separated/ divorced/widow	1.11	0.88-1.41	0.375	1.31	1.00-1.72	**0.049**			
Woman's education			**<0.0001**			0.219			
None/Preschool	0.35	0.24-0.53	**0.003**	0.73	0.45-1.18	0.198			
Elementary	0.43	0.33-0.57	**<0.0001**	0.80	0.56-1.14	0.214			
High school/ Technical	0.67	0.51-0.87	**<0.0001**	0.94	0.68-1.30	0.701			
College/ Graduate	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 79 (0.3%) women who did not know their health care coverage status.
[1] Adjusted for variables with a p-value <0.10 in the unadjusted models.
[2] Adjusted for variables with a p-value <0.05 in the full model.

Table 13. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Partner's education			**<0.0001**						
None/Preschool	0.48	0.32-0.72	**<0.0001**	[3]					
Elementary	0.52	0.38-0.69	**<0.0001**						
High school/Technical	0.75	0.55-1.01	**0.056**						
College/Graduate	Ref.								
Woman's occupation			**0.002**			0.129			
Not working	Ref.			Ref.					
Professional/technical job	1.45	1.14-1.84	**0.002**	0.74	0.55-0.99	**0.044**			
Non-prof./non-technical job	0.97	0.83-1.12	0.676	0.93	0.79-1.09	0.366			
Parity			**<0.0001**			0.140			
No children	2.14	1.58-2.91	**<0.0001**	1.66	1.11-2.49	**0.013**			
One child	1.89	1.45-2.45	**<0.0001**	1.50	1.09-2.08	**0.014**			
Two children	2.12	1.64-2.75	**<0.0001**	1.52	1.13-2.05	**0.006**			
Three children	1.74	1.34-2.26	**<0.0001**	1.28	0.96-1.71	**0.094**			
Four children	1.51	1.12-2.02	**0.006**	1.24	0.91-1.68	0.170			
Five children	1.33	0.95-1.86	**0.099**	1.18	0.83-1.66	0.355			
Six or more children	Ref.			Ref.					
Wealth index			**<0.0001**			**<0.0001**			**<0.0001**
Very poor	0.36	0.28-0.46	**<0.0001**	0.47	0.33-0.68	**<0.0001**	0.41	0.30-0.56	**<0.0001**
Poor	0.52	0.40-0.66	**<0.0001**	0.64	0.47-0.87	**0.004**	0.60	0.45-0.80	**<0.0001**
Average	0.67	0.52-0.86	**0.002**	0.77	0.58-1.02	**0.073**	0.75	0.57-1.00	**0.046**
Rich	0.91	0.69-1.20	0.493	0.95	0.71-1.27	0.732	0.95	0.72-1.27	0.743
Very rich	Ref.			Ref.			Ref.		

[3] This variable was not included in the full model

Table 13. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Pap smear payment			**<0.0001**			**<0.0001**			**<0.0001**
Didn't pay anything	Ref.			Ref.			Ref.		
Partial pay	1.07	0.74-1.54	0.725	1.17	0.80-1.69	0.415	1.18	0.82-1.72	0.375
Pay all	1.87	1.52-2.30	**<0.0001**	1.81	1.46-2.25	**<0.0001**	1.86	1.50-2.31	**<0.0001**
Place of residency			**<0.0001**			0.895			
Capital, large city	1.14	0.93-1.40	0.204	0.86	0.47-1.58	0.637			
Small city	1.83	1.53-2.19	**<0.0001**	1.00	0.78-1.27	0.971			
Town	1.51	1.26-1.81	**<0.0001**	1.06	0.83-1.35	0.654			
Rural	Ref.			Ref.					
Geographic mobility			**0.056**			0.597			
0-12 months current place	0.72	0.57-0.92	**0.008**	0.84	0.65-1.08	0.178			
13-36 months current place	0.87	0.67-1.14	0.319	0.96	0.73-1.26	0.766			
37-77 months current place	0.94	0.71-1.24	0.662	0.94	0.71-1.25	0.665			
Lived only in one place	Ref.			Ref.					
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	1.25	0.93-1.68	0.142	1.32	0.95-1.82	**0.095**	1.28	0.95-1.73	0.111
Barranquilla (MA)	1.34	0.89-2.03	0.162	1.22	0.64-2.32	0.545	1.08	0.71-1.64	0.726
Atlántico, San Andres, Northern Bolivar	1.43	0.97-2.11	**0.075**	1.23	0.81-1.87	0.324	1.27	0.86-1.89	0.234
Southern Bolivar, Sucre, Córdoba	2.02	1.39-2.95	**<0.0001**	2.32	1.55-3.47	**<0.0001**	2.35	1.59-3.47	**<0.0001**
Santander, Santander del Norte	1.54	1.06-2.24	**0.023**	1.39	0.93-2.08	0.104	1.34	0.92-1.96	0.130
Boyacá, Cundinamarca, Meta	0.74	0.57-0.96	**0.023**	0.75	0.56-1.02	**0.065**	0.73	0.56-0.95	**0.021**
Medellín (MA)	1.02	0.69-1.51	0.933	0.76	0.43-1.32	0.324	0.67	0.45-1.01	**0.056**
Antioquia without Medellín	0.87	0.60-1.28	0.494	1.10	0.73-1.67	0.642	1.07	0.72-1.59	0.731
Caldas, Risaralda, Quindío	1.07	0.81-1.42	0.612	0.96	0.70-1.32	0.820	0.96	0.72-1.28	0.776
Tolima, Huila, Caquetá	1.31	0.98-1.76	**0.069**	1.49	1.08-2.07	**0.016**	1.45	1.07-1.95	**0.016**
Cali (MA)	2.49	1.37-4.51	**0.003**	2.08	0.91-4.76	**0.081**	1.78	0.97-3.25	**0.062**
Valle without Cali or coast	1.67	1.04-2.69	**0.034**	1.43	0.87-2.35	0.162	1.41	0.87-2.29	0.162
Cauca and Nariño without coast	1.19	0.85-1.67	0.316	1.19	0.82-1.74	0.360	1.16	0.82-1.64	0.392
Pacific Coast	0.72	0.51-1.01	**0.060**	1.01	0.69-1.46	0.970	0.97	0.68-1.38	0.873
Bogota	0.63	0.49-0.82	**0.001**	0.52	0.27-1.00	**0.050**	0.44	0.33-0.58	**<0.0001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		

Table 13. (Continued)

	Unadjusted Model			Full Model (p<0.10)[1]			Reduced Model (p<0.05)[2]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Perceived health status			**<0.0001**			**0.029**			**0.017**
Excellent/very good	1.53	1.20-1.96	**0.001**	1.18	0.91-1.53	0.221	1.19	0.92-1.54	0.187
Good	1.40	1.21-1.62	**<0.0001**	1.23	1.06-1.44	**0.008**	1.25	1.07 -1.46	**0.004**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	2.08	1.79-2.43	**<0.0001**	1.92	1.63-2.26	**<0.0001**	1.95	1.66-2.30	**<0.0001**
No	Ref.			Ref.			Ref.		
Current pregnancy									
Yes	1.06	0.75-1.51	0.726						
No	Ref.								
STI diagnosis last year									
Yes	1.97	0.88-4.43	0.101	1.97	0.87-4.46	0.103			
No	Ref.			Ref.					
Hospitalization last year									
Yes	1.14	0.90-1.44	0.270						
No	Ref.								

Multivariable Analyses

Health Care Coverage Status

Variables that were significant at $p<0.10$ in the bivariate analysis were included in the full model. There were only two variables that were not eligible ($p<0.10$) for adjustment in the full model: current pregnancy and hospitalization in the previous 12 months. All other variables were included in the full model. Partner's education was analyzed in a full model without marital status because accurate estimates could not have been calculated for women without a partner. The model showed that partner's education was not significant, and did not have an effect on the main independent variable. Therefore, it was decided to exclude partner's education in the full or reduced models to be able to include all women who did or did not have a partner. Given that HCC was the main independent variable, it was forced into the models regardless of its significance.

HCC- In the full model (Table 12), women without health care coverage were less likely to obtain their results than women with health care coverage (ORa(Odds ratio adjusted=0.67, 95%CI: 0.57,0.78), after adjusting for age, marital status, education and occupation, parity, wealth index, Pap smear payment, place of residency, geographic mobility, geographic region, perceived health status, health care visit within last year, and STI diagnosis within the last year.

Age- The likelihood of obtaining Pap smear results increased as age increased. A test for linear trend showed that there is a statistically significant linear trend ($p<0.001$). However, by age categories, only women 18 to 19 and 20 to 24 years of age differed significantly from women 45 to 49. Women 18 to 19 years of age were 0.52 (95%CI: 0.34,0.79) times less likely to obtain their results than women 45 to 49 years of age.

Women 20 to 24 years of age were 0.71 (95%CI: 0.53,0.95) times less likely than women 45 to 49 years of age to obtain their results.

Wealth index- After adjusting for the other variables, women with an average wealth index and those very poor and poor were significantly less likely than the very rich women to obtain their Pap smear results. Additionally, the odds ratios increased with increases in wealth going from 0.40 for very poor women, to 0.56 for poor women and 0.70 for women in the average category. There was no statistically significant difference between rich and very rich women. The results were very similar to those in the unadjusted model.

Pap smear payment- Women paying 100% of the Pap smear test were more likely than women who did not pay anything to obtain their results (ORa=1.80, 95%CI: 1.45,2.24). The difference between women who had a partial payment and women who did not pay was not statistically significant. The results were similar to those in the unadjusted model.

Geographic region- Women living in South Bolivar, Sucre, Cordoba, Tolima, Huila and Caquetá were significantly more likely than women in the Orinoquía and Amazonia to obtain their results.

Perceived health status- Women who perceived a good health status were 25% more likely than women who reported fair or bad health to obtain their Pap smear results (ORa=1.25, 95% CI: 1.07,1.46) . There was no significant difference between women who reported excellent/very good health compared to those who reported fair or bad health.

Health care visit last year- Women who had a health care visit in the last 12 months were more likely to obtain their results than women who did not have a health care visit (ORa=1.94, 95% CI: 1.65,2.28).

In the adjusted model, women's education and occupation, place of residency, geographic mobility, or an STI diagnosis in the previous 12 months were no longer associated with obtaining Pap smear results.

In summary, in adjusted analyses (full model), health care coverage status, age, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit within the last year were associated with obtaining Pap smear results.

Variables that were significant at $p<0.05$ in the full model and HCC regardless of significance, were included in the reduced or parsimonious model (Table 12). The variables entered on step one in the reduced model were: age, marital status, parity, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit in the previous 12 months. The only variable that was no longer significant was marital status.

In the reduced model, as in the full and unadjusted models, women without health care coverage were less likely to obtain their results than women with health care coverage (ORa=0.66, 95%CI: 0.56,0.76) , after adjusting for age, parity, wealth index, Pap smear payment, geographic region, perceived health status, health care visit within last year. Therefore, the null hypothesis- H_{02}; There is no difference in the likelihood of obtaining Pap smear results in women with HCC as compared to women with no HCC after adjusting for predisposing characteristics, enabling resources, and need; was rejected.

Health Care Coverage Type

In the full model (Table 13), as in the unadjusted model, women enrolled in the subsidized regime were less likely to obtain their results than women in the contributory regime (ORa=0.69, 95%CI: 0.56,0.86). After adjusting for age, marital status, woman's education and occupation, parity, wealth index, Pap smear payment, place of residency, geographic mobility, geographic region, perceived health status, health care visit within last year, and STI diagnosis within the last year, women with no enrollment as compared to those in the contributory regime were 0.52 times less likely to obtain their results (95%CI: 0.42,0.64),. The estimates for the adjustment variables were very similar to those obtained with the full model for HCC status.

Variables that were significant at $p<0.05$ in the full model were included in the reduced or parsimonious model (Table 13). The variables entered in the first step in the reduced model were age, marital status, woman's occupation, parity, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit in the previous 12 months. Given that HCC was the main independent variable, it was forced into the models regardless of its significance. Marital status, woman's occupation, and parity were not significant in the reduced model.

In the reduced model, women enrolled in the subsidized regime were less likely than women in the contributory regime to obtain their results (ORa=0.68, 95%CI: 0.56,0.84). After adjusting for age, wealth index, Pap smear payment, geographic region, perceived health status, health care visit within last year, women with no enrollment as compared to those in the contributory regime were 0.51 times less likely to obtain their results (95%CI: 0.42,0.62).. Therefore, the null hypothesis; H_{04}: There is no difference in

the likelihood of obtaining Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system, after adjusting for predisposing characteristics, enabling resources, and need; was rejected.

The estimates for the statistically significant adjustment variables in the reduced model were very similar to those obtained with the full model for HCC type, and full and reduced models for HCC status, excluding the fact that parity was not significant in the reduced model for HCC type whereas it was for HCC status.

Stratified Analyses

One of the limitations of the study was that women were asked about their health care coverage at the time of the interview. This may differ from the status of health care coverage at the time of the Pap smear test or obtaining of Pap smear results, especially if the test was taken long time ago. In order to reduce possible errors associated with this limitation, stratified analysis for reduced models by the time of the last Pap smear were conducted. About 62% of women had a Pap smear within the previous 12 months, 19% had it between 13 and 24 months ago, 7% had it between 25 and 36 months ago, and 11.6% had it 37 or more months ago. Results of parsimonious models stratified according to these categories were difficult to interpret and some of the categories within variables did not have enough numbers to obtain estimates. Therefore, it was decided to have two strata: one for those who had a Pap smear within the previous year, and those who had it 13 or more months ago (Table 14 and Table 15). HCC and variables that were statistically significant in reduced models were assessed in stratified models.

Table 14. Logistic Regression Analyses Indicating Obtaining of Pap Smear Results among Colombian Women Stratified by HCC status and by The Time of The Last Pap Smear.

	All[9]			**0-12 months ago**[10 11]			**13 or more months ago**[3 12]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Health care coverage									
No enrollment	0.66	0.56-0.76	**<0.0001**	0.58	0.47-0.72	**<0.0001**	0.73	0.59-0.89	**0.003**
Any enrollment	Ref.			Ref.			Ref.		
Age			**<0.0001**			**0.056**			**0.003**
18-19	0.53	0.35-0.80	**0.002**	0.50	0.29-0.87	**0.014**	0.52	0.27-1.00	**0.048**
20-24	0.72	0.54-0.96	**0.025**	0.65	0.43-0.97	**0.037**	0.83	0.55-1.25	0.374
25-29	0.96	0.73-1.25	0.754	0.93	0.62-1.39	0.726	0.99	0.68-1.43	0.942
30-34	0.85	0.66-1.09	0.194	0.91	0.62-1.33	0.610	0.81	0.58-1.13	0.205
35-39	1.13	0.87-1.46	0.351	0.97	0.67-1.41	0.876	1.31	0.92-1.86	0.135
40-44	1.19	0.92-1.55	0.187	1.00	0.68-1.47	0.993	1.43	1.00-2.06	**0.052**
45-49	Ref.			Ref.			Ref.		
Parity			**0.042**			0.554			**0.013**
No children	1.61	1.12-2.32	**0.010**	1.69	1.00-2.87	**0.050**	1.53	0.92-2.55	0.102
One child	1.59	1.17-2.18	**0.003**	1.49	0.95-2.35	**0.084**	1.75	1.13-2.71	**0.012**
Two children	1.64	1.23-2.20	**0.001**	1.41	0.92-2.15	0.112	1.99	1.32-3.01	**0.001**
Three children	1.37	1.03-1.82	**0.031**	1.46	0.95-2.23	**0.081**	1.33	0.90-1.95	0.148
Four children	1.29	0.95-1.74	0.104	1.56	0.98-2.49	**0.062**	1.14	0.76-1.71	0.520
Five children	1.21	0.86-1.71	0.273	1.34	0.78-2.29	0.284	1.12	0.72-1.76	0.617
Six or more children	Ref.			Ref.			Ref.		

[9] Reduced model with all women n=24,717
[10] Women who had a Pap smear within the last year n=15,278.
[11] Variables that were significant in the reduced model for all women were forced into the model.
[12] Women who had a Pap smear between 13 or more months ago n=9,310.
Ref.: Referent group. Bold: p<0.10.

Table 14. (Continued)

	All[1]			0-12 months ago[2 3]			13 or more months ago[3 4]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Wealth index			**<0.0001**			**<0.0001**			**<0.0001**
Very poor	0.37	0.28-0.50	**<0.0001**	0.35	0.23-0.53	**<0.0001**	0.40	0.26-0.61	**<0.0001**
Poor	0.54	0.41-0.71	**<0.0001**	0.47	0.32-0.68	**<0.0001**	0.62	0.42-0.93	**0.022**
Average	0.69	0.53-0.90	**0.007**	0.66	0.46-0.97	**0.033**	0.72	0.49-1.08	0.112
Rich	0.90	0.68-1.19	0.467	0.82	0.56-1.20	0.302	0.98	0.65-1.50	0.938
Very rich	Ref.			Ref.			Ref.		
Pap smear payment			**<0.0001**			**<0.0001**			**0.005**
Didn't pay anything	Ref.			Ref.			Ref.		
Partial pay	1.17	0.81-1.70	0.409	1.46	0.83-2.58	0.190	0.96	0.59-1.59	0.887
Pay all	1.82	1.46-2.26	**<0.0001**	2.42	1.67-3.51	**<0.0001**	1.57	1.20-2.07	**0.001**
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	1.31	0.97-1.77	**0.080**	1.48	0.93-2.33	**0.095**	1.18	0.78-1.78	0.432
Barranquilla (MA)	1.08	0.71-1.64	0.726	1.02	0.53-1.97	0.943	1.12	0.64-1.95	0.699
Atlántico, San Andres, Northern Bolivar	1.24	0.84-1.85	0.281	1.03	0.60-1.77	0.925	1.51	0.85-2.69	0.162
Southern Bolivar, Sucre, Córdoba	2.33	1.58-3.45	**<0.0001**	2.30	1.31-4.03	**0.004**	2.32	1.34-4.02	**0.003**
Santander, Santander del Norte	1.33	0.91-1.94	0.140	0.98	0.60-1.60	0.929	1.87	1.03-3.39	**0.040**
Boyacá, Cundinamarca, Meta	0.73	0.56-0.95	**0.020**	0.67	0.46-0.97	**0.033**	0.80	0.54-1.18	0.262
Medellín (MA)	0.66	0.44-0.99	**0.047**	0.61	0.35-1.08	**0.093**	0.70	0.39-1.25	0.224
Antioquia without Medellín	1.11	0.75-1.64	0.619	0.85	0.49-1.48	0.566	1.36	0.77-2.38	0.289
Caldas, Risaralda, Quindío	0.92	0.69-1.22	0.566	1.00	0.67-1.49	0.996	0.79	0.52-1.21	0.284
Tolima, Huila, Caquetá	1.45	1.08-1.96	**0.015**	1.57	1.02-2.43	**0.041**	1.31	0.86-1.99	0.213
Cali (MA)	1.71	0.94-3.14	**0.080**	2.35	0.93-5.91	**0.069**	1.25	0.56-2.79	0.594
Valle without Cali or coast	1.38	0.85-2.24	0.192	1.75	0.86-3.56	0.122	1.16	0.58-2.32	0.668
Cauca and Nariño without coast	1.09	0.77-1.54	0.616	1.19	0.74-1.94	0.472	0.92	0.56-1.51	0.734
Pacific Coast	1.00	0.70-1.43	0.987	1.03	0.61-1.74	0.911	0.98	0.60-1.60	0.938
Bogota	0.44	0.33-0.58	**<0.0001**	0.39	0.27-0.58	**<0.0001**	0.50	0.33-0.74	**0.001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		

Table 14. (Continued)

	All[1]			0-12 months ago[2 3]			13 or more months ago[3 4]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Perceived health status			**0.015**			0.134			**0.036**
Excellent/very good	1.21	0.94-1.57	0.140	0.98	0.69-1.39	0.902	1.50	1.02-2.22	**0.041**
Good	1.25	1.07 -1.46	**0.004**	1.22	0.98-1.52	**0.082**	1.28	1.03-1.59	**0.025**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.97	1.67-2.32	**<0.0001**	It is constant for all selected cases.			1.67	1.37-2.04	**<0.0001**
No	Ref.						Ref.		

Table 15. Logistic Regression Analyses Indicating Obtaining of Pap Smear Results among Colombian Women Stratified by HCC Type and by The Time of The Last Pap Smear.

	All[13]			**0-12 months ago**[14 15]			**13 or more months ago**[3 16]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Health care coverage			**<0.0001**			**<0.0001**			**0.001**
No enrollment	0.51	0.42-0.62	**<0.0001**	0.44	0.33-0.59	**<0.0001**	0.58	0.43-0.78	**<0.0001**
Subsidized regime	0.68	0.56-0.84	**<0.0001**	0.65	0.49-0.86	**0.003**	0.72	0.54-0.98	**0.036**
Contributory/special regime	Ref.			Ref.			Ref.		
Age			**0.006**			0.104			**0.020**
18-19	0.68	0.47-0.99	**0.047**	0.61	0.37-1.00	**0.051**	0.72	0.39-1.33	0.295
20-24	0.89	0.69-1.14	0.359	0.74	0.51-1.07	0.105	1.12	0.78-1.61	0.549
25-29	1.12	0.87-1.44	0.390	1.03	0.71-1.50	0.857	1.21	0.86-1.72	0.276
30-34	0.94	0.74-1.20	0.637	0.98	0.68-1.41	0.911	0.92	0.67-1.28	0.634
35-39	1.21	0.94-1.55	0.143	1.02	0.71-1.49	0.899	1.42	1.00-2.01	**0.050**
40-44	1.24	0.95-1.61	0.112	1.03	0.70-1.52	0.878	1.50	1.04-2.15	**0.029**
45-49	Ref.			Ref.			Ref.		
Wealth index			**<0.0001**			**<0.0001**			**<0.0001**
Very poor	0.41	0.30-0.56	**<0.0001**	0.42	0.27-0.65	**<0.0001**	0.39	0.25-0.61	**<0.0001**
Poor	0.60	0.45-0.80	**<0.0001**	0.55	0.37-0.82	**0.003**	0.64	0.42-0.98	**0.038**
Average	0.75	0.57-1.00	**0.046**	0.75	0.51-1.11	0.150	0.76	0.51-1.13	0.178
Rich	0.95	0.72-1.27	0.743	0.88	0.60-1.30	0.516	1.02	0.66-1.55	0.941
Very rich	Ref.			Ref.			Ref.		

[13] Reduced model with all women n=24,717
[14] Women who had a Pap smear within the last year n=15,278.
[15] Variables that were significant in the reduced model for all women were forced into the model.
[16] Women who had a Pap smear between 13 or more months ago n=9,310.
Ref.: Referent group. Bold: p<0.10.

Table 15. (Continued)

	All[1]			0-12 months ago[1 2]			13 or more months ago[3 4]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Pap smear payment			**<0.0001**			**<0.0001**			**0.002**
Didn't pay anything	Ref.			Ref.			Ref.		
Partial pay	1.18	0.82-1.72	0.375	1.47	0.83-2.60	0.182	0.99	0.60-1.62	0.965
Pay all	1.86	1.50-2.31	**<0.0001**	2.47	1.70-3.58	**<0.0001**	1.62	1.24-2.14	**<0.0001**
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	1.28	0.95-1.73	0.111	1.43	0.91-2.26	0.122	1.16	0.77-1.74	0.485
Barranquilla (MA)	1.08	0.71-1.64	0.726	1.00	0.52-1.92	0.995	1.12	0.64-1.96	0.688
Atlántico, San Andres, Northern Bolivar	1.27	0.86-1.89	0.234	1.04	0.60-1.78	0.897	1.55	0.87-2.76	0.139
Southern Bolivar, Sucre, Córdoba	2.35	1.59-3.47	**<0.0001**	2.29	1.31-4.01	**0.004**	2.34	1.35-4.05	**0.002**
Santander, Santander del Norte	1.34	0.92-1.96	0.130	0.97	0.60-1.60	0.920	1.88	1.04-3.41	**0.038**
Boyacá, Cundinamarca, Meta	0.73	0.56-0.95	**0.021**	0.66	0.46-0.96	**0.029**	0.80	0.54-1.19	0.275
Medellín (MA)	0.67	0.45-1.01	**0.056**	0.61	0.34-1.08	**0.090**	0.71	0.40-1.27	0.247
Antioquia without Medellín	1.07	0.72-1.59	0.731	0.82	0.47-1.43	0.487	1.33	0.76-2.34	0.323
Caldas, Risaralda, Quindío	0.96	0.72-1.28	0.776	1.03	0.69-1.52	0.898	0.83	0.54-1.27	0.388
Tolima, Huila, Caquetá	1.45	1.07-1.95	**0.016**	1.54	1.00-2.38	**0.051**	1.31	0.86-1.99	0.212
Cali (MA)	1.78	0.97-3.25	**0.062**	2.41	0.96-6.07	**0.061**	1.29	0.57-2.89	0.538
Valle without Cali or coast	1.41	0.87-2.29	0.162	1.76	0.87-3.57	0.119	1.19	0.60-2.38	0.617
Cauca and Nariño without coast	1.16	0.82-1.64	0.392	1.26	0.77-2.04	0.354	0.97	0.59-1.60	0.913
Pacific Coast	0.97	0.68-1.38	0.873	0.99	0.59-1.67	0.966	0.95	0.58-1.55	0.839
Bogota	0.44	0.33-0.58	**<0.0001**	0.39	0.26-0.58	**<0.0001**	0.49	0.33-0.74	**0.001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		
Perceived health status			**0.017**			0.170			**0.041**
Excellent/very good	1.19	0.92-1.54	0.187	0.96	0.68-1.36	0.815	1.46	0.99-2.16	**0.056**
Good	1.25	1.07 -1.46	**0.004**	1.19	0.96-1.49	0.116	1.28	1.03-1.59	**0.023**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.95	1.66-2.30	**<0.0001**	It is constant for all selected cases.			1.65	1.35-2.02	**<0.0001**
No	Ref.						Ref.		

The results of exploration of sociodemographic variables by whether the last Pap smear was performed within the last year or more time ago are presented in the APPENDIX D. All socio-demographic variables except for perceived health status, current pregnancy, and hospitalization during the last year were statistically significantly different. However, most of the differences were small; the majority were within less than four percentage points. The most meaningful differences were found for HCC and Pap smear payment. A higher proportion of women without HCC had their last Pap smear more than a year ago. In contrast, women with some kind of enrollment, especially those in the subsidized regime, were more likely to have had their Pap smear within the last year. Also, a bigger proportion of women who paid for their Pap smear had it more than a year ago, and those who had their Pap smear within the last year were more likely to not pay anything.

Health Care Coverage Status

Results for stratified analyses for health care coverage status are presented in Table 14. The association between health care coverage status and obtaining Pap smear results for all women held significant for both strata.

Age, wealth index, Pap smear payment, and geographic region remained significant for both strata. Parity and perceived health status were only significant for women who had their Pap smear 13 or more months ago.

Health Care Coverage Type

Results for stratified analyses for health care coverage type are presented in Table 15. The association between health care coverage type and obtaining Pap smear results for all women remained significant for both strata.

Wealth index, Pap smear payment, and geographic region remained significant for both strata. Age and perceived health status were only significant for women who had their Pap smear 13 or more months ago.

Follow-up of Abnormal Pap Smear Results

This section will first present the socio-demographic characteristics of the women who had an abnormal Pap smear (N=2,632) stratified by whether they had a follow-up (n=2,198, 83.5%) or not (n=434, 16.5%)). Then, the results of multicollinearity analysis and the results of multivariable analysis by HCC status and HCC type are presented.

Socio-demographic Characteristics

Comprehensive information about socio-demographic characteristics stratified by whether the women had a follow-up or not is presented in Table 16. Statistically significant differences between women who had and did not have a follow-up of abnormal Pap smear results were assessed for each variable by using Pearson $\chi 2$ for categorical variables and *t*-Test for continuous variables. Statistically significant results (p-value <0.05) based on chi-square tests were further analyzed using post-hoc analyses. The following results present only statistically significant differences based on the post-hoc analyses.

Age- Women in the sample were 18 to 49 years of age with a mean age of 33.4 years (SD 8.33). There was no statistically significant difference in age between women with follow-up and no follow-up.

HCC- Thirty percent of women did not have any health care coverage, and among those who had coverage, 46.8% and 53.2% were enrolled in the contributory/special regime and subsidized regime, respectively. When comparing women with no enrollment to each of the different regimes, the proportion of women without health care coverage was higher among those who did not have a follow-up than among those who did (34.6% vs. 29.1%). The same pattern was observed for those enrolled in the subsidized regime, among women who did not have a follow-up there was a higher proportion of women enrolled in this regime as compared to those who had a follow-up (39.73% vs. 36.8%).

Women's education- About half of the women (54.4%) had high school or technical education, only 3.3% did not have any education or preschool only. The proportion of women with less than elementary school education was higher among those who did not have a follow-up than among women who had. Conversely, the proportion of women with high school education or more was higher among those who had a follow-up than among those who did not. The same pattern was found for partner's education.

Wealth index- 42.7% of the women were very poor or poor, 24.9% were average and 32.5% were rich or very rich. There was a higher proportion of very poor and poor women among those who did not have a follow-up (46.6% vs. 41.9%). On the other hand, the proportion of rich and very rich women was higher among those who had a follow-up than among those who did not (33.6% vs. 27.0%).

Place of residency- Almost half of women (40.3%) lived in a small city (population between 50,000 and 1 million inhabitants), 11.4% lived in a capital city or a city with a population greater than 1 million, the remaining lived in other urban and rural areas. The percentage of women living in rural areas was higher among those who did not

have a follow-up than among those who had one. On the contrary, women living in small towns were more likely to have a follow-up. There were no differences for women living in other places.

Geographic region- There was a lower proportion of women living in certain regions of the country such as Boyacá, Cundinamarca, Meta, Tolima, Huila, Caquetá, and Bogotá who had a follow-up. On the other hand, there were a higher proportion of women living in Guajira, Cesar, Magdalena, Orinoquía, and Amazonía who had a follow-up.

Perceived health status- The majority of women (64.5%) perceived their health as excellent, very good or good. The proportion of women who stated that their perceived health status was excellent or very good was higher among those who had a follow-up than among those who did not have a follow-up (10.5% vs. 6.9%).

Health care visit last year- Most of the women (86.8%) had a health care visit in the previous 12 months. The proportion of women who did not have a health care visit was much higher among those who did not have a follow-up than among those who had (18.7% vs. 12.1%).

Hospitalization last year- The proportion of women who had not been hospitalized in the previous 12 months was higher among those who did not have a follow-up than among those who did (92.9% vs. 88.8%).

The proportion of pregnant women at the time of the interview, and with a diagnosis of a sexually transmitted disease in the previous 12 months did not differ according to whether or not they had a follow-up. Similarly, in terms of marital status, woman's occupation, parity categories, out of pocket payment of Pap smear, and

geographic mobility there were no differences when comparing women who had a follow-up with those who did not.

In summary, compared to the women who had a follow-up visit, women who did not have a follow-up were more likely to have no health care coverage or to be enrolled in the subsidized regime. Additionally, women who did not have a follow-up were less educated, poorer, lived mostly in the countryside, reported fair or bad health status, did not have a health care visit in the previous 12 months, and were hospitalized in the last 12 months.

Multicollinearity Analyses for Socio-demographic Characteristics

Results of correlation analysis presented in Table 11 show that even though most of the correlations were statistically significant they were very weak. Only a few showed a moderate correlation. Women's education showed a statistically significant correlation with partner's education (r=0.51) and wealth index (r=0.47), and it was inversely correlated with parity (r=-0.44). Partner's education and wealth index were also correlated (r=0.40). As expected, parity was positively correlated with age (r=0.46). Based on these analyses multicollinearity was not found.

Table 16. Socio-Demographic Characteristics of Colombian Women who had Abnormal Pap Smear Results Stratified by Follow-Up Status.

	All (N=2,632)	Follow-up (N=2,198)	No Follow-up (N=434)	P-value
Health care coverage[1]				
No enrollment	788 (30.01%)	639 (29.11%)	149 (34.57%)	**0.025**[2]
Any enrollment	1838 (69.99%)	1556 (70.89%)	282 (65.43%)	
Health care coverage				
No enrollment	788 (30.01%)	639 (29.11%)	149 (34.57%)	**0.002**[2]
Subsidized regime	978 (37.24%)	807 (36.77%)	171 (39.68%)	
Contributory\special regime	860 (32.75%)	749 (34.12%)	111 (25.75%)	
Age				
Mean (Standard deviation)	33.42 (8.332)	33.34 (8.372)	33.79 (8.127)	0.308[3]
Median (range)	33.0 (18-49)	33.0 (18-49)	34.00 (18-49)	
18-19	79 (3.00%)	69 (3.14%)	10 (2.30%)	0.594[2]
20-24	386 (14.67%)	327 (14.88%)	59 (13.59%)	
25-29	505 (19.19%)	425 (19.34%)	80 (18.43%)	
30-34	480 (18.24%)	400 (18.20%)	80 (18.43%)	
35-39	467 (17.74%)	376 (17.11%)	91 (20.97%)	
40-44	387 (14.70%)	325 (14.79%)	62 (14.29%)	
45-49	328 (12.46%)	276 (12.56%)	52 (11.98%)	
Marital status				
Single	293 (11.13%)	248 (11.28%)	45 (10.37%)	0.593[2]
Married	718 (27.28%)	592 (26.93%)	126 (29.03%)	
Living with someone	1098 (41.72%)	913 (41.54%)	185 (42.63%)	
Separated/divorced/widow	523 (19.87%)	445 (20.25%)	78 (17.97%)	

[1] 6 women did not know their health care coverage status
[2] Pearson $\chi 2$
[3] *t*-Test (two-tailed)
Bold: $p<0.10$

Table 16. (Continued)

	All (N=2,632)	Follow-up (N=2,198)	No Follow-up (N=434)	P-value
Woman's education				
None/Preschool	87 (3.31%)	69 (3.14%)	18 (4.15%)	**0.002**[2]
Elementary	872 (33.13%)	703 (31.98%)	169 (38.94%)	
High school/Technical	1432 (54.41%)	1209 (55.00%)	223 (51.38%)	
College/Graduate	241 (9.16%)	217 (9.87%)	24 (5.53%)	
Partner's education[4]				
None/Preschool	122 (5.22%)	91 (4.67%)	31 (7.97%)	**0.004**[2]
Elementary	890 (38.05%)	728 (37.33%)	162 (41.65%)	
High school/Technical	1112 (47.54%)	944 (48.41%)	168 (43.19%)	
College/Graduate	181 (7.74%)	161 (8.26%)	20 (5.14%)	
Don't know	34 (1.45%)	26 (1.33%)	8 (2.06%)	
Woman's occupation				
Not working	797 (30.3%)	668 (30.4%)	129 (29.7%)	0.121[2]
Professional/technical job	294 (11.2%)	257 (11.7%)	37 (8.5%)	
Non-prof./non-technical job	1541 (58.5%)	1273 (57.9%)	268 (61.8%)	
Parity				
Mean (Standard deviation)	2.51 (1.884)	2.47 (1.860)	2.71 (1.992)	**0.014**[3]
Median (range)	2.00 (0-13)	2.00 (0-13)	2.00 (0-13)	
No children	289 (10.98%)	249 (11.33%)	40 (9.22%)	0.272[2]
One child	524 (19.91%)	447 (20.34%)	77 (17.74%)	
Two children	701 (26.63%)	593 (26.98%)	108 (24.88%)	
Three children	519 (19.72%)	421 (19.15%)	98 (22.58%)	
Four children	258 (9.80%)	210 (9.55%)	48 (11.06%)	
Five children	167 (6.34%)	138 (6.28%)	29 (6.68%)	
Six or more children	174 (6.61%)	140 (6.37%)	34 (7.83%)	

[4] n=2,305

Table 16. (Continued)

	All (N=2,632)	Follow-up (N=2,198)	No Follow-up (N=434)	P-value
Wealth index				
Very poor	449 (17.06%)	365 (16.61%)	84 (19.35%)	**0.044**[2]
Poor	673 (25.57%)	555 (25.25%)	118 (27.19%)	
Average	656 (24.92%)	541 (24.61%)	115 (26.50%)	
Rich	510 (19.38%)	432 (19.65%)	78 (17.97%)	
Very rich	344 (13.07%)	305 (13.88%)	39 (8.99%)	
Pap smear payment				
Didn't pay anything	1922 (73.02%)	1605 (73.02%)	317 (73.04%)	0.146[2]
Partial pay	104 (3.95%)	80 (3.64%)	24 (5.53%)	
Pay all	606 (23.02%)	513 (23.34%)	93 (21.43%)	
Place of residency				
Capital, large city	299 (11.36%)	248 (11.28%)	51 (11.75%)	**0.011**[2]
Small city	1062 (40.35%)	888 (40.40%)	174 (40.09%)	
Town	663 (25.19%)	576 (26.21%)	87 (20.05%)	
Rural	608 (23.10%)	486 (22.11%)	122 (28.11%)	
Geographic mobility				
0-12 months at current place	179 (6.80%)	144 (6.55%)	35 (8.06%)	0.406[2]
13-36 months at current place	177 (6.72%)	154 (7.01%)	23 (5.30%)	
37-77 months at current place	167 (6.34%)	141 (6.41%)	26 (5.99%)	
Lived in only one place	2109 (80.13%)	1759 (80.03%)	350 (80.65%)	

Table 16. (Continued)

	All (N=2,632)	Follow-up (N=2,198)	No Follow-up (N=434)	P-value
Geographic region				
Guajira, Cesar, Magdalena	443 (16.83%)	391 (17.79%)	52 (11.98%)	<**0.001**[2]
Barranquilla (MA)	99 (3.76%)	89 (4.05%)	10 (2.30%)	
Atlántico, San Andres, Northern Bolivar	80 (3.04%)	65 (2.96%)	15 (3.46%)	
Southern Bolivar, Sucre, Córdoba	142 (5.40%)	120 (5.46%)	22 (5.07%)	
Santander, Santander del Norte	287 (10.90%)	237 (10.78%)	50 (11.52%)	
Boyacá, Cundinamarca, Meta	137 (5.21%)	101 (4.60%)	36 (8.29%)	
Medellín (MA)	75 (2.82%)	66 (3.00%)	9 (2.07%)	
Antioquia without Medellín	67 (2.52%)	61 (2.78%)	6 (1.38%)	
Caldas, Risaralda, Quindío	329 (12.50%)	267 (12.15%)	62 (14.29%)	
Tolima, Huila, Caquetá	198 (7.52%)	150 (6.80%)	48 (11.06%)	
Cali (MA)	63 (2.39%)	55 (2.50%)	8 (1.84%)	
Valle without Cali or coast	74 (2.81%)	61 (2.78%)	13 (3.00%)	
Cauca and Nariño without coast	135 (5.13%)	109 (4.96%)	26 (5.99%)	
Pacific Coast	135 (5.13%)	116 (5.28%)	19 (4.38%)	
Bogota	125 (4.75%)	94 (4.28%)	31 (7.14%)	
Orinoquía and Amazonia	243 (9.23%)	216 (9.83%)	27 (6.22%)	
Perceived health status				
Excellent/very good	260 (9.88%)	230 (10.46%)	30 (6.91%)	**0.026**[2]
Good	1438 (54.64%)	1206 (54.87%)	232 (53.46%)	
Fair/Bad	934 (35.49%)	762 (34.67%)	172 (39.63%)	
Health care visit last year				
Yes	2285 (86.82%)	1932 (87.90%)	353 (81.34%)	**<0.0001**[2]
No	347 (13.18%)	266 (12.10%)	81 (18.66%)	
Current pregnancy				
Yes	112 (4.26%)	95 (4.32%)	17 (3.92%)	0.795[2]
No	2520 (95.74%)	2103 (95.68%)	417 (96.08%)	
STI diagnosis last year				
Yes	116 (4.41%)	102 (4.64%)	14 (3.23%)	0.248[2]
No	2516 (95.59%)	2096 (95.36%)	420 (96.77%)	
Hospitalization last year				
Yes	277 (10.52%)	246 (11.19%)	31 (7.14%)	**0.013**[2]
No	2355 (89.48%)	1952 (88.81%)	403 (92.86%)	

Unadjusted Logistic Regression Models

In the bivariate logistic regression models (Table 17 and Table 18) age, marital status, woman's occupation, parity, payment of Pap smear, geographic mobility, current pregnancy, or STI diagnosis in the last 12 months were not associated with having a follow-up of abnormal Pap smear results. The significant variables are presented next

HCC- Women without health care coverage were less likely than women with health care coverage to have a follow-up (ORu=0.78, 95%CI: 0.62,0.97). Therefore, the null hypothesis; $H_{07:}$ There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC; was rejected. When looking at type of health care coverage, women enrolled in the subsidized regime were less likely to have a follow-up than women in the contributory regime (ORu=0.70, 95%CI: 0.54,0.91). When women with no enrollment were compared with those in the contributory regime we observed a similar association (ORu=0.64, 95%CI: 0.49,0.83). Therefore, the null hypothesis; H_{09}: there is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system; was rejected.

Women's education- It was observed that women with high school or technical education or less were less likely than women with college or graduate education to have a follow-up. Additionally, the likelihood of having a follow-up increases with increases in education. Women with no education or only preschool were 58% less likely than women with college or graduate education to have a follow-up (ORu=0.42, 95%CI:

0.22,0.83). Similarly, women with elementary school or high school/technical education were 54% and 40% less likely than women with college or graduate education to have a follow-up (ORu=0.46, 95%CI: 0.29,0.72; ORu=0.60, 95%CI: 0.38,0.94, respectively). Similar results were observed with partner's education.

Wealth index- Women with an average wealth index and those very poor and poor were significantly less likely than very rich women to have a follow-up. The odds ratios were the same for poor women and those with an average index (ORu=0.60, 95% CI: 0.41,0.89). The odds ratio for very poor women was 0.56 (95% CI: 0.37,0.84). There was no statistically significant difference between rich and very rich women.

Place of residency- Women living in small cities and towns were more likely to have a follow-up than women living in rural areas (ORu=1.28, 95% CI: 0.99,1.66 and ORu=1.66, 95% CI: 1.23,2.24, respectively). There was no statistically significant difference between women living in rural areas, versus those in capital and large cities.

Geographic region- Women living in the Santanderes, Boyacá, Cundinamarca, Meta, Caldas, Risaralda, Quindío, Tolima, Huila, Caquetá, Bogotá, Cauca and Nariño without the coast were less likely to have a follow-up as compared to women living in the Orinoquía and Amazonía.

Perceived health status- Women who perceived an excellent/very good health status were 73% more likely to have a follow-up than women who reported fair or bad health (ORu=1.73, 95%CI: 1.14,2.62). There was no difference between women who reported good health as compared to those who reported fair or bad health.

Health care visit last year- Women who had a health care visit in the previous 12 months were more likely to have a follow-up than women who did not have a health care visit (ORu=1.67, 95% CI: 1.27,2.19).

Hospitalization last year- Women who were hospitalized in the prior 12 months were more likely to have a follow-up than women who did not have a hospitalization (ORu=1.64, 95% CI: 1.11,2.42).

In summary, in unadjusted analyses, health care coverage, education, wealth index, place of residency, geographic region, perceived health status, health care visit within the previous year, and hospitalization the last year were associated with follow-up of abnormal Pap smear results.

Multivariable Analyses

Health Care Coverage Status

Variables that were significant at $p<0.10$ in the bivariate analysis were included in the full model. Age, marital status, woman's occupation, geographic mobility, current pregnancy, and STI diagnosis in the last 12 months were not eligible ($p<0.10$) for adjustment in the full model, all other variables were included in the full model. Given that HCC was the main independent variable it was forced into the models regardless of its significance.

Partner's education did not have an effect on follow-up of an abnormal Pap smear. Therefore, in order to be able to include all women, those who did and did not have a partner, the partner's education was not included in multivariable models.

In the full model (Table 17), the association between health care coverage status and follow-up of abnormal Pap smear results was not statistically significant(ORa=0.89, 95%CI: 0.70,1.13).

Only wealth index, geographic region, and health care visit and hospitalization in the previous year were statistically significant in the full model. When looking at the wealth index it was found that women with an average and poor wealth index were 38% and 41%, respectively, less likely to have a follow-up than very rich women (ORa=0.62, 95% CI: 0.41,0.95; and ORa=0.59, 95% CI: 0.38,0.94 respectively). There was no statistically significant difference between very poor and rich women as compared to very rich women.

Women living in Boyacá, Cundinamarca, Meta, and Tolima, Huila and Caquetá were less likely to have a follow-up as compared to women living in the Orinoquía and Amazonía (ORa=0.43, 95% CI: 0.24,0.78; ORa=0.48, 95% CI: 0.28,0.83, respectively).

Women who had a health care visit in the previous 12 months were more likely to have a follow-up than women who did not have a health care visit (ORa=1.58, 95% CI: 1.18,2.11).

Women who were hospitalized in the prior 12 months were more likely than women who did not have a hospitalization to have a follow-up (ORa=1.60, 95% CI: 1.07,2.39).

In summary, in adjusted analyses (full model), geographic region, health care consult within the previous year and hospitalization the last year were associated with follow-up of abnormal Pap smear results.

Variables that were significant at $p<0.05$ in the full model and HCC regardless of significance, were included in the reduced or parsimonious model (Table 17). The variables entered on step number one in the reduced model were: wealth index, geographic region, perceived health status, health care visit, and hospitalization in the previous year.

In the reduced model, as in the full model, the association between health care coverage status and follow-up of abnormal Pap smear results was not longer significant. Therefore, we failed to reject the null hypothesis - H_{08}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with HCC as compared to women with no HCC after adjusting for predisposing characteristics, enabling resources, and need.

Wealth index, geographic region, perceived health status, health care visit within the previous year, and hospitalization in the previous year were associated with follow-up of abnormal Pap smear results in reduced models.

Health Care Coverage Type

In the full model (Table 18), as in the unadjusted model, the association between health care coverage type and follow-up of abnormal Pap smear results was not statistically significant. Variables that were significant at $p<0.05$ in the full model were included in the reduced or parsimonious model (Table 18). The variables entered on step number one in the reduced model were: wealth index, geographic region, perceived health status, and health care visit and hospitalization in the previous 12 months. Given that HCC was the main independent variable it was forced into the models regardless of

its significance. Wealth index and hospitalization were not significant in the reduced model.

In the reduced model, women enrolled in the subsidized regime were less likely than women in the contributory regime to have a follow-up (ORa=0.75, 95%CI: 0.57,0.98). When women with no enrollment were compared with those in the contributory regime, we observed a similar association (ORu=0.71, 95%CI: 0.54,0.95). Therefore, we rejected the null hypothesis; H_{010}: There is no difference in the likelihood of having follow-up of abnormal Pap smear results in women with no health care enrollment, and those enrolled in the subsidized regime of the health care system as compared to those enrolled in the contributory regime of the health care system after adjusting for predisposing characteristics, enabling resources, and need. The estimates for the adjustment variables were very similar to those obtained with the full model for HCC status.

The estimates for the statistically significant adjustment variables were very similar to those obtained with the full model for HCC type, and full and reduced models for HCC status, excluding the fact that wealth index and hospitalization were not significant in the reduced model for HCC type whereas they were for HCC status.

Stratified Analyses

Given that HCC at the time of the interview may be different from HCC at the time of Pap smear test or follow-up, stratified analyses by time of last Pap smear were conducted. About 66% of women had a Pap smear within the previous 12 months, 18% had it between 13 and 24 months ago, about 7% had it between 25 and 36 months ago, and approximately 9% had it 37 or more months ago. Results of parsimonious models

Table 17. Logistic Regression Analyses Indicating Follow-Up of Abnormal Pap Smear by Health Care Coverage Status Among Colombian Women.

	Unadjusted Model			**Full Model (p<0.10)[21]**			**Reduced Model (p<0.05)[22]**		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Health care coverage									
No enrollment	0.78	0.62-0.97	**0.024**	0.89	0.70-1.13	0.347	0.88	0.70-1.11	0.287
Any enrollment	Ref.			Ref.			Ref.		
Age			0.597						
18-19	1.30	0.63-2.69	0.479						
20-24	1.04	0.70-1.57	0.834						
25-29	1.00	0.68-1.46	0.996						
30-34	0.94	0.64-1.38	0.759						
35-39	0.78	0.54-1.13	0.190						
40-44	0.99	0.66-1.48	0.952						
45-49	Ref.								
Marital status			0.593						
Single	Ref.								
Married	0.85	0.59-1.24	0.400						
Living with someone	0.90	0.63-1.28	0.542						
Separated/divorced/widow	1.04	0.70-1.54	0.865						
Woman's education			**0.002**			0.615			
None/Preschool	0.42	0.22-0.83	**0.012**	0.60	0.29-1.27	0.184			
Elementary	0.46	0.29-0.72	**0.001**	0.77	0.45-1.30	0.322			
High school/ Technical	0.60	0.38-0.94	**0.024**	0.79	0.49-1.28	0.340			
College/ Graduate	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[21] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[22] Adjusted for variables with a p-value <0.05 in the full model

Table 17. (Continued)

	Unadjusted Model			Full Model (p<0.10)[23]			Reduced Model (p<0.05)[24]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Partner's education			**0.003**						
None/Preschool	0.36	0.20-0.68	**0.001**						
Elementary	0.56	0.34-0.92	**0.021**						
High school/Technical	0.70	0.43-1.14	0.153						
College/Graduate	Ref.								
Woman's occupation			0.123						
Not working	Ref.								
Professional/technical job	1.34	0.91-1.99	0.143						
Non-prof./non-technical job	0.92	0.73-1.15	0.462						
Parity			0.275			0.878			
No children	1.51	0.92-2.50	0.107	1.05	0.60-1.85	0.861			
One child	1.41	0.90-2.20	0.131	1.16	0.71-1.90	0.552			
Two children	1.33	0.87-2.04	0.187	1.13	0.71-1.81	0.602			
Three children	1.04	0.68-1.61	0.848	0.94	0.59-1.50	0.803			
Four children	1.06	0.65-1.73	0.808	0.99	0.59-1.66	0.977			
Five children	1.16	0.67-2.00	0.605	1.19	0.67-2.11	0.550			
Six or more children	Ref.			Ref.					
Wealth index			**0.046**			0.184			**0.040**
Very poor	0.56	0.37-0.84	**0.005**	0.62	0.36-1.08	**0.091**	0.54	0.34-0.85	**0.008**
Poor	0.60	0.41-0.89	**0.010**	0.59	0.38-0.94	**0.025**	0.56	0.37-0.85	**0.006**
Average	0.60	0.41-0.89	**0.011**	0.62	0.41-0.95	**0.027**	0.60	0.40-0.91	**0.015**
Rich	0.71	0.47-1.07	0.100	0.75	0.49-1.17	0.204	0.74	0.48-1.13	0.166
Very rich	Ref.			Ref.			Ref.		

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[23] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[24] Adjusted for variables with a p-value <0.05 in the full model

Table 17. (Continued)

	Unadjusted Model			Full Model (p<0.10)[25]			Reduced Model (p<0.05)[26]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Pap smear payment			0.149			0.165			
Didn't pay anything	Ref.			Ref.					
Partial pay	0.66	0.41-1.06	**0.082**	0.64	0.40-1.05	**0.079**			
Pay all	1.09	0.85-1.40	0.504	1.07	0.82-1.41	0.613			
Place of residency			**0.011**			0.313			
Capital, large city	1.22	0.85-1.75	0.279	0.84	0.29-2.42	0.745			
Small city	1.28	0.99-1.66	**0.058**	0.95	0.67-1.36	0.792			
Town	1.66	1.23-2.24	**0.001**	1.27	0.88-1.85	0.203			
Rural	Ref.			Ref.					
Geographic mobility			0.408						
0-12 months at current place	0.82	0.56-1.21	0.311						
13-36 months at current place	1.33	0.85-2.10	0.214						
37-77 months at current place	1.08	0.70-1.67	0.731						
Lived in only one place	Ref.								
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	0.94	0.57-1.54	0.806	1.21	0.71-2.05	0.481	1.01	0.61-1.66	0.981
Barranquilla (MA)	1.11	0.52-2.39	0.785	1.42	0.47-4.27	0.528	1.04	0.48-2.25	0.926
Atlántico, San Andres, Northern Bolivar	0.54	0.27-1.08	**0.081**	0.63	0.31-1.30	0.210	0.55	0.27-1.10	**0.091**
Southern Bolivar, Sucre, Córdoba	0.68	0.37-1.25	0.215	0.87	0.46-1.68	0.685	0.77	0.41-1.44	0.415
Santander, Santander del Norte	0.59	0.36-0.98	**0.041**	0.73	0.42-1.26	0.257	0.60	0.36-1.00	**0.048**
Boyacá, Cundinamarca, Meta	0.35	0.20-0.61	**<0.0001**	0.43	0.24-0.78	**0.005**	0.36	0.20-0.63	**<0.0001**
Medellín (MA)	0.92	0.41-2.05	0.832	1.03	0.38-2.81	0.956	0.75	0.33-1.71	0.495
Antioquia without Medellín	1.27	0.50-3.22	0.613	1.60	0.61-4.16	0.337	1.40	0.55-3.57	0.486
Caldas, Risaralda, Quindío	0.54	0.33-0.88	**0.013**	0.59	0.35-1.01	**0.053**	0.50	0.30-0.82	**0.006**
Tolima, Huila, Caquetá	0.39	0.23-0.65	**<0.0001**	0.48	0.28-0.83	**0.009**	0.41	0.24-0.69	**0.001**

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[25] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[26] Adjusted for variables with a p-value <0.05 in the full model

Table 17. (Continued)

	Unadjusted Model			Full Model (p<0.10)[27]			Reduced Model (p<0.05)[28]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Geographic region (Continued)									
Cali (MA)	0.86	0.37-2.00	0.724	1.02	0.27-3.85	0.981	0.71	0.30-1.68	0.439
Valle without Cali or coast	0.59	0.29-1.21	0.146	0.66	0.31-1.41	0.283	0.58	0.28-1.23	0.158
Cauca and Nariño without coast	0.52	0.29-0.94	**0.031**	0.62	0.33-1.16	0.137	0.51	0.28-0.92	**0.026**
Pacific Coast	0.76	0.41-1.43	0.399	0.99	0.50-1.93	0.966	0.91	0.48-1.75	0.784
Bogota	0.38	0.21-0.67	**0.001**	0.47	0.14-1.55	0.216	0.32	0.18-0.58	**<0.0001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		
Perceived health status			**0.028**			**0.074**			**0.052**
Excellent/very good	1.73	1.14-2.62	**0.010**	1.63	1.05-2.54	**0.031**	1.65	1.07-2.56	**0.025**
Good	1.17	0.94-1.46	0.149	1.19	0.94-1.50	0.150	1.21	0.96-1.52	0.107
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.67	1.27-2.19	**<0.0001**	1.58	1.18-2.11	**0.002**	1.59	1.19-2.11	**0.002**
No	Ref.			Ref.			Ref.		
Current pregnancy									
Yes	1.11	0.65-1.88	0.703						
No	Ref.								
STI diagnosis last year									
Yes	1.46	0.83-2.58	0.192						
No	Ref.								
Hospitalization last year									
Yes	1.64	1.11-2.42	**0.013**	1.60	1.07-2.39	**0.021**	1.61	1.08-2.40	**0.019**
No	Ref.			Ref.			Ref.		

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[27] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[28] Adjusted for variables with a p-value <0.05 in the full model

Table 18. Logistic Regression Analyses Indicating Follow-Up of Abnormal Pap Smear by Health Care Coverage Type Among Colombian Women.

	Unadjusted Model			Full Model (p<0.10)[29]			Reduced Model (p<0.05)[30]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Health care coverage			**0.002**			0.493			**0.045**
No enrollment	0.64	0.49-0.83	**0.001**	0.83	0.61-1.13	0.235	0.71	0.54-0.95	**0.020**
Subsidized regime	0.70	0.54-0.91	**0.007**	0.89	0.66-1.21	0.465	0.75	0.57-0.98	**0.035**
Contributory/special regime	Ref.			Ref.			Ref.		
Age			0.597						
18-19	1.30	0.63-2.69	0.479						
20-24	1.04	0.70-1.57	0.834						
25-29	1.00	0.68-1.46	0.996						
30-34	0.94	0.64-1.38	0.759						
35-39	0.78	0.54-1.13	0.190						
40-44	0.99	0.66-1.48	0.952						
45-49	Ref.								
Marital status			0.593						
Single	Ref.								
Married	0.85	0.59-1.24	0.400						
Living with someone	0.90	0.63-1.28	0.542						
Separated/divorced/widow	1.04	0.70-1.54	0.865						
Woman's education			**0.002**			0.678			
None/Preschool	0.42	0.22-0.83	**0.012**	0.63	0.30-1.32	0.219			
Elementary	0.46	0.29-0.72	**0.001**	0.79	0.47-1.35	0.392			
High school/ Technical	0.60	0.38-0.94	**0.024**	0.81	0.50-1.31	0.396			
College/ Graduate	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[29] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[30] Adjusted for variables with a p-value <0.05 in the full model. Data were missing for 6 (0.2%) women who did not know their health care coverage status.

Table 18. (Continued)

	Unadjusted Model			Full Model (p<0.10)[31]			Reduced Model (p<0.05)[32]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Partner's education			**0.003**						
None/Preschool	0.36	0.20-0.68	**0.001**						
Elementary	0.56	0.34-0.92	**0.021**						
High school/Technical	0.70	0.43-1.14	0.153						
College/Graduate	Ref.								
Woman's occupation			0.123						
Not working	Ref.								
Professional/technical job	1.34	0.91-1.99	0.143						
Non-prof./non-technical job	0.92	0.73-1.15	0.462						
Parity			0.275			0.878			
No children	1.51	0.92-2.50	0.107	1.05	0.59-1.84	0.874			
One child	1.41	0.90-2.20	0.131	1.16	0.71-1.89	0.564			
Two children	1.33	0.87-2.04	0.187	1.13	0.71-1.80	0.616			
Three children	1.04	0.68-1.61	0.848	0.94	0.59-1.49	0.788			
Four children	1.06	0.65-1.73	0.808	0.99	0.59-1.65	0.966			
Five children	1.16	0.67-2.00	0.605	1.19	0.67-2.11	0.552			
Six or more children	Ref.			Ref.					
Wealth index			**0.046**			0.292			
Very poor	0.56	0.37-0.84	**0.005**	0.66	0.37-1.17	0.154			
Poor	0.60	0.41-0.89	**0.010**	0.62	0.39-1.00	**0.048**			
Average	0.60	0.41-0.89	**0.011**	0.64	0.42-0.99	**0.044**			
Rich	0.71	0.47-1.07	0.100	0.77	0.50-1.19	0.237			
Very rich	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[31] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[32] Adjusted for variables with a p-value <0.05 in the full model. Data were missing for 6 (0.2%) women who did not know their health care coverage status.

Table 18. (Continued)

	Unadjusted Model			Full Model (p<0.10)[33]			Reduced Model (p<0.05)[34]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Pap smear payment			0.149			0.167			
Didn't pay anything	Ref.			Ref.					
Partial pay	0.66	0.41-1.06	**0.082**	0.65	0.40-1.06	**0.082**			
Pay all	1.09	0.85-1.40	0.504	1.08	0.82-1.42	0.600			
Place of residency			**0.011**			0.299			
Capital, large city	1.22	0.85-1.75	0.279	0.85	0.29-2.47	0.767			
Small city	1.28	0.99-1.66	**0.058**	0.96	0.67-1.36	0.812			
Town	1.66	1.23-2.24	**0.001**	1.28	0.88-1.87	0.188			
Rural	Ref.			Ref.					
Geographic mobility			0.408						
0-12 months current place	0.82	0.56-1.21	0.311						
13-36 months current place	1.33	0.85-2.10	0.214						
37-77 months current place	1.08	0.70-1.67	0.731						
Lived in only one place	Ref.								
Geographic region			**<0.0001**			**<0.0001**			**<0.0001**
Guajira, Cesar, Magdalena	0.94	0.57-1.54	0.806	1.21	0.72-2.06	0.472	1.02	0.62-1.68	0.938
Barranquilla (MA)	1.11	0.52-2.39	0.785	1.41	0.47-4.24	0.538	1.12	0.52-2.42	0.776
Atlántico, San Andres, Northern Bolivar	0.54	0.27-1.08	**0.081**	0.64	0.31-1.31	0.221	0.58	0.29-1.17	0.126
Southern Bolivar, Sucre, Córdoba	0.68	0.37-1.25	0.215	0.88	0.46-1.69	0.706	0.76	0.41-1.41	0.385
Santander, Santander del Norte	0.59	0.36-0.98	**0.041**	0.73	0.42-1.27	0.265	0.63	0.38-1.05	**0.079**
Boyacá, Cundinamarca, Meta	0.35	0.20-0.61	**<0.0001**	0.43	0.24-0.78	**0.005**	0.37	0.21-0.65	**<0.0001**
Medellín (MA)	0.92	0.41-2.05	0.832	1.02	0.37-2.78	0.971	0.86	0.38-1.94	0.717
Antioquia without Medellín	1.27	0.50-3.22	0.613	1.58	0.61-4.12	0.346	1.34	0.53-3.42	0.537
Caldas, Risaralda, Quindío	0.54	0.33-0.88	**0.013**	0.60	0.35-1.02	**0.059**	0.54	0.33-0.88	**0.014**
Tolima, Huila, Caquetá	0.39	0.23-0.65	**<0.0001**	0.48	0.28-0.84	**0.010**	0.42	0.25-0.70	**0.001**

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[33] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[34] Adjusted for variables with a p-value <0.05 in the full model. Data were missing for 6 (0.2%) women who did not know their health care coverage status.

Table 18. (Continued)

	Unadjusted Model			Full Model (p<0.10)[35]			Reduced Model (p<0.05)[36]		
	Crude OR	95% CI	p-value	Adj. OR	95% CI	p-value	Adj. OR	95%CI	p-value
Geographic region (Continued)									
Cali (MA)	0.86	0.37-2.00	0.724	1.03	0.27-3.91	0.965	0.80	0.25-0.70	0.603
Valle without Cali or coast	0.59	0.29-1.21	0.146	0.66	0.31-1.42	0.286	0.63	0.34-1.88	0.222
Cauca and Nariño without coast	0.52	0.29-0.94	**0.031**	0.63	0.34-1.20	0.160	0.55	0.30-1.32	**0.050**
Pacific Coast	0.76	0.41-1.43	0.399	0.99	0.50-1.94	0.972	0.87	0.31-1.00	0.670
Bogota	0.38	0.21-0.67	**0.001**	0.47	0.14-1.53	0.209	0.35	0.46-1.64	**<0.0001**
Orinoquía and Amazonia	Ref.			Ref.			Ref.	0.20-0.63	
Perceived health status			**0.028**			**0.085**			**0.028**
Excellent/very good	1.73	1.14-2.62	**0.010**	1.61	1.03-2.51	**0.036**	1.73	1.12-2.68	**0.014**
Good	1.17	0.94-1.46	0.149	1.18	0.94-1.49	0.158	1.23	0.98-1.54	**0.076**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.67	1.27-2.19	**<0.0001**	1.58	1.18-2.11	**0.002**	1.57	1.05-2.34	**0.027**
No	Ref.			Ref.			Ref.		
Current pregnancy									
Yes	1.11	0.65-1.88	0.703						
No	Ref.								
STI diagnosis last year									
Yes	1.46	0.83-2.58	0.192						
No	Ref.								
Hospitalization last year									
Yes	1.64	1.11-2.42	**0.013**	1.59	1.06-2.38	**0.023**			
No	Ref.			Ref.					

OR: Odds Ratio. CI: Confidence Interval. Ref.: Referent group. Bold: p<0.10.
Data were missing for 6 (0.2%) women who did not know their health care coverage status.
[35] Adjusted for variables with a p-value <0.10 in the unadjusted model.
[36] Adjusted for variables with a p-value <0.05 in the full model. Data were missing for 6 (0.2%) women who did not know their health care coverage status.

stratified according to these categories were difficult to interpret and some of the categories within variables did not have enough numbers to obtain estimates. Therefore, it was decided to have two strata, one for those who had a Pap smear within the previous year, and those who had it 13 or more months ago (Table 19 and Table 20).

HCC and variables that were statistically significant in reduced models were assessed in stratified models.

Health Care Coverage Status

Results for stratified analyses for health care coverage status are presented in Table 19. The association between health care coverage status and follow-up of abnormal Pap smear results for all women was not statistically significant in unstratified models. However, the association was significant for those women who had a Pap smear within the previous year.

Wealth index, perceived health status and hospitalization within the last year were significant in unstratified models. However, the association only held significant for women who had their Pap smear within the last year. Geographic region held significant for both strata.

Health Care Coverage Type

Results for stratified analyses for health care coverage type are presented in Table 20. Health care coverage type only held significant for women who had a Pap smear within the last year. Geographic region held significant for both strata. After the stratification, perceived health status was only significant for those who had a Pap smear within the last year.

Table 19. Logistic Regression Analyses Indicating Follow-Up of Abnormal Pap Smear among Colombian Women Stratified by HCC Status and by the Time of the Last Pap Smear.

	All[37]			**0-12 months ago**[38 39]			**13 or more months ago**[3 40]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Health care coverage									
No enrollment	0.88	0.70-1.11	0.287	0.73	0.55-0.97	**0.032**	1.21	0.81-1.79	0.353
Any enrollment	Ref.			Ref.			Ref.		
Wealth index			**0.040**			**0.035**			0.193
Very poor	0.54	0.34-0.85	**0.008**	0.63	0.36-1.08	0.093	0.42	0.18-1.00	**0.050**
Poor	0.56	0.37-0.85	**0.006**	0.56	0.34-0.91	**0.019**	0.60	0.26-1.37	0.225
Average	0.60	0.40-0.91	**0.015**	0.77	0.47-1.25	0.282	0.42	0.19-0.94	**0.035**
Rich	0.74	0.48-1.13	0.166	1.01	0.60-1.68	0.981	0.47	0.21-1.08	0.075
Very rich	Ref.			Ref.			Ref.		
Geographic region			**<0.0001**			**0.017**			**<0.0001**
Guajira, Cesar, Magdalena	1.01	0.61-1.66	0.981	0.89	0.48-1.64	0.703	1.32	0.55-3.20	0.534
Barranquilla (MA)	1.04	0.48-2.25	0.926	0.69	0.28-1.72	0.428	2.19	0.45-10.69	0.332
Atlántico, San Andres, Northern Bolivar	0.55	0.27-1.10	0.091	0.77	0.30-2.01	0.601	0.34	0.12-1.00	**0.050**
Southern Bolivar, Sucre, Córdoba	0.77	0.41-1.44	0.415	0.91	0.41-2.00	0.812	0.61	0.21-1.76	0.362
Santander, Santander del Norte	0.60	0.36-1.00	**0.048**	0.79	0.40-1.54	0.488	0.46	0.21-1.05	0.064
Boyacá, Cundinamarca, Meta	0.36	0.20-0.63	**<0.0001**	0.37	0.18-0.75	**0.006**	0.37	0.14-0.96	**0.041**
Medellín (MA)	0.75	0.33-1.71	0.495	1.57	0.43-5.71	0.494	0.38	0.12-1.21	0.101
Antioquia without Medellín	1.40	0.55-3.57	0.486	1.28	0.40-4.07	0.681	1.68	0.33-8.47	0.527
Caldas, Risaralda, Quindío	0.50	0.30-0.82	**0.006**	0.62	0.33-1.14	0.122	0.33	0.14-0.80	**0.013**
Tolima, Huila, Caquetá	0.41	0.24-0.69	**0.001**	0.47	0.24-0.91	**0.026**	0.32	0.13-0.76	**0.010**
Cali (MA)	0.71	0.30-1.68	0.439	0.55	0.21-1.45	0.227	2.40	0.27-21.47	0.434
Valle without Cali or coast	0.58	0.28-1.23	0.158	0.47	0.20-1.13	0.092	1.22	0.24-6.15	0.810

[37] Reduced model with all women n=2,632
[38] Women who had a Pap smear within the last year n=1,745.
[39] Variables that were significant in the reduced model for all women were forced into the model.
[40] Women who had a Pap smear between 13 or more months ago n=880.
Ref.: Referent group.
Bold: $p<0.05$.

Table 19. (Continued)

	All[41]			0-12 months ago[42 43]			13 or more months ago[3 44]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Geographic region (Continued)									
Cauca and Nariño without coast	0.51	0.28-0.92	**0.026**	0.67	0.31-1.46	0.316	0.33	0.13-0.84	**0.021**
Pacific Coast	0.91	0.48-1.75	0.784	0.93	0.41-2.10	0.853	0.92	0.31-2.72	0.883
Bogota	0.32	0.18-0.58	**<0.0001**	0.32	0.15-0.65	**0.002**	0.31	0.11-0.83	**0.021**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		
Perceived health status			**0.052**			**0.036**			0.095
Excellent/very good	1.65	1.07-2.56	**0.025**	2.22	1.20-4.09	**0.011**	1.04	0.53-2.02	0.912
Good	1.21	0.96-1.52	0.107	1.07	0.80-1.42	0.656	1.52	1.02-2.26	**0.037**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.59	1.19-2.11	**0.002**	It is constant for all selected cases.			1.82	1.24-2.68	**0.002**
No	Ref.						Ref.		
Hospitalization last year									
Yes	1.61	1.08-2.40	**0.019**	1.93	1.15-3.24	**0.012**	1.21	0.63-2.32	0.566
No	Ref.			Ref.			Ref.		

[41] Reduced model with all women n=2,632
[42] Women who had a Pap smear within the last year n=1,745.
[43] Variables that were significant in the reduced model for all women were forced into the model.
[44] Women who had a Pap smear between 13 or more months ago n=880.
Ref.: Referent group.
Bold: p<0.05.

Table 20. Logistic Regression Analyses Indicating Follow-Up of Abnormal Pap Smear among Colombian Women Stratified by HCC Type and by the Time of the Last Pap Smear.

	All[45]			0-12 months ago[46 47]			13 or more months ago[3 48]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Health care coverage			**0.045**			**0.004**			0.718
No enrollment	0.71	0.54-0.95	**0.020**	0.55	0.39-0.79	**0.001**	1.14	0.70-1.87	0.593
Subsidized regime	0.75	0.57-0.98	**0.035**	0.67	0.48-0.94	**0.019**	0.96	0.60-1.55	0.876
Contributory/special regime	Ref.			Ref.			Ref.		
Geographic region			**<0.0001**			**0.042**			**<0.0001**
Guajira, Cesar, Magdalena	1.02	0.62-1.68	0.938	0.84	0.46-1.55	0.578	1.38	0.57-3.33	0.472
Barranquilla (MA)	1.12	0.52-2.42	0.776	0.67	0.27-1.68	0.395	2.62	0.54-12.63	0.231
Atlántico, San Andres, Northern Bolivar	0.58	0.29-1.17	0.126	0.74	0.29-1.92	0.539	0.37	0.13-1.07	0.067
Southern Bolivar, Sucre, Córdoba	0.76	0.41-1.41	0.385	0.85	0.39-1.84	0.675	0.60	0.21-1.72	0.345
Santander, Santander del Norte	0.63	0.38-1.05	0.079	0.80	0.41-1.55	0.504	0.46	0.21-1.02	**0.057**
Boyacá, Cundinamarca, Meta	0.37	0.21-0.65	**<0.0001**	0.37	0.19-0.75	**0.005**	0.37	0.14-0.95	**0.039**
Medellín (MA)	0.86	0.38-1.94	0.717	1.63	0.45-5.90	0.453	0.39	0.12-1.20	0.101
Antioquia without Medellín	1.34	0.53-3.42	0.537	1.09	0.34-3.44	0.890	1.62	0.33-8.00	0.553
Caldas, Risaralda, Quindío	0.54	0.33-0.88	**0.014**	0.62	0.34-1.14	0.125	0.35	0.15-0.84	**0.018**
Tolima, Huila, Caquetá	0.42	0.25-0.70	**0.001**	0.47	0.24-0.90	**0.024**	0.32	0.14-0.75	**0.009**
Cali (MA)	0.80	0.34-1.88	0.603	0.58	0.22-1.52	0.265	2.57	0.29-22.39	0.393
Valle without Cali or coast	0.63	0.30-1.32	0.222	0.48	0.20-1.14	**0.095**	1.28	0.25-6.40	0.766
Cauca and Nariño without coast	0.55	0.31-1.00	**0.050**	0.67	0.31-1.45	0.312	0.35	0.13-0.90	**0.030**
Pacific Coast	0.87	0.46-1.64	0.670	0.79	0.36-1.76	0.564	0.89	0.31-2.56	0.836
Bogota	0.35	0.20-0.63	**<0.0001**	0.33	0.16-0.68	**0.003**	0.34	0.13-0.92	**0.033**
Orinoquía and Amazonia	Ref.			Ref.			Ref.		

[45] Reduced model with all women n=2,632.
[46] Women who had a Pap smear within the last year n=1,745.
[47] Variables that were significant in the reduced model for all women were forced into the model.
[48] Women who had a Pap smear between 13 or more months ago n=880.
Ref.: Referent group.
Bold: p<0.05.

Table 20. (Continued)

	All[49]			0-12 months ago[50 51]			13 or more months ago[3 52]		
	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value	Adj. OR	95% CI	P-value
Perceived health status			**0.028**			**0.034**			0.105
Excellent/very good	1.73	1.12-2.68	**0.014**	2.23	1.21-4.10	**0.010**	1.15	0.59-2.22	0.683
Good	1.23	0.98-1.54	0.076	1.07	0.81-1.42	0.626	1.52	1.03-2.25	**0.036**
Fair/Bad	Ref.			Ref.			Ref.		
Health care visit last year									
Yes	1.57	1.05-2.34	**0.027**	It is constant for all selected cases.			1.88	1.29-2.74	**0.001**
No	Ref.						Ref.		

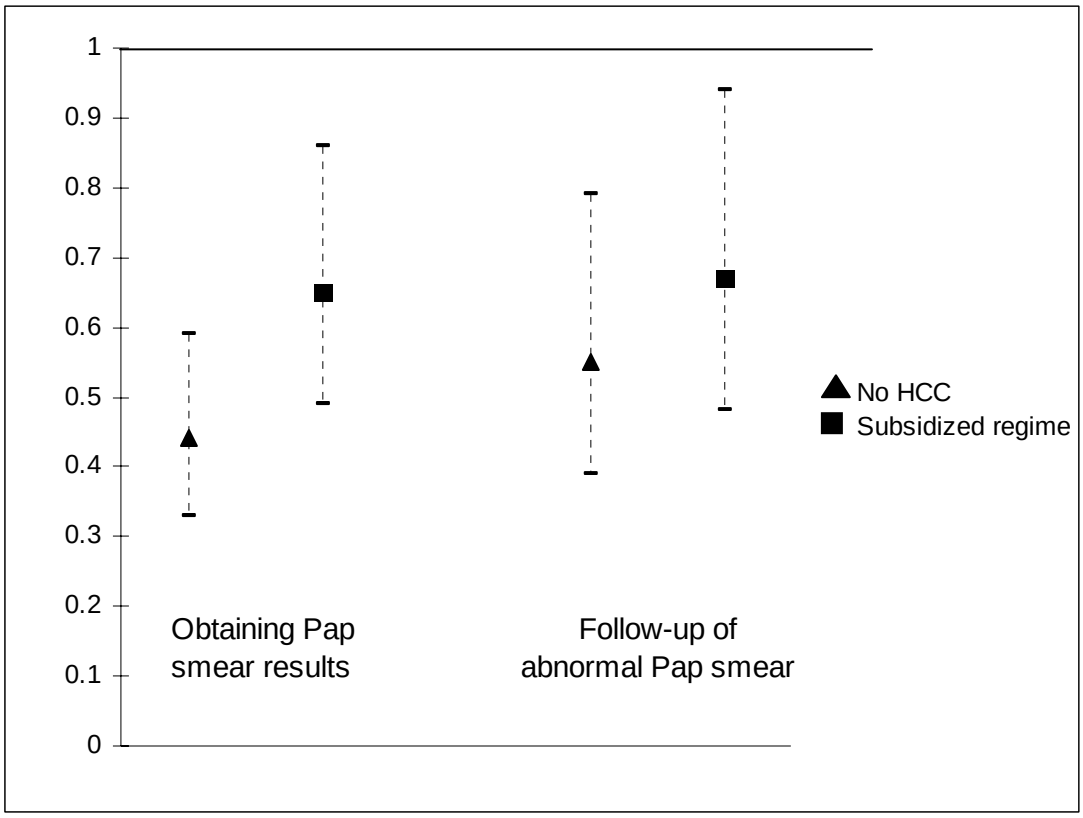
[49] Reduced model with all women n=2,632.
[50] Women who had a Pap smear within the last year n=1,745.
[51] Variables that were significant in the reduced model for all women were forced into the model.
[52] Women who had a Pap smear between 13 or more months ago n=880.
Ref.: Referent group.
Bold: $p<0.05$.

Health Care Coverage and obtaining Pap smear results and Follow-up of abnormal results among Women with Pap Smear within the Last Year

Because HCC status and type at the time of the interview may differ from the status of health care coverage at the time of the Pap smear test and subsequent obtaining results and follow-up of abnormal results, stratified analyses by the time of Pap smear test were conducted. It is expected that those women who had a Pap smear within the last year are more likely to have the same HCC at the time of the interview and at the time they obtained test results and followed-up abnormal results. Therefore, we expect those are the most accurate estimates. Figure 7 depicts the adjusted odds ratios for the association between type of HCC and obtaining Pap smear results and follow-up of abnormal results among women who had a Pap smear within the previous year. These odds ratios were previously presented in Table 15 and Table 20.

Figure 7 shows that women enrolled in the subsidized regime and those without enrollment who had a Pap smear within the last year were less likely than women enrolled in the contributory regime to obtain their Pap smear results and to have a follow-up of abnormalities. It also shows that there was no significant difference between women in the subsidized regime and those without HCC.

Figure 7. Adjusted odds ratios for the association between type of HCC and obtaining Pap smear results and follow-up of abnormal results among women who had a Pap smear within the previous year



Contributory regime is the referent group.
Obtaining results was adjusted for: age, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit within the last year.
Follow-up of abnormality was adjusted for: geographic region, perceived health status, and health care visit within the last year.

Reasons for not Having a Follow-up

The third aim of our study was to describe the reasons women mentioned for not following-up cervical cancer screening, and to describe if the reasons differed by the presence and type of HCC. Results for both follow-up behaviors are presented next.

Obtaining Pap Smear Results

In the survey, when women were asked about whether or not they obtained their results, they could answer ‘yes’, ‘no’, or that they ‘have not received the results yet’. The

reasons for not obtaining Pap smear results were only asked to those women who answered ‘no’. The reasons that women who answered ‘no’ choose from the given list of options are the following: institution where test was taken never gave it back (39.6%), not interested in result (19.8%), afraid to have cancer (2.6%), felt mistreated/offended when took test (1.3%), and other (36.8%). There were no statistical differences found between women with or without HCC. Similarly, there were no differences between types of HCC (Table 21). However, the “other” category was not further explored in the survey. Therefore, other reasons may be different by presence or type of HCC, but we were unable to explore them because they are not presented in the survey.

Further analyses among women who sought their results, but did not obtain them (n=1,322 out of 24,717) were conducted. The proportion of women who haven’t received their results yet is significantly higher in the subsidized regime (46.7%) as compared to women in the contributory regime (29.9%) and with women without HCC (23.4%) (p-value <0.0001).

Follow-up of Pap Abnormal Smear Results

The reasons women listed (Table 22) for not having a follow-up of abnormal Pap smear were: laziness/lack of interest (31.1%), did not have economic resources (28.1%), fear/afraid (6.5%), thought that could wait (4.6%), they did not explain it was important (4.4%), did not know what to do (2.1%), did not believe in the result (2.1%), and other (21.1%).

Table 21. Reasons for not Obtaining Pap Smear Results Stratified by HCC among women who did not obtain their results.

	All	No HCC	Any HCC	Contributory regime	Subsidized regime
Institution where test was taken didn't return it	349 (39.61%)	122 (37.08%)	227 (41.12%)	73 (37.06%)	154 (43.38%)
Not interested in result	174 (19.75%)	63(19.15%)	111 (20.11%)	43 (21.83%)	68 (19.15%)
Afraid to have cancer	23 (2.61%)	7(2.13%)	16 (2.90%)	7 (3.55%)	9 (2.54%)
Felt mistreated/offended when took test	11 (1.25%)	3 (0.91%)	8 (1.45%)	2 (1.02%)	6 (1.69%)
Other	324 (36.78%)	134 (40.73%)	190 (34.42%)	72 (36.55%)	118 (33.24%)

Pearson $\chi 2$ p-value when comparing No HCC and Any HCC: 0.390
Pearson $\chi 2$ p-value when comparing No HCC, contributory regime, and subsidized regime: 0.515

Table 22. Reasons for Not Having a Follow-Up of Abnormal Pap Smear Results Stratified by HCC among women who did not have a follow-up.

	All	No HCC	Any HCC	Contributory regime	Subsidized regime
Laziness/lack of interest	134 (31.09%)	36 (24.16%)	98 (34.75%)	45 (40.54%)	53 (30.99%)
Didn't have economic resources	121 (28.07%)	64 (42.95%)	57 (20.21%)	14 (12.61%)	43 (25.15%)
Fear/afraid	28 (6.50%)	8 (5.37%)	20 (7.09%)	8 (7.21%)	12 (7.02%)
Thought that could wait	20 (4.64%)	5 (3.36%)	15 (5.32%)	7 (6.31%)	8 (4.68%)
They didn't explain it was important	19 (4.41%)	6 (4.03%)	13 (4.61%)	2 (1.80%)	11 (6.43%)
Didn't know what to do	9 (2.09%)	4 (2.68%)	5 (1.77%)	0 (0.00%)	5 (2.92%)
Didn't believe in the result	9 (2.09%)	2 (1.34%)	7 (2.48%)	3 (2.70%)	4 (2.34%)
Other	91 (21.11%)	24 (16.11%)	67 (23.76%)	32 (28.83%)	35 (20.47%)

Pearson $\chi 2$ p-value when comparing No HCC and Any HCC: <0.0001
Pearson $\chi 2$ p-value when comparing No HCC, Contributory regime, and Subsidized regime: <0.0001

Chi-squared analyses showed that there were statistical differences when comparing women with no HCC and those with HCC, and by type of regime (p-value <0.0001). After post-hoc analyses it was found that a greater proportion of women without HCC (42.9%) reported lack of economic resources as a reason for not having a follow-up whereas fewer women with any enrollment (20.2%) reported this as a reason. When looking at the type of enrollment, fewer women enrolled in the contributory regime (12.6%) reported lack of economic resources as a reason, followed by women in the subsidized regimen (25.2%). Even though the difference was marginally significant, women in the contributory regime (40.5%) reported laziness or lack of interest as a reason for not having a follow-up more frequently than women in the subsidized regime (31%) or those without any coverage (24.2%) (Table 22).

Summary of Study Findings

The goal of this study was to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening (obtaining Pap smear results and following-up abnormal Pap smear results) among Colombian women.

The first aim was to assess the association between HCC and obtaining Pap smear results. Only 3.6% (n=885) of the women who had a Pap smear did not obtain their results. However, when looking at this proportion by the types of HCC there were significant differences. Only 2.1% of women enrolled in the contributory regime did not obtain their results. Whereas, 4.2% and 4.8% of women enrolled in the subsidized regime and without enrollment, respectively, did not obtain their results.

In univariate analyses, compared to women who obtained their results, women who did not obtain their results were less educated and poorer; a greater proportion of them were working in non-professional or non-technical jobs; living in capital, large cities or the countryside; had lived less than a year in the place of the interview; reported fair or bad health status; and did not have a health care visit in the previous 12 months.

In adjusted analyses, women without health care coverage were less likely than women with health care coverage to obtain their results (ORa=0.66, 95%CI: 0.56,0.76). Similarly, women enrolled in the subsidized regime were less likely to obtain their results than women in the contributory regime (ORa=0.68, 95%CI: 0.56,0.84). Women not enrolled in any plan as compared to those in the contributory regime were 0.51 times less likely to obtain their results (95%CI: 0.42,0.62), even after adjusting for age, marital status, woman's occupation, parity, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit in the previous year.

When analyzing HCC status, age, parity, wealth index, Pap smear payment, geographic region, perceived health status, and health care visit within the last year, were associated with obtaining Pap smear results. When analyzing HCC type, all the previous variables but parity were associated with obtaining Pap smear results.

When examining those with a Pap smear in the previous 12 months, women without health care coverage were less likely to obtain their results than women with health care coverage (ORa=0.57, 95%CI: 0.46,0.70). Women enrolled in the subsidized regime were less likely to obtain their results than women in the contributory regime (ORa=0.63, 95%CI: 0.48,0.84). Similarly, women without HCC, as compared to those in

the contributory regime, were 0.43 times less likely to obtain their results (95%CI: 0.32,0.57).

The second aim was to assess the association between HCC and follow-up of abnormal Pap smear results. Nearly 13% (12.9%) of women enrolled in the contributory regime did not have a follow-up. Whereas, 17.5% and 19% of women enrolled in the subsidized regime and without enrollment, respectively, did not have a follow-up of abnormal Pap smear results.

In univariate analyses, compared to the women who had a follow-up of abnormalities, women who did not have a follow-up of abnormalities were less educated and poorer, a greater proportion of them were living in the countryside, reported fair or bad health status, did not have a health care visit in the previous 12 months, and were hospitalized in the last 12 months.

In adjusted analyses, women enrolled in the subsidized regime were less likely than women in the contributory regime to have a follow-up of abnormalities (ORa=0.75, 95%CI: 0.57,0.98). Similarly, when women with no enrollment were compared with those in the contributory regime we observed a similar association (ORa=0.71, 95%CI: 0.54,0.95), even after adjusting for wealth index, geographic region, perceived health status, and health care visit and hospitalization in the previous year. However, these results need to be interpreted with caution given the extent of the confidence intervals.

Wealth index, geographic region, perceived health status, health care visit within the last year, and hospitalization in the previous year were associated with follow-up of abnormal Pap smear results when analyses were done by HCC status. When looking at HCC type only geographic region, perceived health status, and health care visit within the

last year were significantly associated with having a follow-up of abnormal Pap smear results.

Among those who had a Pap smear in the previous 12 months, women without health care coverage were less likely to have a follow-up than women with health care coverage (ORa=0.73, 95%CI: 0.55,0.97). Women enrolled in the subsidized regime were less likely than women in the contributory regime to have a follow-up (ORa=0.67, 95%CI: 0.48,0.94). Similarly, women with no enrollment as compared to those in the contributory regime were 0.55 times less likely to have a follow-up (95%CI: 0.39,0.79).

The third aim was to describe the reasons women mentioned for not following-up after cervical cancer screening. The most important reasons for not obtaining Pap smear results were that the institution did not return it and lack of interest in the results. The main reasons for not having a follow-up of abnormal Pap smear results were laziness/lack of interest and lack of economic resources..

It was found that a greater proportion of women without HCC (42.9%) reported lack of economic resources as a reason for not having a follow-up of abnormalities, whereas fewer women with any enrollment (20.2%) reported this as a reason. When looking at the type of enrollment, fewer women enrolled in the contributory regime (12.6%) reported lack of economic resources as a reason, followed by women in the subsidized regimen (25.2%).

CHAPTER 5

DISCUSSION AND CONCLUSIONS

The goal of our study was to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening (obtaining Pap smear results and following-up abnormal Pap smear results) among Colombian women. The Behavioral Model proposed by Andersen served as the basis for the conceptual framework for the study.[200] The model proposes that the use of health services is a function of the predisposition to use services, the factors which enable or impede use, and the need for health services.

Predisposing Characteristics

The predisposing characteristics are inherent to a person and encompass demographic factors and social structure. In this study, age was used as the demographic characteristic. Marital status, education of the woman and her partner, woman's occupation, and parity were part of social structure.

In reduced models of type of HCC, age was the only one of the predisposing characteristics significantly associated with obtaining Pap smear results. However, the association did not remain significant among women who had a Pap smear within the last year. None of the analyzed predisposing characteristics was significantly associated with follow-up of abnormal Pap smear results in reduced models of type of HCC.

Our findings showed that even after adjusting for other variables, women younger than 24 years of age were less likely than women 45 to 49 years of age to obtain their

results. Even though not all age categories were statistically significantly different from the oldest age group, a statistically significant linear trend was observed. This trend demonstrated that the likelihood of obtaining Pap smear results increased as age increased. Studies in the HIV screening literature were consistent with our results that younger women are less likely to obtain their results. For instance, Galvan and colleagues found that with decreases in age the proportion of women obtaining their HIV results was lower.[180]

Given that information about obtaining Pap smear results is limited, we compared our results to the findings regarding cervical cancer screening among Latinas. Even though screening and obtaining results are two different behaviors, our findings regarding age were consistent with the ones of Coughlin and Uhler, and Piñeros and colleagues, who reported that younger women were less likely to have a Pap smear than older women.[123, 168] Our finding is not surprising, because younger women may have a lower perceived susceptibility to cervical cancer than older women and thus getting Pap smear results may not be seen as a priority for them. However, we need to keep in mind that our study only includes women under the age of 50.

Most predisposing factors, such as age, education, marital status, and parity, identified in the literature as being associated with follow-up of abnormal Pap smear results were not significantly associated with follow-up of abnormal Pap smear results in our study. Some studies, for instance, have reported that follow-up increases with age.[91, 106] Even though we found an association between age and obtaining results, we did not find such an association between age and follow-up of abnormalities.

Need for Use of Health Services

The need for services can be perceived or evaluated. In terms of perceived need for use of health services, perceived health status, health care visit in the previous year, and current pregnancy were examined. Diagnosis of a sexually transmitted infection during the last year and being hospitalized in the last year were examined as components of need for the use of health services.

In reduced models of type of HCC, only perceived health status and health care visit within the last year were associated with obtaining Pap smear results. However, the associations did not remain statistically significant for women who had a Pap smear within the last year. In reduced models of type of HCC for follow-up of abnormal Pap smear results, perceived health status and health care visit within the last year were also significant. Among women who had a Pap smear within the last year, only perceived health status remained significant. Finding different results in stratified analyses was not surprising given the fact that these two groups of women differ in terms of their HCC status and type. Women with a Pap smear within the last year are more likely to be enrolled in the subsidized regimen than women with a Pap smear more than a year ago. Also, the proportion of women without HCC was higher among women with a Pap smear more than a year ago than within the last year.

We found that women who perceived themselves to be in fair or bad health were less likely than women with good health to obtain their results. Similarly, women who reported fair or bad health were less likely than women who reported excellent or very good health to have a follow-up of abnormal results. Women with fair or bad health may experience symptoms of cervical cancer as compared to women who report good health

and may not experience such symptoms. As supported by the HIV screening literature, individuals with symptoms may be afraid of a positive diagnosis, and avoid seeking screening results.[181, 184, 185] Hightow and colleagues, for instance, reported that individuals with symptoms of sexually transmitted infections were less likely than those without symptoms at the time of the test to obtain their HIV test results.[182] A study by Sullivan and colleagues reported that 25% of individuals at high risk for HIV infection reported fear of test results as a barrier for obtaining their result.[185] Fear of test results or fear of having cancer have also been mentioned as barriers for not being screened in several cervical cancer screening studies among Latinas in the U.S. and Latin America.[112, 119, 127, 143, 175, 177] In our study, the proportion of women who mentioned they did not obtain their result because they were afraid to have cancer was only 3%. However, the survey did not explore symptoms at the time of the Pap smear.

Consistent with our findings of follow-up of abnormal results, Yabroff and colleagues reported that women who perceived better health were more likely to have a follow-up of abnormal mammograms.[192] Usually, women in early stages of cervical cancer do not have symptoms, but women in late stages do have symptoms. If women with symptoms avoid obtaining results and having a follow-up, they are more likely to present complications from the disease, especially if they are in more advanced stages of the disease, which could explain some of the high mortality rates in Colombia. It may be relevant to further explore if women with symptoms avoid obtaining their results and having a follow-up of abnormal results. Women with symptoms can be more easily identified by health care professionals and be particularly educated about the importance of obtaining results and the availability of effective treatment or control if necessary.

Almost 20% of the women who did not obtain their Pap smear results reported that they were not interested in their results. There could be many reasons for this. Maybe these women do not have symptoms, maybe they are afraid of a positive diagnosis, maybe they do not perceive themselves at risk, maybe they did not self-initiate the test, etc. Various HIV studies reported that individuals for whom the test was compulsory, required, or suggested by health care professionals were significantly less likely to seek their results than those who had initiated the test themselves.[179, 186, 187] Even though the reasons for having the Pap smear test were not explored in our study, it may be possible that some women were getting the Pap smear in conjunction with other services such as prenatal care, post-partum check-ups, or obtaining of contraceptive methods, and may see the test only as a requirement, and consequently are less likely to seek their results.

Women who do not self-initiate the test should be specially advised of the importance of obtaining their results. Also, education among women with symptoms is crucial. They need to understand that effective treatment is available, and that cervical cancer is not necessarily deadly. The fatalistic view of cancer has been mentioned by researchers, such as Cardin and colleagues, who reported that among Latinas in the United States, women who delayed care had more fatalistic views about cancer than those who did not delay care.[87] Another study in Latin America revealed that fears related to cervical cancer screening were based on negative images of cancer.[176]

With regards to health care visit within the last year, women who had a health care visit were more likely than women without a health care visit to obtain Pap smear results and to have a follow-up of abnormalities. Similar results were seen for cervical cancer screening in Colombia. Piñeros et al., found that women with a health care visit

within the previous year were more likely to have a Pap smear within the last three years.[168] This finding was expected since a regular source of health care is a major predictor of various health care behaviors, including cervical cancer screening.[118, 128, 134, 142, 152, 163, 167, 168] If women who had a health care visit within the last year are more likely to be screened, obtain their Pap smear results and to have a follow-up of abnormal results, it supports the idea that available and affordable sources of care is an important step to accomplish various public health preventive strategies including secondary prevention of cervical cancer.

Enabling resources

Enabling resources facilitate or hinder access to health care. Such resources include personal or family resources and community resources. In relation to personal or family resources, wealth index and Pap smear payment were analyzed in the study. Place of residency, geographic mobility, and geographic region were components of community resources. HCC, which was included in all the models, as it is the main independent variable, can also be considered as an enabling resource.

In reduced models for type of HCC, the following enabling resources were associated with obtaining Pap smear results: HCC, wealth index, Pap smear payment, and geographic region. All these factors remained significant among women who had a Pap smear within the last year and more than a year ago. Geographic region and HCC were the only variables associated with follow-up of abnormal Pap smear results in reduced analyses of HCC type and they remained significant among women with a Pap smear within the last year.

Women without HCC were less likely than women with HCC to obtain their Pap smear results, even after adjusting for other factors. Similarly, women without HCC and those enrolled in the subsidized regime were less likely than those enrolled in the contributory regime to obtain their results. Information in the literature for HCC and obtaining Pap smear results was not available, so we explored literature in other screening tests. Only one study found HCC to be associated with obtaining test results; in this case HIV screening test results. Lazebnik and colleagues reported that among a sample of adolescents at a free clinic, those with private insurance were more likely to return for their results that those who did not have private insurance.[183]

Similarly, we found that women enrolled in the contributory regime were more likely than women without HCC or in the subsidized regime to have a follow-up of abnormal Pap smear results. Given our sample size, these results need to be interpreted with caution. However, the results are comparable with various studies that show that women with private insurance are more likely to adhere to follow-up of abnormal Pap smears.[94, 96, 100] Peterson et al., reported that women with Medicaid insurance, which is the U.S. parallel to the subsidized regime in Colombia, were less likely than women with private insurance to have a follow-up of abnormal Pap smears.[100] Similar results were found in the follow-up of abnormal mammography screening findings. Arnsberger and colleagues reported that in bivariate analyses women without insurance and those who had public insurance were less likely than women with private insurance to have a follow-up.[167]

Even though cervical cancer screening and obtaining Pap smear results or follow-up of abnormal results are different behaviors, HCC has been also associated with being

screened among Colombian women. As reported by Piñeros and colleagues, women without HCC and those enrolled in the subsidized regime were less likely to have had a Pap smear in the last three years compared to women enrolled in the contributory regime.[168] Similarly, Lucumi and Gómez also found that after adjusting for socio-economic confounders, Colombian women without HCC were less likely than women with HCC to have had a Pap smear within the past three years.[167]

Our findings may indicate that not only having HCC, but also the kind of HCC may contribute to whether or not women obtain their Pap smear results and have a follow-up of abnormal results. These differences can be the result of inherent characteristics of the women enrolled in each regime or the result of differences in the way the two regimes operate. The purpose of the subsidized regime is to provide health care to the poorest Colombians. Therefore, women enrolled in the subsidized regime are among the poorest in the country and are also less educated.[3] Furthermore, various studies have found that there is a link between low socioeconomic status and higher incidences of cervical cancer and diagnosis at later stages, even after adjusting for other variables.[31, 212-214] Hence, women in the subsidized regime may be at a higher risk of cervical cancer. In terms of the health care system, regulations of services for the prevention of cervical cancer are the same for both regimes. However, individuals enrolled in the subsidized regime have reported that access to the health care system is difficult and that administrative procedures are the main barriers to accessing the system.[83, 84, 215] Therefore, characteristics of the health care system and of the women enrolled in each regime could be playing an important role for obtaining Pap smear

results and having a follow-up of abnormal results.[215] Further research with a bigger sample size may help to confirm or reject this hypothesis.

Information regarding wealth index and obtaining screening test results was not found. However, Piñeros and colleagues reported that in Colombia, wealth index was associated with cervical cancer screening. They found that very poor women were less likely than the rest of the women to have had a Pap smear within the last three years.[168] Also, in the United States, women with lower income have been found to be less likely than women with higher income to get screened.[3, 109, 144] These results are comparable with our findings for obtaining Pap smear results. We found that poor and very poor women were less likely than very rich women to obtain their results after adjusting for other variables.

Further, the association between HCC and obtaining results remained after controlling for wealth index. Wealth index was also significantly associated with obtaining results when HCC was present. Women in the subsidized regime are the poorest. These women may be facing competing needs as they struggle every day to fulfill basic needs such as food and housing, and having HCC may not be enough for obtaining Pap smear results. For instance, they may have to decide whether to use the few resources they have to feed their families or to use them for transportation to obtain their results. Poverty and the subsidized regime are intrinsically related. Elucidating how both factors affect follow-up of cervical cancer screening is not easy. However, we can hypothesize that women in the subsidized regime, either because they are poor or because of problems in the system, are less likely to obtain their Pap smear results and possibly to follow-up with abnormal results. Therefore, efforts to increase cervical cancer screening

follow-up in Colombia should first focus on women in the subsidized regime, who, at the same time, are the poorest women in the country.

Women in Southern Bolivar, Sucre, and Cordoba were more likely, even after adjusting for other variables, than women living in Orinoquía and Amazonia to obtain their results. Orinoquía and Amazonía are the less inhabited and more isolated areas of the country. Southern Bolivar, Sucre and Cordoba on the other hand have among the highest rates of poverty, lack of education, and lack of HCC.[3] However, even in adjusted models, odds of obtaining Pap smear results in this geographic region are higher. Therefore, it appears that this region may be doing something different that helps women obtain their Pap smear results.

Additionally, even after adjusting for other socio-demographic factors, women living in Boyacá, Cundinamarca, Meta, and Bogotá (capital city) as compared to women living in Orinoquía and Amazonía were less likely to obtain their results and have a follow-up of abnormal results. Boyacá, Cundinamarca, Meta, and Bogotá are among the regions with the highest rates of wealth, education, and HCC.[3] Consequently, this finding is counterintuitive. Further research is needed to explore the factors that are associated with these advantages or disadvantages. A possibility is that there are differences in the way the health care system operates in these regions or that there are different public health strategies that help women to obtain their results or have a follow-up of abnormalities.

The behavioral model used as the conceptual framework for this study can also shed light on whether access to health care is equitable.[200] According to Andersen, when predisposing characteristics or need for use of health services are the factors associated

with differences in access, the health care system is considered equitable. On the other hand, when enabling factors explain the differences, the system is considered inequitable.[200] When examining women who had a Pap smear within the last year, which are expected to be the less biased estimates, results showed that most of the factors associated with obtaining Pap smear results and follow-up of abnormal Pap smear results were enabling factors, such as HCC, wealth index, and geographic region. Therefore, based on the behavioral model, it may be suggested that the Colombian health care system could be considered inequitable regarding cervical cancer screening follow-up. All women regardless of their HCC, wealth index or place of residency should obtain their Pap smear results and have a follow-up of abnormal results.

In Colombia, 76.5% of women have had a Pap smear within the last 3 years.[168] This rate is not drastically different from the rate of cervical cancer screening in the United States (84%).[216] Additionally, in Colombia, rates of obtaining results are about 90% and of following-up abnormal results 83%.[3] Even though the rates are not perfect, they are comparable with rates of developed countries such as the United States where mortality rates are very low. However, mortality data show striking differences. Cervical cancer mortality among Colombian women is almost 8 times higher than cervical cancer mortality in the U.S. (18.2/100,000 vs. 2.3/100,000).[1]

The sample of the Demographic and Health Survey represented 99% of the Colombian rural and urban population. If we were to extrapolate our findings about obtaining results and follow-up of abnormalities to women 18 to 49 years of age in the Colombian population, we can predict that approximately 298,178 women 18 to 49 years of age who had a Pap smear did not return to obtain their results. We could also predict

that approximately 559,912 women had sought their result but had not yet received it. Also, we can predict that 126,726 women 18 to 49 years of age with abnormal Pap smear results did not return for a follow-up. It is reported that between 7% and 23% of women with abnormal Pap smear results who are not treated will progress to a higher grade lesion within 24 months.[217] This can be even higher in resource poor settings. A study conducted in Peru reported that 56% of women with an abnormal Pap smear who did not have a follow-up presented moderate Cervical Intraepithelial Neoplasia or a higher lesion between 6 to 21 months after the test.[218] This suggests that between 8,871 and 70,966 of those women in Colombia who did not return for a follow-up will likely experience complications. Even though we found high rates of obtaining results and follow-up of abnormalities, the estimates of the impact that these relatively good rates may have in poor resource settings like Colombia in the number of women with complications, may explain in part the high mortality rates of cervical cancer in Colombia.

Screening alone is not sufficient to reduce mortality.[219] Recently, researchers from the National Cancer Institute of Colombia developed models of the natural history of cervical cancer and found that with the current 1-1-3* Pap smear strategy in Colombia, low rates of follow-up of abnormal screening results are more detrimental in mortality than low coverage.[219] They suggested that follow-up of 50% of abnormal results (Low-grade Squamous Intraepithelial Lesions or higher) with 100% screening coverage reduces the risk of mortality by 52.7%.[219] On the other hand, follow-up of 100% of abnormal results with 50% screening coverage reduces mortality risk by 74%.[219, 220] Our estimates for the amount of women who may experience complications with the current follow-up

* If screening is normal two consecutive years, subsequent Pap test must be performed every three years if they continue to be normal.

with the current follow-up rates and the report of the impact that lack of follow-up may have in mortality rates, supports the idea that efforts to decrease cervical cancer mortality rates should start focusing on increasing follow-up of abnormal Pap smear results.

Women with abnormal cervical cancer screening results are at a higher risk of having or developing cervical cancer. Given the high incidence of cervical cancer in Colombia, elucidating some of the factors associated with follow-up is relevant. Adequate follow-up care, such as availability of screening results, diagnostic tests, and treatment are crucial to reducing the burden of the disease. The process of having follow-up of screening tests is complex, and finding solutions to these problems is not an easy endeavor. There are many public health priorities competing for limited resources. Our study only looks at two aspects of cervical cancer screening follow-up, obtaining Pap smear results and follow-up of abnormal results. Many aspects involved in cervical cancer prevention such as adherence and quality of treatment, remain unknown. However, our results give insights of the important role that HCC and other socio-demographic variables may be playing in the follow-up of cervical cancer screening.

Public Health Significance of the Study

Cervical cancer is the most common cancer among Colombian women. The national government and local health authorities are very interested in addressing the high incidence and mortality of this type of cancer.[167] However, continuous efforts in the last 30 years to increase cervical cancer screening have not translated into lower mortality rates. Given our estimates of the number of women who may present complications after an abnormal Pap smear (which were based on the current cervical cancer screening follow-up rates and according to a recent study), the efforts to reduce cervical cancer

incidence and mortality in Colombia should focus on the follow-up of abnormal Pap smear results more than on initial screening.[219]

It has been documented that HCC is associated with cervical cancer screening. According to our results, HCC is also associated with obtaining Pap smear results and possibly with follow-up of abnormal Pap smear results.[167, 168] Our results also indicate that in terms of cervical cancer screening follow-up, the Colombian health care system may not be equitable. Enabling factors such as wealth index and geographic region are not easily addressed. However, health care has the potential to be more easily and realistically modified. Changes in the way the health care system is administering cervical cancer prevention activities may be relevant to make the system more equitable and to reduce the high cervical cancer incidence and mortality. For example, it may be that administrative obstacles prevent women in the subsidized regime from obtaining their Pap smear results or to having a follow-up, and by changing administrative procedures and regulations that determine the way the system operates may help to increase the rates of follow-up. A detailed discussion on the kind of changes that can be implemented is presented in the section of suggestions for future research, policy and interventions.

Study Limitations and Strengths

A limitation of this study is that we performed secondary data analyses. The sample and the structure of the data were fixed. Primary data collection would have provided more specific information to answer our questions. Data that incorporate elements of the health belief model, such as perceived susceptibility, perceived severity, perceived benefits, and perceived barriers would have been very useful to understand

how health beliefs affect follow-up of cervical cancer screening.[221] Also, it would have been very useful to have additional variables that explore factors associated with cervical cancer screening and follow-up of screening. For instance, reason for women to be screened (self-initiated or recommended); presence of symptoms at the time of screening; type of health care provider who performed the test; quality of service received at time of screening; was the woman informed about the importance of obtaining results and follow-up?; number of times attempted to obtain the result; was the result explained?; were authorizations necessary for a follow-up visit?; how many visits and how long did it take for getting the necessary authorizations?; how long did it take for getting the follow-up visit?; type of HCC at the time of screening and at the time of obtaining Pap smear results and follow-up visit.

Furthermore, women were asked about their health care coverage at the time of the interview. This may differ from the status of health care coverage at the time of the follow-up behavior, which could have happened months or years earlier. Health care coverage data from 2000 found that enrollment in the contributory regime has been fairly stable, whereas enrollment in the subsidized regime between the years 2000 and 2005 increased from 22% to 30%.[203] This was also confirmed through our analyses. As compared to women who had their Pap smear more than a year ago, those who had their Pap smear within the last year were more likely to be enrolled in the subsidized regime. A bigger proportion of women without HCC was found among those who had their Pap smear more than a year ago. Subsequently, stratified analyses by the time of the Pap smear test were relevant to minimize the effects of different pattern of enrollment across time and differences of HCC at the time of the interview and at the time of follow-up. It

is expected that HCC status at the time of the interview and at the time of obtaining Pap smear results or follow-up of abnormalities is very similar among women with a Pap smear within the last year, and these analyses provide better estimates of the association between HCC and follow-up.

There is also the possibility of recall bias for some of the questions (e.g., having seen a health care provider in the last 12 months). However, questions ascertaining such behaviors in the last 12 months have been widely used and validated in other surveys such as the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. Hence, bias caused by this limitation may not be a big problem.[1, 222, 223]

Another limitation of the study is that the information is self-reported. Information about follow-up of cervical cancer screening, either obtaining results or having a follow-up of abnormal results, may be over reported. Women may feel that not having follow-up of screening is not a socially accepted behavior. Therefore, women may answer that they had follow-up when in reality they did not. This will potentially create a bias towards the null hypothesis, underestimating the associations. Consequently, we could suggest that in fact the associations may be stronger.

All power estimates for the second goal of the study - to assess the association between HCC and follow-up of abnormal Pap smear results among Colombian women who obtained their Pap smear results were lower than 80%. Consequently, the lack of association between presence of HCC and follow-up of abnormal Pap smear results needs to be interpreted with caution. A larger sample size will be needed in future studies to have higher power. Given that the proportion of abnormalities in this dataset was 9% and

the proportion of women in that group without a follow-up was 17%, a case-control study may be a good alternative to collect the amount of cases needed to reach higher power. Cross-sectional studies are not very effective when the outcome of interest is not very common, thus looking for women who do not have a follow-up of abnormal Pap smear results (cases) and comparing them with women who have (controls) will be a more cost-effective way to reach an adequate sample size. Cases and controls need to be selected regardless of their HCC and then compared to see if HCC differences are present.

Moreover, given that demographic and health related information was only asked of women 13 to 49 years of age, the present study only includes women younger than 50 years of age. Extrapolation to women 50 years of age or older may not be appropriate. Studies are consistent in showing that women aged 50 and older have lower rates of screening[123, 149, 157, 163, 168] and based on the DHS they are also less likely to have a follow-up of abnormalities.[3] This is very important because in Colombia cervical cancer incidence and mortality increases with age, being especially high for women aged 65 and older.[1] Therefore, studies that look for factors associated with cervical cancer screening follow-up among women 50 and older are necessary.

Despite these limitations, this study was the first, to our knowledge, to examine among Colombian women whether HCC and other socio-demographic factors play a role in obtaining Pap smear results and follow-up of abnormal Pap smear results. There is a paucity of research available on the topic of follow-up of cervical cancer screening among Hispanics in the United States. Further, information for Latin America, and specifically for Colombia, is lacking in existing literature. Therefore, a population-based study on the topic was needed and relevant. Moreover, the survey has a complete array of

socio-demographic questions that fit within the Behavioral Model proposed by Andersen which was used as the theoretical model for this study.[200]

Data for this study were derived from the DHS, which is a very well known survey around the world. The survey methodology has been well established since 1985. The DHS program has conducted over 200 surveys in 75 countries. The 2005 DHS was the fifth survey conducted in Colombia since 1985. The 2005 Colombian DHS sample was multistage, probabilistic, stratified, and within clusters of the non-institutionalized population.[3] Therefore, our data came from a recent and very strong population-based study that represents 99% of the Colombian rural and urban population.[3] As a result, the findings of this study may be generalized to Colombian women 18 to 49 years of age. Also, replicating the study in other countries or comparing results with the next Colombian survey is viable.

Finally, we hope that the findings will serve to assist researchers, health care providers and policy makers in developing strategies to reduce the high incidence of cervical cancer in Colombia. In the following section, suggestions for the development of future research, programs, and policies will be discussed.

Suggestions for Future Research, Policy and Interventions

Facilitating and henceforth increasing follow-up care is clearly an important step to reduce incidence and mortality of cervical cancer. Further research is needed to determine if aspects of the subsidized regime are preventing appropriate follow-up. Navigating the health care system can be a major barrier to facilitating follow-up care. A review by Wujcik et al. reported that difficulties scheduling appointments was one of the barriers for follow-up of breast cancer screening.[84] In Colombia, difficulties scheduling

follow-up appointments also appear to be a barrier. Currently, women enrolled in the subsidized regime should get screened at the local health departments and women in the contributory regime should get screened at the EPS (Health Promoter Company).[84] However, the colposcopy and/or biopsy in the subsidized regime are the responsibility of the ARS (Subsidized Regime Administration) and authorization from the ARS is needed to get the tests. In addition, colposcopy may be administered in one place and the biopsy in yet another place.[83] As a consequence, after getting the Pap smear, a minimum of three visits to the health care system may be needed to get a diagnosis. The process may easily take 6 months.[83, 84] Allen and colleagues reported that for breast cancer screening, obtaining follow-up services in a different setting from the one the screening took place introduced new barriers, such as locating and getting to facilities and lack of familiarity or trust with providers.[83] Few providers, long lines, and waiting for authorizations from the ARS or EPS have been reported by clients and health care providers in Colombia as barriers to be screened and to return for follow-up.[83, 84, 215] In addition, difficulties accessing the health care system and administrative procedures have been mentioned as barriers for participants of the subsidized regime.[215]

With all these issues in mind, it is evident that navigation of the health care system is difficult for those in the subsidized regime. Women in the subsidized regime are the poorest, and consequently financial and logistical obstacles are greater if multiple visits are needed. Exploring how ARS and EPS can change the regulations that require multiple visits and authorizations for diagnostic and treatment procedures may be a relevant option to reduce the high incidence and mortality of cervical cancer in Colombia.

Researchers have also addressed low follow-up rates through patient navigation/case management models with promising results. Wagner et al., reported that outreach workers were more effective than mail or telephone reminders at increasing follow-up rates of abnormal Pap smears.[3] In Colombia, the mail system is not well organized or reliable, and telephone reminders are not realistic as only 68.7% of the urban and 15.5% of the rural population have a telephone.[3] Therefore, considering the addition of outreach workers in Colombia to increase follow-up rates may be a more viable option than mail or telephone reminders.

Furthermore, reducing the number of visits after the screening test may also reduce the number of women who do not return for follow-up. It may be a relevant alternative to implement a single-visit approach in which women with abnormalities are treated immediately following the screening test. The single-visit approach using the VIA method has proven to be a viable alternative where financial and human resources are very limited.[224] This option needs to be explored further in the Colombian context, especially for women living in rural areas for whom returning for multiple visits is a significant burden due to financial, practical, and logistic obstacles.[224]

Also, there is a new HPV test under development that is expected to be more affordable and to provide same-day results.[224] Herrero et al., recently recommended that screening with HPV testing followed, when abnormal, by Pap smear or VIA, should become the standard for care.[224] If HPV test and VIA can be obtained and conducted in the same visit, that could facilitate follow-up of cervical cancer screening. It is evident that HPV research is evolving rapidly, thus, the Ministry of Social Protection needs to be cautious when updating regulations regarding cervical cancer prevention strategies. These

decisions need to be made by a consensus of all of the stakeholders that include policy makers, ARS and EPS representatives, researchers, health care providers, community based organizations, and women affected or potentially affected by the disease. Based on evidence-based findings, this interdisciplinary group can help make decisions relevant to the most underserved women,.

Further research is needed to identify why some regions of the country are doing better than others in terms of follow-up of cervical cancer screening. Comparing incidence and mortality rates with rates of obtaining Pap smear results and follow-up of abnormal results by geographic region may help to determine if these differences in follow-up are consistent with lower incidence and mortality rates. If so, exploring what these regions are doing differently may help to increase follow-up of cervical cancer screening in the rest of the country, and hence reduce cervical cancer incidence and mortality.

Comprehension of screening test results has been strongly associated with timely follow-up in breast cancer screening research.[189] In Colombia, when women obtain their Pap smear results they get a report from the laboratory. However, the manner in which the report is presented is not uniform across the country. It is unknown how the report is explained; i.e. if non-technical language is used to explain the results, and if women are given an appropriate explanation on what is the following step in the process. The explanation that the result is abnormal and that another visit is needed could be given by the physician, nurse, lab technician or a receptionist. Additionally, according to our findings, reasons for not having a follow-up of abnormal results included providers not explaining why it was important to return, women thinking they could wait, not knowing

what to do, and not believing the result. These reasons could imply that some women are not well educated about the meaning and implications of their results.

Additionally, we found that women who perceived a good health status were more likely than women with poor or bad health, who in fact may be experiencing cervical cancer symptoms to obtain their results and to have a follow-up. Appropriate and consistent communication during the various steps in the process of cervical cancer screening may be important to appropriate follow-up behavior. At the time of initial screening, outreach health workers or health care providers should underscore the importance of returning for the results, the possibility of false-positive results, emphasize that cervical cancer does not always have symptoms and that even in the presence of symptoms timely follow-up is essential, and that returning for another visit if there are abnormal results is very important in order to have a diagnosis. This is a crucial time to minimize the fear of cancer, and reinforce the importance of the Pap smear in the early detection of cervical cancer and inform as to the availability of treatment for precancerous and cancerous lesions. Dissemination of these educational strategies to health care providers can be done through continuing education within the ARS and EPS where providers offer their services.

To improve follow-up of cervical cancer screening in Colombia, we propose to conduct more research that addresses the limitations of our study and to explore various long term strategies that may help ease the differences found between the subsidized and the contributory regimes. A summary of these strategies is presented next.

First, it is necessary to design a case-control study for women 20 years of age and older including variables based on the behavioral model analyzed in the present study,

and incorporating elements of the health belief model and factors related with cervical cancer screening and follow-up procedures.

Second, it is necessary to further investigate if there are differences in the way the health care system operates or if there are different public health strategies that make women in some regions of the country more or less likely to obtain their Pap smear results and to have a follow-up of abnormal results.

Third, it is important to implement a list of important educational points that outreach health workers or health care providers could emphasize to patients during the Pap smear visit. The list should be short and concrete, and it can have items such as: cervical cancer is preventable if caught on time. It is necessary to inform that there are effective treatments for cervical cancer. Cervical cancer may not have symptoms, and even if symptoms are present, timely treatment is crucial. Therefore, returning for the results and returning for a new visit if results are abnormal is very important. Implementing this educational strategy should start in places with a bigger influx of poor women.

Fourth, the results should be reported using non-technical language and with clear instructions on where and when to return for another visit. The laboratory that performs the analysis, based on national guidelines, should clearly specify in the report what should be the next step. For instance, it should specify if the woman needs another Pap smear in a year, six months or if she needs an immediate visit.

Finally, we hypothesized that, in part, the difference in follow-up between the subsidized and contributory regime may be due to the administrative or authorization processes. These processes are a bigger barrier for poorer women who are less likely than

richer women to have a follow-up. The case-control study proposed may help to elucidate if differences in follow-up of abnormalities truly exist between the subsidized and contributory regimes. If the results are confirmed, we propose to eliminate the need for authorizations to get follow-up care after an abnormal Pap smear. Colombia has clear guidelines on what needs to be done after an abnormal Pap smear is found and there are comprehensive algorithms that dictate what should occur in each case. Women who can be diagnosed and treated following these national guidelines should not need authorizations. To avoid unnecessary diagnostic tests, authorizations might be required for women who have a case that cannot be followed-up with the current guidelines.

Conclusions

Despite the availability of Pap smear tests since the early seventies in Colombia, cervical cancer is still the most common cancer among women in the country. Almost 77% of women in Colombia had a Pap smear within the last 3 years.[3] However, not all women who get screened have the opportunity to receive follow-up. According to 2005 DHS data, 3.6% of Colombian women who got a Pap smear did not return to obtain their results and 5.4% of women who sought their results had not yet received them. Additionally, 17% of women with abnormal Pap smear results did not return for follow-up. Even though these estimates appear to be low, cervical cancer incidence and mortality rates in Colombia remain high.

The goal of this study was to determine the role that health care coverage (HCC) plays in the follow-up of cervical cancer screening (obtaining Pap smear results and follow-up of abnormal Pap smear results) among Colombian women. We found that

among women who had a Pap smear within the last year, having HCC is not enough to obtain their Pap smear results. There is a difference in the likelihood of obtaining Pap smear results in women without HCC as compared to women with HCC. There is also a difference in women without HCC and those enrolled in the subsidized regime as compared to those enrolled in the contributory regime even after adjusting for predisposing characteristics, enabling resources, and need for the use of health services. Similar results were found for follow-up of abnormal results. However, findings for the follow-up of abnormal Pap smear results need to be interpreted with caution and more research is needed to confirm differences between the subsidized and contributory regimes.

Other variables associated with obtaining Pap smear results were: age, wealth index, Pap smear payment, geographic region, perceived health status, and health care visits within the last year. For follow-up of abnormal results, the only significant variables apart from HCC were geographic region, perceived health status, and health care visit within last year. Failure of the institution to return the results and not being interested in the results were mentioned by the women as main reasons for not obtaining their results. On the other hand, laziness/lack of interest, lack of economic resources, and fear of results were listed as barriers for not having a follow-up of abnormal Pap smear results.

According to our findings, it appears that the health care system is not equitable for the follow-up of cervical cancer screening. Women, regardless of their HCC, economic resources, and place of residence should have equal access to cervical cancer preventive strategies, but it seems that this is not the case. At least in the short term,

universal health care coverage for all women may not be realistic. However, we can start improving cervical cancer prevention services for those enrolled in the subsidized regime. Based on previous reports in the literature, some of the barriers in the health care system in Colombia appear to be of an administrative nature and they may be solved by the combined effort of regulatory entities such as the Ministry of Social Protection and the administrators of the subsidized regime.[83, 84, 215] Women in the subsidized regime are the poorest and as a result administrative barriers represent an even bigger obstacle. For poor women, multiple visits to the health care system in order to obtain results and have follow-up of abnormal results may not be easily achievable.

Educational strategies that address the importance of timely follow-up (obtaining results and follow-up of abnormalities) regardless of the presence of symptoms are important. Additionally, we could also benefit from investigating the reasons for some regions to have better cervical cancer screening follow-up rates than others, even after adjusting for other factors.

By implementing successful strategies to educate providers and women on the importance of timely delivery and obtaining of Pap smear results, and follow-up of abnormalities, we are hopeful that we can contribute to the reduction of the number of Colombian women who suffer and die due to cervical cancer. We can also accomplish this goal by further exploring if the way in which the subsidized and contributory regimes operate impact cervical cancer screening follow-up.

LIST OF REFERENCES

1. Ferlay J, Bray F, Pisani P, Parkin DM. Globocan 2002:Cancer Incidence, Mortality and Prevalence Worldwide. IARC CancerBase No. 5. Version 2.0. Lyon: IARCPress; 2004.

2. World Health Organization. Pap cytology screening: most of the benefits reaped? Available at: http://www.who.int/archives/inf-pr-1997/en/pr97-25.html. Accessed: October, 2004.

3. Ojeda G, Ordonez M, Ochoa LH. *Salud Sexual y Reproductiva en Colombia. Encuesta Nacional de Demografia y Salud, 2005*.

4. Departamento Administrativo Nacional de Estadísticas. Censo General 2005. Available at: http://www.dane.gov.co/files/censo2005/resultados_am_municipios.pdf. Accessed: Sept 12, 2006.

5. Colombia Journal. Colombia Facts. Available at: http://www.colombiajournal.org/colombiafacts.htm. Accessed: September 10, 2006.

6. Colombia Trade News. Available at: http://www.coltrade.org/about/index.asp. Accessed: September, 2006.

7. Library of Congress- Federal Research Division. Country Profile: Colombia, December 2004. Available at: http://lcweb2.loc.gov/frd/cs/profiles/Colombia.pdf. Accessed: September 12, 2006.

8. World Health Organization. Reproductive Health Indicators Database. July 2006. Available at: http://www.who.int/reproductive-health/global_monitoring/RHRxmls/RHRmainpage.htm. Accessed: September, 2006.

9. Ministerio de la Proteccion Social. Indicadores 2005. June 2006. Available at: http://www.minproteccionsocial.gov.co/VBeContent/NewsDetail.asp?ID=14714&IDCompany=3. Accessed: September, 2006.

10. Departamento Administrativo Nacional de Estadística. Colombia: Población indígena y negra censada por área de residencia y sexo, según grupo étnico, 1993. Available at: http://www.dane.gov.co/files/investigaciones/poblacion/grupos_etnicos/etnico2.xls. Accessed: Septiembre, 2006.

11. Central Intelligence Agency. The World Factbook. August, 2007. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/co.html. Accessed: August, 2007.

12. International Monetary Fund. World Economic and Financial Surveys. World Economic Outlook Database. April 2007:Available at: http://www.imf.org/external/pubs/ft/weo/2007/01/data/index.aspx. Accessed: August, 2007.

13. Departamento Administrativo Nacional de Estadística. Censo General 2005. Available at: http://www.dane.gov.co/files/censo2005/resultados_am_municipios.pdf. Accessed: Sept 12, 2006.

14. Amnesty International USA. Colombia "Scarred bodies, hidden crimes": Sexual Violence against women in the armed conflict. October 12, 2004. Available at: http://www.amnestyusa.org/countries/colombia/document.do?id=34AA01C4A3274ECA80256EF900423197. Accessed: September, 2006.

15. Iglitzin L, Ross R. *Women in the world: A comparative study*: Clio Press, Inc.; 1976.

16. Yeager G. *Confronting Change, Challenging Tradition. Women in Latin America History*: Scholarly Resources Inc.; 1994.

17. Bohman K. *Women of the barrio: Class and Gender in a Colombian City*: Stockholm studies in social anthropology; 1984.

18. World Health Organization. *The World Health Report 2006 - Working together for health.* Geneva: World Health Organization. Available at: http://www.who.int/countries/col/en/. Accessed September, 2006

19. Pan American Health Organization. Health Analysis and Information Systems Area. Regional Core Health Data Initiative; Technical Health Information System. 2005. Available at: http://www.paho.org/English/SHA/coredata/tabulator/newTabulator.htm. Accessed: September, 2006.

20. Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R. *World report on violence and health.* Geneva: World Health Organization; 2002. Available at: http://www.who.int/violence_injury_prevention/violence/world_report/en/full_en.pdf. Accessed

21. UNICEF. At a glance: United States of America. Available at: http://www.unicef.org/infobycountry/usa_statistics.html. Accessed: March, 2008.

22. UNFPA Colombia. Situación de la mortalidad materna. Available at: http://colombia.unfpa.org/tempob/mortmat/mortmat.htm. Accessed: September, 2006.

23. World Health Organization. *National Health Accounts. COLOMBIA: National Expenditure on Health.* 2006. Available at: http://www.who.int/nha/country/en/. Accessed September, 2006

24. HRSA. National Center for Health Workforce Analysis. U.S. Health Workforce Personnel Factbook. Available at: http://bhpr.hrsa.gov/healthworkforce/reports/factbook.htm. Accessed: September, 2006.

25. Escobar ML. *Health sector reform in Colombia*: World Bank Institute; 2005. Available at: http://www1.worldbank.org/devoutreach/may05/article.asp?id=295. Accessed October, 2006

26. Pan American Health Organization. Health situation analysis and trends summary. Available at: http://www.paho.org/English/DD/AIS/cp_170.htm. Accessed: September, 2006.

27. Quintana S. *El Acceso a los Servicios de Salud en Colombia*: Médicos sin Fronteras; 2002. Available at: http://www.disaster-info.net/desplazados/informes/msf/accesosaludcol.htm. Accessed January, 2008

28. U.S. Cancer Statistics Working Group. United States Cancer Statistics: 1999-2004 Incidence and Mortality Web-based Report. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2007. Available at: www.cdc.gov/uscs. Accessed: April, 2008.

29. American Cancer Society. *Cancer Facts & Figures for Hispanics/Latinos 2006-2008*. Available at: http://www.cancer.org/downloads/STT/CAFF2006HispPWSecured.pdf. Accessed April,2008

30. Singh GK, Miller BA, Hankey BF, Edwards BK. Persistent area socioeconomic disparities in U.S. incidence of cervical cancer, mortality, stage, and survival, 1975-2000. *Cancer.* Sep 1 2004;101(5):1051-1057.

31. Parikh S, Brennan P, Boffetta P. Meta-analysis of social inequality and the risk of cervical cancer. *Int J Cancer.* Jul 10 2003;105(5):687-691.

32. Pineros M, Ferlay J, Murillo R. Cancer incidence estimates at the national and district levels in Colombia. *Salud Publica Mex.* Nov-Dec 2006;48(6):455-465.

33. Murillo R. [Vacunacion contra el virus del Papiloma Humano en Colombia]. *Rev Colomb Cancerol.* 2006;10(2):85-97.

34. Parkin DM, Whelan SL, Ferlay J, Storm H. Cancer incidence in five continents, Vol I to VIII. *IARC CancerBase*: Lyon; 2005.

35. Yang BH, Bray FI, Parkin DM, Sellors JW, Zhang ZF. Cervical cancer as a priority for prevention in different world regions: an evaluation using years of life lost. *Int J Cancer.* Apr 10 2004;109(3):418-424.

36. HCUP Databases. *Healthcare Cost and Utilization Project (HCUP). 1998-2004.*: Agency for Healthcare Research and Quality, Rockville, MD. Available at: http://www.hcup-us.ahrq.gov/databases.jsp. Accessed February 2007

37. Insinga RP, Dasbach EJ, Elbasha EH. Assessing the annual economic burden of preventing and treating anogenital human papillomavirus-related disease in the US: analytic framework and review of the literature. *Pharmacoeconomics.* 2005;23(11):1107-1122.

38. Goldie SJ, Gaffikin L, Goldhaber-Fiebert JD, et al. Cost-effectiveness of cervical-cancer screening in five developing countries. *N Engl J Med.* Nov 17 2005;353(20):2158-2168.

39. Insinga RP. Annual productivity costs due to cervical cancer mortality in the United States. *Womens Health Issues.* Sep-Oct 2006;16(5):236-242.

40. Munoz N, Bosch FX, de Sanjose S, et al. The causal link between human papillomavirus and invasive cervical cancer: a population-based case-control study in Colombia and Spain. *Int J Cancer.* Nov 11 1992;52(5):743-749.

41. Koutsky LA, Holmes KK, Critchlow CW, et al. A cohort study of the risk of cervical intraepithelial neoplasia grade 2 or 3 in relation to papillomavirus infection. *N Engl J Med.* Oct 29 1992;327(18):1272-1278.

42. Schiffman MH, Bauer HM, Hoover RN, et al. Epidemiologic evidence showing that human papillomavirus infection causes most cervical intraepithelial neoplasia. *J Natl Cancer Inst.* Jun 16 1993;85(12):958-964.

43. zur Hausen H. Papillomaviruses causing cancer: evasion from host-cell control in early events in carcinogenesis. *J Natl Cancer Inst.* May 3 2000;92(9):690-698.

44. Munoz N, Bosch FX, de Sanjose S, et al. Epidemiologic classification of human papillomavirus types associated with cervical cancer. *N Engl J Med.* Feb 6 2003;348(6):518-527.

45. Clifford GM, Gallus S, Herrero R, et al. Worldwide distribution of human papillomavirus types in cytologically normal women in the International Agency for Research on Cancer HPV prevalence surveys: a pooled analysis. *Lancet.* Sep 17-23 2005;366(9490):991-998.

46. Dunne EF, Unger ER, Sternberg M, et al. Prevalence of HPV infection among females in the United States. *Jama.* Feb 28 2007;297(8):813-819.

47. Franco EL, Schlecht NF, Saslow D. The epidemiology of cervical cancer. *Cancer J.* Sep-Oct 2003;9(5):348-359.

48. Walboomers JM, Jacobs MV, Manos MM, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *J Pathol.* Sep 1999;189(1):12-19.

49. Bosch FX, Lorincz A, Munoz N, Meijer CJ, Shah KV. The causal relation between human papillomavirus and cervical cancer. *J Clin Pathol.* Apr 2002;55(4):244-265.

50. Bosch FX, Manos MM, Munoz N, et al. Prevalence of human papillomavirus in cervical cancer: a worldwide perspective. International biological study on cervical cancer (IBSCC) Study Group. *J Natl Cancer Inst.* Jun 7 1995;87(11):796-802.

51. Clifford GM, Smith JS, Plummer M, Munoz N, Franceschi S. Human papillomavirus types in invasive cervical cancer worldwide: a meta-analysis. *Br J Cancer.* Jan 13 2003;88(1):63-73.

52. Ylitalo N, Josefsson A, Melbye M, et al. A prospective study showing long-term infection with human papillomavirus 16 before the development of cervical carcinoma in situ. *Cancer Res.* Nov 1 2000;60(21):6027-6032.

53. Schlecht NF, Kulaga S, Robitaille J, et al. Persistent human papillomavirus infection as a predictor of cervical intraepithelial neoplasia. *Jama.* Dec 26 2001;286(24):3106-3114.

54. Moscicki AB, Hills N, Shiboski S, et al. Risks for incident human papillomavirus infection and low-grade squamous intraepithelial lesion development in young females. *Jama.* Jun 20 2001;285(23):2995-3002.

55. Bosch FX, Munoz N. The viral etiology of cervical cancer. *Virus Res.* Nov 2002;89(2):183-190.

56. Lai HC, Peng MY, Nieh S, et al. Differential viral loads of human papillomavirus 16 and 58 infections in the spectrum of cervical carcinogenesis. *Int J Gynecol Cancer.* Mar-Apr 2006;16(2):730-735.

57. Carestiato FN, Silva KC, Dimetz T, Oliveira LH, Cavalcanti SM. Prevalence of human papillomavirus infection in the genital tract determined by hybrid capture assay. *Braz J Infect Dis.* Oct 2006;10(5):331-336.

58. Guo M, Sneige N, Silva EG, et al. Distribution and viral load of eight oncogenic types of human papillomavirus (HPV) and HPV 16 integration status in cervical intraepithelial neoplasia and carcinoma. *Mod Pathol.* Dec 22 2006.

59. Song SH, Lee JK, Hur JY, Kim I, Saw HS, Park YK. The expression of epidermal growth factor receptor, vascular endothelial growth factor, matrix metalloproteinase-2, and cyclooxygenase-2 in relation to human papilloma viral load and persistence of human papillomavirus after conization with negative margins. *Int J Gynecol Cancer.* Nov-Dec 2006;16(6):2009-2017.

60. Ho CM, Cheng WF, Chu TY, et al. Human papillomaviral load changes in low-grade squamous intraepithelial lesions of the uterine cervix. *Br J Cancer.* Nov 20 2006;95(10):1384-1389.

61. Schlecht NF, Trevisan A, Baggio ML, et al. Lack of agreement between cervicography and cytology and the effect of human papillomavirus infection and viral load. *J Low Genit Tract Dis.* Oct 2006;10(4):229-237.

62. Song SH, Lee JK, Oh MJ, Hur JY, Park YK, Saw HS. Risk factors for the progression or persistence of untreated mild dysplasia of the uterine cervix. *Int J Gynecol Cancer.* Jul-Aug 2006;16(4):1608-1613.

63. Tirado-Gomez LL, Mohar-Betancourt A, Lopez-Cervantes M, Garcia-Carranca A, Franco-Marina F, Borges G. [Risk factors in invasive cervical cancer among Mexican women]. *Salud Publica Mex.* Sep-Oct 2005;47(5):342-350.

64. Alam S, Conway MJ, Chen HS, Meyers C. The cigarette smoke carcinogen benzo[a]pyrene enhances human papillomavirus synthesis. *J Virol.* Jan 2008;82(2):1053-1058.

65. Pereira CR, Rosa ML, Vasconcelos GA, Faria PC, Cavalcanti SM, Oliveira LH. Human papillomavirus prevalence and predictors for cervical cancer among high-risk women from Rio de Janeiro, Brazil. *Int J Gynecol Cancer.* May-Jun 2007;17(3):651-660.

66. Madeleine MM, Anttila T, Schwartz SM, et al. Risk of cervical cancer associated with Chlamydia trachomatis antibodies by histology, HPV type and HPV cofactors. *Int J Cancer.* Feb 1 2007;120(3):650-655.

67. Castellsague X, Diaz M, de Sanjose S, et al. Worldwide human papillomavirus etiology of cervical adenocarcinoma and its cofactors: implications for screening and prevention. *J Natl Cancer Inst.* Mar 1 2006;98(5):303-315.

68. Behtash N, Mehrdad N. Cervical cancer: screening and prevention. *Asian Pac J Cancer Prev.* Oct-Dec 2006;7(4):683-686.

69. Miller AB, Chamberlain J, Day NE, Hakama M, Prorok PC. Report on a Workshop of the UICC Project on Evaluation of Screening for Cancer. *Int J Cancer.* Nov 15 1990;46(5):761-769.

70. World Health Organization. *National cancer control programmes: policies and managerial guidelines*. 2nd ed. Geneva: World Health Organization; 2002.

71. Shingleton HM, Patrick RL, Johnston WW, Smith RA. The current status of the Papanicolaou smear. *CA Cancer J Clin.* Sep-Oct 1995;45(5):305-320.

72. O'Meara AT. Present standards for cervical cancer screening. *Curr Opin Oncol.* Sep 2002;14(5):505-511.

73. Nanda K, McCrory DC, Myers ER, et al. Accuracy of the Papanicolaou test in screening for and follow-up of cervical cytologic abnormalities: a systematic review. *Ann Intern Med.* May 16 2000;132(10):810-819.

74. Bishop JW, Bigner SH, Colgan TJ, et al. Multicenter masked evaluation of AutoCyte PREP thin layers with matched conventional smears. Including initial biopsy results. *Acta Cytol.* Jan-Feb 1998;42(1):189-197.

75. Janicek MF, Averette HE. Cervical cancer: prevention, diagnosis, and therapeutics. *CA Cancer J Clin.* Mar-Apr 2001;51(2):92-114; quiz 115-118.

76. Sangwa-Lugoma G, Mahmud S, Nasr SH, et al. Visual inspection as a cervical cancer screening method in a primary health care setting in Africa. *Int J Cancer.* Sep 15 2006;119(6):1389-1395.

77. Ghaemmaghami F, Behtash N, Modares Gilani M, Mousavi A, Marjani M, Moghimi R. Visual inspection with acetic acid as a feasible screening test for cervical neoplasia in Iran. *Int J Gynecol Cancer.* May-Jun 2004;14(3):465-469.

78. Sodhani P, Gupta S, Sharma JK, et al. Test characteristics of various screening modalities for cervical cancer: a feasibility study to develop an alternative strategy for resource-limited settings. *Cytopathology.* Dec 2006;17(6):348-352.

79. U.S. Preventive Services Task Force. *Screening for cervical cancer*. Baltimore: Williams & Wilkins; 1996.

80. American Cancer Society. American Cancer Society Guidelines for the Early Detection of Cancer. Available at: http://www.cancer.org/docroot/PED/content/PED_2_3X_ACS_Cancer_Detection_Guidelines_36.asp?sitearea=PED. Accessed: April, 2008.

81. Secretaria Distrital de Salud de Bogota. Manual de normas tecnico-administrativas para el programa de deteccion y control del cancer de cuello uterino. 2005.

82. Khanna N, Phillips MD. Adherence to care plan in women with abnormal Papanicolaou smears: a review of barriers and interventions. *J Am Board Fam Pract.* Mar-Apr 2001;14(2):123-130.

83. Pinilla J. Bogotá's Administrative Health Department, Bogotá, Colombia. Personal Communication. October 10, 2007.

84. Wiesner C, Tovar S, Cendales R, Vejarano M. [Healthcare services arrangement for cervical cancer control in Soacha, Colombia]. *Rev Colomb Cancerol.* 2006;10(2):98-108.

85. Wright TC, Jr., Massad LS, Dunton CJ, Spitzer M, Wilkinson EJ, Solomon D. 2006 consensus guidelines for the management of women with abnormal cervical cancer screening tests. *Am J Obstet Gynecol.* Oct 2007;197(4):346-355.

86. Cardin VA, Grimes RM, Jiang ZD, Pomeroy N, Harrell L, Cano P. Low-income minority women at risk for cervical cancer: a process to improve adherence to follow-up recommendations. *Public Health Rep.* Nov-Dec 2001;116(6):608-616.

87. Nelson K, Geiger AM, Mangione CM. Effect of health beliefs on delays in care for abnormal cervical cytology in a multi-ethnic population. *J Gen Intern Med.* Sep 2002;17(9):709-716.

88. Breitkopf CR, Catero J, Jaccard J, Berenson AB. Psychological and sociocultural perspectives on follow-up of abnormal Papanicolaou results. *Obstet Gynecol.* Dec 2004;104(6):1347-1354.

89. Eggleston KS, Coker AL, Das IP, Cordray ST, Luchok KJ. Understanding barriers for adherence to follow-up care for abnormal pap tests. *J Womens Health (Larchmt).* Apr 2007;16(3):311-330.

90. Hunt LM, de Voogd KB, Akana LL, Browner CH. Abnormal Pap screening among Mexican-American women: impediments to receiving and reporting follow-up care. *Oncol Nurs Forum.* Nov-Dec 1998;25(10):1743-1749.

91. McKee MD, Lurio J, Marantz P, Burton W, Mulvihill M. Barriers to follow-up of abnormal Papanicolaou smears in an urban community health center. *Arch Fam Med.* Mar-Apr 1999;8(2):129-134.

92. Benard VB, Lawson HW, Eheman CR, Anderson C, Helsel W. Adherence to guidelines for follow-up of low-grade cytologic abnormalities among medically underserved women. *Obstet Gynecol.* Jun 2005;105(6):1323-1328.

93. Engelstad LP, Stewart S, Otero-Sabogal R, Leung MS, Davis PI, Pasick RJ. The effectiveness of a community outreach intervention to improve follow-up among underserved women at highest risk for cervical cancer. *Prev Med.* Sep-Oct 2005;41(3-4):741-748.

94. Marcus AC, Crane LA, Kaplan CP, et al. Improving adherence to screening follow-up among women with abnormal Pap smears: results from a large clinic-based trial of three intervention strategies. *Med Care.* Mar 1992;30(3):216-230.

95. Fox P, Amsberger P, Zhang X. An examination of differential follow-up rates in cervical cancer screening. *J Community Health.* Jun 1997;22(3):199-209.

96. Melnikow J, Chan BK, Stewart GK. Do follow-up recommendations for abnormal Papanicolaou smears influence patient adherence? *Arch Fam Med.* Nov-Dec 1999;8(6):510-514.

97. Paskett ED, Phillips KC, Miller ME. Improving compliance among women with abnormal Papanicolaou smears. *Obstet Gynecol.* Sep 1995;86(3):353-359.

98. Eger RR, Peipert JF. Risk factors for noncompliance in a colposcopy clinic. *J Reprod Med.* Sep 1996;41(9):671-674.

99. Hartz LE, Fenaughty AM. Management choice and adherence to follow-up after colposcopy in women with cervical intraepithelial neoplasia 1. *Obstet Gynecol.* Oct 2001;98(4):674-679.

100. Peterson NB, Han J, Freund KM. Inadequate follow-up for abnormal Pap smears in an urban population. *J Natl Med Assoc.* Sep 2003;95(9):825-832.

101. Engelstad LP, Stewart SL, Nguyen BH, et al. Abnormal Pap smear follow-up in a high-risk population. *Cancer Epidemiol Biomarkers Prev.* Oct 2001;10(10):1015-1020.

102. Ell K, Vourlekis B, Muderspach L, et al. Abnormal cervical screen follow-up among low-income Latinas: Project SAFe. *J Womens Health Gend Based Med.* Sep 2002;11(7):639-651.

103. Crane LA. Social support and adherence behavior among women with abnormal Pap smears. *J Cancer Educ.* Fall 1996;11(3):164-173.

104. Lerman C, Hanjani P, Caputo C, et al. Telephone counseling improves adherence to colposcopy among lower-income minority women. *J Clin Oncol.* Feb 1992;10(2):330-333.

105. Miller SM, Siejak KK, Schroeder CM, Lerman C, Hernandez E, Helm CW. Enhancing adherence following abnormal Pap smears among low-income minority women: a preventive telephone counseling strategy. *J Natl Cancer Inst.* May 21 1997;89(10):703-708.

106. Marcus AC, Kaplan CP, Crane LA, et al. Reducing loss-to-follow-up among women with abnormal Pap smears. Results from a randomized trial testing an intensive follow-up protocol and economic incentives. *Med Care.* Mar 1998;36(3):397-410.

107. McKee MD, Schechter C, Burton W, Mulvihill M. Predictors of follow-up of atypical and ASCUS papanicolaou tests in a high-risk population. *J Fam Pract.* Jul 2001;50(7):609.

108. Lacey L, Whitfield J, DeWhite W, et al. Referral adherence in an inner city breast and cervical cancer screening program. *Cancer.* Aug 1 1993;72(3):950-955.

109. U.S. National Health Interview Survey. *Health, United States, 2006 with Chartbook on Trends in the Health of Americans.* Hyattsville, MD: U.S. National Center for Health Statistics; 2006. Available at. Accessed

110. Intercultural Cancer Council. Report of the Data Working Group Meeting. September 25-26, 1999.

111. Haynes MA, Smedley BD, Institute of Medicine (U.S.). Committee on Cancer Research among Minorities and the Medically Underserved. *The unequal burden of cancer: an assessment of NIH research and programs for ethnic minorities and the medically underserved*. Washington, D.C.: National Academy Press; 1999. http://books.nap.edu/books/0309071542/html/index.html.

112. Byrd TL, Chavez R, Wilson KM. Barriers and facilitators of cervical cancer screening among Hispanic women. *Ethn Dis.* Winter 2007;17(1):129-134.

113. Warren AG, Londono GE, Wessel LA, Warren RD. Breaking down barriers to breast and cervical cancer screening: a university-based prevention program for Latinas. *J Health Care Poor Underserved.* Aug 2006;17(3):512-521.

114. del Carmen MG, Findley M, Muzikansky A, et al. Demographic, risk factor, and knowledge differences between Latinas and non-Latinas referred to colposcopy. *Gynecol Oncol.* Jan 2007;104(1):70-76.

115. De Alba I, Sweningson JM. English proficiency and physicians' recommendation of Pap smears among Hispanics. *Cancer Detect Prev.* 2006;30(3):292-296.

116. Shah M, Zhu K, Wu H, Potter J. Hispanic acculturation and utilization of cervical cancer screening in the US. *Prev Med.* Feb 2006;42(2):146-149.

117. Jacobs EA, Karavolos K, Rathouz PJ, Ferris TG, Powell LH. Limited English proficiency and breast and cervical cancer screening in a multiethnic population. *Am J Public Health.* Aug 2005;95(8):1410-1416.

118. Garbers S, Chiasson MA. Inadequate functional health literacy in Spanish as a barrier to cervical cancer screening among immigrant Latinas in New York City. *Prev Chronic Dis.* Oct 2004;1(4):A07.

119. Coronado GD, Thompson B, Koepsell TD, Schwartz SM, McLerran D. Use of Pap test among Hispanics and non-Hispanic whites in a rural setting. *Prev Med.* Jun 2004;38(6):713-722.

120. Fernandez-Esquer ME, Cardenas-Turanzas M. Cervical cancer screening among Latinas recently immigrated to the United States. *Prev Med.* May 2004;38(5):529-535.

121. Byrd TL, Peterson SK, Chavez R, Heckert A. Cervical cancer screening beliefs among young Hispanic women. *Prev Med.* Feb 2004;38(2):192-197.

122. Fernandez-Esquer ME, Espinoza P, Torres I, Ramirez AG, McAlister AL. A su salud: a quasi-experimental study among Mexican American women. *Am J Health Behav.* Sep-Oct 2003;27(5):536-545.

123. Coughlin SS, Uhler RJ. Breast and cervical cancer screening practices among Hispanic women in the United States and Puerto Rico, 1998-1999. *Prev Med.* Feb 2002;34(2):242-251.

124. Boyer LE, Williams M, Callister LC, Marshall ES. Hispanic women's perceptions regarding cervical cancer screening. *J Obstet Gynecol Neonatal Nurs.* Mar-Apr 2001;30(2):240-245.

125. Buller D, Modiano MR, Guernsey de Zapien J, Meister J, Saltzman S, Hunsaker F. Predictors of cervical cancer screening in Mexican American women of reproductive age. *J Health Care Poor Underserved.* Feb 1998;9(1):76-95.

126. Lobell M, Bay RC, Rhoads KV, Keske B. Barriers to cancer screening in Mexican-American women. *Mayo Clin Proc.* Apr 1998;73(4):301-308.

127. Chavez LR, Hubbell FA, Mishra SI, Valdez RB. The influence of fatalism on self-reported use of Papanicolaou smears. *Am J Prev Med.* Nov-Dec 1997;13(6):418-424.

128. Selvin E, Brett KM. Breast and cervical cancer screening: sociodemographic predictors among White, Black, and Hispanic women. *Am J Public Health.* Apr 2003;93(4):618-623.

129. Coughlin SS, Uhler RJ, Richards T, Wilson KM. Breast and cervical cancer screening practices among Hispanic and non-Hispanic women residing near the United States-Mexico border, 1999-2000. *Fam Community Health.* Apr-Jun 2003;26(2):130-139.

130. Rodriguez MA, Ward LM, Perez-Stable EJ. Breast and cervical cancer screening: impact of health insurance status, ethnicity, and nativity of Latinas. *Ann Fam Med.* May-Jun 2005;3(3):235-241.

131. Goel MS, Wee CC, McCarthy EP, Davis RB, Ngo-Metzger Q, Phillips RS. Racial and ethnic disparities in cancer screening: the importance of foreign birth as a barrier to care. *J Gen Intern Med.* Dec 2003;18(12):1028-1035.

132. Bazargan M, Bazargan SH, Farooq M, Baker RS. Correlates of cervical cancer screening among underserved Hispanic and African-American women. *Prev Med.* Sep 2004;39(3):465-473.

133. Echeverria SE, Carrasquillo O. The roles of citizenship status, acculturation, and health insurance in breast and cervical cancer screening among immigrant women. *Med Care.* Aug 2006;44(8):788-792.

134. Gorin SS, Heck JE. Cancer screening among Latino subgroups in the United States. *Prev Med.* May 2005;40(5):515-526.

135. Koval AE, Riganti AA, Foley KL. CAPRELA (Cancer Prevention for Latinas): findings of a pilot study in Winston-Salem, Forsyth County. *N C Med J.* Jan-Feb 2006;67(1):9-15.

136. Wee CC, Phillips RS, McCarthy EP. BMI and cervical cancer screening among white, African-American, and Hispanic women in the United States. *Obes Res.* Jul 2005;13(7):1275-1280.

137. Harlan LC, Bernstein AB, Kessler LG. Cervical cancer screening: who is not screened and why? *Am J Public Health.* Jul 1991;81(7):885-890.

138. Harmon MP, Castro FG, Coe K. Acculturation and cervical cancer: knowledge, beliefs, and behaviors of Hispanic women. *Women Health.* 1996;24(3):37-57.

139. Hubbell FA, Chavez LR, Mishra SI, Valdez RB. Beliefs about sexual behavior and other predictors of Papanicolaou smear screening among Latinas and Anglo women. *Arch Intern Med.* Nov 11 1996;156(20):2353-2358.

140. Jennings KM. Getting a Pap smear: focus group responses of African American and Latina women. *Oncol Nurs Forum.* Jun 1997;24(5):827-835.

141. McMullin JM, De Alba I, Chavez LR, Hubbell FA. Influence of beliefs about cervical cancer etiology on Pap smear use among Latina immigrants. *Ethn Health.* Feb 2005;10(1):3-18.

142. O'Malley AS, Mandelblatt J, Gold K, Cagney KA, Kerner J. Continuity of care and the use of breast and cervical cancer screening services in a multiethnic community. *Arch Intern Med.* Jul 14 1997;157(13):1462-1470.

143. Scarinci IC, Beech BM, Kovach KW, Bailey TL. An examination of sociocultural factors associated with cervical cancer screening among low-income Latina immigrants of reproductive age. *J Immigr Health.* Jul 2003;5(3):119-128.

144. Skaer TL, Robison LM, Sclar DA, Harding GH. Cancer-screening determinants among Hispanic women using migrant health clinics. *J Health Care Poor Underserved.* Nov 1996;7(4):338-354.

145. Skaer TL, Robison LM, Sclar DA, Harding GH. Knowledge, attitudes, and patterns of cancer screening: a self-report among foreign born Hispanic women utilizing rural migrant health clinics. *J Rural Health.* Summer 1996;12(3):169-177.

146. Suarez L, Pulley L. Comparing acculturation scales and their relationship to cancer screening among older Mexican-American women. *J Natl Cancer Inst Monogr.* 1995(18):41-47.

147. Suarez L, Roche RA, Nichols D, Simpson DM. Knowledge, behavior, and fears concerning breast and cervical cancer among older low-income Mexican-American women. *Am J Prev Med.* Mar-Apr 1997;13(2):137-142.

148. Abraido-Lanza AF, Chao MT, Gates CY. Acculturation and cancer screening among Latinas: results from the National Health Interview Survey. *Ann Behav Med.* Feb 2005;29(1):22-28.

149. Wu ZH, Black SA, Markides KS. Prevalence and associated factors of cancer screening: why are so many older Mexican American women never screened? *Prev Med.* Oct 2001;33(4):268-273.

150. Borrayo EA, Thomas JJ, Lawsin C. Cervical cancer screening among Latinas: the importance of referral and participation in parallel cancer screening behaviors. *Women Health.* 2004;39(2):13-29.

151. Fernandez-Esquer ME, Espinoza P, Ramirez AG, McAlister AL. Repeated Pap smear screening among Mexican-American women. *Health Educ Res.* Aug 2003;18(4):477-487.

152. Corbie-Smith G, Flagg EW, Doyle JP, O'Brien MA. Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. *J Gen Intern Med.* Jun 2002;17(6):458-464.

153. Frank-Stromborg M, Wassner LJ, Nelson M, Chilton B, Wholeben BE. A study of rural Latino women seeking cancer-detection examinations. *J Cancer Educ.* Winter 1998;13(4):231-241.

154. Jennings-Dozier K. Perceptual determinants of Pap test up-to-date status among minority women. *Oncol Nurs Forum.* Sep 1999;26(8):1327-1333.

155. Jennings-Dozier K, Lawrence D. Sociodemographic predictors of adherence to annual cervical cancer screening in minority women. *Cancer Nurs.* Oct 2000;23(5):350-356; quiz 357-358.

156. Peragallo NP, Alba ML, Tow B. Cervical cancer screening practices among Latino women in Chicago. *Public Health Nurs.* Aug 1997;14(4):251-255.

157. Ramirez AG, Suarez L, Laufman L, Barroso C, Chalela P. Hispanic women's breast and cervical cancer knowledge, attitudes, and screening behaviors. *Am J Health Promot.* May-Jun 2000;14(5):292-300.

158. Randolph WM, Freeman DH, Jr., Freeman JL. Pap smear use in a population of older Mexican-American women. *Women Health.* 2002;36(1):21-31.

159. Suarez L, Lloyd L, Weiss N, Rainbolt T, Pulley L. Effect of social networks on cancer-screening behavior of older Mexican-American women. *J Natl Cancer Inst.* May 18 1994;86(10):775-779.

160. Suarez L, Ramirez AG, Villarreal R, et al. Social networks and cancer screening in four U.S. Hispanic groups. *Am J Prev Med.* Jul 2000;19(1):47-52.

161. Thompson B, Coronado GD, Solomon CC, McClerran DF, Neuhouser ML, Feng Z. Cancer prevention behaviors and socioeconomic status among Hispanics and non-Hispanic whites in a rural population in the United States. *Cancer Causes Control.* Oct 2002;13(8):719-728.

162. Wu ZY, Zhao MJ, Li ZP. Regulation of Gene Expression by SAR of Silkworm Attacus ricini rRNA Gene. *Sheng Wu Hua Xue Yu Sheng Wu Wu Li Xue Bao (Shanghai).* 2001;33(1):59-64.

163. Zambrana RE, Breen N, Fox SA, Gutierrez-Mohamed ML. Use of cancer screening practices by Hispanic women: analyses by subgroup. *Prev Med.* Dec 1999;29(6 Pt 1):466-477.

164. Lazcano-Ponce EC, Najera-Aguilar P, Buiatti E, et al. The cervical cancer screening program in Mexico: problems with access and coverage. *Cancer Causes Control.* Sep 1997;8(5):698-704.

165. Abraido-Lanza AF, Chao MT, Gammon MD. Breast and cervical cancer screening among Latinas and non-Latina whites. *Am J Public Health.* Aug 2004;94(8):1393-1398.

166. Wiesner-Ceballos C, Vejarano-Velandia M, Caicedo-Mera JC, Tovar-Murillo SL, Cendales-Duarte R. [Cervical cytology in Soacha, Colombia: social representation, barriers and motivation]. *Rev Salud Publica (Bogota).* Sep-Dec 2006;8(3):185-196.

167. Lucumi Cuesta DI, Gomez Gutierrez LF. [Acesibility to Healthcare Services in the Recent Cervical Cytology Performed in an Urban Area in Colombia]. *Rev Esp Salud Publica.* May-Jun 2004;78(3):367-377.

168. Piñeros M, Cendales R, Murillo R, Wiesner C, Tovar S. Cobertura de la Citologia de Cuello Uterino y Factores Relacionados en Colombia,2005. *Rev. Salud Pública.* 2007;9(3):327-341.

169. Castro-Jimenez MA, Londono-Cuellar PA, Vera-Cala LM. [Use and determinants of Pap smear in a rural Colombian municipality 1998-1999]. *Rev Salud Publica (Bogota).* Sep-Dec 2006;8(3):248-257.

170. Loaiza-Quintero LA, Gómez-Peñaloza SA. Factores socio-cognitivos asociados a la práctica de la citologia vaginal en mujeres de nivel socioeconómico medio y bajo de Bogotá D.D. Estudio exploratorio. Bogotá D.C.: Hospital de Nazareth, Secretaria Distritial de Salud de Bogotá D.C.; 2003.

171. Lazcano-Ponce EC, Moss S, Cruz-Valdez A, et al. [The factors that determine participation in cervical cancer screening in the state of Morelos]. *Salud Publica Mex.* Jul-Aug 1999;41(4):278-285.

172. Watkins MM, Gabali C, Winkleby M, Gaona E, Lebaron S. Barriers to cervical cancer screening in rural Mexico. *Int J Gynecol Cancer.* Sep-Oct 2002;12(5):475-479.

173. Lamadrid Alvarez S. [Knowledge and fears of Chilean women with respect to Papanicolaou smears]. *Bol Oficina Sanit Panam.* 1996;121(6):542-549.

174. Claeys P, Gonzalez C, Gonzalez M, Page H, Bello RE, Temmerman M. Determinants of cervical cancer screening in a poor area: results of a population-based survey in Rivas, Nicaragua. *Trop Med Int Health.* Nov 2002;7(11):935-941.

175. Soto Soto F, Martin Perez G, Carballo Perez N, Benitez Grey T. [Conditioning factors for negation behavior toward the cytological test]. *Medisan.* November 30 2003;7(2):8-16.

176. Bingham A, Bishop A, Coffey P, et al. Factors affecting utilization of cervical cancer prevention services in low-resource settings. *Salud Publica Mex.* 2003;45 Suppl 3:S408-416.

177. Agurto I, Bishop A, Sanchez G, Betancourt Z, Robles S. Perceived barriers and benefits to cervical cancer screening in Latin America. *Prev Med.* Jul 2004;39(1):91-98.

178. Garcés IC, Bohorquez MS, Scarinci IC. Socio-Cultural factors and knowledge associated with cervical cancer and screening among Colombian women; 2008.

179. Tao G, Branson BM, Kassler WJ, Cohen RA. Rates of receiving HIV test results: data from the U.S. National Health Interview Survey for 1994 and 1995. *J Acquir Immune Defic Syndr.* Dec 1 1999;22(4):395-400.

180. Galvan FH, Bing EG, Bluthenthal RN. Accessing HIV testing and care. *J Acquir Immune Defic Syndr.* Dec 15 2000;25 Suppl 2:S151-156.

181. Grusky O, Roberts KJ, Swanson AN. Failure to return for HIV test results: a pilot study of three community testing sites. *J Int Assoc Physicians AIDS Care (Chic Ill).* Mar 2007;6(1):47-55.

182. Hightow LB, Miller WC, Leone PA, Wohl D, Smurzynski M, Kaplan AH. Failure to return for HIV posttest counseling in an STD clinic population. *AIDS Educ Prev.* Jun 2003;15(3):282-290.

183. Lazebnik R, Hermida T, Szubski R, Dieterich-Colon S, Grey SF. The proportion and characteristics of adolescents who return for anonymous HIV test results. *Sex Transm Dis.* Jul 2001;28(7):401-404.

184. Wilson TE, Jaccard J, Levinson RA, Minkoff H, Endias R. Testing for HIV and other sexually transmitted diseases: implications for risk behavior in women. *Health Psychol.* Jul 1996;15(4):252-260.

185. Sullivan PS, Lansky A, Drake A. Failure to return for HIV test results among persons at high risk for HIV infection: results from a multistate interview project. *J Acquir Immune Defic Syndr.* Apr 15 2004;35(5):511-518.

186. Wiley DJ, Frerichs RR, Ford WL, Simon PA. Failure to learn human immunodeficiency virus test results in Los Angeles public sexually transmitted disease clinics. *Sex Transm Dis.* Aug 1998;25(7):342-345.

187. Molitor F, Bell RA, Truax SR, Ruiz JD, Sun RK. Predictors of failure to return for HIV test result and counseling by test site type. *AIDS Educ Prev.* Feb 1999;11(1):1-13.

188. Jemal A, Siegel R, Ward E, et al. Cancer statistics, 2006. *CA Cancer J Clin.* Mar-Apr 2006;56(2):106-130.

189. Wujcik D, Fair AM. Barriers to diagnostic resolution after abnormal mammography: a review of the literature. *Cancer Nurs.* Sep-Oct 2008;31(5):E16-30.

190. Strzelczyk JJ, Dignan MB. Disparities in adherence to recommended followup on screening mammography: interaction of sociodemographic factors. *Ethn Dis.* Winter 2002;12(1):77-86.

191. Yabroff KR, Breen N, Vernon SW, Meissner HI, Freedman AN, Ballard-Barbash R. What factors are associated with diagnostic follow-up after abnormal mammograms? Findings from a U.S. National Survey. *Cancer Epidemiol Biomarkers Prev.* May 2004;13(5):723-732.

192. Allen JD, Shelton RC, Harden E, Goldman RE. Follow-up of abnormal screening mammograms among low-income ethnically diverse women: findings from a qualitative study. *Patient Educ Couns.* Aug 2008;72(2):283-292.

193. Behbakht K, Lynch A, Teal S, Degeest K, Massad S. Social and cultural barriers to Papanicolaou test screening in an urban population. *Obstet Gynecol.* Dec 2004;104(6):1355-1361.

194. Carrasquillo O, Pati S. The role of health insurance on Pap smear and mammography utilization by immigrants living in the United States. *Prev Med.* Nov 2004;39(5):943-950.

195. Hewitt M, Devesa SS, Breen N. Cervical cancer screening among U.S. women: analyses of the 2000 National Health Interview Survey. *Prev Med.* Aug 2004;39(2):270-278.

196. Hiatt RA, Pasick RJ, Stewart S, et al. Community-based cancer screening for underserved women: design and baseline findings from the Breast and Cervical Cancer Intervention Study. *Prev Med.* Sep 2001;33(3):190-203.

197. Coughlin SS, Leadbetter S, Richards T, Sabatino SA. Contextual analysis of breast and cervical cancer screening and factors associated with health care access among United States women, 2002. *Soc Sci Med.* Jan 2008;66(2):260-275.

198. Morgan MA, Behbakht K, Benjamin I, Berlin M, King SA, Rubin SC. Racial differences in survival from gynecologic cancer. *Obstet Gynecol.* Dec 1996;88(6):914-918.

199. Ferrante JM, Gonzalez EC, Roetzheim RG, Pal N, Woodard L. Clinical and demographic predictors of late-stage cervical cancer. *Arch Fam Med.* May 2000;9(5):439-445.

200. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* Mar 1995;36(1):1-10.

201. Owusu GA, Eve SB, Cready CM, et al. Race and ethnic disparities in cervical cancer screening in a safety-net system. *Matern Child Health J.* Sep 2005;9(3):285-295.

202. Tamez-Gonzalez S, Valle-Arcos RI, Eibenschutz-Hartman C, Mendez-Ramirez I. [Adjustment of the Andersen's model to the Mexican context: access to prenatal care]. *Salud Publica Mex.* Sep-Oct 2006;48(5):418-429.

203. Ojeda G, Ordonez M, Ochoa LH. *Salud Sexual y Reproductiva en Colombia. Encuesta Nacional de Demografia y Salud, 2000*.

204. Dupont WD, Plummer WD. PS: power and sample size calculation. Version 2.1.31. 2004. Available at: http://biostat.mc.vanderbilt.edu/twiki/bin/view/Main/PowerSampleSize. Accessed: December 29, 2007.

205. Gwatkin DR, Rutstein S, Johnson K, Suliman E, Wagstaff A, Amouzou A. Socio-Economic Differences in Health,Nutrition, and Population. COLOMBIA. *World Bank* [Available at: http://siteresources.worldbank.org/INTPAH/Resources/400378-1178119743396/colombia.pdf. Accessed: December, 2007.

206. DHS. Description of the Demographic and Health Surveys Individual Recode Data File.

207. Hanson S. Perspectives on the geographic stability and mobility of people in cities. *Proc Natl Acad Sci U S A.* Oct 25 2005;102(43):15301-15306.

208. Centers for Disease Control and Prevention. Sexually Transmitted Diseases. Treatment Guidelines, 2006. MMWR. Vol 55 No. RR-11; 2006.

209. Guía de Atención de las Enfermedades de Transmisión Sexual. *Resolución 00412* [Available at: http://www.saludcolombia.com/actual/htmlnormas/ntets.htm. Accessed: March, 2008.

210. *SPSS* [computer program]. Version 11.5. Chicago, IL: SPSS Inc.

211. Agresti A. *Categorical data analysis*. 2nd ed. New York: Wiley-Interscience; 2002.

212. Mitchell JB, McCormack LA. Time trends in late-stage diagnosis of cervical cancer. Differences by race/ethnicity and income. *Med Care.* Dec 1997;35(12):1220-1224.

213. Liu T, Wang X, Waterbor JW, Weiss HL, Soong SJ. Relationships between socioeconomic status and race-specific cervical cancer incidence in the United States, 1973-1992. *J Health Care Poor Underserved.* Nov 1998;9(4):420-432.

214. Krieger N, Quesenberry C, Jr., Peng T, et al. Social class, race/ethnicity, and incidence of breast, cervix, colon, lung, and prostate cancer among Asian, Black, Hispanic, and White residents of the San Francisco Bay Area, 1988-92 (United States). *Cancer Causes Control.* Dec 1999;10(6):525-537.

215. Alvis-Guzman N, Alvis-Estrada L, Orozco-Africano J. [Subsidised Regimen users' perceptions concerning their right to health and access to health services in a Colombian town, 2005.]. *Rev Salud Publica (Bogota).* Jul-Sep 2008;10(3):386-394.

216. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia U.S.: Department of Health and Human Services, Centers for Disease Control and Prevention; 2006.

217. Melnikow J, Nuovo J, Willan AR, Chan BK, Howell LP. Natural history of cervical squamous intraepithelial lesions: a meta-analysis. *Obstet Gynecol.* Oct 1998;92(4 Pt 2):727-735.

218. Gage JC, Ferreccio C, Gonzales M, Arroyo R, Huivin M, Robles SC. Follow-up care of women with an abnormal cytology in a low-resource setting. *Cancer Detect Prev.* 2003;27(6):466-471.

219. Andres-Gamboa O, Chicaiza L, Garcia-Molina M, et al. Cost-effectiveness of conventional cytology and HPV DNA testing for cervical cancer screening in Colombia. *Salud Publica Mex.* Jul-Aug 2008;50(4):276-285.

220. Ministerio de la Protección Social. Resolución Número 0412; 2000 (Febrero 25).

221. Glanz K, Rimer BK, Lewis FM. *Health behavior and health education: theory, research, and practice*. 3rd ed. San Francisco: Jossey-Bass; 2002.

222. Nelson DE, Holtzman D, Bolen J, Stanwyck CA, Mack KA. Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Soz Praventivmed.* 2001;46 Suppl 1:S3-42.

223. Nelson DE, Powell-Griner E, Town M, Kovar MG. A comparison of national estimates from the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. *Am J Public Health.* Aug 2003;93(8):1335-1341.

224. Herrero R, Ferreccio C, Salmeron J, et al. New approaches to cervical cancer screening in Latin America and the Caribbean. *Vaccine.* Aug 19 2008;26 Suppl 11:L49-58.

APPENDIX A

POWER CALCULATIONS

Table 23. Power Analysis for Hypotheses Related to Obtaining Pap Smear Results (contributory Vs. subsidized).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05
Number of cases (i.e., women in the subsidized regime)	n	7924	7924	7924	7924	7924
Probability of exposure (i.e., likelihood of non claiming results) among controls (i.e., women in the contributory regime)	P_0	0.085	0.085	0.085	0.085	0.085
Ratio of women in the contributory and subsidized regimes	m	1:1	1:1	1:1	1:1	1:1
Hypothesized odds ratio of exposure (non claiming results) among cases (women in the subsidized regime) relative to controls (women in the contributory regime)	ψ	1.10	1.15	1.20	1.35	1.40
Power	$1-\beta$	0.40	0.73	0.92	0.99	1.0

Table 24. Power Analysis for Hypotheses Related to Obtaining Pap Smear Results (contributory Vs. special).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05
Number of cases (i.e., women in the special regime)	n	739	739	739	739	739
Probability of exposure (i.e., likelihood of non claiming results) among controls (i.e., women in the contributory regime)	P_0	0.085	0.085	0.085	0.085	0.085
Ratio of women in the contributory and special regimes	m	14:1	14:1	14:1	14:1	14:1
Hypothesized odds ratio of exposure (non claiming results) among cases (women in the special regime) relative to controls (women in the contributory regime)	ψ	1.25	1.3	1.35	1.5	2.0
Power	$1-\beta$	0.63	0.77	0.87	0.99	1.0

Table 25. Power Analysis for Hypotheses Related to Obtaining Pap Smear Results (Any HCC Vs. No HCC).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05
Number of cases (i.e., uninsured women)	n	7185	7185	7185	7185
Probability of exposure (i.e., likelihood of **non** claiming results) among controls (i.e., insured women)	P_0	0.085	0.085	0.085	0.085
Ratio of insured women and uninsured	m	2:1	2:1	2:1	2:1
Hypothesized odds ratio of exposure (non follow-up) among cases (uninsured women) relative to controls (insured women)	ψ	1.10	1.15	1.20	1.35
Power	$1-\beta$	0.47	0.79	0.95	0.1

Table 26. Power Analysis for Hypotheses Related to Follow-Up of Abnormal Pap Smear Results (Contributory Vs. Special).

Alpha: Type I error probability for a two-sided test	α	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Number of cases (i.e., women in the special regime)	n	75	75	75	75	75	75	75
Probability of exposure (i.e., likelihood of non follow-up) among controls (i.e., women in the contributory regime)	P_0	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Ratio of women in the contributory and special regimes	m	14:1	14:1	14:1	14:1	14:1	14:1	14:1
Hypothesized odds ratio of exposure (non follow-up) among cases (women in the special regime) relative to controls (women in the contributory regime)	ψ	1.25	1.50	1.75	2.0	2.25	2.75	5.0
Power	$1-\beta$	0.098	0.27	0.48	0.67	0.81	0.95	1.0

APPENDIX B

IRB APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Institutional Review Board for Human Use

DATE: 6/9/08

MEMORANDUM

TO: **Isabel Cristina Garces**
Principal Investigator

FROM: Sheila Moore, CIP
Director, IRB

RE: Request for Determination—Exempt Research
IRB Protocol # N080527001 – Impact of health care coverage and other socio-demographic variables on the follow-up of cervical cancer screening among Colombian women

The Office of the IRB has received the above referenced exemption application. The application has been reviewed according to the IRB Policies and Procedures and it has been determined that your project qualifies as Not Human Subjects Research. Should your research change you will need to resubmit to the IRB for further review and determination.

SM/hw

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APPENDIX C

DETAILED LIST OF STUDY VARIABLES

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
	DEPENDENT VARIABLES		
Obtained results	904. Have you ever gotten a Pap smear? 1. Yes 2. No→ 914 905. What month and year did you have the last Pap smear? Month __ Year ____ 906 Don't know/don't remember the month 98 Don't know/don't remember the year 9998 905A. The last Pap smear was more than 3 years ago? 1. Yes 2. No 8. Don't know/don't remember 909. Did you pick up the result of your last Pap smear? 1. Yes 2. No 3. They haven't give it to you	1. No= 909:2 2. Yes= 909:1,3	Dichotomous
Follow-up of abnormalities	910. What was the result of the last Pap smear? 1. Normal → 915 2. Abnormal 8. Don't remember→ 915 911. Did you go for a new appointment for treatment? 1. Yes 2. No	1. No= 911:2 2. Yes= 911:1	Dichotomous
	INDEPENDENT VARIABLES		

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
Type of HCC	39. Are you enrolled or are beneficiary of a company of the Health and Social Security System? If yes, which company? 01. ISS 02. EPS 03. ARS 04. Supportive Entity 05. Army/Police 06. ECOPETROL 07. Teaching professionals 08. Foncolpuertos 09. No enrollment 98. Don't know	1. No enrollment=09 2. Contributory/Special regime=01, 02, 05,06, 07,08 3. Subsidized regime=03,04	Nominal
Any kind of HCC		Variable created based on the type of HCC 1. No HCC=1 2. Any HCC=2,3,4 * 98-Missing.	Nominal
Adjustment Variables			
Age	104. How old are you? Age in years reached _____	###	Continuous
Marital status	501. Current marital status 0. Single 1. Married 2. Living with someone 3. Separated 4. Divorced 5. Widow	0. Single= 0 1. Married= 1 2. Living with someone= 2 3. Separated/divorced/widow= 3,4,5	Nominal
Woman's education	106. What was the last year of approved studies? 0. None 1. Preschool 2. Elementary 3. High school 4. Technical 5. College 6. Graduate	1. None/Preschool= 106=0,1 2. Elementary= 106=2 3. High school/Technical= 106=3,4 4. College/Graduate= 106= 5,6	Ordinal

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
Partner's education	701. Partner's education level 0. No education 1. Primary 2. Secondary 3. Higher 4. Don't know 804. What was the last year of studies that your (last) spouse/partner approved? 0. None 1. Preschool 2. Elementary 3. High school 4. Technical 5. College 6. Graduate 998.Don't know	1. None/Preschool= 701=0 or 804=0,1 2. Elementary= 804=2 3. High school/Technical= 804=3,4 4. College/Graduate= 804= 5,6 * 998-Missing.	Ordinal
Woman's occupation	807. Besides working at home, currently do you have other job? 1. Yes → 812 2. No 812. What is your current occupation? IF SHE HAS HAD SEVERAL JOBS, ASK: What was your occupation in your last job? 01. Professional, technician, assimilated worker 02. Director, superior public worker 03. Administrative staff, assimilated worker 04. Merchant, vendor 05. Service worker 06. Agricultural or forestry worker, fisherman, hunter 07. Non agricultural worker or operator, heavy equipment operator, transport vehicle, assimilated worker 08. Worker that cannot be classified according to occupation and armed forces	1. Homemaker= 807=2 2. Professional/ technical job= 812=01,02,03 3. Non-professional/non-technical job= 812= 04,05,06,07,08	Nominal
Parity	208. How many children have you had? IF HAVEN'T HAD ANY LIVE BORNS, WRITE "00"	###	Continuous

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
Wealth index	Variable already computed in the database	Very poor Poor Medium Rich Very rich	
Out of pocket	908. When you got the last Pap smear, did you have to pay? IF THE ANSWER IS "YES". Did you pay all or just a portion? 1. Yes, pay all 2. Yes, partial pay 3. Didn't pay anything	1. Pay all 2. Partial pay 3. Didn't pay anything	Nominal
Residency	6. Area 1. Head of the municipality 2. Rest (village) 3. Rest (disperse)	1. Urban= 6=1 2. Rural= 6=2,3	Dichotomous
Geographic mobility (length of stay)	826. Have you lived in one place or more than one since January, 1999? 1. One place → 901 2. More than one place → 829 829. In what month and year did you come to live (NAME OF MUNICIPALITY OF THE INTERVIEW)? Month ## Year #### Date interview	1.Have lived there 12 months or less= computed using 829 and date of interview 2.Have lived there between 13 and 36 months=computed using 829 and date of interview 3.Have lived there more than 37 months= computed using 829 and date of interview	Ordinal
Geographic mobility (residences previous 5 years)	826. Have you lived in one place or more than one since January, 1999? 1. One place → 901 2. More than one place → 829	1. One place =1 2. More than one place =2	

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
Geographic region	Variable already computed in the database	• Guajira, Cesar, Magdalena • Barranquilla (Metropolitan area) • Atlántico without Barranquilla, San Andres, Northern Bolivar • Southern Bolivar, Sucre, Córdoba • Santander, Santander del Norte • Boyacá, Cundinamarca, Meta • Bogota (without Soacha) • Medellín (metropolitana rea) • Antioquia without Medellín • Caldas, Risaralda, Quindío • Tolima, Huila, Caquetá • Cali (Metropolitan area) • Valle without Cali or coastal zone • Cauca and Nariño without coast • Chocó, Coastal zone of Valle, Cauca and Nariño • Arauca, Casanare, Guainía, Vichada, Amazonas, Putumayo, Guaviare, Vaupés	Nominal
Perceived health status	41. How do you believe your general health is? 1. Excellent 2. Very good 3. Good 4. Fair 5. Bad	1. Excellent/very good=1,2 2. Good=3 3. Fair/Bad=4,5	Nominal
Health care visit	312.What method are you using 317.Date of start of use of method (CMC) 008.Date of the interview 347. In the past 12 months did you have any health care visit? 1. Yes 2. No	Women using IUD, female sterilization or norplant within the last 12 months AND Had a health care visit within the last 12 months 1. Yes 2. No	Dichotomous

Variable Name	Questions	Value Description & Computation of Variables	Variable Type
Current pregnancy	226. Are you currently pregnant? 1. Yes 2. No 3. Don't know	1. Yes 2. No 3. Don't know	Nominal
STI last 12 months	1024. Have you been diagnosed with any sexually transmitted infection during the last 12 months? 1. Yes 2. No 3. Have never had sexual intercourse 8. Don't know/don't answer	1. Yes=1 2. No=2,3,8	Dichotomous
Hospitalized last 12 months	51. During the last 12 months, has somebody in this household being hospitalized? 1. Yes 2. No Write name and order number	1. Yes 2. No	Dichotomous
Reasons not obtaining results	913. Why did not pick up the result of the last Pap smear? 1. Afraid to be told that have cancer 2. You felt maltreated/offended when got the test 3. You don't care about the result 4. With the test you are sure you are not getting cancer 5. The institution where you did the test did not give it to you 6. Other: _____	1. Afraid to be told that have cancer 2. You felt maltreated/ offended when got the test 3. You don't care about the result 4. With the test you are sure you are not getting cancer 5. The institution where you did the test did not give it to you 6 Other	Nominal
Reasons not going new appointment	912. Why you didn't go to the new appointment? 01. They didn't explain it was important 02. Believed that could wait 03. Didn't know what to do 04. Didn't believe in the result 05. Fear/Fright 06. Laziness/carelessness 07. Lack of resources 96. Other: _____	1. They didn't explain it was important 2. Believed that could wait 3. Didn't know what to do 4. Didn't believe in the result 5. Fear/Fright 6. Laziness/carelessness 7. Lack of resources 96 Other	Nominal

APPENDIX D

SOCIODEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS BY THE TIME OF THE LAST PAP SMEAR

	0-12 months (N=15,326)	≥ 13 months (N=9,341)	P-value
Health care status			
No enrollment	3609 (23.6%)	3199 (34.4%)	<0.0001[1]
Any enrollment	11669 (76.4%)	6111 (65.6%)	
Health care type			
No enrollment	3609 (23.6%)	3199 (34.4%)	<0.0001[1]
Subsidized regime	6370 (41.7%)	3015 (32.4%)	
Contributory/special regime	5299 (34.7%)	3096 (33.3%)	
Age[2]	33.52 (8.509)	34.11 (8.272)	<0.0001[3]
Marital status			
Single	2123 (13.9%)	1249 (13.4%)	<0.0001[1]
Married	4346 (28.4%)	2376 (25.4%)	
Living with someone	6034 (39.4%)	3627 (38.8%)	
Separated/divorced/widow	2823 (18.4%)	2089 (22.4%)	
Woman's education			
None/Preschool	414 (2.7%)	314 (3.4%)	<0.0001[1]
Elementary	4749 (31.0%)	3047 (32.6%)	
High school/Technical	8203 (53.5%)	5029 (53.8%)	
College/Graduate	1960 (12.8%)	951 (10.2%)	
Partner's education			
None/Preschool	560 (4.3%)	425 (5.4%)	<0.0001[1]
Elementary	4798 (36.9%)	2833 (35.7%)	
High school/Technical	6187 (47.5%)	3924 (49.4%)	
College/Graduate	1467 (11.3%)	755 (9.5%)	
Woman's occupation			
Not working	4613 (30.1%)	2888 (30.9%)	<0.0001[1]
Professional/technical job	2425 (15.8%)	1194 (12.8%)	
Non-prof./non-technical job	8288 (54.1%)	5259 (56.3%)	
Parity[2]	2.31 (1.764)	2.53 (1.850)	<0.0001[3]
Wealth index			
Very poor	2321 (15.1%)	1561 (16.7%)	
Poor	3519 (23.0%)	2363 (25.3%)	<0.0001[1]
Average	3580 (23.4%)	2294 (24.6%)	
Rich	3229 (21.1%)	1842 (19.7%)	
Very rich	2677 (17.5%)	1281 (13.7%)	

[1] Pearson $\chi 2$
[2] Mean (Standard deviation)
[3] *t*-Test (two-tailed)

	0-12 months (N=15,326)	≥ 13 months (N=9,341)	P-value
Pap smear payment			
Didn't pay anything	12187 (79.5%)	6806 (72.9%)	<0.0001[1]
Partial pay	514 (3.4%)	322 (3.4%)	
Pay all	2625 (17.1%)	2213 (23.7%)	
Place of residency			
Capital, large city	2130 (13.9%)	1501 (16.1%)	
Small city	5438 (35.5%)	3228 (34.6%)	<0.0001[1]
Town	4327 (28.2%)	2609 (27.9%)	
Rural	3431 (22.4%)	2003 (21.4%)	
Geographic mobility			
0-12 months at current place	968 (6.3%)	684 (7.3%)	
13-36 months at current place	935 (6.1%)	667 (7.1%)	<0.0001[1]
37-77 months at current place	916 (6.0%)	584 (6.3%)	
Have lived in only one place	12507 (81.6%)	7406 (79.3%)	
Geographic region			
Guajira, Cesar, Magdalena	1273 (8.3%)	883 (9.5%)	<0.0001[1]
Barranquilla (MA)	502 (3.3%)	450 (4.8%)	
Atlántico, San Andres, northern Bolivar	667 (4.4%)	488 (5.2%)	
Southern Bolivar, Sucre, Córdoba	1123 (7.3%)	655 (7.0%)	
Santander, Santander del Norte	845 (5.5%)	557 (6.0%)	
Boyacá, Cundinamarca, Meta	1239 (8.1%)	735 (7.9%)	
Medellín (MA)	495 (3.2%)	337 (3.6%)	
Antioquia without Medellín	438 (2.9%)	328 (3.5%)	
Caldas, Risaralda, Quindío	1562 (10.2%)	684 (7.3%)	
Tolima, Huila, Caquetá	1469 (9.6%)	856 (9.2%)	
Cali (MA)	498 (3.2%)	249 (2.7%)	
Valle without Cali or coast	552 (3.6%)	290 (3.1%)	
Cauca and Nariño without coast	949 (6.2%)	443 (4.7%)	
Pacific Coast	514 (3.4%)	369 (4.0%)	
Bogota	986 (6.4%)	702 (7.5%)	
Orinoquía and Amazonia	2214 (14.4%)	1315 (14.1%)	
Perceived health status			
Excellent/very good	1834 (12.0%)	1027 (11.0%)	0.067[1]
Good	9423 (61.5%)	5820 (62.3%)	
Fair/Bad	4069 (26.5%)	2494 (26.7%)	
Current pregnancy			
Yes	637 (4.2%)	367 (3.9%)	0.381[1]
No	14689 (95.8%)	8974 (96.1%)	
STI diagnosis last year			
Yes	247 (1.6%)	75 (0.8%)	<0.0001[1]
No	15079 (98.4%)	9266 (99.2%)	
Hospitalization last year			
Yes	1531 (10.0%)	970 (10.4%)	0.319[1]
No	13795 (90.0%)	8371 (89.6%)	