



## The Impact of Education and Literacy Levels on Cancer Screening Among Older Latin American and Caribbean Adults

Carlos A. Reyes-Ortiz, MD, PhD, Maria E. Camacho, MD, Luis F. Amador, MD, Luis F. Velez, MD, PhD, Kenneth J. Ottenbacher, PhD, and Kyriakos S. Markides, PhD

**Background:** *There is limited information related to the effects of education and literacy on cancer screening practices among older adults in Latin American and Caribbean countries.*

**Methods:** *To determine the association between education and cancer screening use, we developed a cross-sectional study using data from the Health, Well-Being and Aging in Latin America and the Caribbean Study. The sample included 4,183 men and 6,708 women aged 60 years and older from seven cities. The outcomes are mammogram and Pap smear use in women and prostate examination use in men within the last 2 years.*

**Results:** *In general, illiterate or lower-educated older men and women have the lowest rates of cancer screening use compared with higher-educated counterparts. Multivariate logistic models, by city and in a combined sample of six cities showed that high education is associated with higher odds of having a mammogram or a Pap smear in women and a prostate examination in men.*

**Conclusions:** *Older adults with low educational or literacy levels should be targeted for screening programs in these populations.*

*From the Division of Geriatrics at the Sealy Center on Aging (CAR-O, MEC, KJO, KSM), the Division of Rehabilitation Sciences (CAR-O, KJO), and the Department of Preventive Medicine & Community Health (KSM) at the University of Texas Medical Branch, Galveston, Texas, the Internal Medicine-Geriatrics Program at the University of Colorado Health Science Center, Denver, Colorado (LFA), and the Institute for Health Promotion Research, School of Medicine, and Department of Epidemiology and Biostatistics at the University of Texas Health Science Center San Antonio, San Antonio, Texas (LFV).*

*Submitted October 18, 2006; accepted April 25, 2007.*

*Address correspondence to Carlos A. Reyes-Ortiz, MD, PhD, Sealy Center on Aging, University of Texas Medical Branch, 301 University Boulevard, Galveston, TX 77555. E-mail: careyeso@utmb.edu*

*No significant relationship exists between the authors and the companies/organizations whose products or services may be referenced in this article.*

*The editor of Cancer Control, John Horton, MB, ChB, FACP, has nothing to disclose.*

*This work was supported by Grant #W81XWH-06-1-0290 from the Department of Defense, Prostate Cancer Research Program, and Grant #P50CA105631 from NCI, Center on Population Health and Health Disparities.*

*Abbreviations used in this paper:* SABE = Survey on Health, Well-Being and Aging in Latin America and the Caribbean.

### Introduction

Mortality rates due to cancer vary considerably across Latin American and Caribbean countries.<sup>1,3</sup> From 1960 to 1994, mortality rates from cervical cancer increased in Haiti, Bolivia, and Nicaragua, countries of low social and economic development.<sup>1</sup> At the same time, Argentina and Uruguay, two countries with developmental patterns similar to those of more developed countries, had the lowest mortality rates from cervical cancer in the region. These variations are also seen in breast and prostate cancer between countries. From 1996 to 1998, the highest mortality rates due to breast cancer in the Americas occurred in Uruguay, Canada, the United States, Argentina, Trinidad, and Tobago. During the same period, Cuba, Puerto Rico, Costa Rica, and Venezuela had intermediate mortality rates. Mexico and Colombia had the lowest mortality rates.<sup>2</sup> In 2000, the highest mortality rates for prostate cancer occurred in Cuba and Venezuela, followed by Costa Rica, Chile, Argentina,

Ecuador, and Colombia. Brazil and Mexico had the lowest mortality rates.<sup>3</sup>

Little is known about the protective effect of screening programs for cervical, breast, and prostate cancer across Latin American and Caribbean countries.<sup>1-3</sup> In some countries (Puerto Rico, Colombia, and Argentina), cervical cancer screening result in decreased mortality rates, but in others (Cuba, Costa Rica, Chile, and Mexico), changes in mortality appear to be limited following the introduction of cervical screening.<sup>1</sup> The impact of screening practices for breast and prostate cancer mortality in the region is largely unknown.<sup>2,3</sup> In addition, screening practices might determine an early stage at diagnosis for cervical, breast, and prostate cancer among adults in these countries.<sup>2,4,5</sup>

Factors related to cancer screening use by Hispanics in the United States include high education or income, health insurance, a usual source of care, a physician's recommendation, discussion with a physician about screening, and social integration or acculturation.<sup>6-15</sup> Similarly, factors related to cancer screening use in Latin American and Caribbean countries include high income, health insurance, a regular physician, and a sex partner's approval of gynecologic examination (in women).<sup>16-21</sup> Data on the effect of education or literacy on screening practices among older adults in Latin American and Caribbean countries are limited.<sup>20,21</sup>

The objective of this study was to determine the association between education and cancer screening use (mammography, Pap smear, and prostate examination) among older adults from seven cities using data from the Survey on Health, Well-Being, and Aging in Latin America and the Caribbean (Project SABE).

## Methods

### Study Population

The study population included 4,183 men and 6,708 women aged 60 years or older living in urban areas of Buenos Aires (Argentina), Bridgetown (Barbados), Sao Paulo (Brazil), Santiago (Chile), Havana (Cuba), Mexico City (Mexico), and Montevideo (Uruguay).

### Data Source

The data source was the SABE study, consisting of a round of cross-sectional surveys from cities in seven Latin American and Caribbean countries during 1999–2000.<sup>22,23</sup> The Pan American Health Organization (PAHO) coordinated the overall SABE study and directed its logistics. The Center for Demography and Ecology at the University of Wisconsin-Madison, jointly with the PAHO, designed the study.

Local, country-based teams consisting of a principal investigator and his or her associates trained the interviewers in each city. The focus of the study was

the population aged 60 years and older residing in the metropolitan areas of Buenos Aires, Bridgetown, Santiago, and Mexico City, and in the cities of Sao Paulo, Havana, and Montevideo. The response rates were 60% in Buenos Aires, 85% in Bridgetown, 84% in Santiago, 85% in Mexico City, 85% in Sao Paulo, 95% in Havana, and 66% in Montevideo. Two cities with a lowest response rates, Buenos Aires and Montevideo, were compared with their corresponding Census information (*Censo Nacional de Población, Hogares y Viviendas año 2001*, and *Censo General de Población, Hogares y Viviendas año 1996*, respectively), and confirmed that their sociodemographic distributions were comparable. The proportions of interviews by proxy were 3.7% in Buenos Aires, 3.9% in Bridgetown, 7.9% in Santiago, 8.2% in Mexico City, 13.1% in Sao Paulo, 9.7% in Havana, and 1.4% in Montevideo.

A classic multistage, clustered sampling with stratification of the units at the highest levels of aggregation was used: the primary sampling unit was a cluster of independent households within predetermined geographic areas grouped into socioeconomic strata and then divided into secondary sampling units, each containing a smaller number of households. Finally, the household and target individuals — person 60 years of age and older — were randomly selected. The potential participants were then contacted to schedule an interview at home. The interviews were conducted in English for Bridgetown (Barbados), Portuguese for Sao Paulo (Brazil), and Spanish for all other cities, using the same validated questionnaires. Oral consent and written consent forms — approved by the Human Subjects Committee at each city with the corresponding affiliated Medical Research Institution or University — were obtained from all subjects, and personal identifiers were deleted. If a person who agreed to be interviewed failed the cognitive test, a proxy was selected to respond to some parts of the questionnaire.<sup>22,23</sup>

### Variables

The dependent variables were mammography use, Pap smear use, and prostate examination. Mammography use was assessed in each city by answers to the question: “In the last 2 years have you had a mammogram of your breasts?” Pap smear use was assessed by answers to the question: “In the last 2 years have you had a Pap smear that is a test to determine whether you have cervical or uterine cancer?” Prostate examination was assessed by answers to the question: “In the last 2 years have you had a prostate examination?” In all three variables, use was dichotomized as user (coded 1) and nonuser (coded 0).

The primary independent variable — level of education (years of schooling) — was categorized as 0 (illiterate), 1–5 years, 6–11 years, and 12 or more years of education. This was also used as a continuous variable. Sociodemographic correlates included age (years), mar-

ital status (unmarried = 0, married = 1), and health insurance coverage (private, public, or military insurance coded = 1, no insurance = 0). Financial strain was assessed by answers to the question: "Do you believe that you (and your spouse/companion) have enough money to cover your daily living necessities?" (yes = 1, no = 0). This measure replaced income information that was often incomplete and unreliable in this survey, and it correlated well across wealth categories (eg, economic resources) and access to health care (eg, insurance).<sup>24</sup>

Medical conditions were assessed with a series of questions asking the respondents if they had been ever told by a doctor or other healthcare provider that they had arthritis, diabetes mellitus, hypertension, heart disease, stroke or cancer (yes = 1, no = 0). A summary score for medical conditions was constructed, from 0 to 6, and used as a continuous variable. Functional status was assessed by four Instrumental Activities of Daily Living (IADL) items<sup>25</sup>: shopping for groceries, preparing meals, taking medicine, and handling money. Subjects were asked if they had difficulty performing the activity at the time of the interview. IADL scoring was used as a continuous variable, with a possible score of 0 to 4.

## Statistical Analysis

Descriptive statistics were used to report prevalence of mammography use and to describe characteristics of the study population. Multivariate logistic regression analyses were used to estimate the odds of having a mammogram in each survey and in the combined sample of surveys from Buenos Aires, Bridgetown, Mexico City, Montevideo, Santiago, and Sao Paulo (excluding Havana where health insurance does not apply because coverage is universal), where dummy variables for the city were included. All analyses were performed using the SAS System for Windows, version 9.1 (SAS Institute, Inc, Cary, NC). A significant level was considered to be  $P < .05$ .

## Results

Table 1 shows sociodemographic and health characteristics of Latin American and Caribbean older women ( $\geq 60$  years of age) from the SABE study. Mexico City has a relatively younger population and Sao Paulo and Havana have a relatively older population compared

**Table 1. — Characteristics of Study Population, Men and Women 60 Years of Age and Older**

	Buenos Aires	Bridgetown	Sao Paulo	Santiago	Havana	Mexico City	Montevideo	Total Sample
<b>Women</b>	n = 656	n = 1,082	n = 1,262	n = 855	n = 1,197	n = 740	n = 916	N = 6,708
Age (yrs)	71.5 ± 7.5	72.3 ± 8.3	72.9 ± 8.4	72.1 ± 8.3	72.8 ± 9.0	70.0 ± 7.8	71.1 ± 7.6	72.0 ± 8.3
Currently married	30.0	34.4	36.5	29.2	21.0	38.8	35.2	31.9
Education (yrs)	5.9 ± 3.7	6.7 ± 3.4	4.0 ± 3.0	6.0 ± 5.3	6.7 ± 3.9	4.1 ± 4.1	6.3 ± 4.5	5.7 ± 4.1
0	8.8	3.0	29.5	19.4	5.9	29.6	8.1	14.8
1–5	35.7	51.2	61.8	31.4	27.9	34.7	37.5	41.3
6–11	48.9	37.9	6.2	35.2	51.7	26.6	40.5	34.2
≥12	6.6	7.9	2.5	14.0	14.5	9.1	13.9	9.7
Have insurance	85.3	13.7	97.4	89.9	N/A	72.0	96.7	74.7
Have enough money*	30.5	35.0	30.9	28.6	19.6	50.0	43.8	33.0
Medical conditions (0–6)**	1.5 ± 1.0	1.6 ± 1.1	1.5 ± 1.1	1.6 ± 1.1	1.8 ± 1.2	1.2 ± 1.0	1.5 ± 1.1	1.5 ± 1.1
IADL difficulties (0–4)	0.3 ± 0.8	0.3 ± 0.8	0.6 ± 1.0	0.4 ± 0.9	0.4 ± 1.0	0.3 ± 0.8	0.1 ± 0.5	0.3 ± 0.9
<b>Men</b>	n = 383	n = 730	n = 881	n = 446	n = 708	n = 507	n = 528	N = 4,183
Age (yrs)	69.5 ± 6.8	72.4 ± 7.6	73.7 ± 8.5	70.5 ± 7.4	70.5 ± 8.5	69.8 ± 7.9	70.7 ± 6.8	71.4 ± 7.9
Currently married	65.0	60.4	74.9	70.4	61.5	75.7	72.0	68.5
Education (yrs)	7.0 ± 4.2	6.9 ± 3.6	4.8 ± 3.4	7.3 ± 5.7	7.7 ± 3.9	5.1 ± 4.7	7.0 ± 5.0	6.4 ± 4.4
0	5.5	4.5	19.3	12.6	4.4	22.1	7.0	11.0
1–5	28.2	49.6	67.3	30.0	19.2	35.1	36.7	40.7
6–11	53.8	36.3	7.3	35.4	57.3	28.0	38.1	34.5
≥12	12.5	9.6	6.1	22.0	19.1	14.8	18.2	13.8
Have insurance	78.5	16.6	97.6	86.7	N/A	77.8	95.7	73.6
Have enough money*	36.3	42.2	32.9	34.8	22.4	52.2	48.1	37.5
Medical conditions (0–6)**	1.3 ± 1.1	1.1 ± 1.0	1.2 ± 1.1	1.1 ± 1.0	1.2 ± 1.0	0.9 ± 0.9	1.1 ± 1.0	1.1 ± 1.0
IADL difficulties (0–4)	0.1 ± 0.6	0.2 ± 0.6	0.5 ± 1.0	0.2 ± 0.7	0.2 ± 0.7	0.1 ± 0.6	0.1 ± 0.3	0.2 ± 0.7

Data are presented as percentages (%) or means ± SD.  
 \* Enough to cover daily living necessities.  
 \*\* Include hypertension, diabetes, heart attack, arthritis, stroke, and cancer.  
 N/A = Not applicable; insurance does not apply for Havana.

with other cities. About one third of women and two thirds of men were currently married. Most subjects had health insurance (except in Bridgetown, where 14% of women and 17% of men had insurance); this characteristic does not apply for participants in Havana. The mean number of years of education was highest in Havana and lowest in Sao Paulo. The highest percentages of illiterate subjects were in Mexico City (30% of women, 22% of men) and Sao Paulo (29% of women, 19% of men). About half of the subjects in Mexico City and one fifth in Havana reported having enough money to cover daily living necessities. The number of medical conditions reported was highest in Havana (1.8 for women, 1.2 for men) and lowest in Mexico City (1.2 for women, 0.9 for men). The highest number of IADL difficulties was reported in Sao Paulo (0.6 for women, 0.5 for men) and the lowest in Montevideo (0.1 for both men and women).

Table 2 shows the bivariate associations between screening use and education categories by gender. Mammography use in women was associated with higher education in all cities except Havana. Pap smear use in women was associated with higher education in all cities except Bridgetown and Santiago. Prostate examinations in men was associated with higher education in all cities except Bridgetown and Havana. The lowest percentages of mammography use among illiterate women were in Bridgetown (6%) and Havana (7%), and

the highest percentages were in Sao Paulo (26%) and Montevideo (22%). The lowest percentages of Pap smear use among illiterate women were in Bridgetown (9%) and Montevideo (18%), and the highest percentages were in Mexico City (39%) and Sao Paulo (28%). Finally, the lowest percentages of prostate examination among illiterate men were in Havana (13%) and Mexico City (14%), and the highest percentages were in Bridgetown (51%) and Buenos Aires (48%).

The Figure shows the percentage of screening methods by education categories in the total sample of cities (6,708 women, 4,183 men). Percentages for mammography or a Pap smear in women or a prostate examination in men were lowest among illiterate subjects (0 years of education) and highest among highly educated subjects (all  $P < .0001$ ).

Table 3 shows the results of the multiple logistic regression analyses predicting odds of screening methods use in the previous 2 years according to city and also in a combined sample of six cities (excluding Havana where insurance coverage does not apply). Education was associated with increased odds of having a mammogram among women in Buenos Aires, Sao Paulo, Santiago, Mexico City, and Montevideo. Education was associated with increased odds of having a Pap smear among women in Buenos Aires, Sao Paulo, Mexico City, and Montevideo. Education was associated with increased odds

**Table 2. — Bivariate Associations Between Screening Use (Mammogram, Pap Smear, or Prostate Examination) and Education Categories**

	Buenos Aires	Bridgetown	Sao Paulo	Santiago	Havana	Mexico City	Montevideo
<b>Women</b>	n = 656	n = 1,082	n = 1,262	n = 855	n = 1,197	n = 740	n = 916
Mammogram % per city	29.4	19.8	34.6	20.8	10.0	14.1	28.6
Education (yrs)							
0	17.2	6.2	26.3	14.5	7.1	8.7	21.6
1–5	18.0	16.3	35.1	15.3	8.4	10.9	24.4
6–11	36.8	23.7	52.6	23.3	10.5	19.9	29.1
≥12	53.5 <sup>d</sup>	29.1 <sup>c</sup>	71.9 <sup>d</sup>	35.8 <sup>d</sup>	12.6	26.9 <sup>d</sup>	42.5 <sup>c</sup>
Pap smear % per city	34.2	22.9	38.0	30.8	24.8	45.7	24.8
Education (yrs)							
0	27.6	9.4	28.0	24.7	21.4	38.8	17.6
1–5	23.9	21.6	40.4	29.5	18.0	43.2	19.2
6–11	39.4	25.9	50.0	32.2	26.0	50.3	27.8
≥12	60.5 <sup>d</sup>	22.1	68.7 <sup>d</sup>	38.3	35.1 <sup>c</sup>	64.2 <sup>b</sup>	35.7 <sup>c</sup>
<b>Men</b>	n = 383	n = 730	n = 881	n = 446	n = 708	n = 507	n = 528
Prostate examination % per city	37.6	52.3	39.6	30.5	21.9	24.0	33.4
Education (yrs)							
0	47.6	51.5	31.9	19.6	12.9	13.8	32.4
1–5	25.2	51.0	38.9	26.9	18.4	16.7	26.3
6–11	35.0	51.1	46.9	31.6	21.2	31.9	32.7
≥12	72.3 <sup>d</sup>	64.3	63.0 <sup>c</sup>	39.8 <sup>a</sup>	29.6	41.3 <sup>d</sup>	50.0 <sup>b</sup>

Data are presented as percentages (%).

<sup>a</sup> <.05.  
<sup>b</sup> <.01.  
<sup>c</sup> <.001.  
<sup>d</sup> <.0001.

of having a prostate examination among men in all cities except Bridgetown. Finally, in the combined sample of six cities, education was associated with increased odds of having a mammogram or a Pap smear among older women and having a prostate examination among older men.

## Discussion

This is a comparative analysis of the association between education and screening methods among older subjects living in urban areas of seven Latin American and Caribbean cities. Overall, we found that high educational level was associated with increased mammography, Pap smear, and prostate examination use among Latin American and Caribbean older adults, even after adjusting for other relevant sociodemographic and health factors. This association between higher education and increased screening methods use is consistent with other reports in Hispanic populations in the United States.<sup>6,10,12</sup> Education is one of the most used measures of socioeconomic status in older adult health studies because it is relatively easy to obtain and is potentially measurable for every respondent. Another benefit is that education is typically completed before the onset of health problems. Education has been treated as a proxy for access to social and economic resources that influence health status and use of preventive services.<sup>26</sup> Parts of the effects of education on

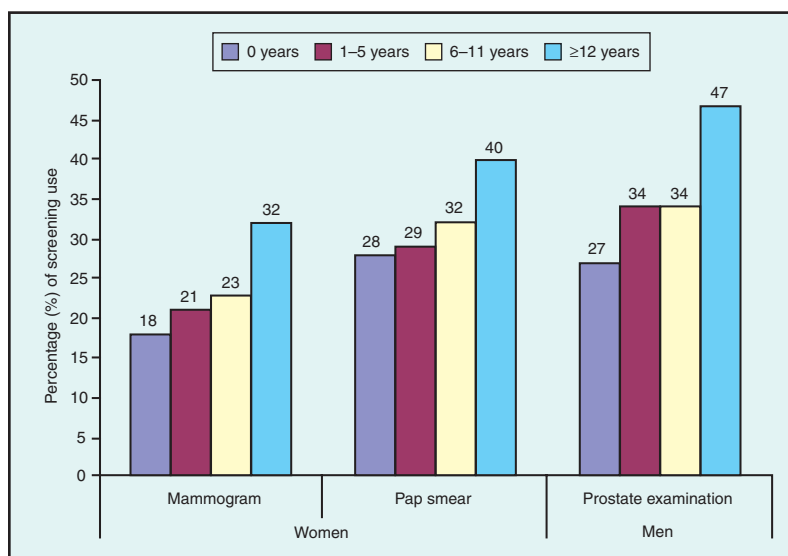


Figure. — Percentage of screening use (mammogram, Pap smear, or prostate examination) by education categories in the total sample of seven cities (6,708 women, 4,183 men).

health can be either explained by or mediated through other socioeconomic indicators such as income or occupation.<sup>27</sup> In general, the lower education population has less economic resources and thus economic barriers could be an important explanatory factor for disparities on screening methods. Education also has been interpreted as influencing health through the acquisition of higher cognitive functions and its effect not only on knowledge and attitudes regarding healthy lifestyles, but also on the degree of mastery or control individuals feel regarding their own health.<sup>26,27</sup>

Low literacy, which correlates with low education, might also affect cancer screening. Low literacy may

Table 3. — Odds Ratio (95% Confidence Intervals) for Education Predicting Use of Screening Methods in Men and Women Aged 60 Years and Older (1999–2000)

	Buenos Aires	Bridgetown	Sao Paulo	Santiago	Havana	Mexico City	Montevideo	Combined Sample*
<b>Women</b>	n = 656	n = 1,082	n = 1,262	n = 855	n = 1,197	n = 740	n = 916	N = 5,511
Mammogram								
Education (yrs)	1.15 (1.09–1.22) <sup>d</sup>	1.04 (0.99–1.09)	1.07 (1.03–1.12) <sup>b</sup>	1.06 (1.03–1.09) <sup>c</sup>	1.02 (0.97–1.07)	1.12 (1.06–1.18) <sup>d</sup>	1.05 (1.01–1.08) <sup>a</sup>	1.06 (1.05–1.08) <sup>d</sup>
Pap smear								
Education (yrs)	1.08 (1.03–1.14) <sup>b</sup>	1.00 (0.95–1.05)	1.06 (1.02–1.11) <sup>b</sup>	1.01 (0.98–1.04)	1.01 (0.97–1.05)	1.06 (1.01–1.10) <sup>b</sup>	1.06 (1.02–1.10) <sup>b</sup>	1.02 (1.01–1.04) <sup>b</sup>
<b>Men</b>	n = 383	n = 730	n = 881	n = 446	n = 708	n = 507	n = 528	N = 3,475
Prostate examination								
Education (yrs)	1.13 (1.06–1.20) <sup>d</sup>	1.01 (0.96–1.06)	1.08 (1.03–1.13) <sup>c</sup>	1.05 (1.01–1.08) <sup>a</sup>	1.09 (1.03–1.14) <sup>c</sup>	1.11 (1.06–1.17) <sup>d</sup>	1.06 (1.01–1.10) <sup>a</sup>	1.07 (1.05–1.09) <sup>d</sup>

<sup>a</sup> <.05.  
<sup>b</sup> <.01.  
<sup>c</sup> <.001.  
<sup>d</sup> <.0001.

Odds ratios were adjusted for age, marital status, insurance status (except Havana), having enough money to cover daily necessities, number of medical conditions (hypertension, diabetes, heart attack, stroke, cancer, score 0–6), and Instrumental Activities of Daily Living difficulties (score 0–4).

\*The combined sample includes all cities except Havana, which has no insurance data.

impact functioning in the healthcare environment, affect patient-physician communication dynamics, and inadvertently lead to substandard medical care.<sup>28</sup> It is associated with a poor understanding of written or spoken medical advice, adverse health outcomes, and decreased use of preventive services. Low literacy also has negative effects on the health of the population. In addition, cancer screening information may be ineffective with less literate individuals because they do not understand or have limited knowledge of cancer screening concepts, such as health vocabulary and anatomy.<sup>28</sup>

There is also a relationship between cancer screening, literacy, and cultural barriers. In the United States, older women with low literacy mistakenly believe that increased age protects them from getting cancer and that cervical cancer is unlikely in the absence of sexual activity, and they are concerned that a mammogram would be embarrassing, harmful, or painful.<sup>29</sup> Barriers to breast and cervical cancer screening among Latinas in the United States include not taking care of oneself (“descuido”), lack of information, and fear. Efforts to increase access to breast or cervical cancer screening services may not be sufficient for low-income Latinas; even when women have a source of health care, personal barriers may prevent many women from seeking screening.<sup>30</sup> In Mexican women, reasons for not obtaining a Pap smear included anxiety regarding physical privacy, lack of knowledge, and difficulty accessing health care.<sup>18</sup> In Bolivia, women believed that cancer is a “death sentence,” and in Mexico, women reported fears that any gynecological treatment would leave them sexually disabled (“hueca”).<sup>17</sup>

Cultural barriers and lack of adequate information about screening have been identified as factors affecting prostate screening in men, especially digital rectal examination. These include misconceptions about masculinity (“machismo”), unwillingness to admit weakness, and not taking care of oneself (“descuido”).<sup>31,32</sup> Most elderly men and those with limited education prefer to leave decisions related to participation on prostate cancer screening to their physician.<sup>33,34</sup>

The World Health Organization (WHO) and its regional office, the Pan American Health Organization, have provided guidelines for organizing national cancer control programs in Latin American and Caribbean countries.<sup>35,36</sup> However, the guidelines emphasized cervical cancer screening for all countries, and only breast cancer screening for those countries of high levels of resources. The guidelines did not include prostate cancer screening because it has not yet been proven to be cost effective. Although in most countries public health entities have no regulatory role with respect to standard clinical screening,<sup>36</sup> the WHO guidelines might have some influence regarding national screening policies in these countries (the least recommended is screening for prostate cancer).<sup>35</sup> On

the other hand, several differences on cancer screening across the cities in our study might be explained at least in part by specific characteristics of those cities or their health systems (opportunistic or unorganized vs organized screening).<sup>37</sup>

Education was not associated with screening usage among men and women from Bridgetown. In contrast, older subjects in Bridgetown had higher education levels and lower illiteracy rates compared with subjects from other cities. In fact, education at the primary and the secondary levels is compulsory until 16 years of age in Barbados.<sup>38</sup> Marked improvements in living conditions have occurred in Barbados during the past half century. Despite of low frequencies of health insurance coverage, health care is free for all Barbadians, and older persons have unrestricted access to primary health care, which is available at the polyclinics that are operated by the government.<sup>38,39</sup> These factors may contribute to a low variation of screening use across educational levels in this population.

In addition, we found that education was not associated with screening methods among women from Havana. However, older women in Havana had the highest education levels compared with older women from the other cities. Cuba represents an example where modest infrastructure investments combined with a well-developed public health strategy have generated universal health coverage and health status measures comparable with those of industrialized countries.<sup>40</sup> Those factors might explain the lack of association between education and screening use among older women in Havana. In 2000, Cuba had an opportunistic breast cancer screening program, and mammography use was recommended every 2 to 3 years for women 50 to 65 years of age.<sup>2</sup> A cervical cytology screening program offering Pap smears every 2 years to women aged 20 years or more was implemented through the primary healthcare services in 1968.<sup>41</sup> However, no reduction in cervical cancer mortality has been observed since the introduction of the program. Cuba has a public health policy only and not a population-based cervical cancer screening program.<sup>42</sup>

In the other cities where education was associated with screening methods, some issues might be potential explanations. In 2000, Argentina had an opportunistic breast cancer program, and mammography use was recommended every 2 years for women 50 to 70 years of age.<sup>2</sup> Argentina had low incidence (14.2) and mortality (7.6) age-standardized cervical cancer rates (per 100,000) in 2000.<sup>1</sup> Argentina has a public health policy only and not a population-based cervical cancer screening program.<sup>1,42</sup>

In 1997, cervical cancer screening every 3 years for women 25 to 64 years of age was officially included among the 10 national health priorities of the Ministry of Health in Chile.<sup>43</sup> Between 1986 and 2001 there was

a 39% reduction in age-adjusted mortality for cervical cancer (2.6% per year). However, the incidence of invasive carcinoma of the cervix in 1996 (age-specific rates per 100,000) in women 64 years of age and older was 45.2 in the Metropolitan Region of Santiago, the highest rates among all age groups.<sup>43</sup> In 2000, Chile had an opportunistic breast cancer screening program, and mammography use was recommended every 3 years for women 50 to 64 years of age.<sup>2</sup> Chile has an opportunistic prostate cancer screening program.<sup>44</sup>

Rather than an early detection tool, the Pap smear in Mexico is frequently used to diagnose advanced cases of cervical cancer.<sup>45</sup> According to some studies, between 20% and 60% of all cervical cancer deaths could be prevented through an effective early detection screening program. It has been reported that 60% of cases detected using the Pap smear are invasive cervical cancer.<sup>46</sup> Potential explanations for the low coverage of the Mexican cervical cancer screening program are the limited utilization and acceptability of the Pap smear due to cultural and institutional barriers. These barriers include: the pelvic examination is uncomfortable, their male sexual partners do not let them have an examination, they had a previous negative experience, and they lack of knowledge about the test. Additional reasons include the perceived financial expense and the long wait time to get the test at a clinic or to receive the results.<sup>47</sup> In 2000, Mexico had implemented an opportunistic breast cancer screening program, and mammography use was recommended every 2 years for women 40 years of age or older.<sup>2</sup>

In 2000, Uruguay had made efforts to implement an organized breast cancer screening program, and annual mammography was recommended for women 50 to 64 years of age.<sup>2</sup> Uruguay had low incidence (13.8) and mortality (7.6) age-standardized cervical cancer rates (per 100,000) in 2000.<sup>1</sup> However, Uruguay does not have an established program or policy on cervical cancer screening.<sup>42</sup>

In 2001, Brazil did not have an organized breast cancer screening program.<sup>48</sup> Brazil had intermediate incidence (31.3) and mortality (11.6) age-standardized cervical cancer rates (per 100,000) in 2000.<sup>1</sup> In 1988, the Brazilian Ministry of Health recommended cervical screening for women 25 to 60 years of age every 3 years, after having two annual and consecutive negative Pap smears.<sup>49</sup> Brazil has a public health policy only and not an organized cervical cancer screening program.<sup>37,42</sup>

There is little or no information about policies for prostate cancer screening among countries related to the SABE study. Data suggest that cervical and breast cancer screening programs have been mostly limited to offering the test to older women attending primary healthcare and other health clinics (opportunistic screening). Almost all SABE cities have no organized efforts to reach high-risk men and women or to ensure

that those having an abnormal screening receive effective follow-up and treatment.<sup>1,36-38,43</sup>

## Study Limitations and Strengths

This study has some limitations. Our reliance on cross-sectional data precludes establishing causal order between certain variables and screening methods use. Data on screening methods use were self-reported, which might affect the accuracy of our measures and consequently our results. Indeed, concordance between self-reported data and medical record documentation has been reported as greater for procedures that generated a test report (eg, mammogram, Pap smear, or prostate-specific antigen [PSA]).<sup>50</sup> In addition, we were unable to distinguish between diagnostic and screening procedures (in mammograms for women) and between a digital rectal examination and a PSA (in self-reporting of prostate examination in men). We also did not include data for breast self-examination or clinical breast examination, which might explain part of the variation for mammography use across cities. Finally, the SABE survey does not represent the diversity of the elderly population that exists in the selected countries because the information was collected only in large cities.

This study also has some strengths. The lowest percentages of screening methods for illiterate and low-educated older subjects were consistent across most of the cities and in the combined sample. The effect of education on screening methods remained after we controlled for sociodemographic factors related to cancer screening. These factors included having insurance (highly associated with screening methods in these populations)<sup>20</sup> and a measure of socioeconomic resources (financial strain measured by having enough money to cover daily living necessities), which has been reported to be an important indicator of inequality for access to health services across Latin American and Caribbean cities.<sup>24</sup> This large, unique sample provides estimates of screening methods by older populations in an area of the world (Central and South America) in which little systematic data are available. On the other hand, our results might aid the development of specific health policies such as providing free access to cancer screening among older persons with less socioeconomic resources and providing health education on cancer screening that is appropriate for older adults with low literacy levels.

## Conclusions

Variations in the organization of the health system in each country in our study and the screening programs in each city (opportunistic vs organized) might explain some differences in screening utilization and in the

effect of education on cancer screening among Latin American and Caribbean older adults. In the overall combined sample and in most of the cities, high education was associated with higher odds of women having a mammogram or a Pap smear and with higher odds of men having a prostate examination. Therefore, older adults with low educational attainment should be targeted for screening programs in these populations.

## References

1. Arrossi S, Sankaranarayanan R, Parkin DM. Incidence and mortality of cervical cancer in Latin America. *Salud Publica Mex.* 2003;45(suppl 3):S306-S314.
2. Robles SC, Galanis E. Breast cancer in Latin America and the Caribbean. *Rev Panam J Salud Publica.* 2002;11:178-185.
3. Bosetti C, Malvezzi M, Chatenoud L, et al. Trends in cancer mortality in the Americas, 1970-2000. *Ann Oncol.* 2005;16:489-511. Epub 2005 Jan 24.
4. Sandoval Jiménez O, Santana Sarrhy L, Coll Ruiz M. Valor del tacto rectal y el antígeno prostático específico en el pesquiasaje del adenocarcinoma de próstata. *Rev Cubana Cir.* 2002;41. Available at [http://scielo.sld.cu/scielo.php?script=sci\\_arttext&pid=S0034-74932002000400005&lng=en&nrm=iso](http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-74932002000400005&lng=en&nrm=iso). Accessed on July 5, 2007.
5. Hanchard B, Blake G, Wolff G, et al. Age-specific incidence of cancer in Kingston and St Andrew, Jamaica, 1993-1997. *West Indian Med J.* 2001;50:123-129.
6. Coughlin SS, Uhler RJ. Breast and cervical cancer screening practices among Hispanic women in the United States and Puerto Rico, 1998-1999. *Prev Med.* 2002;34:242-251.
7. Valdez A, Banerjee K, Ackerson L, et al. Correlates of breast cancer screening among low-income, low-education Latinas. *Prev Med.* 2001;33:495-502.
8. Wu ZH, Black SA, Freeman JL, et al. Older Mexican American women and cancer screening: progress toward targets for Healthy People 2000. *Ethn Dis.* 2001;11:645-651.
9. Zambrana RE, Breen N, Fox SA, et al. Use of cancer screening practices by Hispanic women: analyses by subgroup. *Prev Med.* 1999;29(6 Pt 1):466-477.
10. Selvin E, Brett KM. Breast and cervical cancer screening: sociodemographic predictors among White, Black, and Hispanic women. *Am J Public Health.* 2003;93:618-623.
11. Suarez L, Ramirez AG, Villarreal R, et al. Social networks and cancer screening in four U.S. Hispanic groups. *Am J Prev Med.* 2000;19:47-52.
12. Rodríguez MA, Ward LM, Pérez-Stable EJ. Breast and cervical cancer screening: impact of health insurance status, ethnicity, and nativity of Latinas. *Ann Fam Med.* 2005;3:235-241.
13. Palmer RC, Fernandez ME, Tortolero-Luna G, et al. Acculturation and mammography screening among Hispanic women living in farm worker communities. *Cancer Control.* 2005;12(suppl 2):21-27.
14. Talavera GA, Ramirez AG, Suarez L, et al. Predictors of digital rectal examination in U.S. Latinos. *Am J Prev Med.* 2002;22:36-41.
15. Gorin SS, Heck JE. Cancer screening among Latino subgroups in the United States. *Prev Med.* 2005;40:515-526.
16. Mendoza-Sassi R, Beria JU. Prevalence of having a regular doctor, associated factors, and the effect on health services utilization: a population-based study in Southern Brazil. *Cad Saude Publica.* 2003;19:1257-1266. Epub 2003 Dec 2.
17. 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-S416.
18. Watkins MM, Gabali C, Winkleby M, et al. Barriers to cervical cancer screening in rural Mexico. *Int J Gynecol Cancer.* 2002;12:475-479.
19. Aguilar-Pérez JA, Leyva-López AG, Angulo-Nájera D, et al. Cervical cancer screening: knowledge of Pap smear benefits and utilization in Mexico [in Spanish]. *Rev Saude Publica.* 2003;37:100-106.
20. Reyes-Ortiz CA, Freeman JL, Peláez M, et al. Mammography use among older women of seven Latin American and the Caribbean cities. *Prev Med.* 2006;42:375-380. Epub 2006 Mar 23.
21. Sánchez-Ayéndez M, Suárez-Pérez E, Vázquez MO, et al. Knowledge and beliefs of breast cancer among elderly women in Puerto Rico. *Puerto Rico Health Sci J.* 2001;20:351-359.
22. Albala C, Lebrão ML, León Díaz EM, et al. The Health, Well-Being, and Aging ("SABE") survey: methodology applied and profile of the study population [in Spanish]. *Rev Panam Salud Publica.* 2005;17:307-322.
23. Wong R, Peláez M, Palloni A, et al. 2006. Survey data for the study of aging in Latin American and the Caribbean: selected studies. *J Aging Health.* 2006;18:157-179.
24. Wallace SP, Gutiérrez VF. Equity of access to health care for older adults in four major Latin American cities. *Rev Panam Salud Publica.* 2005;17:394-409.
25. Fillenbaum GG. Screening the elderly: a brief instrumental activity of daily living measure. *J Am Geriatr Soc.* 1985;33:698-706.
26. Rudkin L, Markides KS. Measuring the socioeconomic status of elderly people in health studies with special focus on minority elderly. *J Mental Health Aging.* 2001;7:53-66.
27. Lahelma E, Martikainen P, Laaksonen M, et al. Pathways between socioeconomic determinants of health. *J Epidemiol Community Health.* 2004;58:327-332.
28. Davis TC, Williams MV, Marin E. Health literacy and cancer communication. *CA Cancer J Clin.* 2002;52:134-149.
29. List MA, Lacey L, Hopkins E, et al. The involvement of low literate elderly women in the development and distribution of cancer screening materials. *Fam Community Health.* 1994;17:42-45.
30. Garbers S, Jessop DJ, Foti H, et al. Barriers to breast cancer screening for low-income Mexican and Dominican women in New York City. *J Urban Health.* 2003;80:81-91.
31. Lucumí DI, Cabrera GA. Creencias sobre examen digital rectal como tamiz para cáncer en la próstata: hallazgos cualitativos de un estudio en Cali. *Colombia Medica.* 2003;34:111-118.
32. Miranda PS, Côrtes Mda C, Martins ME, et al. Practice of precocious diagnosis for prostate cancer among professors of the school of medicine, Minas Gerais Federal University- Brazil [in Portuguese]. *Rev Assoc Med Bras.* 2004;50:272-275. Epub 2004 Oct 21.
33. Kripalani S, Sharma J, Justice E, et al. Prostate cancer screening in a low-literacy population: does informed decision making occur? *Cancer Control.* 2005;12(suppl 2):116-117.
34. Levinson W, Kao A, Kuby A, et al. Not all patients want to participate in decision making. A national study of public preferences. *J Gen Intern Med.* 2005;20:531-535.
35. World Health Organization. Policies and managerial guidelines for national cancer control programs. *Rev Panam Salud Publica.* 2002;12:366-370.
36. Organización Panamericana de la Salud (OPS). Enfermedades de la nutrición y el metabolismo. En: La Salud en las Américas, 1998. Vol I. Publ Cient No. 569. OPS: Washington, D.C.; 1998.
37. Sankaranarayanan R, Budukh AM, Rajkumar R. Effective screening programmes for cervical cancer in low- and middle-income developing countries. *Bull World Health Organ.* 2001;79:954-962. Epub 2001 Nov 1.
38. *Health in the Americas.* Pan American Health Organization; 1998. Available at [http://www.paho.org/english/hia\\_1998ed.htm](http://www.paho.org/english/hia_1998ed.htm). Accessed on July 5, 2007.
39. Hambleton IR, Clarke K, Broome HL, et al. Historical and current predictors of self-reported health status among elderly persons in Barbados. *Rev Panam Salud Publica.* 2005;17:342-352.
40. Cooper RS, Kennelly JF, Orduñez-García P. Health in Cuba. *Int J Epidemiol.* 2006;35:817-824.
41. Fernández Garrote L, Lence Anta JJ, Cabezas Cruz E, et al. Evaluation of the cervical cancer control program in Cuba. *Bull Pan Am Health Organ.* 1996;30:387-391.
42. Mackay J, Jemal A, Lee NC, et al, eds. *The Cancer Atlas.* Atlanta, Ga: American Cancer Society; 2006.
43. Sepúlveda C, Prado R. Effective cervical cytology screening programmes in middle-income countries: The Chilean experience. *Cancer Detect Prev.* 2005;29:405-411. Epub 2005 Sep 26.
44. Krebs A, Bustos M, Campos R, et al. Cáncer de próstata: resultados de un programa continuo de "screening". *Rev Chil Urol.* 2005;70:127-131.
45. Flores Y, Bishai D, Lazcano E et al. Improving cervical cancer screening in Mexico: results from the Morelos HPV Study. *Salud Publica Mex.* 2003;45(suppl 3):S388-S398.
46. Hernández-Avila M, Lazcano-Ponce EC, Alonso de Ruiz P et al. Evaluation of a program for the early detection of cancer of the uterine cervix in Mexico City. A populational-based epidemiologic study of cases and controls [in Spanish]. *Gac Med Mex.* 1994;130:201-209.
47. Lazcano-Ponce EC, Castro R, Allen B et al. Barriers to early detection of cervical-uterine cancer in Mexico. *J Womens Health.* 1999;8:399-408.
48. Godinho ER, Koch HA. O perfil da mulher que se submete a mamografia em Goiania- uma contribuicao a bases para um programa de deteccao precoce do cancer de mama. *Radiol Bras.* 2002;35:139-145.
49. Pinho Ade A, França Junior I, Schraiber LB, et al. Cervical cancer screening in the Municipality of Sao Paulo: coverage and factors involved in submitting the Pap test. *Cad Saude Publica.* 2003;19(suppl 2):S303-S313. Epub 2004 Mar 8.
50. Gordon NP, Hiatt RA, Lampert DI. Concordance of self-reported data and medical record audit for six cancer screening procedures. *J Natl Cancer Inst.* 1993;85:566-570.