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Differentials by Socioeconomic Status and Institutional Characteristics in Preventive Service Utilization by Older Persons in Costa Rica

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Objective: The goals of this article are to assess the level of preventive service utilization by older persons in Costa Rica and to determine whether there are differentials in utilization across socioeconomic status (SES) and institutional characteristics. **Method**: Using data from the Costa Rican Study on Longevity and Healthy Aging (CRELES) project, a study of healthy aging in Costa Rica, the authors use self-reported information on preventive service utilization. The SES differentials are studied using logistic regressions. **Results**: Preventive services linked to cardiovascular disease prevention are frequently utilized; preventive services linked to cancer screening, vaccination, and sense impairments are not so widely used. Higher SES people are more likely to utilize most preventive services. Utilization rates among uninsured seniors are lower than among their insured peers. Home visits by community health workers are positively associated with higher utilization rates. **Discussion**: The SES disparities in preventive service utilization exist in Costa Rica, and institutional characteristics are positively associated with increasing utilization.

Keywords: *preventive health care services; Costa Rica; socioeconomic status differentials; health insurance; community health workers*

Costa Rica has a life expectancy as high as in the United States at several ages, even though the Costa Rican gross domestic product (GDP) per capita is less than a quarter of the United States's GDP (United Nations Development Program, 2006), and total health expenditure per capita in

Costa Rica is 11% of the total health expenditure per capita in the United States (World Health Organization, 2006). One explanation of low Costa Rican mortality is the country's effective primary health care system (Rosero-Bixby, 1995, 2004a, 2004b; Rosero-Bixby, Dow, & Laclé, 2005). However, there are very few studies that assess the level of preventive service utilization among adults in this country. Effective primary health care systems are associated with lower mortality and morbidity, lower health care costs, and reductions in the association between income inequality and health outcomes (Macinko, Starfield, & Shi, 2003; Ploeg et al., 2005; Starfield & Shi, 2002; Shi, Starfield, Politzer, & Regan, 2002). Preventive services are a basic component of primary health care. Hence, generalized utilization of preventive services constitutes an inexpensive means of improving population health. In addition to high life expectancy, Costa Rica has a moderate socioeconomic status (SES) gradient in mortality (Rosero-Bixby, 1995; Rosero-Bixby et al., 2005). Understanding the possible mechanisms that underlie such small differentials—like primary health care services—might be useful to policy makers in a time when social disparities in health have not been reduced despite increasing investment in health services and technology around the world (Commission on Social Determinants of Health, 2008).

In Costa Rica, governmental institutions began effective preventive service programs in the early 20th century (Palmer, 2003). In particular, primary health care programs, created in 1971 to serve rural populations and poor urban neighborhoods, contributed to the sharp mortality decline experienced by the country in the 1970s (Rosero-Bixby, 1986, 1995; Rosero-Bixby, Grimaldo, & Raabe, 1990). A new push for primary health care interventions, as part of the health sector reform that the country has

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implemented since 1995, ended a period of stagnation in the death-rate trend and resulted in new and important advances in life expectancy (Rosero-Bixby, 2004a). Because of the secular mortality decline, Costa Rica is well advanced in the epidemiological transition, with cardiovascular diseases as the principal cause of death. Having the highest life expectancy in the Latin American region, as well as a below–replacement fertility level, Costa Rica is undergoing a fast process of population aging (Chackiel, 2004). Its health care system is now facing an increasing number of older patients seeking care for chronic conditions.

The Costa Rican Health Care System

Costa Rica has an almost universal health insurance and care system, which has been administered by the *Caja Costarricense del Seguro Social* (CCSS, the Costa Rican Social Security Fund) since 1941. Health insurance is mandatory for all workers and is provided by the CCSS along with retirement and disability insurance. There are no copayments. Therefore, health care services and prescription drugs are provided free of charge by CCSS health care units. The system is funded by mandatory payroll-based deductions from employees, employers, and the government. For those with no formal jobs, including peasants, farmers, petty merchants, or artisans, and those with no jobs at all, there are two other ways of getting into the public health insurance and care system of the CCSS: (a) buying voluntary insurance from the CCSS or (b) being insured through a means-tested program run by the government, who pays the premiums to the CCSS for poor or destitute individuals from a special fund, established for this purpose in the early 1970s (Barahona-Montero, 1999; Durán-Valverde, 2002; Martinez-Franzoni & Mesa-Lago, 2003; Organización Panamericana de la Salud, 2004a, 2004b).

The Costa Rican public health insurance, in its three modalities, covers about 90% of the population and about 95% of elderly people (Organización Panamericana de la Salud, 2004a). People who consistently declare themselves as uninsured (10% of total population, 5% of the elderly) can still obtain health care from the CCSS units for a fee or for free if institutional social workers verify the patients have no means to pay for health care services. Young and middle-aged uninsured adults are generally entrepreneurs or self-employed workers with informal sector jobs who remain uninsured because they do not want to undergo the administrative procedures needed to purchase public voluntary insurance. It is worth noting the

paradox that the uninsured seem to be healthier individuals who start to apply for public health insurance after the need for health care arises. Rosero-Bixby et al. (2005) have found that the highest mortality rates in a sample of elderly Costa Ricans occur among those with noncontribution insurance and the lowest among the uninsured. These authors hypothesized that a negative self-selection process out of the uninsured status and into the voluntary or noncontribution insurance type is operating: Some uninsured elderly apply for health insurance when they start to feel sick. Unpublished results based on CRELES data and the National Household Survey show that uninsured elderly are more likely to be younger, nondisabled people living alone due to widowhood, divorce, or celibacy, and seniors who are still working.

The CCSS is by far the main health insurance and health care provider in Costa Rica. The public health care system is composed of primary-, secondary-, and tertiary-level services. Primary health care services are offered primarily at small health care facilities and clinics that are spread all over the country. Secondary and tertiary health care facilities are located in the main regional cities. The most complex tertiary health care services are provided only at the three CCSS main hospitals and at five specialized hospitals, each focused on one target area or population: children, psychiatric patients, specialized obstetric services, physical rehabilitation, and elderly patients. These eight hospitals are situated in San José, the country's capital.

There is also a private sector of health care providers concentrated in San José's metropolitan area. Private health care expenditure accounts for 30% of the total health care expenditure in the country (the rest is classified as public health care expenditure). The private sector includes few hospitals, clinics and laboratories, and a large set of pharmacies, physicians, and dentists in private practice. In most cases, people who go to these services have to pay out of pocket for them. Private health insurance plans are rare, although their number has been increasing lately. These private plans cater to high-income households and employees of transnational companies. Private providers are attractive to people with enough income to pay for them, given that long waiting lists and overcrowded clinics and hospitals are the main problems of public services (Organización Panamericana de la Salud, 2004a, 2004b).

In 1995, as part of a health sector reform, the CCSS started offering basic care in community health centers, called EBAIS (a Spanish acronym for Basic Integrated Health Care Teams), first in rural areas and poor neighborhoods and then all over the country.[1] Each EBAIS covers a population of 2,500 to 7,000 inhabitants. Its staff includes at least one physician, one nurse,

and one community health worker, called an ATAP (a Spanish acronym for primary health care technical assistant). It may also receive support from other health professionals (Organización Panamericana de la Salud, 2004b). These centers provide health promotion as well as free preventive and control health care services. If patients need secondary- or tertiary-level care, EBAIS health professionals refer them to clinics and hospitals of the public health care system. The typical preventive services provided by the EBAIS are blood pressure control, glycemia tests, cholesterol control, vaccination (flu and tetanus shots, among the elderly), anthropometric measurements, Pap smears, and basic (not specialized) visual and hearing examinations. Not all EBAIS are located near institutional laboratories; therefore, the staff at those EBAIS sends specimens to specialized CCSS facilities elsewhere. Patients have to wait at least 1 day for test results. If patients seek more specialized preventive services (e.g., mammograms, prostate examination, bone densitometry, psychiatric treatment, or more specialized hearing or visual examination), EBAIS physicians refer them to secondary-level clinics. Appointments at these facilities are not as readily available as at EBAIS and are often hampered by long waiting lists. The EBAIS, an incarnation of the very successful rural health posts that in the 1970s brought down Costa Rican infant mortality (Rosero-Bixby, 1986), have had a documented impact improving health and life expectancy in Costa Rica and reducing inequities in access to health care (Rosero-Bixby, 2004a).

An important EBAIS activity is the home visit that each ATAP is supposed to make twice a year to all households in the territory under his or her watch, regardless of health insurance status. A person does not need to have a college degree to become an ATAP. The high school diploma is the minimum requirement to enter the selection process. The CCSS trains this community health worker directly after the selection process. The EBAIS nurse is their direct supervisor. The main task performed by the ATAP is to fill out a comprehensive household card (*Ficha del hogar*). With this card, the ATAP collects information about whether any household member has had a previous diagnosis of high-priority diseases: hypertension, diabetes, cancer (any kind), asthma, rheumatic fever, cardiopathies, chronic renal insufficiency, malaria, intestinal parasitosis, child diarrheas, or tuberculosis. The card also records compliance to mandatory vaccination, among both children and the elderly. ATAPs should also have conversations with household members to promote healthy diets, proper garbage disposal, and household hygiene as well as utilization of preventive services provided by EBAIS or by secondary-level clinics: Pap smears, vaccinations, glycemia tests, and cholesterol control. ATAPs always take sphigmomanometers to

home visits and ask residents if they want their blood pressure to be measured. Except for blood pressure and vaccinations, ATAPs are not allowed to perform any medical examinations. However, they can arrange an appointment for the patients at EBAIS facilities. The efficacy of home visits depends on the size of the area to be covered. These visits are more effective in covering populations that are more likely to stay at home during the day: housewives, children, and elderly. ATAPs are basically health promoters and information gatherers (Conejo-Jara, Méndez-Gonzáles, & Morice-Chavarria, 2003; Mora-Gomez & Arias-Arrieta, 2006).

The EBAIS is the basic tool for promoting primary health care. It is aimed to increase the capacity of the public health care system throughout the Costa Rican territory, delivering preventive services at no cost to patients. Nevertheless, the fast epidemiological transition with its sizable increase in older adult patients constitutes a challenge to these centers. The aims of this article are to assess the level of preventive service utilization among the elderly in Costa Rica and to explore whether there are differentials in these utilization levels across SES and institutional characteristics. The institutional characteristics to be studied are type of public health insurance and home visits by ATAPs (community health workers).

Method

Data Collection

The Costa Rican Study on Longevity and Healthy Aging (CRELES, referring to its name in Spanish, "Costa Rica: Estudio de longevidad y envejecimiento saludable") is an ongoing longitudinal study of a nationally representative sample of 2,827 adults born in 1945 or before (aged 60 and over at the first interview) and residing in Costa Rica by the year 2000. The data used in this article refer to the first wave of interviews, conducted from November 2004 through September 2006.

The CRELES has a complex sampling design. There is an original master sample of 9,600 individuals that was randomly selected from the 2000 census database with stratification by 5-year age groups and oversampling of older individuals. Within each stratum, persons were selected using simple random sampling based on a systematic selection procedure. In the master sample, sampling fractions ranged from 1.1% among those born in 1941-1945 to 100% for those born before 1905. The individuals in the master sample were grouped into 102 geographical clusters according to the 102

health areas created by the government. The final sample for the in-depth interview is composed of a probabilistic subsample of 60 health areas (out of the 102). This subsample, which included nearly 5,000 individuals and covered 59% of Costa Rican territory, yielded the following nonresponse rates: 19% deceased by the contact date; among those alive, 18% were not found in the field, 2% moved to other addresses, 2% rejected the interview, and 2% pendant interviews after several visits (likely rejections). From those interviewed, 95% provided blood samples, 91% had anthropometric measures, and 24% required a proxy to answer the questionnaire. After nonresponse, the resulting sample size is of 2,827 individuals. Final sampling weights are computed as the inverse of selection probabilities, which take into account the complex sampling design (selection of the master sample and of the second subsample), as well as differential nonresponse rates. All statistical analyses take sampling weights into account.

All data and specimens in the study were collected at the participants' homes, usually over two visits. In the first visit, participants provided informed consent for the interview and answered a 90-min long questionnaire (including some mobility tests and two blood-pressure measurements) as well as a 10-min frequency of tracer food consumption questionnaire. The interviewer also asked for permission to check all medication prescribed by a health care professional. In a second visit early the next day, fieldworkers collected anthropometric measures and urine and fasting blood samples (the procedures followed for storing and processing the specimens are described in Méndez-Chacón, Rosero-Bixby, Fernández-Rojas, and Barrantes-Jiménez (2007). All field data were collected using personal digital assistants (PDAs), also known as palm computers, with software applications developed by Centro Centroamericano de Poblacion (CCP) for this study.

Variable Definition

Preventive services studied in this article are described in Appendix A. They are derived from self-reported answers to questions in the CRELES instrument. Preventive service periodicity is the maximum period of time that a patient is recommended to wait before utilizing a given service again. For example, an elderly person should have a flu shot every year, so the periodicity is every year. Periodicities are defined according to guidelines from CCSS (Consejo Técnico Asesor de Atención Integral a las Personas Costa Rica, 1995) when these are available. However, not all periodicities for preventive services are well established

in Costa Rica. Another problem with assessing periodicities is that some of the CRELES questions that gather information about preventive services have closed answers with predefined time brackets (less than a year, from 1 year to less than 3 years, from 3 to less than 5 years, 5 years or more, never, don't know, refuse). Therefore, the tetanus vaccine is recommended to be provided every 10 years, but because of the closed answers, the longest periodicity that could be chosen was either *5 years* or *never*. We decided to choose 5 years, because some of these cohorts might have been vaccinated against tetanus when they were much younger, and this condition might inflate the utilization rate. In a similar way, mammograms and Pap smears are recommended to be performed every 2 years in Costa Rica; in this case, mammography and Pap smear utilization are assessed with periodicities of 1 year and 3 years, to approximate the 2-year periodicity. This decision also allows us to compare results with findings in other countries that establish other periodicities (see Appendix B). Regarding cross-national comparability, it is important to note that in the United States there is a recommendation against routine Pap smears among women who have had a hysterectomy (U.S. Preventive Services Task Force, 2005). This article provides estimates for the total sample of women and for the subsample of females without a hysterectomy.

There are two groups of main explanatory variables: SES categories and institutional characteristics. Two variables are used to measure SES: years of schooling and respondent's average income. Completed years of schooling are classified into three categories: 0 to 3 years, 4 to 6 years, and 7 years or more. The first bracket is the reference category. In the Costa Rican education system, primary school is finished at 6 years of schooling, therefore any person classified in the third category spent at least 1 year in high school (in Costa Rica, high school—or secondary education—is equivalent to 7 to 11 years of schooling). CRELES does not collect information about whole household income but about the respondent's and the spouse's income. Income is then measured in the following way: It is the total monthly income reported by the respondent, if the respondent lives without a spouse; it is the average of the respondent's and spouse's monthly income, if the respondent lives with a spouse. Income is then classified into three categories: 50,000 colones per month or less (approximately $\leq$ US$100, in mid-2005), more than 50,000 colones but less than 200,000 (approximately, from more than US$100 to less than US$400, in mid-2005), and 200,000 colones or more (approximately, US$400 or more, in mid-2005). In the tables, categories are reported using approximate

equivalence in U.S. dollars rather than in colones. Again, the lowest category is the reference category. The income cutoff points for the three categories are approximately equal to tertiles. A monthly income of 50,000 colones per month is above the poverty line in Costa Rica.[2]

The other main group of explanatory variables refers to institutional characteristics or policy measures. Two types of policy measures are studied in this article: type of public health insurance and home visits by community health workers (denominated here also as ATAP home visits, as explained above). Two dummy variables are constructed: one for being uninsured (1 = *if uninsured*, 0 = *otherwise*) and another for having the noncontribution insurance (1 = *if having this type of insurance*, 0 = *otherwise*). The reference category is having the contribution health insurance, either because the respondent has made direct contributions to the system or because the respondent is a dependent of someone entitled to it. Private health insurance is not analyzed because few respondents have it, and some of the persons who have private health insurance also have public health insurance.

The ATAP visit is also constructed as a dummy variable: 1 = *if the person has been visited at home by the community health worker during the past 12 months* and 0 = *otherwise*. Although the noncontribution insurance was established more than three decades ago, and thus represents health care policy measures that have been in practice for several years, ATAP home visits are part of more recent policy measures pushed by the health sector reform carried out during the mid-1990s.

Analyses in this article control for several potential confounding variables derived from respondents' self-reports or proxy reports. Sex, age, region of residence, and retirement status are variables known for their relationship with health services utilization (Andersen, 1995; Chen, Diamant, Pourat, & Kagawa-Singer, 2005; Leal, Nogueira da Gama, Frias, & Szwarcwald, 2005; Pagan, Puig, & Soldo, 2007). We also control for being a current smoker, being a past smoker, being a current alcohol drinker, and being a past alcohol drinker (operationalized as dummy variables) because these characteristics are closely linked with health beliefs and behaviors. Finally, we control for covariates that describe respondents' health status: self-rated health, having at least one limitation in performing activities of daily living (ADL), having at least one limitation in instrumental activities of daily living (IADL; Nagi, 1976), and self-reported diagnosis of 10 chronic diseases: hypertension, dyslipidemia, diabetes mellitus, lung disease, arthritis, osteoporosis, cancer, heart attacks, other heart diseases excluding heart attacks, and strokes.

Statistical Analysis

Statistical analysis is conducted using STATA SE version 9.0 (StataCorp, 2005). Descriptive statistics are basically proportions for categorical variables. Preventive service utilization gradients across SES and institutional characteristics are analyzed by computing odds ratios from multivariate logistic regressions that control for confounders. A logistic regression equation is computed for each preventive service, including all the main explanatory variables at the same time. Descriptive statistics and logistic regressions are weighted by the inverse of the selection probability based on the complex sampling design.

Ethics Clearance

The University of Costa Rica Ethics Committee approved the procedure for collecting data and the informed consent form. Institutional Review Boards at the University of California–Berkeley and at the University of Wisconsin–Madison reviewed the approval so that members of these universities could participate in the project.

Results

Table 1 displays the distribution of the sample according to SES and institutional variables. It is worth noticing that the average of these cohorts' years of schooling is relatively low; 40% have 3 years of schooling or less, whereas only 21% have more than 6 years of schooling (equivalent to at least 1 year in high school or more). Regarding income levels, more than a third of this population has an income of at most US$100 per month, placing them below the poverty line, whereas 31% have an income of at least US$400 per month. By income and education, a considerably large proportion of the population can be classified as having low SES. In summary, these cohorts witnessed very rapid social and economic changes in the country without necessarily benefiting from all of them.

Turning attention to policy measures, we begin with health insurance measures. Four out of every 5 persons aged 60 years and over have contribution health insurance. As mentioned before, only 5% of the elderly are classified as uninsured, and 15% have received noncontribution health insurance. Regarding the policy measure associated with the health sector reform, 42% of the elderly report having been visited by an ATAP during the past 12 months. These figures suggest that public policy aimed

Table 1
Descriptive Statistics of Socioeconomic Status and Institutional Characteristics, Population Age ≥ 60, Costa Rica, 2004-2006 (Weighted and Nonweighted Distributions[a])

Enabling Factor	Weighted	Nonweighted
SES variable	100.0	100.0
Percentage with 0-3 years of schooling	40	54
Percentage with 4-6 years of schooling	39	33
Percentage with 7 years of schooling or more	21	13
Percentage with couple's or individual's income ≤ US$100 per month	35	43
Percentage with couple's or individual's income of US$100-US$399 per month	34	31
Percentage with couple's or individual's income ≥ US$400 per month	31	26
Institutional characteristic		
Percentage with no health insurance	5	4
Percentage with contribution health insurance	79	71
Percentage with noncontribution health insurance	15	25
Percentage visited by ATAP (community health worker)	43	47
Percentage not visited by ATAP	57	57

Note: $N = 2,696$. SES = socioeconomic status; ATAP = primary health care technical assistant.
a. Differences in weighted and nonweighted statistics are due to oversampling of oldest cohorts.

at expanding health services coverage has reached a large portion of the old-age population. Descriptive statistics for other covariates are presented in Table 2. Half of older adults report regular or poor health. Some chronic conditions that are highly prevalent are hypertension (48%), dyslipidemia (39%), and diabetes mellitus (21%). These prevalence statistics are based on self-reported diagnoses, and they might increase in a relatively large proportion if undiagnosed cases were to be considered (Méndez-Chacon & Rosero-Bixby, 2007). All of these conditions are risk factors for cardiovascular disease, the most frequent cause of death in the country. However, there are other cardiovascular risk factors that are not as frequent: smoking and alcohol drinking.

Table 3 shows the proportion of older population utilizing different preventive services. During the past 12 months, a substantial majority have had blood pressure measurement (89%), a cholesterol test (79%), and glycemia

Table 2
Descriptive Statistics of Covariates, Population Age ≥ 60, Costa Rica, 2004-2006 (Weighted and Nonweighted[a])

Characteristic	Weighted	Nonweighted
Predisposing characteristic		
Percentage males	47	45
Percentage aged 60-69 years	54	30
Percentage aged 70-79 years	32	34
Percentage aged 80 years +	15	36
Percentage living in metropolitan capital city	52	50
Percentage retired	53	62
Percentage married or cohabiting	60	50
Need factor		
Percentage reporting regular or bad health	48	50
Percentage with physician's diagnosis of		
hypertension	48	49
dyslipidemia	39	35
diabetes mellitus	21	19
lung disease	17	18
arthritis	15	15
other heart disease without heart attack	12	14
osteoporosis	10	9
cancer	6	7
heart attack	5	5
stroke	4	6
Percentage with at least one ADL limitation[b]	65	74
Percentage with at least one IADL limitation[c]	23	37
Percentage current smokers	10	8
Percentage past smokers	33	35
Percentage never having smoked	57	57
Percentage current alcohol drinkers	33	27
Percentage past alcohol drinkers	31	34
Percentage never having drank alcohol	36	39

Note: $N = 2{,}696$. ADL = activities of daily living; IADL = instrumental activities of daily living.
a. Differences in weighted and nonweighted statistics are due to oversampling of oldest cohorts.
b. ADL limitations include limitations in walking across a room, bathing, eating, getting in bed, using the toilet, and cutting toenails.
c. IADL limitations include limitations in cooking meals, managing money, shopping, and taking medication.

screening (75% among people without a diagnosis of diabetes mellitus). It is worth noticing that the high prevalence of blood pressure and cholesterol testing are mostly due to disease control rather than to screening, given that proportions are higher among those who already have hypertension or dyslipidemia than among those without a diagnosis of either of the two diseases. Other preventive services are not utilized as frequently. A third of the women have had a mammography during the past 3 years, and almost two thirds have had a papanicolau examination (Pap smear) during the same period. Regarding the latter, the proportions do not differ if only women without a hysterectomy are considered. Thirty percent of men have had prostate cancer screening (prostate-specific antigen PSA or digital rectal examinations). Mammograms and prostate examinations are not provided at community health centers as the appropriate technology is only available at more specialized clinical settings (clinics and hospitals). However, primary health care physicians should refer patients to secondary and tertiary health care institutions if there are reasons to believe that patients need specialized treatment.

Regarding preventive services for eye and hearing impairments, 33% of respondents have had an eye examination in the past 12 months, but only 14% have had a hearing examination during the same period. Finally, prevalence of vaccination against influenza (49%) and against tetanus (46%) is moderate. Summing up, utilization of preventive services related with cardiovascular illnesses is considerably high, but this is not the case with health care services for cancer screening, for hearing and visual impairment, or for infectious diseases.

Describing levels of preventive service utilization is the first goal of this article. The other is to test whether there are SES and institutional differentials in these services. According to bivariate analyses (not shown), the clearest pattern is the set of significant differences by type of health insurance, with uninsured persons consistently having the lowest rates of all. Home visits by community health workers are associated with greater utilization of preventive services related to cardiovascular diseases (blood pressure measurement, cholesterol and glycemia examinations) and to immunizations (vaccination against tetanus and influenza). In terms of SES differentials, more educated older adults are more likely to utilize mammograms, prostate screening, and hearing examinations. Nevertheless, they are less likely to have flu and tetanus shots when compared to the least-educated individuals. Having a higher income is positively associated with prostate screening and hearing examinations, and—at a significance level of 10%—with cholesterol and glycemia tests. There are apparent income differentials

Table 3
Utilization of Preventive Health Care Services, Population Age ≥ 60, Costa Rica, 2004-2006 (Weighted and Nonweighted[a])

Preventive Service Category	*n*	% of Utilization	
		Weighted	Nonweighted
Preventive services for chronic diseases			
Blood pressure measurement < 1 year			
Total	2,688	89	91
With hypertension	1,320	97	96
Without hypertension	1,368	82	85
Cholesterol examinations < 1 year			
Total	2,668	79	81
With dyslipidemia	931	92	93
Without dyslipidemia	1,737	70	75
Glycemia screening < 1 year (only without diabetes)	2,142	75	78
Mammography < 1 year (only women)	1,460	18	14
Mammography < 3 years (only women)	1,460	33	26
Pap smear < 1 year (only women)			
Total	1,464	32	26
Without hysterectomy	1,128	31	25
Pap smear < 3 years (only women)			
Total	1,464	64	54
Without hysterectomy	1,128	64	54
Prostate screening < 1 year (only men)	1,108	30	30
Preventive services for sense impairments			
Hearing examination < 1 year	2,668	33	31
Eye examination < 1 year	2,635	14	15
Immunization services			
Flu vaccine < 1 year	2,671	49	60
Tetanus vaccine < 5 years	2,191	46	49

a. Differences in weighted and nonweighted statistics are due to oversampling of oldest cohorts.

in having a mammogram within 1 year too, but these differences are no longer significant when a periodicity of 3 years is considered. As with education, an inverse income gradient is observed in flu shot prevalence.

Disease burden, functional limitations, and perceived health are essential determinants of health care utilization. In multivariate analysis, after controlling for such need factors (Andersen, 1995), we would expect to find no

SES gradient in the utilization of preventive services, especially in those services provided by EBAIS, under the assumption that EBAIS have been effective in increasing access to primary health care—and thus preventive health care—among underserved populations. Table 4 displays odds ratios for utilization of preventive services by SES characteristics controlling for confounding variables. Logistic regressions reveal SES gradients in service utilization related to cardiovascular disease. More educated seniors are more likely to have blood pressure measurements during the past year, and the odds ratios are larger among those who already have a hypertension diagnosis. This means that there is a steeper schooling gradient in hypertension control rather than in screening. There are also sizable differentials by income in cholesterol and glycemia tests. However, there is no linear gradient. On the contrary, middle-income adults are more likely to have either test than adults in the lowest and highest income brackets. As with blood pressure, the largest odds ratios in cholesterol tests are observed among those with a previous diagnosis of dyslipidemia, and therefore, differentials seem to occur in disease control rather than in screening. Education gradients are also observed in prostate screening and in eye examination. Inverse associations with years of schooling are observed in vaccination against influenza and tetanus, mammograms, and Pap smears. However, the sets of odds ratios for the two services aimed at women are no longer statistically significant when periodicity increases from 1 year to 3 years. These figures seem to indicate that less educated women tend to use this kind of services more often (every year perhaps), whereas more educated women tend to wait longer between every two appointments. Finally, women with a monthly income equal to or greater than US$400 are more likely to have mammograms during the past 3 years than women with lower income. Summing up, analyses show SES differentials in almost all preventive services considered here. The only service contradicting this pattern is hearing examination, one of the services with the lowest utilization rates. Also, there is a clear inverse association between SES and immunization prevalence.

On the subject of institutional characteristics (Table 5), logistic regressions confirm that uninsured seniors have consistently lower utilization of preventive services than their insured peers. Even in services where the odds ratios are not significantly different than one (mammograms, hearing examinations, and flu shots), the magnitude of these odds ratios suggest that they are not significant because of a lack of statistical power rather than because there are no real differentials. In addition, there are no significant differences between people with contribution health insurance and people with noncontribution health insurance (the health insurance for the

Table 4
Odds Ratios of Utilization of Different Preventive Services, by Education and Income Categories, Derived From Multiple Logistic Regressions, Population Age ≥ 60, Costa Rica, 2004-2006 (Weighted by Inverse of Sample Selection Probabilities)[a]

		Years of Schooling			Monthly Income		
Preventive Service	*n*	0-3	4-6	7+	<US$100	US$100-US$399	US$400+
Blood pressure measurement < 1 year							
Total	2,688	1.00	1.37	1.78**	1.00	1.16	0.97
With hypertension	1,320	1.00	3.21**	3.09	1.00	1.06	0.76
Without hypertension	1,368	1.00	1.15	1.62	1.00	1.28	1.08
Cholesterol test < 1 year							
Total	2,668	1.00	0.95	1.28	1.00	1.73***	1.18
With dyslipidemia	931	1.00	0.98	1.53	1.00	4.29***	2.05
Without dyslipidemia	1,737	1.00	1.02	1.26	1.00	1.48**	1.00
Glycemia screening < 1 year (only without diabetes)	2,142	1.00	1.00	1.36	1.00	1.75***	1.11
Mammography < 1 year	1,460	1.00	0.63**	0.84	1.00	0.79	1.16
Mammography < 3 years	1,460	1.00	0.96	1.17	1.00	0.88	1.47**
Pap smear < 1 year[b]	1,464	1.00	0.78	0.67*	1.00	1.21	1.20
Pap smear < 3 years[b]	1,464	1.00	0.80	0.93	1.00	0.94	0.83
Prostate screening < 1 year	1,108	1.00	1.07	1.71**	1.00	0.99	1.34
Hearing examination < 1 year	2,635	1.00	1.09	0.97	1.00	1.15	1.09
Eye examination < 1 year	2,668	1.00	1.16	1.83***	1.00	1.10	1.22
Flu vaccination < 1 year	2,671	1.00	0.66***	0.94	1.00	0.83	0.80
Tetanus vaccination < 5 years	2,191	1.00	1.00	0.73*	1.00	0.93	0.84

a. Each line represents a logistic regression model. All models control for sex, age, metropolitan residence, retirement status, marital status, self-reported health, having at least one limitation in activities of daily living, having one limitation in instrumental activities of daily living, smoking history, alcohol drinking history, type of health insurance, having been visited by a community health worker (ATAP), and self-reported diagnosis by a physician of 10 conditions: hypertension, dyslipidemia, diabetes mellitus, lung disease, arthritis, stroke, heart attack, other heart disease without a heart attack, cancer, and osteoporosis.
b. Results for women without hysterectomy are very similar.
*$p < .10$. **$p < .05$. **$p < .01$.

destitute). This lack of difference suggests that public health care does not seem to discriminate by type of health insurance. The only exception is in

Table 5
Odds Ratios of Utilization of Different Preventive Services, by Institutional Characteristics, Derived From Multiple Logistic Regressions, Population Age ≥ 60, Costa Rica, 2004-2006 (Weighted by the Inverse of Sample Selection Probabilities[a])

		Type of Health Insurance			Visited by ATAP	
Preventive Service	*n*	Uninsured	Contribution	Noncontribution	No	Yes
Blood pressure measurement < 1 year						
Total	2,688	0.47**	1.00	1.11	1.00	2.09***
With hypertension	1,320	0.22**	1.00	0.98	1.00	1.47
Without hypertension	1,368	0.56	1.00	1.18	1.00	2.36***
Cholesterol test < 1 year						
Total	2,668	0.40***	1.00	0.86	1.00	1.30*
With dyslipidemia	931	0.31*	1.00	1.33	1.00	2.72***
Without dyslipidemia	1,737	0.44***	1.00	0.80	1.00	1.13
Glycemia screening < 1 year (only without diabetes)	2,142	0.39***	1.00	0.94	1.00	1.24
Mammography < 1 year	1,460	0.42	1.00	0.80	1.00	1.03
Mammography < 3 years	1,460	0.68	1.00	0.81	1.00	0.93
Pap smear < 1 year[b]	1,464	0.47*	1.00	1.03	1.00	1.27
Pap smear < 3 years[b]	1,464	0.40**	1.00	1.35	1.00	1.29*
Prostate screening < 1 year	1,108	0.43*	1.00	0.67*	1.00	1.24
Hearing examination < 1 year	2,635	0.63	1.00	1.04	1.00	1.07
Eye examination < 1 year	2,668	0.62*	1.00	0.90	1.00	1.15
Flu vaccination < 1 year	2,671	0.76	1.00	0.89	1.00	2.39***
Tetanus vaccination < 5 years	2,191	0.56**	1.00	0.92	1.00	1.71***

Note: ATAP = primary health care technical assistant.
a. Each line represents a logistic regression model. All models control for sex, age, metropolitan residence, retirement status, marital status, self-reported health, having at least one limitation in activities of daily living, having one limitation in instrumental activities of daily living, smoking history, alcohol drinking history, years of schooling, monthly income, and self-reported diagnosis by a physician of 10 conditions: hypertension, dyslipidemia, diabetes mellitus, lung disease, arthritis, stroke, heart attack, other heart disease without a heart attack, cancer, and osteoporosis.
b. Results for women without hysterectomy are very similar.
*$p < .10$. **$p < .05$. **$p < .01$.

prostate screening because people with noncontribution health insurance are less likely to utilize this service. Finally, home visits by community

health workers are significantly associated with increased utilization of blood pressure measurement (particularly with screening rather than with control), cholesterol examinations (particularly with control rather than with screening), vaccination against influenza and tetanus, and Pap smears during the past 3 years.

Home visits are associated with higher utilization rates, and lower SES adults are more likely to be visited by ATAPs than higher SES adults (results available on request). Moreover, people with noncontribution health insurance—who are on average poorer than people with contribution health insurance—do not have different utilization rates than those with the other type of public health insurance. We expected that the effectiveness of such policy measures would translate into no SES gradients, after controlling for several confounding factors (basically need for care, perceived health, and other predisposing characteristics). However, there are persistent SES differentials. Does this mean that institutional characteristics are not covering enough low SES persons to diminish SES gradients? If the answer is yes, then low SES people who have been visited by an ATAP or who have noncontribution health insurance should have higher utilization rates than low SES people who have not benefited from these institutional programs, holding everything else constant. This statement can be tested by adding interaction terms for every pair of one SES variable and one institutional variable (recoding SES variables into just two categories, where 1 = *low SES* and 0 = *otherwise*). If the odds ratios for the interaction terms were greater than one, this would mean that SES differentials are lower among beneficiaries of policy measures (people visited by an ATAP or people with noncontribution health insurance).[3] Almost none of the interactions have significant coefficients in the expected direction (results available on request). The interaction between more years of schooling and noncontribution health insurance in utilizing prostate screening is the single exception. These results mean that SES differentials persist despite the implementation of policy measures aimed at reducing such gradients, net of other factors.

Discussion

The first goal of this article is to assess the level of preventive service utilization by elders in Costa Rica. Three preventive services—related to cardiovascular disease screening and control—have utilization rates above 70%: blood pressure measurement, cholesterol tests, and glycemia screening.

Other utilization rates associated with cancer screening range from 25% to 75%: Pap smears, mammography, and prostate cancer screening. Regarding services related to infectious diseases, almost half of the people aged 60 and above have had influenza immunization during the past year, but only 18% have had vaccination against tetanus during the past 5 years. Finally, preventive services intended to examine for sense impairments are not utilized by the majority of the elderly population in Costa Rica.

Even though utilization rates for services related to cardiovascular diseases are high, there are differences between those trying to avoid getting the disease and those seeking to control an already diagnosed condition. Utilization of annual blood pressure measurement is almost universal among Costa Rican elderly who have been diagnosed with hypertension, but the proportion is lower among those with no diagnosis of hypertension. Similarly, patients with a previous diagnosis of dyslipidemia have a higher probability of having an annual cholesterol examination than those who have not been diagnosed with this condition. These differences suggest that seemingly healthy elderly individuals—people with no diagnosis of certain diseases—are not as aware of the usefulness of preventive services as people who have already been diagnosed with such diseases. Using Andersen's behavioral-model terminology (Andersen, 1995), a physician's diagnosis of a certain disease should—in theory—increase the evaluated need for preventive services aimed at controlling such disease. The elderly are at high risk of becoming ill because of the biological consequences of aging. The elderly population requires frequent utilization of preventive services not only for controlling an already diagnosed condition but also for preventing the onset of a disease. Therefore, utilization of such preventive services as blood pressure measurements and periodical cholesterol examination should be high among the elderly, regardless of a previous diagnosis. Therefore, it seems that people with the highest perceived need of preventive services (those with a previous diagnosis of a disease) are utilizing such services the most. The finding (not shown) that the regression coefficient for self-reported bad health is consistently significant in almost all regressions, net of the effect of previously diagnosed diseases, strengthens this interpretation about the role of perceived need. These results might mean that the Costa Rican health care system is not raising enough awareness of the need for preventive care, especially among a population at high risk of becoming ill such as the elderly.

Population disparities in health care service utilization imply that there is still a chance to improve utilization rates by expanding access or awareness

among underserved groups. One goal of this analysis has been to determine whether there are differentials in preventive service utilization across groups defined by SES characteristics and policy measures. Disparities by income and education in cardiovascular disease prevention services remain, even after controlling for policy measures and other confounder variables. It is particularly interesting that the services with the highest utilization rates are the ones with the largest disparities. It is possible that high SES elders have taken more advantage of the availability of these services provided by the health care system, relative to their lower SES peers. Regarding services aimed at the female population, advantages in utilization rates favoring women with fewer years of schooling disappear when the observed periodicity of the service increases from 1 year to 3 years. This means that less educated women are more likely to have a Pap smear during the past year, but the odds are not significantly different for the same services during the past 3 years. The reasons for this kind of pattern are not clear. However, it is worth noting that there are recommendations in the United States against performing Pap smears too frequently (e.g., every year; U.S. Preventive Services Task Force, 2005). If these results mean that more educated women in Costa Rica are spacing their Pap smears because of differential reception of information, future research could study whether these more educated women are getting information from sources that are more aware of American clinical guidelines.

Utilization of some services shows income disparities, whereas utilization of other services shows education gradients. What is the difference between these two sets of differentials? Higher mammography utilization rates among women in the highest income bracket might represent the effect of waiting lists. Mammograms are not provided by EBAIS but by clinics and hospitals, where the problem of waiting lists is more common (CCSS, 2006). It is very likely that the highest-income women can afford to have a mammography at private health care services, where there are no waiting lists. Therefore, income differentials in mammograms might be related to affordability. Income differentials in utilization of services related to cardiovascular diseases are more difficult to explain because people in the middle-income bracket seem to have greater utilization rates than people in the highest-income bracket. More research is needed to explain this apparently inverse U-shaped gradient.

Differences in preventive service utilization across education categories are observed in blood pressure control, prostate screening, and eye examinations. We expected to find income disparities in the latter two given that these services are also affected by waiting lists (CCSS, 2006). Therefore, it

might be possible that education differentials represent affordability even though there are no significant income differentials. In theory, education differentials in hypertension screening should not be related to affordability because hypertension screening is part of the free services provided by EBAIS and by ATAPs during home visits. It is more likely that education gradients in these three services are more related to knowledge about the importance of such preventive behaviors because campaigns in favor of prostate examinations, blood pressure screening, or eye examinations are not as common or vocal as campaigns for breast cancer screening or for control of diabetes and hyperlipidemia. Again, perceived need or awareness of the usefulness of preventive care might be an important proximate determinant of the observed SES gradients.

Results also show that two policy measures conducted by the Costa Rican government in different periods are associated with higher utilization rates. Older adults who have received home visits by community health workers are more likely to utilize several services: vaccination against influenza and tetanus, blood pressure measurement, cholesterol tests, and Pap smears. All of these services are provided by EBAIS, where the ATAPs work. More extensive training or more ATAPs in each health area could have a beneficial effect in raising utilization rates of other preventive services, especially hearing and eye examination. It is necessary to clarify that home visits by community health workers have been generalized by the new structure in primary health care designed by the health sector reform. However, they are not completely new to the system. Since the 1970s, personnel from the Ministry of Health conducted home visits for very specific purposes—mainly child and maternal health—as part of the primary health care programs (Rosero-Bixby et al., 1990). Current home visits are the inheritors of those programs. Therefore, it is no surprise that ATAP visits are strongly associated with immunization coverage, given immunization was one of the main tasks of the home visits promoted since their inception.

The lack of significant differences in preventive service utilization across types of health insurance is also a sign that a public policy may have increased access to primary health care. Noncontribution health insurance is given by the government to individuals who would not have been entitled to health insurance otherwise and therefore would not have utilized preventive services. The lack of statistical differences shows that the health care system does not seem to discriminate between welfare beneficiaries and the individuals who are supporting the system financially through their contributions. However, the analyses do show that uninsured older adults are less likely to utilize preventive services.

Although uninsured seniors represent a small fraction of the population (5%), it is important for the government to study who these people are and whether they are at higher risk of becoming ill given that they are not receiving as much preventive health care as their insured peers. As explained before, a brief description of Costa Rican uninsured elderly and results by Rosero-Bixby et al. (2005) suggest that this population might be composed of relatively healthier adults who do not want to utilize preventive services and do not seem to recognize the importance of being insured. It seems that, when becoming ill, most of these persons might apply for health insurance through institutional mechanisms: noncontribution health insurance or health insurance as a dependent of somebody who is insured. However, more research is needed to understand this process.

The SES gradients in preventive service utilization have been documented in other countries (Leal et al., 2005; Macinko et al., 2003; Mead, Witkowski, Gault, & Hartmann, 2001; Okoro, Young, Strine, Balluz, & Mokdad, 2005; Oladele & Barnett, 2006; Qi, Phillips, & Hopman, 2006; Shenson, Bolen, & Adams, 2007; Shi et al., 2002; Solberg, Brekke, & Kottke, 1997). Although Deaton (2002) argued that access to health care services cannot completely explain the SES gradient in health and mortality, recent research suggests that effective primary care can reduce SES disparities in self-rated health (Ploeg et al., 2005; Shi et al., 2002). Our analysis provides insights into this relationship as it shows SES differentials in the utilization of preventive services in a country where SES differentials in health and mortality are not so stark (Rosero-Bixby et al., 2005). Does this set of results suggest that the weak SES gradient in health and mortality in Costa Rica is explained by other factors, such as secondary or tertiary health care services or health behaviors and practices, rather than by the extended system of primary health care? This question calls for more research on the topic. Nonetheless, the high utilization rates of services linked to cardiovascular disease prevention and control might be related to the fact that Costa Rican mortality rates due to cardiovascular causes are lower than rates in industrialized countries with similar life expectancies, like the United States (Rosero-Bixby, 1995).

This article has tried to contribute to expand the knowledge about the outcomes of the health care system in Costa Rica, a country with very good health indicators despite being part of the developing world. How do these utilization levels fare in the international context? (See Appendix B for a comparative table with references). There are problems of comparability between these results and those presented in other papers due to restrictions in the CRELES questionnaire. However, certain general figures can be compared to some extent. For cholesterol, blood pressure, and glycemia

examinations, utilization rates in Costa Rica are very similar to those observed in the United States and Canada (Okoro et al., 2005; Qi et al., 2006) and considerably higher than in Mexico (Pagan et al., 2007). For flu immunization, coverage in Costa Rica is lower than in Canada and the United States (Chen et al., 2005; Johansen et al., 2006; Okoro et al., 2006; Shenson et al., 2007) but very similar to the size of the overall total coverage proportion observed in five European countries—the United Kingdom, Germany, Italy, France, and Spain (Szucs & Muller, 2005). Concerning cancer screening services, mammography and prostate cancer screening utilization rates are lower than in the United States by a magnitude of several tens of percentage points (Chen et al., 2005; Okoro et al., 2005, 2006; Shenson et al., 2007) but are higher than in Mexico (Pagan et al., 2007). Coverage of mammography is also lower than in Brazil (Leal et al., 2005) and Canada (Qi et al., 2006). In Pap smears, Costa Rica performs worse than both industrialized countries—like the United States and Canada (Okoro et al., 2005, 2006; Qi et al., 2006)—and developing countries—like Brazil and Mexico (Leal et al., 2005; Pagan et al., 2007). Summing up, Costa Rica has very high utilization rates in services related to cardiovascular disease control and prevention but not in other services. The low utilization rates of services for cancer screening are of particular concern. To our knowledge, no literature includes information on utilization rates for eye and hearing examination and tetanus vaccination among the elderly in other countries.

Results presented in this article can be useful for public policy in Costa Rica. However, the analysis has some limitations. The first limitation is that it is based on cross-sectional data. As such, it is impossible to determine causal mechanisms; this is particularly true in the association between home visits and preventive service utilization because it is likely that, for some respondents, the latter occurred before the former. In addition, most of the data come from self-reported information that can be affected by recall bias; recall bias might be even graver among older respondents and for events that go many months back in time such as the tetanus vaccine.

Another limitation is that the absence of possible explanatory variables in the statistical models might be confounding the relationship between SES and institutional characteristics, on one hand, and preventive service utilization, on the other. Health behaviors and more organizational characteristics might be some of these confounders (Andersen, 1995). It is possible that people with less income or less education or uninsured people may believe they do not need preventive services. CRELES does not collect data about health beliefs or about awareness of the importance of preventive services.

As mentioned before, it seems that differential awareness is having an impact on the results, given that there are differences in utilization of certain services related to cardiovascular diseases among those with previous diagnosis of hypertension or dyslipidemia, compared to those with no diagnosis. Other possible confounders that the analysis is not considering are organizational characteristics of different health care facilities. There may be organizational problems in community health centers located in poor areas thwarting timely receipt of primary health care.

Cross-national comparison of results (based on published data) is also limited by comparability problems. The predetermined time brackets in some CRELES questions and the differences in data collection processes hinder the ability to easily compare this article's results with those observed in other countries; nonetheless, some of the comparisons are valid to make insofar as they can be explained by known characteristics of the health care systems of the countries for which scientific research has been found.

In conclusion, preventive service utilization rates are high in services related to cardiovascular conditions but not high in other preventive services. There are SES differentials in these utilization rates despite the positive association between policy measures and utilization rates. Government officials that administer the public health care system in Costa Rica should check attention guidelines in community health centers to improve access to these health services as well as awareness of the usefulness of preventive services. Special attention should be paid to services related to cancer screening.

Appendix A
Preventive Services Studied in the CRELES Project

Preventive Service	Period (in Years)	Population
Blood pressure measurement	<1	Total, with hypertension diagnosis and without hypertension diagnosis
Cholesterol or lipids test	<1	Total, with dyslipidemia diagnosis and without dyslipidemia diagnosis
Glycemia screening	<1	Only without diabetes mellitus diagnosis
Mammography	<1 <3	Total female
Pap smear	<1 <3	Total female, and without hysterectomy
Prostate cancer screening (either prostate specific antigen tests or digital rectal examinations)	<1	Total male

(continued)

Appendix A (continued)

Preventive Service	Period (in Years)	Population
Hearing examination	<1	Total
Eye examination	<1	Total
Influenza vaccine	<1	Total
Tetanus vaccine	<5	Total

Source: Consejo Técnico Asesor de Atención Integral a las Personas Costa Rica, 1995.
Note: CRELES = Costa Rican Study on Longevity and Healthy Aging.

Appendix B
Literature Review About Preventive Service Utilization

Preventive Service	Estimate[a]	Country	Period[b] (in Years)	Age Group	Article
Mammogram	80.8	United States	2	>65	Okoro, Young, Strine, Balluz, & Mokdad, 2005
	79.0	United States	1	>65	Chen, Diamant, Pourat, & Kagawa-Singer, 2005
	77.3	United States	2	>65	Shenson, Bolen, & Adams, 2007
	74.7	United States	2	>65	Okoro et al., 2006
	55.3	Canada	1	50-69	Qi, Phillips, & Hopman, 2006
	48.6	Brazil	3	50-69	Leal, Nogueira da Gama, Frias, & Szwarcwald, 2005
	33.2	Costa Rica	3		
	20.5	Mexico	2	>50	Pagan, Puig, & Soldo, 2007
Pap smear	81.8	Canada	3	20-69	Qi et al., 2006
	78.0	United States	3	>65	Okoro et al., 2005
	72.7	United States	3	>65	Okoro et al., 2006
	71.2	United States	3	>65	Shenson et al., 2007
	64.1	Mexico	2	50-69	Pagan et al., 2007
	63.8	Costa Rica	3	>60	
	62.2	Brazil	3	50-69	Leal et al., 2005
Prostate	67.9	United States	1	>65	Okoro et al., 2005
	29.9	Costa Rica	1	>60	
	14.1	Mexico	2	50-69	Pagan et al., 2007
Flu vaccine	70.0	United States	1	>65	Okoro et al., 2005
	69.3	United States	1	>65	Shenson et al., 2007

(continued)

Appendix B (continued)

Preventive Service	Estimate[a]	Country	Period[b] (in Years)	Age Group	Article
	67.5	United States	1	>65	Chen et al., 2005
	66.8	United States	1	>65	Okoro et al., 2006
	61.0	Canada	1	>65	Johansen et al., 2006
	50.6	United Kingdom, Germany, Italy, France, and Spain	1	>65	Szucs & Muller, 2005
	49.1	Costa Rica	1	>60	
	46.5	United States	1	>65	Pham, Schrag, Hargraves, & Bach, 2005
Diabetes screening	74.8	Costa Rica	1	>60	
	59.1	Mexico	2	>50	Pagan et al., 2007
Blood pressure control	97.8	United States	2	>65	Okoro et al., 2006
	89.2	Costa Rica	1	>60	
	76.6	Canada	1	>20	Qi et al., 2006
	69.7	Mexico	2	>50	Pagan et al., 2007
Cholesterol test	89.4	United States	5	>65	Okoro et al., 2006
	78.9	Costa Rica	1	>60	
	46.7	Mexico	2	>50	Pagan et al., 2007

a. Values for Costa Rica are derived from this article.
b. Period refers to maximum interval for the exams (e.g., having a mammogram over the past 2 years).

Notes

1. By definition, the *Basic Integrated Health Care Teams* (EBAIS) refers to health professionals providing primary health care, rather than the centers where health care is provided. However, given that most EBAIS have an established physical location where they work, the name EBAIS has been extended to the physical building where the team works.

2. The poverty line in Costa Rica is based on comparisons to the per capita household income needed to fulfill the caloric requirements of a family. The Costa Rican Study on Longevity and Healthy Aging project does not gather information about total or per capita household income but only about income of respondents and spouses.

3. Assume we have the model: logit(utilization) = $\beta 1$(low SES) + $\beta 2$(policy) + $\beta 3$[(low SES)*(policy)] + $\beta 4$(confounders). $\beta 1$ is negative, indicating socioeconomic status (SES) gradients; $\beta 2$ is positive, indicating policy variables increase utilization. If $\beta 3$ is positive, then low SES beneficiaries of policy measures have higher utilization, and therefore SES gradients are diminished.

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