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Effect of Acculturation and Income on Hispanic Women's Health

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Abstract: This research examines how acculturation and income affect health care access, utilization, and prevention knowledge among a population of Hispanic women living along the U.S.-Mexico border in Yuma, Arizona, a rural agricultural county. A cross-sectional survey was conducted among 417 Hispanic women with mean age 61.3 years (s.d.=9.2). Most were long-term residents of Yuma County with some elementary and middle school education. Respondents had low monthly household incomes (average: \$927.77, s.d.=550.40) and 10% reported current employment. The results show that income may be a more important predictor of actual utilization of health care services while acculturation may play a more prominent role with respect to provider preferences. A better understanding of the complex interplay between the individual and the society she inhabits is required in order to develop a meaningful public health intervention that will affect disease risk.

Key words: Hispanic, women, income, acculturation.

In the last decade, the U.S. experienced an increase of 13 million in its number of Hispanic residents.¹ Of these, the vast majority (64%) were from Mexico.² Researchers attribute this tremendous growth to high birth and immigration rates.²

Most Mexican Americans reside in the four contiguous states that form the border with Mexico (California, Arizona, New Mexico, and Texas).³ Mexican Americans living along the U.S.-Mexico border are a heterogeneous population with broadly divergent levels of acculturation, economic access, educational attainment, and English language proficiency.⁴

Hispanics in general experience comparatively poor access to health care services due in part to economic factors. Nearly 23% of border residents have incomes below 200% of the federal poverty level. When compared with non-Hispanic White women, Hispanic women have disproportionately lower median incomes.³ Additionally

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25–30% of U.S.-Mexico border residents are uninsured, and Hispanic women in particular are three times as likely to be uninsured as their non-Hispanic White counterparts.⁵ For a substantial proportion of Hispanics, the costs associated with seeking care⁶ and actually accessing health care services^{7–8} pose additional barriers, which for some are insurmountable.⁴

Language often presents another possible barrier. Among adult Hispanics, Spanish is the dominant language.² Those Hispanics born in the U.S. are more likely to speak English as their primary language than are their foreign-born counterparts (61% vs. 4%).² Foreign-born Hispanics are more likely than U.S.-born Hispanics to speak Spanish primarily (72% vs. 4%).² English language proficiency is an important indicator of acculturation, and its absence explains some of the challenges Hispanics face entering the health care setting in the U.S.

Simply stated, acculturation is an adaptation to a new or different culture.⁹ It is a complex phenomenon that may increase or decrease health risk depending on specific behaviors. Hispanic women who are highly acculturated are less likely to fear cancer and more likely to seek out screening and other health care services, compared with their less acculturated peers.⁸ On the other hand, high acculturation may also be associated with health behaviors that increase health risk.^{10–11}

Our research examines how acculturation and income bear on health care access, utilization, and prevention knowledge among a population of Hispanic women living along the U.S.-Mexico border in Yuma, Arizona, a rural agricultural county. The mixed effect of acculturation on health outcomes and risk factors that has been found in earlier research may be due to a high degree of confounding by socioeconomic status (SES).¹² No studies to date have systematically compared health outcomes among people with differing combinations of income level and acculturation.¹² Comparisons between different levels of income and acculturation would provide evidence supporting our hypothesis that utilization and access to health care services is more related to income than to culture.

Methods

A cross-sectional survey was conducted from April 2000 to April 2001 in Yuma County, Arizona. Yuma County is one of four Arizona counties located along the U.S.-Mexico border. Its economy centers on the production of fruits and vegetables. The county has a 2003 estimated population of 171,134 residents.¹³ This number increases substantially on a seasonal basis with the periodic influx of migrant farm workers and the arrival of winter visitors. However, of the permanent population, approximately 55% are between the ages of 18 and 65 years and 51% are Hispanic.¹³ In addition, over 19% of the population have incomes below the federal poverty level; 35% are not high school graduates. The unemployment rate for the county is approximately 29.8%. All of these rates are substantially greater than comparable rates for the rest of the state of Arizona.¹³

In this study, participants were selected from 7 of 24 census tracts with majority Hispanic populations. The area included three small urban centers (Yuma, Somerton and San Luis) as well as surrounding rural agricultural communities. The Human Subjects Committee of the University of Arizona approved the study. Dwellings were

selected at random from each of the census tracts in order to achieve proportional representation of respondents. This was accomplished by using detailed maps of census tracts and assigning dwellings a number calculated from a computerized random number generator. All interviews and subject contacts were carried out by female, bilingual community health workers (*promotoras*) from the same communities that were being surveyed. Up to three visits on different days and at varying times were attempted in order to reach potential subjects from each selected household before excluding the household from the survey. If more than one woman per household was eligible, the individual whose birthday was nearest the date of the interviewer's visit was invited to participate. Eligible women were 50 years of age or older and residents of the household.

A total of 1,255 contacts were made in order to identify 639 eligible individuals, and enroll 504 participants. Of the 135 eligible individuals who did not enroll in the study, the major reasons cited included lack of time and family care issues. However, since the dwellings of the 135 eligible but not-enrolled individuals were chosen according to the random process described previously, it can be assumed that eligible non-enrollees do not differ significantly from the individuals who did enroll in the study. Of the 504 participants who did enroll in the study, 417 provided all of the information necessary to conduct the analysis presented here (because some subjects left some answers blank at random). Therefore, although the overall response rate of 65% (417/639) is somewhat low, the actual response rate from enrolled subjects of 83% (417/504) is very good.

Study participants completed a written informed consent document as well as an interviewer-administered questionnaire in their preferred language (English or Spanish). Although written literacy in either Spanish or English was an implicit criterion for completing the written consent form, the *promotoras* were available for any questions about it. In addition, the purpose of having an interviewer-administered questionnaire was to allow women with low literacy skills to participate. The questionnaire was a 182-item survey instrument consisting of 14 sections that was developed for a comprehensive study of women who reside along the U.S.-Mexico border. The questionnaire included sections on demographics, health coverage, access to care services, utilization, prevention orientation, and acculturation. Additional sections included general health, breast cancer, mammography, cervical cancer, and sexual history.

Completed surveys were reviewed for completeness by the local study coordinator prior to data entry. Surveys were manually entered into a computerized database. A random selection of 10% of entered questionnaires was manually rechecked for accuracy of data entry. This was assessed by comparing the paper questionnaire responses with those entered into the database.

The aim of this study was to provide insight into differences in health care access, utilization, and prevention beliefs among those with different acculturation levels and income. In particular, this study systematically compares health outcomes among those with relatively higher and lower incomes and high/low acculturation levels. For the purposes of this study, belonging to the lower income category was operationally defined as being a participant in this study whose monthly household income was less

than or equal to U.S. \$960.00 per month (n=237). Higher income was operationally defined as monthly household income greater than U.S. \$960.00 per month (n=204). This definition is derived from the government definition of poverty for two people as having income of approximately U.S. \$968.00 or less per month.¹⁴ In our study sample, the mean number of people per household who depend on the monthly income reported was 2.36. Less acculturated was operationally defined as a subject who spoke, read, or wrote Spanish only or Spanish better than English and whose circle of friends included almost exclusively or mainly Hispanics/Latinos (n=338). More acculturated was operationally defined as a subject who spoke, read, or wrote only English, English better than Spanish, or both English and Spanish equally well and whose circle of friends included almost entirely or mainly Americans (including, among others, Anglo Americans, African Americans, and Asian Americans) from the U.S. or equally Americans and Hispanics/Latinos from the U.S. (n=79).

When combining the income and acculturation levels operationally defined above, the following groups were created:

- Group 1: Less acculturated and lower income group (n=211)
- Group 2: More acculturated and higher income group (n=53)
- Group 3: More acculturated and lower income group (n=26)
- Group 4: Less acculturated and higher income group (n=127)

This study systematically compared Group 1 vs. Group 3, Group 1 vs. Group 4, Group 2 vs. Group 3, and Group 2 vs. Group 4. In each of these comparisons, either acculturation or income is held constant. This study did not compare Group 1 vs. Group 2 and Group 3 vs. Group 4 because for those two comparisons, both acculturation and income vary, making it impossible to attribute differences between groups to either acculturation or income.

Means and standard deviations were calculated for each continuous variable and for Likert-type data. In addition, for no/yes (0,1) dichotomous variables, the mean percentage calculated represents the percentage of subjects who answered that question positively. Mean percentages were also calculated for all other categorical data. For continuous data, Likert-type data, and mean percentages, statistical tests of comparisons between group means were conducted using the ANOVA procedure. Post-hoc, multiple comparison tests of significant findings from ANOVA were conducted using the Bonferroni correction. In addition, findings from ANOVA were verified using the Kruskal-Wallis (K-W) procedure, in order to investigate if the different sample sizes or if the data being nonparametric would significantly alter the findings from ANOVA. In all cases except one, conclusions from ANOVA were verified by the K-W procedure. All statistical tests were conducted at the $p=0.05$ level.

Results

Table 1 shows demographic and acculturation variables for participants, reported by group. The mean age of respondents enrolled in the study was 61 years (s.d.=9.2). Most were long-term residents of Yuma County (25 years, s.d.=16.8), with minimal formal education (average = 3.18, s.d.=2.53, where 3 is primary completed and 4 is some junior high/middle school). Eighty-three percent (83%) of the respondents

Table 1.

**DEMOGRAPHIC CHARACTERISTICS AND ACCULTURATION LEVELS
FOR TOTAL SAMPLE AND DIFFERENT INCOME/ACCULTURATION GROUPS**

| | All N=417 | Group 1 Less Accult. Lower Income n=211 | | Group 2 More Accult. Higher Income n=53 | | Group 3 More Accult. Lower Income n=26 | | Group 4 Less Accult. Higher Income n=127 | | p-value | |
|-------------------------------------|--------------|--|-----|--|----|---|----|---|-----|---------|---------|
| | | Mean | n | Mean | n | Mean | n | Mean | n | | |
| Age in 2000 (years) | 412 | 61 | 207 | 63 | 53 | 60 | 26 | 66 | 126 | 59 | < 0.001 |
| Years living in town | 393 | 25 | 197 | 20 | 52 | 41 | 25 | 42 | 119 | 21 | < 0.001 |
| Born in Mexico (%) | 417 | 83.0 | 211 | 95.0 | 53 | 34.0 | 26 | 42.0 | 127 | 91.0 | < 0.001 |
| School level completed ^a | 378 | 3.18 | 193 | 2.58 | 50 | 5.22 | 24 | 4.29 | 111 | 3.08 | < 0.001 |
| Monthly income | 399 | \$928 | 211 | \$594 | 43 | \$1,596 | 26 | \$619 | 119 | \$1,346 | < 0.001 |
| Working (%) | 411 | 10.0 | 208 | 5.0 | 53 | 23.0 | 26 | 8.0 | 124 | 12.0 | 0.001 |
| Married or cohabitating (%) | 414 | 70.0 | 210 | 65.0 | 53 | 62.0 | 26 | 46.0 | 125 | 87.0 | < 0.001 |
| Speak Spanish only (%) | 416 | 74.0 | 211 | 92.0 | 52 | 0 | 26 | 0 | 127 | 91.0 | < 0.001 |
| Read Spanish only (%) | 416 | 72.0 | 211 | 88.0 | 52 | 0 | 26 | 0 | 127 | 90.0 | < 0.001 |
| Write Spanish only (%) | 417 | 72.0 | 211 | 88.0 | 53 | 0 | 26 | 0 | 127 | 91.0 | < 0.001 |
| Latino friends mainly (%) | 416 | 76.0 | 211 | 94.0 | 53 | 8.0 | 26 | 12.0 | 126 | 89.0 | < 0.001 |

^a Where 1=No school, 2=Some primary, 3=Primary completed, 4=Some middle school, 5= Middle school completed, 6=Some high school, 7=High school completed

reported that they were born in Mexico, with 16% reporting that they were U.S.-born Hispanic or other and 1% reporting being U.S. born White. Respondents had a low monthly income (average = \$928, s.d.=550). It should be noted that only 10% reported current employment. It is likely that household income comes from another source, such as a spouse's or a cohabitant's income, as 70% of the subjects reported being married or cohabitating with someone. This table also reports the strong statistical differences between the 4 different groups with respect to the demographic and acculturation variables included in this analysis ($p \leq 0.001$ for 9 of the 10 ANOVA tests conducted). These variables follow expected trends, given the defining characteristics of the groups. For example, the group with the highest average monthly income (at \$1,596) is Group 2, the more acculturated and higher income group; the group that has the lower average monthly income (at \$594) is Group 1, the less acculturated and lower income group. In general, this table shows that the 4 groups differ significantly, allowing for comparisons between them with respect to health coverage, access to care, utilization of services, and prevention knowledge, attitudes, and beliefs.

Table 2 presents self-reported health care coverage and access to care comparisons between the four groups. There were significant differences between the groups in four of the eight variables in this table. They differ significantly in (i) health insurance status ($p=0.01$), (ii) lack of money to buy prescription drugs ($p=0.01$), (iii) travel time to medical appointments ($p=0.03$), and (iv) unavailability of transportation for clinical appointments ($p=0.01$). In general, the less acculturated, lower-income respondents (Group 1) were less likely than respondents in other groups to seek needed medical care. They were also the most likely of all groups to report faster travel times to medical appointments and least likely of all groups to report problems with transportation. More acculturated respondents (Groups 2 and 3) regardless of income were more likely (68% and 77%, respectively) to report insurance coverage, compared with less acculturated respondents (Groups 1 and 4, whose rates were 53% and 48%, respectively). The more acculturated, higher-income group (Group 2) was least likely of all groups to report denial of medical services, but this difference was not significant.

Table 3 presents a comparison of utilization of health services between groups. There were statistically significant differences between the groups for 7 of the 15 characteristics analyzed. These were (i) last visit to a medical provider ($p=0.001$), (ii) emergency room used in the last 12 months ($p=0.02$), (iii) clinical breast exam in past 12 months ($p=0.03$), (iv) mammogram done in the past 12 months ($p=0.002$), (v) preference for a female provider ($p=0.01$), (vi) preference for a Latino provider ($p<0.001$), and (vii) preference for speaking Spanish with health care provider ($p<0.001$). The longest average interval since the last physician visit was reported by the more acculturated, lower-income respondents (71%, Group 3), while the lowest average number of emergency department visits was reported by low acculturation respondents (Group 1 and 4), regardless of income. The less acculturated respondents regardless of income group were more likely than the more acculturated to prefer seeing a female or Latino provider and to communicate in Spanish with that provider.

Table 2.

HEALTH COVERAGE AND ACCESS TO CARE COMPARISONS

| | Group 1 Less Accult. Lower Income n=211 | | Group 2 More Accult. Higher Income n=53 | | Group 3 More Accult. Lower Income n=26 | | Group 4 Less Accult. Higher Income n=127 | | p-value |
|--|--|-------|--|-------|---|-------|---|-------|---------|
| | Mean | Mean | Mean | Mean | Mean | Mean | Mean | | |
| 1. Have health insurance (%) ^a * | 211 | 53.0 | 53 | 68.0 | 26 | 77.0 | 126 | 48.0 | 0.01 |
| 2. Insurance denied due to bad health (%) | 211 | 7.0 | 52 | 4.0 | 26 | 12.0 | 127 | 2.0 | 0.16 |
| 3. Has a regular person/place to get medical advice (%) | 211 | 91.0 | 52 | 90.0 | 26 | 88.0 | 127 | 94.0 | 0.76 |
| 4. Didn't seek needed medical advice in the last 12 mos. (%) | 209 | 67.0 | 52 | 71.0 | 26 | 73.0 | 127 | 71.0 | 0.87 |
| 5. Ever denied medical care (%) | 211 | 13.0 | 52 | 6.0 | 26 | 27.0 | 127 | 13.0 | 0.08 |
| 6. Didn't buy prescriptions due to lack of money (%) ^a * | 211 | 28.0 | 52 | 17.0 | 25 | 56.0 | 126 | 33.0 | 0.01 |
| 7. How long does it take you to travel to medical appointments (minutes)** | 207 | 21.71 | 52 | 18.21 | 26 | 19.12 | 125 | 24.38 | 0.03 |
| 8. How often do you find yourself without a ride to a clinic appointment ^a ** | 209 | 3.74 | 51 | 4.24 | 26 | 4.42 | 125 | 3.92 | 0.01 |

^a Where 1=All of the time, 2=Most of the time, 3=Some of the time, 4=A few times, 5=Never

* p ≤ 0.01

** p ≤ 0.05

Table 4 shows how the groups compare regarding knowledge, beliefs, and attitudes about preventive care for cancer and other disease prevention. This table shows that, among the four groups, there were statistically significant differences in 3 of the 12 belief statements, specifically with respect to the statements about (i) breast exams ($p=0.004$), (ii) doctor visits ($p=0.01$), and (iii) early diabetes detection ($p=0.03$). Less acculturated respondents (Groups 1 and 4) were more likely to understand the benefits of clinical breast exams. The more acculturated, higher-income women (Group 2) were least likely of all groups to report health care provider visits only when they were acutely ill, while the more acculturated, lower-income group were most likely to see a provider only when ill.

Table 5 presents a summary of the post-hoc multiple comparisons analysis. This table shows exactly where the differences occur among the 4 groups. Of the 19 cases where differences between 2 groups could be detected, 12 involved changes in acculturation and 7 involved changes in income. These results underscore the important roles of acculturation and income in the health and well being of Hispanic women. It should be noted that there were 4 cases where differences between the 4 groups could not be specifically attributed to acculturation or income.

Discussion

Our work illustrates the close interrelationships among acculturation, income and health in agricultural communities on the U.S.-Mexico border. Our findings suggest that acculturation is associated with provider preference while income is associated with health care utilization behaviors. Not surprisingly, extremely low-income women were less likely to purchase prescriptions and less likely to visit a provider than somewhat higher-income women.

Often, researchers portray Hispanics having a fatalistic attitude as the reason for underutilization of health care services;^{8, 15} we propose instead that the reasons for Hispanics' non-use of health care services can be found in more complex, societal circumstances. Lewis found that fatalistic attitudes were a response to systemic societal conditions related to poor economic conditions in countries such as the U.S. He predicted that people with low incomes in areas with high unemployment would develop the attitudes of despair and hopelessness characteristic of fatalistic thinking. Fatalism may then be a result of economic deprivation rather than a cultural trait independent of politico-economic structures. It is also possible that fatalism is a broader mechanism that encompasses religious commitment to acceptance of conditions in one's life. The concept of fatalism warrants further study. Frequently, it has pejorative connotations that, to a certain extent, perpetuate stereotyping of Hispanics.

Acculturation may play a more prominent role than income with respect to the provider preferences of women in the study as suggested by the large proportion of participants who preferred female, Latino, and/or Spanish-speaking providers. Health care preferences that are attributable to acculturation may be more amenable to educational interventions than those that have to do with scarcity of resources.

Results associated with knowledge, attitudes and beliefs were somewhat mixed and require further study. There are important limitations to our analysis. Perhaps

Table 3.

UTILIZATION OF HEALTH SERVICES COMPARISONS

| | Group 1 Less Accult. Lower Income n=211 | | Group 2 More Accult. Higher Income n=53 | | Group 3 More Accult. Lower Income n=26 | | Group 4 Less Accult. Higher Income n=127 | | p-value |
|--|--|-------|--|-------|---|-------|---|-------|---------|
| | Mean | | Mean | | Mean | | Mean | | |
| 1. Visited a health provider in the last 12 months (%) | 210 | 87.0 | 52 | 85.0 | 25 | 76.0 | 124 | 85.0 | 0.56 |
| 2. Last time visited an MD (months)* | 185 | 10.52 | 46 | 19.86 | 20 | 71.08 | 116 | 14.68 | 0.001 |
| 3. Number of times used emergency room in last 12 months** | 205 | 0.31 | 51 | 0.78 | 24 | 0.5 | 125 | 0.27 | 0.02 |
| 4. Blood pressure checked in past 12 months (%) | 211 | 91.0 | 52 | 88.0 | 26 | 77.0 | 126 | 84.0 | 0.12 |
| 5. Blood sugar test done in past 12 months (%) | 210 | 73.0 | 52 | 69.0 | 26 | 65.0 | 125 | 66.0 | 0.53 |
| 6. Vision test done in past 12 months (%) | 210 | 47.0 | 52 | 46.0 | 26 | 31.0 | 126 | 37.0 | 0.17 |
| 7. Clinical breast exam done in past 12 months (%)** | 211 | 50.0 | 52 | 56.0 | 26 | 31.0 | 125 | 38.0 | 0.03 |
| 8. Mammogram test done in past 12 months (%)** | 211 | 49.0 | 52 | 52.0 | 26 | 19.0 | 126 | 34.0 | 0.002 |
| 9. Pap smear done in past 12 months (%) | 209 | 48.0 | 52 | 50.0 | 26 | 27.0 | 126 | 43.0 | 0.17 |
| 10. Blood test for cholesterol done in past 12 months (%) | 207 | 65.0 | 52 | 67.0 | 25 | 52.0 | 125 | 54.0 | 0.1 |
| 11. Rather be seen by female doctor (%)* | 172 | 95.0 | 40 | 85.0 | 18 | 72.0 | 101 | 91.0 | 0.01 |
| 12. Prefer to be seen by a Latino doctor (%)* | 210 | 98.0 | 41 | 61.0 | 19 | 79.0 | 125 | 98.0 | < 0.001 |

| | | | | | | | | | |
|--|-----|------|----|------|----|------|-----|------|---------|
| 13. Prefer to speak Spanish with health care provider (%) ^a * | 211 | 98.0 | 51 | 57.0 | 26 | 73.0 | 125 | 97.0 | < 0.001 |
| 14. Clinic has someone who speaks Spanish (%) | 207 | 98.0 | 21 | 95.0 | 17 | 94.0 | 125 | 94.0 | 0.49 |
| 15. How difficult to communicate with clinic staff ^a | 210 | 1.48 | 52 | 1.5 | 26 | 1.62 | 124 | 1.52 | 0.82 |

^a Where 0=Very difficult, 1=Somewhat difficult, and 2=Not difficult

* p ≤ 0.01

** p ≤ 0.05

Table 4.

PREVENTION KNOWLEDGE, ATTITUDES, AND BELIEFS COMPARISONS

| | Group 1 | | Group 2 | | Group 3 | | Group 4 | | p-value |
|--|-------------------------------------|----------------|--------------------------------------|---------------|-------------------------------------|---------------|--------------------------------------|----------------|---------|
| | Less Accult. Lower Income (%) | agree n=211 | More Accult. Higher Income (%) | agree n=53 | More Accult. Lower Income (%) | agree n=26 | Less Accult. Higher Income (%) | agree n=127 | |
| 1. Most cancer types are preventable | 83.0 | 211 | 77.0 | 53 | 77.0 | 26 | 82.0 | 126 | 0.88 |
| 2. Early detection of cancer makes a difference in outcome | 91.0 | 211 | 94.0 | 53 | 92.0 | 26 | 88.0 | 126 | 0.64 |
| 3. Pap smear can detect cervical cancer | 85.0 | 211 | 87.0 | 53 | 73.0 | 26 | 88.0 | 126 | 0.23 |
| 4. Abnormal pap smear means a woman will die | 22.0 | 211 | 11.0 | 53 | 27.0 | 26 | 20.0 | 126 | 0.62 |
| 5. Breast exam can detect breast cancer* | 89.0 | 211 | 79.0 | 53 | 62.0 | 26 | 87.0 | 126 | 0.004 |
| 6. Diet affects chances of getting cancer | 82.0 | 209 | 89.0 | 53 | 96.0 | 26 | 88.0 | 126 | 0.14 |
| 7. Only see MD if sick* | 75.0 | 211 | 54.0 | 53 | 85.0 | 26 | 76.0 | 126 | 0.01 |
| 8. A blood test can detect diabetes | 93.0 | 211 | 96.0 | 53 | 88.0 | 26 | 96.0 | 126 | 0.26 |
| 9. Blood pressure measures hypertension | 91.0 | 211 | 96.0 | 53 | 92.0 | 26 | 94.0 | 126 | 0.44 |
| 10. Early cancer detection helps chance of being cured | 95.0 | 211 | 98.0 | 53 | 88.0 | 26 | 97.0 | 126 | 0.1 |
| 11. Early diabetes detection helps manage diabetes** | 80.0 | 209 | 98.0 | 53 | 88.0 | 26 | 85.0 | 126 | 0.03 |
| 12. Early hypertension detection helps manage it | 94.0 | 211 | 96.0 | 53 | 96.0 | 26 | 93.0 | 125 | 0.59 |

* p ≤ 0.01

** p ≤ 0.05

Table 5.**SUMMARY OF POST-HOC MULTIPLE COMPARISONS ANALYSIS**

| | Group Differences | Factor that Varies | p-value |
|---|---|--|--------------------------|
| 1. Have health insurance (%) | none | n/a | n/a |
| 2. Didn't buy prescriptions due to lack of money (%) | Group 1 vs. Group 3 Group 2 vs. Group 3 | Acculturation Income | 0.02 0.003 |
| 3. How long does it take you to travel to medical appointments (minutes) | Group 2 vs. Group 4 | Acculturation | 0.04 |
| 4. How often do you find yourself without a ride to a clinic appointment ^a | none | n/a | n/a |
| 5. Last time visited an MD (months) | Group 1 vs. Group 3 Group 2 vs. Group 3 | Acculturation Income | 0.001 0.02 |
| 6. No. of times used emergency room in last 12 months | Group 2 vs. Group 4 | Acculturation | 0.03 |
| 7. Clinical breast exam done in past 12 months (%) | none | n/a | n/a |
| 8. Mammogram test done in past 12 months (%) | Group 1 vs. Group 3 Group 1 vs. Group 4 Group 2 vs. Group 3 | Acculturation Income Income | 0.02 0.04 0.03 |
| 9. Rather be seen by female doctor (%) | Group 1 vs. Group 3 | Acculturation | 0.01 |
| 10. Prefer to be seen by a Latino doctor (%) | Group 1 vs. Group 3 Group 2 vs. Group 3 Group 2 vs. Group 4 | Acculturation Income Acculturation | 0.002 0.02 <0.001 |
| 11. Prefer to speak Spanish with health care provider (%) | Group 1 vs. Group 3 Group 2 vs. Group 3 Group 2 vs. Group 4 | Acculturation Income Acculturation | <0.001 0.05 <0.001 |
| 12. Breast exam can detect breast cancer | Group 1 vs. Group 3 | Acculturation | 0.004 |
| 13. Only see MD if sick | Group 2 vs. Group 3 Group 2 vs. Group 4 | Income Acculturation | 0.03 0.02 |
| 14. Early diabetes detection helps manage diabetes | none | n/a | n/a |

Group 1 is the less acculturated and lower income group
 Group 2 is the more acculturated and higher income group
 Group 3 is the more acculturated and lower income group
 Group 4 is the less acculturated and higher income group

the most important is that this study was a cross-sectional survey. This limits our ability to assess the temporal relationship between acculturation or income and the variables of interest. Our data represent a one-time snapshot. Additionally, there may be some bias due to the design of the survey, which required face-to-face interviews. Although this is a real possibility, it is highly unlikely that some but not all of the specific groups included in the analysis would feel this effect.

From an analytical perspective, there could be interactions among acculturation, income, and health behaviors; models allowing for this must be studied. This would entail using logistic regression models that would test for interactions and assess confounding in order to produce odds ratios. As the purpose of this study was to test for differences in means among four groups, ANOVA was chosen as the proper tool of analysis. Future work should consider using more complex generalized linear models methods (such as logit models for multinomial responses).

Another path for future work would come out of social epidemiology. The recent development of multilevel models has allowed epidemiologists to examine possible health effects of group-level factors,¹⁶ although empirical testing for these effects is a challenge. In the future, researchers must develop ways to better investigate multilevel systems and to understand how interactions within and between levels affect health outcomes for different groups.¹⁶

Conclusion

Clearly the effect of acculturation and income are closely inter-related phenomena that cannot be considered in isolation from one another or from other factors. They occur within a complex socio-cultural milieu where other variables, including health beliefs, fatalism, familialism, religion, gender, and many other constructs affect the health behavior of the individual. Attribution of particular health practices or behaviors to the cultural background of the individual or their income ignores the broader context in which these practices occur. A better understanding of the complex interplay between the individual and the society she inhabits is required in order to develop meaningful public health interventions that will lessen the risk of disease.

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