How Do Ethnicity and Primary Language Spoken at Home Affect Management Practices and Outcomes in Children and Adolescents With Asthma?

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Background: Lower rates of preventive medication use and higher rates of hospitalization and emergency department use have been documented among Latino children and adolescents with asthma. However, little is known about how language barriers influence asthma management practices and outcomes.

Objective: To examine the effects of language on asthma management practices and asthma-related outcomes.

Design: Cross-sectional survey of asthma management practices, perceived efficacy, asthma knowledge, family functioning, and health-related quality of life in 405 white non-Latino, African American non-Latino, and Latino children and adolescents from English- and Spanish-speaking homes.

Results: Latino children and adolescents from Spanish-speaking homes had lower rates of goal setting and peak flow monitoring, poorer asthma knowledge, and greater negative family impact than white children and adolescents (P < .05 for all). Although Latino children and adolescents from English-speaking homes did worse than their non-Latino white peers, the decrements were modest and not statistically significant (P > .16 for all). Management practices and outcomes for non-Latino African American children and adolescents closely approximated those of white children and adolescents.

Conclusions: Language barriers seem to contribute to poorer asthma management practices and knowledge among Latino children and adolescents. Efforts to increase knowledge in this group may enhance asthma self-care and limit the morbidity associated with asthma.
STUDY DESIGN

Data came from cross-sectional surveys conducted as part of an evaluation of collaborative interventions to improve asthma care. Pediatric patients younger than 18 years were eligible for the study if they received asthma care during the prior 12 months from 1 of 13 US clinics (6 urban and 7 rural) participating in the evaluation. Eight clinics are in the East, 3 are in the West, and 2 are in the Northwest. Eleven clinics were Bureau of Primary Healthcare community clinics that primarily serve patients of low socioeconomic status who have no access to private sector health care services. The remaining 2 clinics primarily served privately insured patients.

Clinic personnel contacted parents or the legal guardian of eligible patients for permission to release the parents’ contact information and their child’s diagnosis to survey personnel. Verbal consent was obtained over the telephone from the parent or guardian most familiar with the patient’s medical history (N=511) to conduct a 40-minute interview. In addition, we obtained consent to conduct a 20-minute telephone interview with 145 adolescent patients (aged 12-17 years) about their asthma. Study participants were interviewed between March 13, 2001, and December 21, 2001, and paid $10 for each completed interview. Response rates, calculated according to specifications for response rate 4 from the American Association for Public Opinion Research, were 76.0% for parents and 75.2% for adolescents. Surveys were administered by trained telephone interviewers who demonstrated mastery of the study protocol in English or in English and Spanish. The consent process and the telephone interview were conducted in Spanish for Spanish speakers. RAND Corporation and local institutional review boards approved the research protocol for this study.

SURVEY INSTRUMENT

Data for the analyses performed in this study are based on parent proxy reports and adolescent self-reports from our telephone surveys. Survey instruments for parents of children aged 2 to 11 years, parents of adolescents with asthma, and adolescents with asthma may be accessed on the Internet (http://www.rand.org/health/ICICE/).

Spanish speakers were administered a Spanish version of the instrument. Each English-language instrument was translated into Spanish by a translator experienced in the production of translations used in health services research. A different translator then translated the Spanish instrument back to English (back-translation). Survey staff bilingual in Spanish and English and familiar with the interview reviewed the original English instrument, the Spanish translation, and the second English translation. Staff who participated with the development of the original instrument reviewed the original English and the second English translation. The translator, back-translator, and review staff worked together to finalize the Spanish translation.

INDEPENDENT VARIABLES

Race/ethnicity and primary language spoken at home were the independent variables. Parents reported their child’s race/ethnicity as Latino, white, African American, Asian or Pacific Islander, or another race/multiracial. They also reported whether English, Spanish, or another language was usually spoken at home. If parents indicated that another language was spoken at home, they were asked to list the other language(s). Of these “other language” respondents, those who indicated English and another language, including Spanish, were categorized as English speakers, while those who indicated Spanish and another non-English language were categorized as Spanish speakers.

We created 4 groups for our analysis: Latinos from Spanish-speaking homes, Latinos from English-speaking homes, African Americans from English-speaking homes, and whites from English-speaking homes. We excluded other ethnic groups to focus our comparisons on the #1 white, African American, and Latino children and adolescents. We excluded 6 more patients to restrict our analyses to those who speak either English or Spanish at home (n=405). Each group included patients from multiple clinics.

DEPENDENT VARIABLES

Asthma Management Practices

Pediatric patients or their parents were asked about recommended asthma management practices: peak flow monitoring (‘Do you check your peak flows at home?’), goal setting (‘Did you work with one of your asthma doctors or nurses to set personal goals for your asthma treatment?’), and presence of a written action plan (“Have your asthma doctors or nurses worked with you to develop an asthma action plan so that you know how to take care of your asthma?”) and “Do you have a copy of this plan in writing?”)

Asthma Knowledge

We constructed a measure of asthma knowledge by summing the number of correct answers to 10 questions adapted from the National Asthma Education Program’s asthma knowledge questionnaire. Because parents are involved in the asthma care of younger children, while adolescents are more responsible for their own care, we used parent-reported responses for children aged 2 to 11 years and self-reported responses for adolescents (those aged ≥12 years).

Self-efficacy

For adolescents, self-efficacy for asthma exacerbation management was measured using an adapted version of 2 items from a previously validated asthma self-efficacy scale developed by Bursch et al (Cronbach α = .38). For parents of children aged 2 to 11 years, parent self-efficacy for asthma exacerbation management was measured using an adapted version of 3 items from a previously validated asthma self-efficacy scale developed by Bursch et al (Cronbach α = .66).

Quality of Life

We used the total score from the PedsQL (Pediatric Quality of Life Inventory) 4.0, SF15, a shortened version of the PedsQL 4.0 Generic Core Scale, to measure generic health-related quality of life and the asthma symptoms (11 items) and treatment problems scales (11 items) from the PedsQL 3.0 Asthma Module to assess asthma-specific health-related quality of life. Higher scores on these scales represent better health-related quality of life, fewer asthma symptoms, and fewer treatment problems, respectively. These scales have demonstrated reliability (Cronbach α = .70) and validity in previous analyses.

Impact on Family Functioning

We measured the impact of asthma on family functioning by asking parents 9 questions from an impact-on-family scale.
The adapted scale (Cronbach α=.77; score range, 24-96, consistent with the original scale) included 4 familial/social functioning items, 3 personal strain items, and 2 mastery items. Higher scores on the scale represent greater impact of asthma on family functioning.

**Acute Unplanned Service Use**

Parents were asked to report for the past 6 months the number of times their child went to an emergency department and the number of times their child spent 1 or more nights at the hospital. Acute-care service use was measured by adding hospitalization and emergency department use. We used the term acute to distinguish from planned ambulatory care follow-up visits, which theoretically should prevent acute-care service use. Although we relied on parent reports, strong agreement (>90%) has been observed between medical records and reports of hospitalizations and emergency department use.21,22

**COVARIATES**

We controlled for the effects of the intervention and clinic site and for patient age, patient sex, parent annual income, parent's level of education, patient health plan type, asthma severity, and number of comorbid conditions in the multivariate models. Parent's annual income was categorized as follows: less than $15000, $15000 to $30000, $30001 to $50000, and more than $50000. Parental education was categorized as less than high school or high school graduate or greater. We controlled for health plan type because health care delivery characteristics have been shown to affect asthma care.23,24 Patient health plan was categorized as health maintenance organization, preferred provider organization, fee-for-service, and none. Parents of children aged 2 to 11 years reported on the daily and nocturnal asthma symptoms, and adolescents self-reported on their asthma symptoms. Using this information, pediatric patients were then categorized as having mild intermittent, mild persistent, or moderate/severe persistent asthma according to guidelines from the National Heart, Lung, and Blood Institute.25 We obtained data on comorbid conditions by asking parents if their child had a history of any of the following conditions: diabetes mellitus, chronic lung disease other than asthma, allergies/allergic rhinitis/hay fever, or other serious health problems.

**ANALYSIS**

We used analysis of variance and χ² tests to examine overall differences in sample characteristics. We performed pairwise tests if significant overall effects were found. We used multivariate linear and logistic regression models to examine the effects of race/ethnicity and primary language spoken at home on self-management practices, asthma knowledge and efficacy, and asthma impact on quality of life and family functioning. We modeled each dependent variable as a function of race/ethnicity and primary language spoken at home (Latinos from Spanish-speaking homes, Latinos from English-speaking homes, and African Americans from English-speaking homes, with whites from English-speaking homes as the reference group) and the covariates previously specified. We specifically compared Latinos and African Americans with whites. We also compared Latinos from Spanish-speaking homes with Latinos from English-speaking homes.

Because knowledge is likely to have a strong influence on asthma management behaviors, we examined whether race/ethnicity and language affect the likelihood of responding correctly to individual knowledge items through similar models.

We also explored the relationships between overall knowledge of asthma and self-management, perceived efficacy, and asthma impact on quality of life and family functioning, using multivariate models that included specified covariates, but not the race/ethnicity and language indicators. For all regression models, we calculated standard errors using the Huber correction to account for clustering effects within sites. We estimated adjusted proportions and means for the 4 groups according to the method described by Graubard and Korn,26 using our sample as the standard population and variable estimates from our regression models. If significant knowledge effects were observed for an outcome that was affected by race/ethnicity or language, we also estimated the rates or levels of the outcome after equalizing the level of knowledge across the groups. Few missing values were observed among covariates, but we imputed values for 14 subjects missing parental income using the hotdeck procedure to limit data loss during analysis.27 Analyses were performed using computer software (Stata, version 7.0).28

**RESULTS**

**SAMPLE**

Of the 405 asthmatic children and adolescents, 57.8% were boys, with a mean age of 9.5 years (Table 1). Socioeconomic status was generally modest, but only 7.7% did not have any health insurance. Asthma tended to be mild, but more than half had at least 1 comorbid condition. Age, sex, asthma severity, and overall disease burden were comparable across the 4 race/ethnicity and language groups (Table 1).

However, substantial differences in socioeconomic status were observed. A significantly higher proportion of white parents had an income of more than $30000 and at least some college education relative to African American and Latino parents from either English- or Spanish-speaking homes (P<.05). Income and educational attainment for African American parents were comparable with those of Latino parents from English-speaking homes, but their income was higher than that of Latino parents from Spanish-speaking homes. More Latino children and adolescents from Spanish-speaking homes were uninsured than white, African American, or Latino children and adolescents from English-speaking homes.

**EFFECTS OF RACE/ETHNICITY AND PRIMARY LANGUAGE SPOKEN AT HOME ON ASTHMA MANAGEMENT AND OUTCOMES**

Table 2 presents estimated means and percentages, after adjustment for covariates. Compared with whites, Latinos from Spanish-speaking homes had lower rates of goal setting and peak flow monitoring, poorer asthma knowledge, and higher negative family impact. Rates of goal setting were higher among African Americans relative to whites, but all other asthma management practices and outcomes for African Americans and Latinos from English-speaking homes did not significantly differ from those of whites (P>.13 for all). Compared with Latinos from English-speaking homes, Latinos from Spanish-speaking homes have poorer generic quality of life and
were less likely to monitor their peak flows and have written action plans.

Table 3 presents estimated percentages of a correct response to specific knowledge items, after adjustment for covariates. Knowledge about inhalers, lung monitoring, and whether asthma attacks occur suddenly was low across all groups. However, knowledge about asthma management was particularly poor among Latinos from Spanish-speaking homes. Relative to whites, Spanish-speaking Latinos were significantly less likely to know about correct inhaler use, monitoring lung function, controlling asthma, and exercising, although they were significantly more likely to know about allergens. Latinos from English-speaking homes were significantly less likely than whites, but significantly more likely than Latinos from Spanish-speaking homes, to answer the question on exercise correctly. The knowledge of Latinos from English-speaking homes on many items was also intermediate between non-Latinos and Latinos from Spanish-speaking homes, but these differences were generally not statistically significant. African Americans exhibited knowledge comparable to whites, except for the item on controlling asthma, on which they performed significantly worse.

### ASTHMA KNOWLEDGE AND ASTHMA MANAGEMENT

Greater knowledge is associated with important asthma management practices. For example, each additional correct answer was positively associated with a greater likelihood of peak flow monitoring (adjusted odds ratio, 1.25; 95% confidence interval, 1.06-1.48) ($P < .01$) and higher perceived self-efficacy for managing asthma exacerbations (adjusted difference, 0.12; 95% confidence interval, 0.04-0.20) ($P < .01$). Those with greater knowledge were also more likely to have a written action plan (adjusted odds ratio, 1.21; 95% confidence interval, 1.01-1.45) ($P = .04$). Knowledge was not significantly related to the other outcomes.

**COMMENT**

We found substantial language effects on asthma management practices and outcomes. Across the groups examined in this study, Latino children and adolescents from Spanish-speaking homes had the poorest asthma management practices and outcomes, while African American and Latino children and adolescents from English-speaking homes more closely approximated those of their white peers.

Active management is important for limiting morbidity in children and adolescents with asthma. Yet, lower rates of preventive medication use and higher rates of hospitalizations and emergency department visits have been observed among Latino children and adolescents with asthma. Our study suggests that language barriers likely contribute to the lower levels of asthma knowledge and recommended asthma management practices among Lati-
nos from Spanish-speaking homes. Furthermore, it seems that knowledge deficits about appropriate asthma treatment and management may be one reason for the lower rates of peak flow monitoring observed in our asthmatic sample. A linguistically and culturally tailored asthma education program was shown to increase asthma knowledge, decrease environmental triggers, and increase controller use in Latino families with an asthmatic child.29 Similar programs may be effective for reducing the gaps in asthma management practices and outcomes observed in our study.

That language differences would lead to gaps in knowledge about asthma and appropriate management strategies is expected. However, despite a lower overall level of knowledge, more Latinos from Spanish-speaking homes correctly answered the item on avoiding allergens and were comparable with whites on other questions about environmental triggers. The high rates of correct re-

| Table 2. Adjusted Values for Asthma Management Practices and Outcomes by Race/Ethnicity and Primary Language Spoken at Home* |
|---|---|---|---|---|
| Asthma Management Practices and Outcomes | White and English-Speaking | African American and English-Speaking | Latino and English-Speaking | Latino and Spanish-Speaking |
| Self-management practices† | | | | |
| Goal setting‡ | 59.4 | 74.3§ | 53.3 | 37.6§ |
| Peak flow monitoring | 71.3 | 67.9 | 67.0 | 57.1§|| |
| Written action plan | 43.4 | 41.0 | 39.1 | 26.1|| |
| Intermediate outcomes | | | | |
| Self-efficacy score | 2.6 | 2.8 | 2.5 | 2.3 |
| Overall asthma knowledge score | 7.5 | 7.4 | 6.8 | 6.5§ |
| Impact on family and quality of life | | | | |
| Impact on family functioning | 49 | 51 | 52 | 54§ |
| Generic quality of life | 78 | 77 | 81 | 77|| |
| Asthma-specific symptoms | 72 | 71 | 72 | 72 |
| Asthma-specific treatment problems | 86 | 88 | 84 | 87 |
| Use of emergency services | | | | |
| No. of acute-care visits in the past 6 mo | 1.0 | 0.6 | 0.6 | 1.0 |

*Data are given as means unless otherwise indicated. Higher values for self-management practices indicate better self-care. Higher self-efficacy and knowledge scores indicate greater perceived efficacy for managing asthma exacerbations and greater asthma knowledge, respectively. Higher scores for family functioning indicate greater negative impact on family function, while higher scores for generic quality of life, asthma-specific symptoms, and asthma-specific treatment problems indicate better health-related quality of life. More acute-care visits indicate greater use of emergency services and suggest poorer asthma management. Adjusted statistics for each column are based on a sample of 405 and models that control for child age, child sex, parent education (< high school vs ≥ high school), parental income in the past year ($15 000–$30 000/$30 001–$50 000/$50 000 vs < $50 000 vs < $15 000), child health plan (fee-for-service/preferred provider organization/health maintenance organization vs none), child asthma severity (mild persistent/moderate-severe persistent vs mild intermittent), number of comorbid conditions, intervention status (intervention vs control), site, and clustering within site.

†Data are given as percentage of each group.
‡n = 266 because of missing values for adolescents on outcome.
§P < .05 for the African American and English-speaking, Latino and English-speaking, or Latino and Spanish-speaking group vs the white and English-speaking group, from the multivariate model.
||P < .05 for the Latino and Spanish-speaking group vs the Latino and English-speaking group, from the multivariate model.

| Table 3. Specific Asthma Knowledge by Race/Ethnicity and Primary Language Spoken at Home* |
|---|---|---|---|---|
| Asthma Knowledge Items | White and English-Speaking | African American and English-Speaking | Latino and English-Speaking | Latino and Spanish-Speaking |
| Knowledge about asthma, treatment or management | | | | |
| Short-acting inhalers are not for quick relief of coughing or breathing problems | 39.5 | 33.2 | 18.1 | 11.9† |
| Asthma attacks are harmful or dangerous | 84.7 | 89.0 | 77.6 | 60.3 |
| Asthma attacks rarely occur suddenly without warning | 29.0 | 37.4 | 28.7 | 25.0 |
| People with asthma can monitor how well their lungs are working | 49.9 | 51.1 | 36.5 | 32.3† |
| Asthma cannot be cured, but it can be controlled | 96.4 | 83.1† | 86.9† | 82.7† |
| Keeping calm will help breathing problems from getting worse | 87.8 | 93.0 | 81.5 | 91.3 |
| Knowledge about environmental triggers | | | | |
| Many different things can bring about an asthma attack | 95.4 | 90.9 | 89.2 | 94.4 |
| Being around tobacco smoke can make asthma worse | 96.7 | 95.9 | 95.4 | 97.2 |
| Avoiding causes of allergic reactions helps prevent an asthma attack | 67.6 | 77.6 | 77.7 | 84.6† |
response to these items could reflect experiential learning that took place as asthmatic children and adolescents within Spanish-speaking households were repeatedly exposed to allergens and other environmental triggers. Although we did not assess exposure to household allergens, the Spanish-speaking children and adolescents in our study had a low socioeconomic status and likely resided in poor housing that may regularly expose household members to allergens. In fact, a recent study of 1319 children in the East Harlem neighborhood of New York City found that Puerto Rican children with asthma were more likely than other children with asthma to live in homes with higher indoor environmental risk factors for asthma. These results suggest that, while providers play a crucial role in educating asthma patients about their condition and its management, sources outside the health care system, such as personal experience, can influence patient knowledge and self-care behaviors.

Our results suggest that language substantially affects asthma management practices and outcomes. However, other factors may play a role in some differences. For example, we found that, compared with their white counterparts, the families of Latino children from English- and Spanish-speaking homes were less likely to know that asthmatic children may exercise. Because English-speaking Latino families also demonstrate lower knowledge on this item, it is unlikely that this gap is due to language differences. However, poor provider-patient communication can also stem from incompatible communication styles and incongruent “explanatory models of sickness,” and it is possible that these communication differences contributed to the lower knowledge on this item among the Latino families in our study.

Our study raises the question of the extent to which language effects, often unmeasured, may have affected the results from earlier studies of ethnic variations. If language effects were not explicitly measured, but captured under ethnicity, then the proportion of Spanish to English speakers would directly affect the magnitude of the “Latino” effect, because aggregation of variations within populations can obscure real differences and create differences where none exist. For example, 44% of the 313 Latino parents in the study by Lieu and colleagues reported speaking English at home while 54% reported speaking Spanish. It is unclear how a higher or lower proportion of Spanish-speaking households would have affected their results.

There are several limitations to this study. First, although we controlled for some factors, such as parental income and education, the data are observational and our results may be influenced by unmeasured variables. Second, some respondents who selected the Spanish category may not be monolingual. Furthermore, where data on multiple languages were available, any participant who indicated English and another language was categorized as English-speaking. As a result, our comparisons may underestimate differences between monolingual English and monolingual Spanish households. Direct measurements of English proficiency would provide a more accurate examination of language effects than the primary language spoken at home indicators and should be used for future studies. Third, we do not have information on the language capabilities of treating clinicians. Treatment by language-concordant providers may result in better adherence to self-care practices and outcomes. Earlier studies of urban clinics serving many Latino patients indicated that 32% of adult and 50% of pediatric patients with limited English proficiency did not receive care from a Spanish-speaking clinician. Fourth, we do not have data on the citizenship status or the number of years patients have been in the United States, which is likely related to the primary language spoken at home.

Fifth, several aspects of our study could potentially bias our findings. Our analyses are based on parent and patient reports, which are prone to recall and other response biases. Our telephone survey would miss households without a telephone. However, we are able to estimate an upper bound of the households missed because of lack of a telephone. From the patient list provided by the sites, 11% could not be tracked for any reason. This suggests that most of our target sample did have telephones and that the impact of telephone administration is likely to be limited. Because our participants are drawn from patient lists provided by our sites, our sample consisted mainly of patients with established relationships with their clinic or health care provider (physicians, nurse practitioners, etc). It is possible that the language effects we found may be exacerbated in patients who lack a regular source of care, because language barriers would not be moderated by a stable provider-patient relationship.

Finally, data for these analyses included clinics that were participating in a quality improvement collaborative. These quality improvement efforts could either reduce or exacerbate subgroup differences that naturally exist in routine practice settings. For example, while efforts to enhance patient education may reduce differences across English-speaking groups by increasing asthma knowledge in groups with low initial knowledge, these same efforts might exacerbate differences for English and non-English speakers if the patient education was offered only in English. Future quality improvement efforts may need to include strategies to accommodate the needs of special populations, such as children of recent immigrants and parents with low literacy.

In conclusion, language barriers seem to contribute to poorer asthma management practices and outcomes among Latino children and adolescents, likely by lowering knowledge about asthma management. Efforts to increase asthma knowledge on self-care in this group may improve asthma management practices and limit the morbidity associated with asthma. Future studies should examine whether the language effects observed in this study vary by Latino subgroups.

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