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Prevalence, knowledge and care patterns for gastro-oesophageal reflux disease in United States minority populations.

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Prevalence, Knowledge, and Care Patterns for GERD in U.S. Minority Populations

[running title: GERD in U.S. Minority Populations]

ABSTRACT

Background: While there is evidence of ethnic variation in the prevalence of GERD symptoms, few population based studies examine GERD symptom prevalence amongst the growing Hispanic minority in the U.S. as well as Asians in the West.

Aim: To examine the prevalence, awareness, and care patterns for GERD across different ethnic groups.

Methods: A population-based, cross sectional survey was fielded in English, Chinese and Spanish that assessed self-reported GERD prevalence, awareness, and care patterns in four ethnic groups (Caucasian, Black, Asian, Hispanic).

Results: 1,172 subjects were included for analysis: 34.6% experienced GERD symptoms at least monthly, 26.2% at least weekly, and 8.2% at least daily. Statistically significant differences in raw prevalence rates between racial groups were found: 50% of Hispanics experienced heartburn at least monthly, compared with 37% of whites, 31% of African Americans, and 20% of Asians ($P > .0001$). Significant differences in knowledge and care seeking patterns by ethnicity were also observed.

Conclusions: This study confirms the high prevalence of GERD symptoms in the U.S. and introduces Hispanics as the ethnicity with the highest prevalence rate. Asian-Americans higher rates of symptoms than in the Far East. These data demonstrate a need for culturally appropriate education about GERD symptoms and treatment.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a chronic disorder, most commonly characterized by heartburn and acid regurgitation.^{1,2} There is evidence of ethnic variation in the prevalence of GERD symptoms in many parts of the world. Studies show higher prevalence rates in Western nations (20-40%), particularly amongst Caucasians, when compared to Spain, Italy, and Asian countries.^{3,4,5} Other factors including genetics, demographics, nutritional status, cultural and behavioral influences, have contributed to challenges to diagnosis, resulting in the under- and over-reporting of GERD.^{3,6}

Studies confirm that medical care utilization rates for GERD vary in different countries from 16-56% and between ethnic groups.^{7,8} Medical care was sought when the frequency and severity of symptoms increased impacting quality of life, when self-treatment was ineffective, when concerns about the condition increased which could be resolved with care and prescription medication.^{9,10} In addition, there are strong correlations between psychosocial factors like depression and anxiety and seeking care, which may serve as a catalyst for care rather than an etiology.⁷ Cultural and ethnic factors, e.g. issues of trust, language, literacy and comprehension barriers, influence health-seeking behaviors and may impede accurate and timely diagnosis, particularly where medical terminology is presented in language unfamiliar or unknown to patients.^{6,11,12} Beliefs about self-treating, lack of control of health, modesty, embarrassment, fear of illness and an attitude of fatalism influence decisions to seek care.^{11,8}

In the United States, studies have identified comparable prevalence of GERD among African Americans and Caucasians; lower rates of symptoms were reported in Hispanic, Asian and North American populations.^{13,14} An epidemiological survey of GERD characteristics was conducted of 450 customers (50 surveys/9 stores in different Philadelphia locations) for data

reflecting representative prevalence, knowledge, complications and care seeking behaviors in this urban center.¹⁴ The findings showed similar frequencies of self-reported heartburn among racial groups but acknowledged that the differences are “unknown.”¹⁴ This study found that 90.3% of medically diagnosed participants were familiar with GERD as opposed to 49.8% undiagnosed participants in an urban population although there was minimal familiarity with other known symptoms and complications.¹⁴ Medical information was sought from the media and “word of mouth” more frequently than from healthcare providers.¹⁴ Few prospective population based studies exist that examine GERD symptom prevalence amongst the growing Hispanics and Asians living in the U.S. To better understand the prevalence, knowledge, and health-seeking behaviors among ethnic populations in U.S., we conducted a small population-based observational study with African-Americans, Asians, Hispanics and Caucasians in Philadelphia, Pennsylvania.

METHODS

This observational, cross sectional, population-based study examined the prevalence, awareness, and care patterns for GERD and related symptoms in a large urban setting, specifically assessing disparities across four different ethnic groups. We hypothesized that some of the ethnic minority groups would have higher prevalence of GERD but have less knowledge about GERD and related symptoms. The rationale for conducting the study in the community setting rather than in clinical settings was to assess participants’ knowledge, awareness, and behavioral intent prior to seeking medical care.

Study Population: The study design designated inclusion of 200 adults (≥ 18 years) participants from each of the four ethnic groups: African-American, Asian, Hispanic/Latino, and Caucasian/White attending local community centers or faith-based community activities or

health fair in specific ethnic sections of Philadelphia. We targeted a minimum of 200 in each ethnic group to ensure there were enough representatives from each group for analytical purposes although a power analysis was not conducted. In addition, the recruitment strategy also considered that in many of the recruiting venues, the investigators would not be able to limit recruitment to just one ethnicity and designate specific numbers of surveys to collect.

Survey Methods: This study was conducted in 2007 in Philadelphia, Pennsylvania. To develop our community-based sample, letters (and follow-up calls) were sent to ethnic community and faith-based organizations in ethnically concentrated neighborhoods to identify health events for our data collection.

A questionnaire, adapted from Srinivasan's descriptive survey¹⁴ and Locke's validated instrument¹⁵, was developed that assessed self-reported familiarity with the term GERD, experiencing of heartburn and prevalence, triggers of heartburn and prevalence, diagnosis of GERD, treatment of heartburn, social impact, attitudes about seeking care, knowledge of heartburn/GERD, sources of information symptoms, care seeking behavior, knowledge of complications, and demographic and socioeconomic status.⁸ Our questionnaire, also included ordinal, nominal and Likert questions and was translated into and back-translated from Chinese and Spanish, with translators available to assist participants. The 36-question eight page survey took respondents approximately 15-20 minutes to complete and a \$5.00 gift card was given to respondents upon completion.

The domains of the questionnaire included (1) familiarity with term GERD; (2) prevalence of heartburn; (3) diagnosis of GERD; (4) medication use; (5) social impact; (5) attitudes about seeking care; (6) knowledge about heartburn or GERD; (7) sources of information; (8) beliefs about symptomatic relief for heartburn; (9) beliefs about symptoms

associated with heartburn; (6) intentions for treating heartburn; (7) demographics (including gender, marital status, education, employment status, income, race/ethnicity, weight and height).

Prevalence was based upon terminology included in Srinivasan¹⁴ and Locke¹⁵; and was worded as a ‘burning feeling in my lower chest rising up toward my neck (heartburn).’

Participants were also asked to identify for how long and at what times of the day they had experienced this feeling. Awareness of GERD was assessed by a question that asked if they ever heard of Gastroesophageal Reflux Disease, also known as GERD with the choice of responses as “Yes” or “No.” This question was intended to differentiate an individual’s experience of symptoms (i.e. “a burning feeling”) from their knowledge of the term “GERD.” Other knowledge questions utilized the more generic term “heartburn” and assessed belief(s) about items that would help to control heartburn, symptoms possibly related to heartburn, and actions they would take if they had severe heartburn. A complete copy of the survey is included in the Appendix.

Statistical Methods and Analysis: Survey data were entered into an Access database and checked for completeness; then analyzed using SAS 9.1. Univariate and multivariate analyses were performed. The prevalence for GERD was calculated for each of the four ethnic groups (Caucasian, African American, Asian, Latino) and then compared, controlling for age, gender and other demographic variables. Body Mass Index (BMI) was calculated using self-reported height and weight, and values were checked for statistical outliers. Knowledge, attitudes, and care seeking patterns for GERD symptoms were assessed for those reporting GERD symptoms, and compared in four ethnic populations. The questionnaire featured two separate questions to assess the prevalence of heartburn after the subject had a meal and after the subject went to sleep.

A final measure for prevalence was created that accounted for all subjects who indicated experiencing heartburn either in general, after a meal, and after going to sleep. This measure was created because it became apparent that some participants did not indicate experiencing heartburn for the primary assessment question, but did indicate experiencing heartburn after a meal or after going to sleep. Statistical controls were used to ensure no participant would be counted twice.

We elected to analyze monthly prevalence rates in the logistic regression models based upon consultation with our physicians who determined it was an appropriate time frame to consider. The logistic model considers the impact of racial, socio-demographic, and body mass index variables upon monthly GERD symptoms. We also considered monthly prevalence rates in aggregate and adjusted the raw rates using direct adjustment methods for both age and gender, using U.S. Census data for Philadelphia County as the standard population. We grouped individuals by age in ten-year increments, and considered age and gender for each of the four ethnicity categories.

RESULTS

Demographics (Table 1): Data were collected at 17 community based events and 7 faith-based events. Given the objective of this study was to assess disparities between African, Asian, Hispanic/Latino and Caucasian-White populations, we removed from any further analysis those participants who indicated their racial group to be ‘American Indian or Native American’, ‘Opt Not to Answer’, or a racial combination that did not clearly indicate one of the four target racial groups (40 surveys were excluded, representing 3.3% of N).

A total of 1,212 subjects completed surveys onsite; 1,172 surveys were included in the analysis: African Americans (N=398; 34%), Caucasians (N=312; 27%), Hispanics (N=250, 21%),

and Asians (N=211; 18%). Females constituted 67% of the study population. In self-reported BMI, we found that 32.9% of our populations were overweight, and 31.7% obese, with Blacks and Hispanics reporting the highest proportions of obesity (43.7% and 40.5% respectively).

Population Prevalence (Table 2): We observed differences in population prevalence based upon a positive response to the question ‘I get a burning feeling in my lower chest rising up toward my neck (heartburn).’ Thirty five percent (34.6%) of the subjects experienced GERD symptoms at least monthly, 26.2% at least weekly, and 8.2% at least daily. Statistically significant differences in raw prevalence rates between racial groups were found: 50.0% of Hispanics experienced heartburn at least monthly, compared with 37.0% of whites, 30.8% of African Americans, and 19.9% of Asians ($P>.0001$). This disparity in prevalence across ethnicities was maintained in other GERD symptom frequencies i.e. weekly and daily, $P>.0001$ and $P=.0017$, respectively.

The total unadjusted prevalence rate for heartburn at any frequency across all four racial groups was 46.5%. Here, the crude rate for Hispanics was the highest with 62.4% reporting heartburn at least rarely. Asians had the lowest crude rate with 32.3%. Hispanics were shown to have statistically significantly higher prevalence rates for heartburn across all frequencies when compared to other groups: 50.0% monthly, 38.0% weekly, and 13.6% daily. The racial group reporting the lowest prevalence for heartburn was the Asian group, 19.9% reporting monthly symptoms, 14.7% weekly, and 4.3% daily. Previous population-based and clinically-based studies have varied in how prevalence of GERD frequency was reported, e.g. occasionally, monthly, weekly, or daily.¹⁶ Our study found that irregardless of the frequency used to compare prevalence rates amongst the racial groups, the same relationship trends were seen.

Adjusted Monthly Prevalence: Age and gender differences in prevalence were found between the racial groups. Age and gender-adjusted monthly prevalence rates for heartburn were 47.9% in Hispanics, 36.1% in Caucasians, 26.6% in African Americans, and 20.4% in Asians. The ratios of the age and gender-adjusted rates comparing the unadjusted to adjusted rates (unadjusted/adjusted) for Hispanic, Caucasian, African, and Asian groups were 1.04, 1.02, 1.16, and .97, respectively.

Conditional Prevalence after Eating or Sleeping: The questionnaire featured two separate questions to assess the prevalence of heartburn for all subjects after a meal and after going to sleep. Statistically significant differences were found between the racial groups for both heartburn after a meal and after sleep ($P < .0001$). The rates after a meal were 50.4%, 40.7%, 35.4%, and 27.5% for Hispanics, Whites, Blacks, and Asians, respectively. These rates include all frequencies. The prevalence rate for heartburn after having gone to sleep was lower for all racial groups: 38.1%, 29.6%, 23.4%, and 19.5% for Hispanics, Whites, Blacks and Asians, respectively.

General Occurrence of Heartburn: A final measure for prevalence was created that accounted for all subjects who indicated experiencing heartburn either in general, after a meal, or after going to sleep. The differences between the racial groups using this combined measure were very consistent with the differences in monthly prevalence rates for heartburn in general: 50.4% for Hispanics, 36.3% for Whites, 29.8% for Blacks, and 20.4% for Asians ($P < .0001$).

Multivariate Analysis of Monthly GERD Symptoms: (Table 3): We explored relationships between ethnicity, age, gender, education income and self-reported BMI and monthly GERD symptoms with a logistic regression. In bivariate analyses of age, we observed that younger adults had a lower prevalence rate for heartburn monthly in comparison to all older

age groups, and females had a higher prevalence of heartburn at least monthly when compared to males. However, these differences were not present in multivariate analyses. After controlling for other variables, Asian and Black ethnicities were significantly less likely to have monthly symptoms compared to Whites (OR=0.51 (0.32, 0.80) for Asians and 0.62 (0.44, 0.87) for Blacks); while Hispanics had a significantly greater likelihood of monthly symptoms (OR=1.57 (1.09, 2.27)). Individuals with lower self-reported income were twice as likely to have monthly symptoms (OR=2.00 (1.13, 3.57)). While we observed that very low education and very high education are protective against GERD; nearly half of those with very low education were Asians who were likely recent immigrants. Finally, obese individuals were one and a half times more likely to have monthly symptoms compared to those of healthy weight (OR=1.53 (1.08, 2.16)).

Awareness and Knowledge of GERD (Table 4): We assessed awareness, knowledge, and care seeking patterns for those who had GERD symptoms (N=544). Seventy-four percent (74.4%) of those with GERD symptoms were familiar with the term “Gastro-esophageal Reflux Disease or GERD.” Research team members noted that many participants mentioned they had heard of “Reflux” or “Reflux Disease” and not necessarily “GERD”. Of those with GERD symptoms, 61.0% of males reported familiarity with GERD, compared to 80.2% of females (P<0.0001). While Hispanics had the highest prevalence rate for GERD, their familiarity with GERD was lower (72.4%) than Whites (78.2%) and Asians (74.4%).

Seventy-six percent (76.3%) of those with GERD symptoms believed serious heartburn could lead to ulcers, while 5.6% disagreed. Hispanics were most likely to disagree while Asians were least likely. Forty-five percent (44.9%) of those with GERD symptoms participants believed serious heartburn could lead to cancer, while 19.7% disagreed, and 35.4% were neutral.

Participants across all racial groups were more confident that heartburn could lead to ulcers and less confident that heartburn could lead to cancer.

Nineteen percent (19.1%) of Black and 21.8% Hispanic participants with GERD symptoms falsely believed that lying down for 2-3 hours after eating would actually help to control heartburn, a significantly higher rate than Asians (14.7%) and Whites (9.5%) (P= 0.0263). Less than half of Black and Hispanic participants with GERD symptoms, 46.2% and 45.5% respectively, believed that smaller, more frequent meals might help to control heartburn, far less than Asians (72.1%) and Whites (57.8%) (P=0.0005). Unlike the other racial groups studied, less than half of Asians believed antacids could help to control heartburn (P=0.0001).

Care Seeking Patterns (Table 5): Thirty four percent (33.7%, N=166) of those with GERD symptoms had been diagnosed with GERD by a doctor, and this did not vary significantly by ethnicity. There was no significant difference in diagnosis rates by a doctor between gender, education levels or household income. When asked if they would see a doctor if they had lesser-known symptoms of heartburn responses varied by ethnic groups, with Whites more likely to seek care if they had pain or difficulty swallowing (P=0.428).

Only 9.8% of Blacks with GERD symptoms indicated they learned about heartburn on the Internet, a rate much lower than Asians (23.5%), Hispanics (18.6%), and Whites (21.1%) (P=0.0159). Likewise, Blacks were also least likely amongst racial groups to use the Internet to get more information about heartburn. Asians were least likely to have learned about heartburn from their doctor (52.7%) as well as least likely to go to a doctor to get more information about heartburn (70.6%). Forty-one percent (40.8%) of whites learned about heartburn from television ads, compared to 25.0% of Hispanics, 37.0% of Blacks, and 16.2% of Asians (P=0.0003).

However, Blacks were significantly more likely to depend on television ads for more information about heartburn compared to other racial groups (P=0.0003).

In the case of experiencing severe heartburn, Hispanics with GERD symptoms were more likely to go to a health clinic (28.9%) compared to Blacks (24.3%) Asians (20.6%), and Whites (12.2%) (P=0.0045). Blacks and Hispanics were also significantly more likely to go the emergency room for severe heartburn (37.6% and 28.9%, respectively) compared to Asians (19.1%) and Whites (16.3%) (P=0.0001). Furthermore, Hispanics were most likely to see specialist for heartburn (P=0.0293) and consider surgical procedures for heartburn (P=0.0033).

Forty two percent (41.8%) of Asians and 35.7% of Hispanics with GERD symptoms indicated that cost and the lack of health insurance would prevent them from seeing a doctor, higher rates than Whites and Blacks, although this was not significant. Hispanics were more likely than the other racial groups to avoid going see a doctor due to not being able to take time away from work (P=0.0142) or family (P=0.0067). One third (33.8%) of Hispanics with GERD symptoms stated 'fear or anxiety about going to the doctor' would prevent them from seeing a doctor, a rate significantly higher than other groups (P<0.0001).

DISCUSSION

Our population-based community study explored the prevalence, knowledge and health-seeking behaviors of African-American, Hispanic/Latino, Asian and Caucasian/White populations in Philadelphia. Data were solicited at community and faith-based organizational centers and health fairs through self-reported surveys.

All four ethnic groups reported experiencing heartburn, at least rarely. The prevalence rates for Caucasians and African-Americans were consistent with other published reports.² However, Hispanics reported the highest prevalence rates across all frequencies which were

significantly higher than the other ethnic populations and higher than reported rates in the literature.³ The higher rates in Caucasians and African Americans compared to Asians are consistent with the literature citing a higher prevalence in Western populations than Asian countries.¹⁶ The prevalence rates for the Asian population were the lowest in this study, but higher than reported rates in East Asian countries.^{17, 18, 19} There were significant differences between ethnicities in their familiarity with “GERD”. Although Hispanics had the highest prevalence of heartburn, their familiarity with the term GERD was lower compared to African-Americans and Caucasians with Asians having the least familiarity with GERD.

Hispanics in this study had the highest rate of diagnosis and were more likely to seek care at a health clinic compared to the other ethnic groups. Among all of the identified treatment options, Hispanics identified “see my doctor” more frequently than the other options including “take OTC”, “go to a health clinic” and “go to an alternative medicine provider.” This is consistent with studies reporting Hispanics choosing traditional care when concerned about the seriousness of a health condition. Fear or anxiety about going to the doctor, inability to take time from work or family were more significant deterrents for Hispanics than other groups. Cost, lack of health insurance and transportation were barriers as well. Television advertisements were the source of information about heartburn for Hispanics. While many Hispanics correctly identified behaviors to help control heartburn, other behaviors known to exacerbate heartburn were incorrectly identified as well.

Based upon the respective prevalence rates, the data reflect a need for education about GERD for all populations. The prevalence rates for Asian Americans, while consistent in having the lowest rate among ethnic groups, was higher than the generally reported rate for Asians in Far East countries. The physical, psychological, social and economic impacts of GERD are

significant as are associated complications. Increased knowledge will not only alert patients to symptoms which may be indicative of GERD, but will inform necessary behavioral changes including dietary, substance use, knowing how to avoid and reduce the severity of symptoms, taking appropriate medications and seeking professional medical care at an earlier time. The need is most pressing in the Hispanic population reflected by the associated prevalence rate. Even though Latinos reported GERD symptoms more frequently, they are less aware of GERD as a disease. This lack of knowledge regarding GERD may delay their seeking treatment until symptoms are severe.

Education about GERD must be provided at medical visits and in the community. Soliciting information about classic and associated symptoms will raise patient awareness about symptoms they may attribute to indigestion or seemingly insignificant disorders. A thorough medication history of all prescribed, OTC, and alternative/home remedies may also provide a window of opportunity to assess concurrent GERD-like symptoms and intervene. Utilization of a validated culturally-sensitive questionnaire with words and graphics will facilitate communication about symptoms and treatment.⁸ Healthcare providers should also educate patients at routine visits about the symptoms and treatment of GERD. Education should include identification of risk factors and triggers, symptoms associated with GERD, dietary and life-style modifications for reducing the severity and frequency of symptoms, appropriate OTC medications, and guidelines for seeking care.

Limitations: There are a number of limitations with our study specific to subject definition, selection and exploration of physiological, psychological and social reasons for differences among ethnicities. The study was designed to obtain unsolicited feedback at a community level from members of the African-American, Hispanic/Latino, Asian, and

Caucasian/White communities in selected ethnic neighborhoods in Philadelphia. In order to meet our targeted number of subjects per group, certain neighborhoods were specifically selected, possibly resulting in selection bias. Additionally, to achieve the targeted 200 subjects per group, the study was conducted at community and faith-based facilities and affiliated health fairs held in various locations, possibly resulting in selection bias with participants seeking health information. Age was the only “inclusion” criterion. There was no randomization in selection of participants or control groups for this survey seeking as large a response rate as possible. We acknowledge that the results of this survey may be limited in their generalizability, although we have adjusted prevalence rates were adjusted by age and gender within ethnicity using U.S. Census data for Philadelphia County in 2000. This study anecdotally documents important differences in awareness and care seeking behaviors between racial groups, and lays the ground for future work that more definitively reports on trends for these groups.

The study instrument was an 8 page, 34 question survey adapted from a population-based observational epidemiological validated instrument with English, Spanish and Chinese versions and translators to assist with comprehension.¹⁴ Although all translators were healthcare providers who are cognizant of survey research, we cannot be certain that they did not lead respondents in responding to the survey. Some of the limitations of the design include the necessity for the participant to be literate or have a literate companion assist with comprehension and the limitation of Asian participants to be able to read English and/or Chinese, possibly restricting the participation of the Asian community.

Additionally the data provided were self-reported without the benefits of soliciting a health history or medical records. Ethnicity was also self-selected by participants. If subjects did not identify themselves as a member of the African-American, Hispanic/Latino, Asian or

Caucasian/White population, their data were excluded from the analysis. This would include people who consider themselves “biracial” or multi-ethnic. Additionally, the study design and questionnaire did not accommodate for considering physiological, psychological and social reasons for differences among ethnicities.

Summary: The results of our study show that all four ethnic groups experienced heartburn, at least rarely. GERD symptoms are more frequent in Hispanic Americans and lower in Asians living in the U.S. compared to other ethnic groups. Prevalence rates for Black and White populations in this study were similar to findings in other population-based studies in Western countries. The reasons for these ethnic disparities require further study. We have identified additional areas of future research that might explore factors which contribute to GERD as well as effective health promotion strategies to reduce the prevalence of GERD in all populations. Reasons for the increase in prevalence of GERD in Asian-Americans compared to population-based studies in the Far East require investigation. The data from our study confirm existing prevalence trends, highlights new findings, informs clinical practitioners about the attitudes and behaviors impacting health seeking behaviors and identifies opportunities for education in the clinical and community settings.

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REFERENCES

1. Dent J, Armstrong D, Delaney B, et al. Symptom evaluation in reflux disease: workshop background, processes, terminology, recommendations, and discussion outputs. *Gut* 2004;53 Suppl 4(iv):1-24.
2. Moayyedi P, Axon ATR. Review article: gastro-oesophageal reflux disease- the extent of the problem. *Aliment Pharmacol Ther* 2005;22(Suppl 1):11-9.
3. Diaz-Rubio M, Moreno-Elola-Olaso C, Rey E, et al. Symptoms of gastro-oesophageal reflux: prevalence, severity, duration and associated factors in a Spanish population. *Aliment Pharmacol Ther* 2004;19:95-105.
4. Delaney BC. Review article: prevalence and epidemiology of gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2004;20(Suppl 8):2-4.
5. Bonatti H, Achem SR, Hinder RA. Impact of changing epidemiology of gastroesophageal reflux disease on its diagnosis and treatment. *J Gastrointest Surg* 2008;12:373-81.
6. Vakil N, van Zanten SV, Kahrilas P, et al. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. *Amer J Gastroenterol* 2006;101:1900-1920.
7. Wong WM, Lai KC, Lam KF, et al. Prevalence, clinical spectrum and health care utilization of gastro-oesophageal reflux disease in a Chinese population: a population-based study. *Aliment Pharmacol Ther* 2003;18:595-604.
8. Zuckerman MJ, Guerra LG, Drossman DA, et al. Health-care seeking behaviors related to bowel complaints: Hispanics versus non-Hispanic Whites. *Dig Dis Sci* 1996; 41:77-82.
9. Ducrotte P, Liker HR. How do people with gastro-oesophageal reflux disease perceive their disease? Results of a multinational survey. *Cur Med Res Opinion* 2007;23(11):2857-2865.

10. Liker H, Hungin P, Wilund I. Managing gastroesophageal reflux disease in primary care: the patient perspective. *J Am Board Fam Pract* 2005;18:393-400.
11. Larkey LK, Hecht ML, Miller K, et al. Hispanic cultural norms for health-seeking behaviors in the face of symptoms. *Health Education & Behavior* 2001;28:65-80.
12. Garces IC, Scarinci IC, Harrison L. An examination of sociocultural factors associated with health and health care seeking among Latina immigrants. *J Immigrant Health* 2006;8:377-385.
13. El-Serag HB, Petersen NJ, Carter J, Graham DY, Richardson P, Genta RM, Rabeneck L. Gastroesophageal reflux among different racial groups in the United States. *Gastroenterol* 2004;126:1692-1699.
14. Srinivasan R, Tutuian R, Schoenfeld P, et al. Profile of GERD in the adult population of a north east urban community. *J Clin Gastroenterology* 2004;38(8):651-657.
15. Locke GR, Talley NJ, Weaver AL, et al. A new questionnaire for gastroesophageal reflux disease. *Mayo Clin Proc* 1994;69:539-547.
16. Kang JY. Systematic review: geographical and ethnic differences in gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2004;20:705-717.
17. Goh K-L. Gastroesophageal reflux disease (GERD) in the East- same as the West. *J Clin Gastroenterol* 2007;41(Suppl 2):S54-S58.
18. Ho KY, Kang JY, Seow A. Patterns of consultation and treatment for heartburn: findings from a Singaporean community survey. *Aliment Pharmacol Ther* 1999;13:1029-1033.
19. Fujiwara Y, Higuchi K, Watanabe Y, et al. Prevalence of gastroesophageal reflux disease and gastroesophageal reflux disease symptoms in Japan. *J Gastroenterology & Hepatology* 2005;20:26-29.
20. Jones R, Galmiche JP. Review: what do we mean by GERD? - definition and diagnosis. *Aliment*

Pharmacol Ther 2005;22(Suppl 1):2-10.

Table 1: Study Population Demographics*

	ALL	Asian	Black	Hispanic	White
TOTAL N	1,172	211	398	250	312
Age Group (N=1,170)					
18-34 years	32.8%	33.5%	26.3%	40.8%	34.3%
35-44 years	18.1%	13.9%	20.3%	24.8%	12.8%
44-54 years	21.2%	14.4%	27.8%	18.0%	19.9%
55+ years	27.9%	38.3%	25.6%	16.4%	33.0%
Education (N=1,164)					
Up to grade 9	7.0%	18.3%	0.8%	12.5%	3.6%
HS graduate	39.5%	18.8%	45.2%	41.9%	44.2%
College or more	53.4%	63.0%	54.0%	45.6%	52.3%
Household income (N=1,144)					
< \$25K	50.4%	51.2%	45.9%	57.4%	50.2%
\$25-\$50 K	30.6%	21.2%	39.0%	28.7%	27.5%
\$50-\$80 K	10.3%	9.9%	10.5%	8.2%	12.1%
> \$80 K	8.7%	17.7%	4.6%	5.7%	10.2%
Gender (N=1,170)					
Male	32.7%	38.1%	28.4%	28.8%	37.5%
Female	67.3%	61.9%	71.6%	71.2%	62.5%
Body Mass Index (N=1,124)					
Underweight	2.7%	8.6%	1.3%	1.3%	2.0%
Healthy weight	32.7%	57.9%	23.3%	23.2%	35.6%
Overweight	32.9%	26.4%	31.8%	35.0%	37.0%
Obese	31.7%	7.1%	43.7%	40.5%	25.4%

*total N varies due to missing values

Table 2: Heartburn by Racial Group and Frequency

Heartburn frequency	ALL	Asian	Black	Hispanic	White	P value
TOTAL N	1,172	211	398	250	312	
Crude rates based upon positive response to ‘I get a burning feeling in my lower chest rising up toward my neck (heartburn).’						
Any Freq	46.5%	32.2%	43.4%	62.4%	47.3%	<0.0001
≥ Monthly	34.6%	19.9%	30.8%	50.0%	37.0%	<0.0001
≥ Weekly	26.2%	14.7%	22.1%	38.0%	29.9%	<0.0001
≥ Daily	8.2%	4.3%	6.8%	13.6%	8.4%	0.0017
≥ Monthly Adjusted rates*		20.4%	26.6%	47.9%	36.1%	
Conditional prevalence**						
After Meals	38.6%	27.5%	35.4%	50.4%	40.7%	<0.0001
After Sleep	27.4%	19.5%	23.4%	38.1%	29.6%	<0.0001
≥ Monthly General Occurrence of heartburn***	34.2%	20.4%	29.8%	50.4%	36.3%	<0.0001

*adjusted by age and gender, direct method, using Philadelphia County 2000 Census

**conditional prevalence based on a yes/no response to questions “After a meal, I get a burning feeling in my lower chest rising up toward my neck (heartburn)” and “After I go to sleep I get a burning in my lower chest rising up toward my neck”

***≥ monthly general occurrence of heartburn based on an indication of monthly symptoms of heartburn in general OR after a meal or after going to sleep.

Table 3: Logistic Regression of Monthly GERD Symptoms

Variable	Odds Ratio	95% CI
Ethnicity (reference=White)		
Asian	0.51	0.32, 0.80
Black	0.62	0.44, 0.87
Hispanic	1.57	1.09, 2.27
Age Group (reference=55 plus yrs)		
18-34 years	0.73	0.51, 1.04
35-44 years	1.44	0.97, 2.13
45-54 years	1.38	0.95, 1.99
Male gender	0.76	0.58, 1.01
Education (reference=9-12 grade)		
Up to 9 th grade	0.59	0.34, 1.04
College or more	0.71	0.53, 0.96
Income (reference= >\$80K)		
Less than \$25K	2.00	1.13, 3.57
\$25K to \$50K	1.42	0.80, 2.53
\$50K to \$80K	1.85	0.97, 3.54
BMI (reference=Healthy weight)		
Underweight	0.67	0.26, 1.75
Overweight	0.97	0.69, 1.37
Obese	1.53	1.08, 2.16

Table 4: Awareness and Knowledge of GERD by Racial Group

	ALL	Asian	Black	Hispan.	White	P value
TOTAL N	544	68	172	156	147	
Heard of GERD	74.4%	75.0%	72.7%	72.4%	78.2%	0.6301
Serious Heartburn Can Lead to Ulcers						
% Strongly Agree/Agree	76.3%	79.4%	77.1%	80.1%	70.1%	0.0918
% Neutral	18.1%	19.1%	17.7%	12.2%	24.5%	
%Disagree/Strongly Disagree	5.6%	1.5%	5.3%	7.7%	5.4%	
Serious Heartburn Can Lead to Cancer						
% Strongly Agree/Agree	44.8%	47.0%	40.2%	54.8%	38.8%	0.0722
% Neutral	35.4%	37.9%	37.3%	30.3%	37.4%	
%Disagree/Strongly Disagree	19.7%	15.1%	22.5%	14.8%	23.8%	
I believe the following will help control heartburn						
Sleeping with head of bed raised	43.9%	36.8%	36.4%	48.7%	51.0%	0.0200
Wearing loose fitting clothing	18.9%	27.9%	15.6%	18.6%	19.1%	0.1827
Having smaller more frequent meals	52.4%	72.1%	46.2%	45.5%	57.8%	0.0005
Choosing a low-fat diet	48.5%	45.6%	49.1%	57.1%	40.1%	0.0301
Taking an antacid	62.7%	42.7%	58.4%	66.7%	72.8%	0.0001
Avoiding fried foods	61.6%	51.5%	62.4%	62.8%	64.0%	0.3287
Lying down for 2-3 hours after eating	16.7%	14.7%	19.1%	21.8%	9.5%	0.0263

Table 5: Care Seeking Patterns for GERD by Racial Group

	ALL	Asian	Black	Hispan.	White	P value
TOTAL N	544	68	172	156	147	
Diagnosed by doctor	33.7%	30.7%	29.8%	37.9%	35.6%	0.4471
If you had the following experiences, would you see a doctor?						
Pain or Difficulty Swallowing	79.1%	67.2%	79.7%	79.0%	84.3%	0.0428
Frequent Vomiting	69.5%	67.2%	71.7%	65.6%	72.0%	0.5533
Feel Full After Eating	40.0%	34.3%	38.8%	44.1%	39.7%	0.5621
Chronic Hoarseness/Breathing Problems	79.9%	64.2%	71.4%	74.7%	73.3%	0.4384
If I had severe heartburn, I would						
Take OTC medications	44.1%	38.2%	41.6%	42.3%	51.7%	0.1697
See my doctor	81.8%	76.5%	83.8%	85.3%	78.2%	0.2329
Go to a health clinic	21.9%	20.6%	24.3%	28.9%	12.2%	0.0045
Go to an alternative/natural/complimentary medicine provider	9.6%	11.8%	7.5%	16.0%	4.1%	0.0031
Go to an emergency room	27.0%	19.1%	37.6%	28.9%	16.3%	0.0001
Go to a medical specialist in heartburn	27.6%	23.5%	28.3%	35.3%	20.4%	0.0293
Ask about surgical procedures for treatment	7.1%	2.9%	5.8%	13.5%	4.1%	0.0033

Table 5: Care Seeking Patterns for GERD by Racial Group (continued)

	ALL	Asian	Black	Hispan.	White	P value
TOTAL N	544	68	172	156	147	
I have learned about heartburn from the following sources						
My doctor	58.1%	52.9%	57.8%	65.4%	53.1%	0.1280
My pharmacist	14.9%	10.3%	17.3%	14.1%	15.0%	0.5661
My family	37.0%	19.1%	28.9%	49.4%	41.5%	<0.0001
Friends / co-workers	29.0%	27.9	23.1%	31.4%	34.0	0.1598
Advertisements	45.8%	27.9%	43.4%	51.3%	51.0%	0.0054
The internet	17.1%	23.5%	9.8%	18.6%	21.1%	0.0159
Books / magazine articles	30.5%	32.4%	28.9%	30.1%	32.0%	0.9235
Medical literature	29.4%	22.1%	33.5%	23.7%	34.0%	0.0683
Alternative health sources	8.3%	5.9%	8.1%	7.1%	10.9%	0.5423
Issues that prevent you from seeing a doctor if you had heartburn symptoms						
No Health Insurance	24.4%	41.8%	29.7%	35.7%	35.4%	0.3185
Can't take time from work	29.8%	35.4%	21.8%	37.5%	28.8%	0.0142
Can't take time from family	19.0%	19.7%	13.0%	27.8%	16.4%	0.0067
Don't have transportation	24.7%	21.5%	23.5%	27.2%	25.2%	0.8067
Anxiety about seeing doctor	23.2%	22.7%	11.7%	33.8%	26.0%	<0.0001
Personal beliefs on healthcare	15.4%	21.9%	12.4%	19.7%	11.6%	0.0706