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## Can a gastric cancer risk survey identify high-risk patients for endoscopic screening? A pilot study

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### ABSTRACT

**Background:** A questionnaire that distinguishes how variability in gastric cancer prevalence is associated with ethnicity/birth country/immigration/cultural diet along with known risk factors may improve targeting populations for gastric cancer screening in the United States. **Methods:** Existing literature was used to identify the item pool. Cluster analysis, focus groups, and cognitive interviewing were used to reduce collinear items and refine the questionnaire. Logistic regression analysis was used to determine which items distinguished gastric cancer cases from the primary care and community controls.

**Results:** The results of analysis of data from 40 cases and 100 controls (primary care = 47; community = 53) were used to reduce the 227 item pool to 12 items. After ranking these variables using model bootstrapping, a logistic regression model using the highest ranked eight variables was chosen as the final model. Older age, foreign nativity, daily consumption of cultural food at ages 15-18, less than high-school education, and greater acculturation were significantly associated with being a gastric cancer case compared with the controls.

**Conclusions:** An eight-item survey that addresses gastric cancer risk factors, ethnicity, cultural habits, and immigration patterns has potential to identify high-risk persons from multicultural areas within the US, who might benefit from endoscopic screening for gastric cancer.

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### Introduction

Gastric adenocarcinoma is the fifth most common cancer and third leading cause of cancer mortality in the world, with an estimated 723,000 deaths in 2012.<sup>1</sup> In the United States (US), gastric cancer is one of the deadliest cancers ranking only

behind lung, pancreas, and esophageal cancer.<sup>2</sup> Screening for gastric cancer has been shown to be effective and attributes a 30%-60% decrease in gastric cancer mortality in countries with national gastric cancer screening programs.<sup>3-5</sup> Despite the success of gastric cancer screening programs in high-incidence countries, screening for gastric cancer is not

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performed in the US due to the low incidence rate of the disease (3.9 cases per 100,000 in the general population).<sup>1</sup>

In a low-incidence region such as the US, screening persons at higher risk would make screening feasible.<sup>6</sup> Methods to identify persons at risk should be easy to administer and applicable in both health care and community settings. There are many well-known risk factors for gastric cancer, including diet, lifestyle, older age, gender, race, tobacco smoking, radiation, family history, *Helicobacter pylori* infection, low socioeconomic status, high intake of salty and smoked foods, low consumption of fruits and vegetables, obesity, and gastroesophageal reflux disease.<sup>7,8</sup> However, little is known about which of these variables will be most contributory in the discrimination of gastric cancer risk in the US with its extraordinary ethnic and racially diverse population.

Racial and ethnic minorities represent 38.3% of the total US population.<sup>9</sup> Among these groups, there is large variation in gastric cancer incidence. African-Americans, Hispanics, Asians, and Pacific Islanders (PIs) have 1.7- to 2.0-fold higher incidence than Whites.<sup>10-12</sup> Foreign-born immigrants from high-incidence countries continue to have a higher risk of gastric cancer even after immigration.<sup>13-16</sup> Yet, few studies have examined gastric cancer risk factors across the various ethnicities and racial subgroups in the US. In addition, there are few studies evaluating country of birth, immigration, and cultural dietary habits as risk factors among various ethnic subgroups in the US. These factors, in combination with known risk factors, may help identify a subpopulation at elevated risk that might benefit from gastric cancer screening.

To this end, our ultimate long-term goal is to develop a short prescreening questionnaire that can be used in both the community setting and health-care settings to identify persons at high risk for gastric cancer so they can undergo screening endoscopy. As a preliminary step to a population-based, case-control study of gastric cancer risk factors in the US, we developed and pilot tested a risk-assessment questionnaire. The aims of the present pilot case-control study were to (1) develop the item pool to assess gastric cancer risk in the US, (2) establish and test the procedures for optimal case and control ascertainment, and (3) analyze the pilot case-control data that were obtained in two health-care sites serving racially and ethnically diverse patient populations.

## Methods

### Materials and process

Exposure was assessed through information collected from a comprehensive questionnaire created specifically for this purpose. The details of the questionnaire development process are provided in [Appendix 1](#). A literature review was conducted to design a questionnaire to collect data on known risk factors for gastric cancer. A preliminary draft of the questionnaire was reviewed and modified through focus groups for the comprehensibility of survey questions. Risk factors assessed included demographics, race, socioeconomic status, food frequency, smoking and alcohol habits, family history, and *H pylori* exposure, as well as less well-studied factors that have potential to be highly discriminating in a

multicultural country such as the US, including ethnicity, country of birth, acculturation index, and lifetime ethnic dietary habits. A complete list of risk factors, references, and questionnaires used to create the questionnaire is shown in [Table 1](#). The questionnaire then went through a process of translation and back-translation into Spanish, Mandarin Chinese, and Korean. Cognitive interviews were used to test comprehension of the questionnaire in different ethnic populations and ensure items carried the same meaning across languages.

### Case-control selection

A pilot case-control study was conducted using the final version of the questionnaire to examine the feasibility of recruiting participants in primary care (PC-controls) and community settings (community control) and to identify questionnaire items that distinguish gastric cancer cases from noncancer controls. A patient list of persons with gastric cancer and persons served in primary care clinics was obtained from two sites, a large urban academic medical center and an inner city public hospital. Both serve a large population of ethnic minorities. After excluding subjects who did not meet age and health-related eligibility criteria, invitation mailings were sent to eligible recruits providing study details and the opportunity to opt out if they did not wish to participate. Patients who did not opt out were contacted by phone for participation. PC-control phone recruitment proved problematic, and recruitment strategy was expanded to direct clinic recruitment for the remaining two-thirds of the PC-controls. Verbal or written informed consent was obtained from all study participants. Participants were initially asked to complete survey questions by telephone interview. This was modified to include paper survey administration about midway in the study. The study protocol was approved by the institutional review boards of each site.

Inclusion criteria for the cases and controls were as follows: (1) age: 40-85 y, (2) mental and physical ability to participate, (3) no prior cancer diagnosis (other than gastric cancer or nonmelanoma skin cancers), (4) no prior diagnosis that requires endoscopic surveillance (Barrett's esophagus, esophageal or gastric adenoma, gastric ulcer, and so forth), and (4) no known personal or family history of genetic syndromes associated with higher risk of gastric cancer (i.e., hereditary diffuse gastric cancer, Peutz-Jeghers syndrome, familial adenomatous polyposis, hereditary nonpolyposis colorectal cancer, and Li-Fraumeni syndrome). Cases also needed to meet the following criterion: diagnosed with biopsy-proven gastric adenocarcinoma in the last 5 y.

A database was created for data input using SurveyMonkey (San Mateo, CA). Interview staff entered phone interview responses directly into the database at the time of interview. Paper surveys were collected and separately entered into the database.

### Statistical analysis

Our primary goal of this pilot analysis was to see if it is feasible to develop a logistic regression model to distinguish cases from controls. The cognitive interview data ( $n = 60$ ) were

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