

## CLINICAL PRACTICE

# Behavioral Risk Factor and Preventive Health Care Practice Survey of Immigrants in the Emergency Department

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## Abstract

**Objective:** To compare the demographic profiles, behavioral risk factors, and preventive health care practices of adult immigrant and non-immigrant patients while considering the effects of various socioeconomic variables.

**Methods:** This was a prospective survey administered at a large urban emergency department in New York City. Study subjects were adult immigrant patients presenting in an eight-week period in 1998. One non-immigrant control patient was recruited concurrently with every two immigrant patients. Differences between immigrants and non-immigrants were evaluated using the chi-square test. Multivariate logistic regression models were used to adjust for confounding variables. **Results:** Eight hundred sixty-nine immigrant patients from 80 countries and 354 non-immigrant patients completed surveys. Immigrants were more likely not to have reached high school (28.9% vs 8.5%;  $p < 0.001$ ), to have annual family incomes less than \$20,000 (73.8% vs 64.5%;  $p < 0.01$ ), and to have no health coverage (51.7% vs 30.8%;  $p < 0.001$ ). Immigrant women were more likely never to have had a Papanicolaou test (16.1% vs 1.4%; OR 11.24, 95% CI = 2.70 to 46.8) and never to have performed a self-breast examination (20.8% vs 7.5%; OR 2.03, 95% CI = 1.29 to 3.20). Immigrants were more likely not to use condoms (63.4%

vs 42.8%; OR 1.61, 95% CI = 1.20 to 2.15) and never to have visited a dentist (21.2% vs 7.8%; OR 2.54, 95% CI = 1.60 to 4.04). Immigrants were more likely never to have received a purified protein derivative (PPD) skin test (30.3% vs 9.1%; OR 3.85, 95% CI = 2.56 to 5.80) and never to have received a tetanus immunization (48.1% vs 13.5%; OR 3.09, 95% CI = 2.17 to 4.42). These differences were independent of age, gender, marital status, employment, education, income, and health insurance status. When analyzing the immigrant group alone, region of origin, length of time in the United States, and English ability were significant independent predictors of higher-risk behavioral profiles and poor preventive health care practices. **Conclusions:** Differences exist between the socioeconomic profiles, behavioral risk profiles, and preventive health care practices of immigrant and non-immigrant patients presenting to a large inner-city municipal emergency department. Different populations within a heterogeneous group of immigrants have distinct health risks and public health needs. **Key words:** immigrants; behavior; risk factors; prevention; public health. *ACADEMIC EMERGENCY MEDICINE* 2002; 9: 599–608.

In July 2002, the foreign-born population of the United States was expected to reach 28.4 million, or 10.1% of the total U.S. population.<sup>1</sup> This is an increase from just under 20 million (7.9%) foreign-born residents in 1990.<sup>2</sup> In addition, more than 6.3 million illegal immigrants are currently estimated to be residing in the United States.<sup>3</sup> Recent federal legislation, including the 1996 Personal Responsibility and Work Opportunity Reconciliation Act and the 1996 Illegal Immigration Reform and Immigration Responsibility Act, has placed strict lim-

its on the ability of immigrants to access federal and state benefit programs such as Medicaid, food stamps, and Supplemental Security Income.<sup>4</sup> Between 1994 and 1997, use of public assistance programs by immigrant households declined 35%, while use by non-immigrant households fell only 14%.<sup>5</sup> These changes occurred despite the lower average incomes and higher poverty rates of immigrants relative to their native counterparts.<sup>6</sup>

The only health care “rights” available to all persons, regardless of immigration status, are access to emergency medical services and “public health assistance for immunizations and treatment of communicable diseases.”<sup>7</sup> The emergency department (ED) is thus the only component of the medical and social welfare systems legislated to be available for many of the most disadvantaged.<sup>8</sup> Immigrants of low-income households are increasingly forced to use EDs not only for emergencies, but also to meet their primary care needs.<sup>9–13</sup>

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Recent studies suggest that differences exist between the behavioral, medical, and social profiles of specific ethnic groups and the general population.<sup>14,15</sup> For example, Korean Americans (immigrants and non-immigrants) surveyed in Alameda County, California, were less likely than the overall California population to have received routine breast examinations, hypertension screening, Papanicolaou (Pap) tests, and mammography.<sup>14</sup> Confounding variables such as level of education, income, length of stay in the United States, language, and insurance status, however, were not systematically assessed in these studies. To the best of our knowledge, no published study in the emergency medicine literature has addressed the broader impact of an increasingly large and diverse population of immigrant patients on the EDs and health care system.

The objective of this study was to describe differences in demographic profiles, behavioral risk factors, and preventive health care practices of adult immigrant and non-immigrant patients of varying ethnicities presenting to a large inner-city ED.

## METHODS

**Study Design.** A prospective 53-item survey was administered by trained research assistants in the Bellevue Hospital ED. This study was performed with the approval of, and in accordance with, the guidelines of the institutional review boards of Bellevue Hospital Center and New York University Medical Center. Verbal consent was obtained.

**Study Setting and Population.** All immigrant patients more than 18 years of age presenting to the adult ED from June 29 to August 24, 1998, between 12 PM and 12 AM were approached for interview. For every two consenting immigrants interviewed, interviewers independently selected one non-immigrant patient present anywhere in the ED at that time to serve as a control.

For this study, "immigrant" is defined as an adult born outside of the contiguous United States, Hawaii, or Alaska, without regard to length of residence in the United States or citizenship status. Because of differences in culture and language, Puerto Ricans were included as "immigrants" under this definition, despite their legal status as U.S. citizens. Tourists, critically ill patients, patients with altered mental status, and patients triaged directly to the obstetric or psychiatric departments were excluded.

**Survey Content and Administration.** Surveys were translated into Spanish and Chinese to be admin-

istered by assistants who spoke those languages; hospital interpreters were used for other languages. All data were confidentially collected. Survey questions included demographics, health and fitness, immunizations, routine medical examinations, ED visits, dental care, alcohol and tobacco use, sexually transmitted diseases, women's health, and injury prevention. Patients reported their annual family income by \$10,000 increments, with the highest category "\$50,001 or more." Patients were prompted for their highest level of education—grade school, junior high school, high school, college, and graduate school. Finally, patients reported their health insurance status as "none/self-pay," "Medicare/Medicaid," or "HMO/private insurance." At the end of survey, interviewers rated each patient's language skills as excellent, good, or poor. Questions regarding legal immigration status were not asked.

**Data Analysis.** Data were entered into Epi Info 6, a database/statistics package obtained from the Centers for Disease Control and Prevention (CDC) web page.<sup>16</sup> Differences between the immigrant and non-immigrant groups were evaluated using the two-sample t-test for continuous variables, and the chi-square test for categorical variables. Because the main outcome variables were dichotomous, multivariate logistic regression models were also fit to adjust for the following confounders: age, number of children, gender, marital status (married vs not married), employment status (employed vs not employed), education (less than high school vs high school or more), annual family income (less than \$20,000 vs \$20,000 or more), and health insurance status (health coverage vs no health coverage).

Demographic characteristics were compared between different regions within the immigrant group using analysis of variance for continuous variables and logistic regression models for binary variables. Regional contrasts were specified within each statistical procedure to evaluate pairwise comparisons. Within the immigrant population, further multivariate analyses were performed to identify significant independent predictors of behavioral risk factors and preventive health care practices. The following variables were considered: region of origin (Asia, Europe, Latin America, Caribbean, and Other); length of stay in the United States (grouped into tertiles: <8 years, 8–20 years, and >20 years); level of education; English language ability; annual family income; insurance status; age; gender; marital status; number of children; and employment status.

For each outcome, the final multivariate model was determined by using a stepwise selection pro-

cedure with a significance level of 0.10 as the criterion for entry and retention of a variable. Since this study is exploratory, no adjustment for multiple comparisons was made.

### RESULTS

**Comparison of Immigrant and Non-immigrant Patients.** Eight hundred sixty-nine immigrant patients and 354 non-immigrant patients completed surveys. Three hundred thirty-one immigrants were approached but did not complete surveys, yielding a response rate of 72.4% for the immigrant group. This included patients who declined to participate, patients who left the department before survey completion, and 115 patients who could not be interviewed due to lack of a suitable interpreter. Non-immigrant response rate was not measured. Immigrants interviewed came from 80 countries and spoke 35 first languages. The median number of years living in the United States was 13.5 (25% 6 yr, 75% 28 yr). The regional distribution of the immigrants surveyed is shown in Figure 1.

The demographic profiles of immigrant and non-immigrant patients were found to be significantly different (Table 1). The immigrants surveyed were older, were more likely to be female, had higher rates of marriage, and had more children. Although similar employment rates were found, immigrants were more likely than non-immigrants never to have reached high school, to have annual family incomes less than \$20,000, and to have no health coverage (including Medicaid).

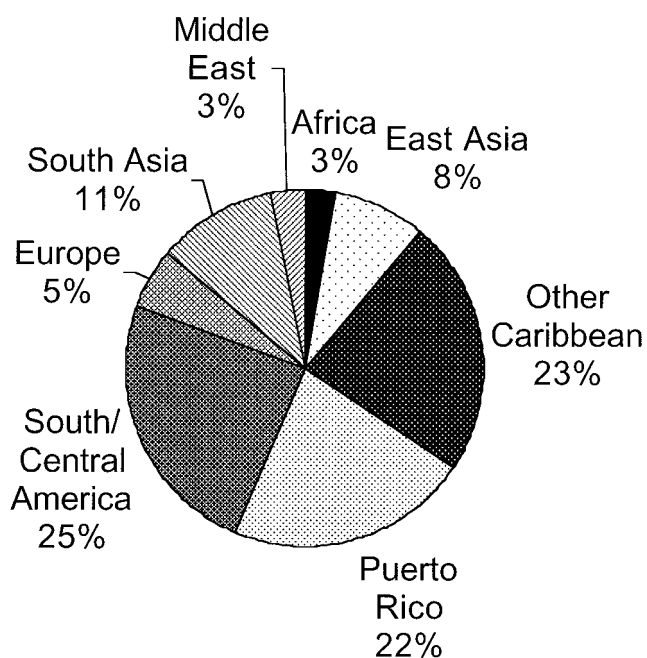


Figure 1. Region or country of origin of the immigrant study patients.

TABLE 1. Demographic Characteristics of the Immigrants and Non-immigrants

|                               | Immigrants  | Non-immigrants | p-value |
|-------------------------------|-------------|----------------|---------|
| No. surveyed                  | 869         | 354            |         |
| Age—mean ± SD (yr)            | 43.8 ± 15.4 | 39.1 ± 14.3    | <0.001  |
| No. of children—mean ± SD     | 2.25 ± 2.3  | 1.52 ± 2.2     | <0.001  |
| Gender—female (%)             | 48.2        | 41.8           | <0.05   |
| Married (%)                   | 45.1        | 23.7           | <0.001  |
| Employed (%)                  | 44.5        | 41             | 0.25    |
| Never reached high school (%) | 28.9        | 8.5            | <0.001  |
| Family income < \$20,000 (%)  | 73.8        | 64.5           | <0.01   |
| No health coverage (%)        | 51.7        | 30.8           | <0.001  |

Immigrants were compared with non-immigrants using the chi-square test in 16 categories of particular importance to health and behavioral risk (Table 2). Immigrants were at higher risk than non-immigrants in 12 of 16 categories. Non-immigrants were at higher risk in three categories—smoking, alcohol use, and intravenous drug use.

Except for the category of prenatal care, when multivariate logistic regression models were fit to account for confounders, these differences persisted and were independent of age, number of children, gender, marital status, employment status, education, family income, and health coverage.

**Analysis of Immigrant Patients—Predictors of Risk within the Immigrant Group.** Data from the immigrant group were analyzed to evaluate differences in demographic and socioeconomic profiles and to identify independent predictors of high-risk behaviors and poor preventive health care practices. The demographic profiles of the regional groups differed significantly (Table 3). Asian immigrants and immigrants categorized as “Other” were more likely than the other groups to be recent immigrants, to be married, and to have no health coverage. Asian immigrants were more likely than European immigrants, and less likely than Latin American immigrants, to have family incomes under \$20,000. Despite having similar demographic profiles, European immigrants were more likely than both Latin American and Caribbean immigrants to have reached high school, and they were more likely than Latin American immigrants to have family incomes over \$20,000.

Multivariate logistical modeling was performed on data from the immigrant group to identify significant independent predictor variables for each of the 16 outcome categories listed in Table 2. Due to space constraints, adjusted odds ratio estimates for

**TABLE 2. Preventive Health and Behavioral Risk Indices of Immigrants and Non-immigrants**

|  | Immigrants (%) | Non-immigrants (%) | OR   | 95% CI Limits | Adjusted OR* | 95% CI Limits |
|--|----------------|--------------------|------|---------------|--------------|---------------|
| Do not exercise regularly                        | 59.6           | 49.6               | 1.5  | 1.16, 1.95    | 1.43         | 1.11, 1.85    |
| Never received tetanus shot                      | 48.1           | 13.5               | 3.09 | 2.17, 4.42    | 2.59         | 1.82, 3.67    |
| Last tetanus shot > 10 years ago                 | 34.7           | 22.1               | 1.88 | 1.31, 2.70    | 2.07         | 1.39, 3.10    |
| Never had purified protein derivative (PPD) test | 30.3           | 9.1                | 4.33 | 2.87, 6.56    | 3.85         | 2.56, 5.80    |
| Positive PPD skin test                           | 23.5           | 14.2               | 1.86 | 1.26, 2.74    | 1.86         | 1.29, 2.69    |
| Last routine exam ≥ 3 years ago                  | 23.4           | 14.9               | 1.75 | 1.23, 2.49    | 1.67         | 1.16, 2.40    |
| Never visited dentist                            | 21.2           | 7.8                | 3.17 | 2.01, 5.05    | 2.54         | 1.60, 4.04    |
| Never use condoms                                | 63.4           | 42.8               | 2.32 | 1.76, 3.07    | 1.61         | 1.20, 2.15    |
| Never had Pap test                               | 16.1           | 1.4                | 13.7 | 3.20, 82.9    | 11.24        | 2.70, 46.8    |
| Never did self-breast exam                       | 39             | 21.2               | 2.37 | 1.48, 3.80    | 2.03         | 1.29, 3.20    |
| Never had clinical breast exam                   | 20.8           | 7.5                | 3.22 | 1.60, 6.64    | 2.84         | 1.42, 5.68    |
| No prenatal care                                 | 22.2           | 5.2                | 4.04 | 1.49, 11.9    | 2.43         | 0.91, 6.52    |
| Consider self overweight                         | 39.6           | 39.4               | 1.01 | 0.78, 1.31    | 0.94         | 0.72, 1.22    |
| Currently a smoker                               | 53.1           | 70.8               | 0.47 | 0.32, 0.67    | 0.54         | 0.37, 0.78    |
| Ever used intravenous drugs                      | 4.3            | 14.9               | 0.26 | 0.16, 0.41    | 0.33         | 0.21, 0.53    |
| Ever had alcohol problem                         | 13.3           | 36.7               | 0.26 | 0.17, 0.39    | 0.32         | 0.21, 0.48    |

\*Adjusted by age, number of children, gender, marital status, employment status, education (never reached high school), annual family income (less than \$20,000), and health coverage status.

only selected variables from the final models are given in Tables 4A–4E. To illustrate the use of these tables for a specific outcome, we note that Table 4A indicates the seven outcomes for which region of origin was a significant independent predictor. The corresponding adjusted odds ratio estimate for the effect of region of origin on the outcome of never having visited a dentist are given, where the estimates are adjusted for the other significant variables in the final model of never having visited a dentist: English language ability, annual family income, health insurance status (denoted by lettered superscripts).

**Region of origin (Table 4A).** Europe was used as the baseline category when computing odds ratios for the different regions. Asian immigrants were at increased risk of lack of regular exercise, never having received a tetanus immunization or purified protein derivative ((PPD) test, never having visited a dentist, never having had a Pap test, and never having performed a self-breast examination. Latin American immigrants were at decreased risk of

never having had a PPD test or Pap test. Europeans were more likely to consider themselves overweight than the other groups. No regional difference was found in rates of smoking, intravenous (IV) drug use, or alcohol use.

**Length of stay (Table 4B).** A shorter duration of stay in the United States was independently predictive of having had a positive PPD test, not having had a routine medical examination within the past three years, and never having had a clinical breast examination. Recent immigrants were also at decreased risk of having used IV drugs and of ever having had a problem with alcohol.

**English language ability (Table 4C).** The interviewers rated the immigrant patients' language skills as excellent (25.8%), good (36.9%), and poor (34.6%). Poor English language skill was independently associated with not having had a tetanus immunization within the past ten years, never having had a PPD test, not having had a routine medical examination within the past three years, never having

**TABLE 3. Demographic Characteristics of the Immigrants Grouped by Region of Origin\***

|                               | Asia                  | Europe                 | Latin America        | Caribbean            | Other                 | p-value |
|-------------------------------|-----------------------|------------------------|----------------------|----------------------|-----------------------|---------|
| Mean age (yr)                 | 41.4 <sup>1,2,3</sup> | 42.2                   | 45.0 <sup>1,4</sup>  | 46.4 <sup>2,5</sup>  | 38.1 <sup>3,4,5</sup> | 0.0016  |
| Length of stay in U.S. (yr)   | 9.3 <sup>1,2,3</sup>  | 18.7 <sup>1,4</sup>    | 21.6 <sup>2,5</sup>  | 18.7 <sup>3,6</sup>  | 10.6 <sup>4,5,6</sup> | <0.0001 |
| Mean no. of children          | 1.7 <sup>1,5,6</sup>  | 1.0 <sup>1,2,3,4</sup> | 2.6 <sup>2,5,7</sup> | 2.4 <sup>3,6,8</sup> | 1.6 <sup>4,7,8</sup>  | <0.0001 |
| Female gender (%)             | 40 <sup>1,2</sup>     | 44                     | 52 <sup>1,3</sup>    | 55 <sup>2,4</sup>    | 35 <sup>3,4</sup>     | 0.01    |
| Married (%)                   | 66 <sup>1,2,3,4</sup> | 42 <sup>1</sup>        | 40 <sup>2</sup>      | 40 <sup>3</sup>      | 44 <sup>4</sup>       | <0.0001 |
| Employed (%)                  | 47                    | 52                     | 41                   | 52                   | 52                    | 0.11    |
| Never reached high school (%) | 17 <sup>1,2,3</sup>   | 4 <sup>1,4,5,6</sup>   | 36 <sup>2,4,7</sup>  | 29 <sup>3,5</sup>    | 19 <sup>6,7</sup>     | <0.0001 |
| Family income < \$20,000 (%)  | 71 <sup>1,2</sup>     | 57 <sup>1,3</sup>      | 78 <sup>2,3,4</sup>  | 64 <sup>4</sup>      | 71                    | 0.0028  |
| No health coverage (%)        | 69 <sup>1,2,3</sup>   | 46 <sup>1,4</sup>      | 46 <sup>2,5</sup>    | 43 <sup>3,6</sup>    | 68 <sup>4,5,6</sup>   | <0.0001 |

\*Results with the same superscripts in each row are statistically different.

**TABLE 4A. Adjusted Odds Ratio Estimates for Region of Origin, from Final Multivariate Models of the 16 Outcome Variables**

|   | Adjusted Odds Ratio Estimates*† |                       |                   |                     |                    |
|---|---------------------------------|-----------------------|-------------------|---------------------|--------------------|
|   | Asia                            | Latin America         | Caribbean         | Other               | Europe             |
| Do not exercise regularly <sup>(S,G,J)</sup>                          | 1.63 <sup>1,2,3</sup>           | 0.79 <sup>1</sup>     | 0.98 <sup>2</sup> | 0.79 <sup>3</sup>   | 1                  |
| Never received tetanus shot <sup>(S)</sup>                            | 2.09 <sup>1,2,3,4</sup>         | 0.72 <sup>1</sup>     | 0.67 <sup>2</sup> | 1.06 <sup>3</sup>   | 1 <sup>4</sup>     |
| Never had a purified protein derivative (PPD) test <sup>(E,G,J)</sup> | 1.08 <sup>1</sup>               | 0.41 <sup>1,2,3</sup> | 0.67              | 1.15 <sup>2</sup>   | 1 <sup>3</sup>     |
| Never visited a dentist <sup>(E,I,H)</sup>                            | 4.78 <sup>1,2,3</sup>           | 2.19 <sup>1</sup>     | 1.74 <sup>2</sup> | 3.70 <sup>4</sup>   | 1 <sup>3,4</sup>   |
| Never had a Pap test <sup>(E,H)</sup>                                 | 2.90 <sup>1,2</sup>             | 0.40 <sup>1,3</sup>   | 0.60 <sup>2</sup> | 1.22 <sup>3</sup>   | 1                  |
| Never did self-breast exam <sup>(H,A,J)</sup>                         | 5.31 <sup>1,2,3</sup>           | 1.62 <sup>1</sup>     | 1.95 <sup>2</sup> | 2.38                | 1 <sup>3</sup>     |
| Consider self overweight <sup>(G)</sup>                               | 0.35 <sup>1,2</sup>             | 0.64 <sup>1,3</sup>   | 0.53 <sup>4</sup> | 0.30 <sup>3,5</sup> | 1 <sup>2,4,5</sup> |

\*Odds ratios are adjusted for other significant predictor variables in final multivariate model denoted by lettered superscripts: R = region of origin; L = length of stay in United States; E = English language ability; I = income; H = health coverage; S = education; A = age; G = gender; M = marital status; N = number of children; and J = employment status.

†Estimates with the same numerical superscripts are statistically different.

**TABLE 4B. Adjusted Odds Ratio Estimates for Length of Stay in the United States, from Final Multivariate Models of the 16 Outcome Variables**

|  | Adjusted Odds Ratio Estimates*† |                   |                  |
|--|---------------------------------|-------------------|------------------|
|  | <8 Years                        | 8–20 Years        | ≥21 Years        |
| Positive purified protein derivative (PPD) test <sup>(I)</sup> | 1.96 <sup>1</sup>               | 2.04 <sup>2</sup> | 1 <sup>1,2</sup> |
| Last routine exam ≥ 3 yr ago <sup>(E,I,H,G,N)</sup>            | 1.49 <sup>1</sup>               | 1.22              | 1 <sup>1</sup>   |
| Never had clinical breast exam <sup>(I,H)</sup>                | 3.13 <sup>1,2</sup>             | 1.78 <sup>2</sup> | 1 <sup>1</sup>   |
| Ever used intravenous drugs <sup>(A,G,M,J)</sup>               | 0.27 <sup>1</sup>               | 0.16 <sup>2</sup> | 1 <sup>1,2</sup> |
| Ever had alcohol problem <sup>(S,G)</sup>                      | 0.40 <sup>1</sup>               | 0.54 <sup>2</sup> | 1 <sup>1,2</sup> |

\*Odds ratios are adjusted for other significant predictor variables in final multivariate model denoted by lettered superscripts: R = region of origin; L = length of stay in United States; E = English language ability; I = income; H = health coverage; S = education; A = age; G = gender; M = marital status; N = number of children; and J = employment status.

†Estimates with the same numerical superscripts are statistically different.

**TABLE 4C. Adjusted Odds Ratio Estimates for English Language Ability, from Final Multivariate Models of the 16 Outcome Variables**

|   | Adjusted Odds Ratio Estimates*† |                     |                  |
|---|---------------------------------|---------------------|------------------|
|   | Poor                            | Good                | Excellent        |
| Last tetanus shot > 10 yr ago <sup>(A)</sup>                        | 1.72 <sup>1</sup>               | 1.38                | 1 <sup>1</sup>   |
| Never had purified protein derivative (PPD) test <sup>(R,G,J)</sup> | 4.76 <sup>1,2</sup>             | 2.00 <sup>2,3</sup> | 1 <sup>1,3</sup> |
| Last routine exam ≥ 3 yr ago <sup>(L,I,H,G,N)</sup>                 | 1.39 <sup>1</sup>               | 0.68 <sup>1</sup>   | 1                |
| Never visited dentist <sup>(R,I,H)</sup>                            | 2.22 <sup>1</sup>               | 1.87 <sup>2</sup>   | 1 <sup>1,2</sup> |
| Never use condoms <sup>(A,G,M,N)</sup>                              | 1.85 <sup>1,2</sup>             | 1.24 <sup>2</sup>   | 1 <sup>1</sup>   |
| Never had Pap test <sup>(R,H)</sup>                                 | 3.13 <sup>1</sup>               | 2.44 <sup>2</sup>   | 1 <sup>1,2</sup> |

\*Odds ratios are adjusted for other significant predictor variables in final multivariate model denoted by lettered superscripts: R = region of origin; L = length of stay in United States; E = English language ability; I = income; H = health coverage; S = education; A = age; G = gender; M = marital status; N = number of children; and J = employment status.

†Estimates with the same numerical superscripts are statistically different.

visited the dentist, never using condoms, and never having had a Pap smear.

**Annual family income (Table 4D).** Immigrants with annual family incomes less than \$20,000 were less likely to have had their last routine medical examination in the past three years, more likely never to have visited the dentist, more likely never to have had a clinical breast examination, and more likely not to have received prenatal care during

their last pregnancy. They were, however, less likely to have had a positive PPD when tested.

**Health coverage (Table 4E).** Lack of health coverage was independently predictive of not having had a routine medical examination in the past three years, never having visited the dentist, never having had a Pap smear, and never having done a self-breast examination or having had a clinical breast examination.

**TABLE 4D. Adjusted Odds Ratio Estimates for Income, from Final Multivariate Models of the 16 Outcome Variables**

|   | Adjusted Odds Ratio Estimates* |
|---|--------------------------------|
|   | <\$20,000 vs. ≥\$20,000        |
| Positive purified derivative (PPD) skin test <sup>(L)</sup> | 0.49                           |
| Last routine exam = 3 yr ago <sup>(L,E,H,G,N)</sup>         | 1.89                           |
| Never visited dentist <sup>(R,E,H)</sup>                    | 2.17                           |
| Never had clinical breast exam <sup>(L,H)</sup>             | 2.13                           |
| No prenatal care <sup>(S)</sup>                             | 2.94                           |

\*Odds ratios are adjusted for other significant predictor variables in final multivariate model denoted by lettered superscripts: R = region of origin; L = length of stay in United States; E = English language ability; I = income; H = health coverage; S = education; A = age; G = gender; M = marital status; N = number of children; and J = employment status.

**TABLE 4E. Adjusted Odds Ratio Estimates for Health Coverage, from Final Multivariate Models of the 16 Outcome Variables**

|   | Adjusted Odds Ratio Estimates*         |
|---|--|
|   | No Health Coverage vs. Health Coverage |
| Last routine exam ≥ 3 yr ago <sup>(L,E,I,G,N)</sup> | 1.75                                   |
| Never visited a dentist <sup>(R,E,I)</sup>          | 2.44                                   |
| Never had a Pap test <sup>(R,E)</sup>               | 1.89                                   |
| Never did a self-breast exam <sup>(R,A,J)</sup>     | 1.59                                   |
| Never had a clinical breast exam <sup>(L,S,I)</sup> | 3.45                                   |

\*Odds ratios are adjusted for other significant predictor variables in final multivariate model denoted by lettered superscripts: R = region of origin; L = length of stay in United States; E = English language ability; I = income; H = health coverage; S = education; A = age; G = gender; M = marital status; N = number of children; and J = employment status.

**Other variables.** Gender, employment status, education, age, marital status, and number of children were also independently predictive of higher risk in several outcome categories but are not presented in Table 4.

Female sex was found to be independently associated with a lack of regular exercise and with considering oneself overweight. Female immigrants, however, were more likely to have had a PPD test and more likely to have had a routine medical examination within the past three years. Female immigrants were less likely than male immigrants to be current smokers, to have used IV drugs, and to have had an alcohol problem.

Employed immigrants were more likely to exercise regularly, more likely to have performed a self-breast examination, and less likely to have used IV drugs. Employed immigrants were at increased risk of never having had a PPD test.

Immigrants who did not reach high school were less likely to exercise regularly, less likely to have received a tetanus immunization, and less likely to have received prenatal care during their last pregnancy. They were also less likely to have had an alcohol problem.

Older immigrants were less likely to have had a tetanus immunization within the past ten years, less likely to use condoms, more likely to have performed a self-breast examination, more likely to be a current smoker, and more likely to have used IV drugs.

## DISCUSSION

In this survey of patients presenting to a large inner-city ED, significant differences were found between the socioeconomic profiles, behavioral risk profiles, and preventive health care practices of immigrant and non-immigrant patients. Immigrants may be at higher risk for certain medical illnesses, many with significant public health implications, due to a lack of preventive health care and health education. Additionally, important differences in health risk were demonstrated between immigrant groups from different regions of the world and with different socioeconomic profiles. This study portrays a complex and diverse immigrant population with distinct subgroups based on region of origin, duration of residence in the United States, English language ability, and level of education.

The immigrant population studied is clearly underserved by the social and medical systems in place in the United States today. When compared with the control group, who are among New York City's most disadvantaged non-immigrants, the immigrant group had lower family incomes despite higher rates of marriage and more children per family. Immigrants were also less well educated and nearly 2.5 times more likely to be without any form of medical coverage. These demographic differences are all independently associated with poor health status.<sup>12,17-31</sup> Based on socioeconomic status alone, the immigrants studied are at a decidedly higher risk for lower health status than their non-immigrant counterparts. However, when the comparisons between immigrants and non-immigrants in 16 categories of behavior and health risk are adjusted for these confounders, significant differences between the immigrant and non-immigrant groups persist.

Immigrants surveyed were less likely than non-immigrants with similar socioeconomic profiles to receive basic preventive health services. Despite a known association between recent immigrant status, lack of previous immunization, and risk for

development of acute *Clostridium tetani* infection,<sup>32-34</sup> immigrants surveyed were less likely to have received appropriate tetanus immunization. Certain immigrant populations, such as Southeast Asians and Mexicans, are at higher risk for invasive cervical cancer, a disease that is largely preventable with screening and treatment at the pre-invasive stage.<sup>35-39</sup> Yet immigrants in our study, particularly Asian immigrants, did not receive adequate screening for cervical dysplasia.<sup>40-43</sup> The potential societal cost of this neglect of the primary health needs of immigrant patients, particularly with regard to diseases that are preventable, is significant.<sup>12,44-51</sup> The potential cost to individuals who do not have access to routine health care and screening is immeasurable.

Immigrant patients are also at higher risk for medical illnesses that have serious public health implications. From 1986 to 1997, the number of tuberculosis (TB) cases among foreign-born persons in the United States increased by 56%, from 4,925 cases (22% of the national total) to 7,702 cases (39% of the national total), despite an overall decrease in the national incidence rate of TB.<sup>52-56</sup> This could rise to 50% of the national total if immigration continues to increase from Asia and Latin America, regions with rates of TB five to 20 times higher than the U.S. rate. Further, rates of drug-resistant TB are higher among immigrant populations than among non-immigrants.<sup>55,57,58</sup>

Despite higher rates of PPD positivity when tested, immigrants surveyed were nearly four times more likely never to have received a PPD skin test. While Latin American and Caribbean immigrants were overrepresented in this study as compared with the 2000 national averages, Asian immigrants and Mexican immigrants were greatly underrepresented.<sup>6</sup> This suggests that the immigrant group studied was not at disproportionately high risk for TB infection as compared with the general immigrant population in New York City. Current CDC recommendations caution "as the number of reported TB cases among foreign-born persons continues to increase, the elimination of TB in the U.S. will depend increasingly on the elimination of TB among the foreign-born."<sup>56,59</sup> Our study confirms that immigrant populations are not currently receiving adequate "public health assistance for immunizations and treatment of communicable diseases."<sup>7</sup>

The second part of this study illustrates that certain demographic characteristics are independent predictors of higher risk for poor health outcomes within the immigrant group. Comparisons revealed important differences in the demographic profiles of immigrant groups from different world regions.

As a result, multivariate models were fit to identify whether certain variables were independently predictive of poor behavioral risk factors and preventive health care practices among the immigrant group. This analysis revealed many complex associations. For example, the Asian immigrant group was found to be at higher risk than immigrant groups from other regions in several outcome categories, especially in areas of women's health. Poor English language skill was associated with a lower likelihood of receiving preventive health care screening such as Pap smears and PPD testing. More recent immigrants were at higher risk in some preventive health risk categories; however, they were at lower risk in areas of substance abuse. These data illustrate that different immigrant populations have varying health care needs and vulnerabilities. The data presented in this study only begin to demonstrate the heterogeneity of the immigrant population in the United States and the wide disparities in the health needs of individual immigrant groups.

## LIMITATIONS

This study has several limitations. First, in studying only patients presenting to a large, inner-city ED, the characteristics of both immigrants and non-immigrants are skewed toward the poorer and more disenfranchised members of each group. For example, both groups had dramatically high rates of unemployment when compared with U.S. census data.<sup>6</sup> This bias, however, may have disproportionately misrepresented the non-immigrant population, as the rates of alcohol and drug use among the non-immigrant controls are far higher than nationwide averages.<sup>60-64</sup> This oversampling of controls with alcohol and drug problems has likely decreased the observed difference between the groups.

A second limitation of this study is the method of selection of non-immigrant patients. The research assistants were not given specific instructions regarding selection of control patients; they were instructed only to choose any non-immigrant patient present in the ED. If interviewers chose non-immigrants who were more approachable or easier to talk to, they may have selected a more advantaged non-immigrant group with better health profiles. This may have increased the observed differences between immigrants and non-immigrants. Again, however, the prevalence of alcohol and drug problems among the non-immigrant group selected suggests that this bias, if present, was subtle.

Another important limitation is the inability to

compare immigrants of varying immigration status, who may have different legal restrictions on their access to care and public medical coverage. This information was omitted from the survey deliberately to encourage patients both to answer questions more freely and to feel secure in returning to the ED for care. While it is nearly impossible to estimate the percentage of immigrants visiting the ED during this study period who were undocumented or ineligible for entitlements, this number is likely higher than the national average and may have led to an overestimation of the differences between immigrants and non-immigrants.

This study also failed to ascertain the ethnic background of patients in the control population, a population that is certainly not homogeneous. We were unable to compare immigrants and non-immigrants with similar ethnic backgrounds to assess cultural influences on health status and behavioral risk. Furthermore, Puerto Ricans were classified as immigrants, despite being U.S. citizens with legal access to health and social services for which other immigrants may not be eligible. This decision was based on a perception of a "cultural immigrant" with potential language and cultural barriers to access to health care and social services. In fact, data from this study not reported in this article demonstrate that many Puerto Rican immigrants speak English poorly and that Puerto Rican immigrants remain at higher risk in several preventive health and behavioral risk categories when compared with non-immigrants. Analysis also revealed that differences between the immigrant and non-immigrant groups remain when Puerto Ricans are switched into the non-immigrant group, confirming that our classification of the Puerto Rican immigrants did not inappropriately skew our results.

The study period was limited to a convenience sample of eight consecutive weeks and for 12 hours each day during the ED's highest level of clinical activity. This choice might result in study and control groups that are not representative of patients presenting to the ED throughout the day and year. Additionally, 331 immigrant patients were approached but did not have surveys completed, including 115 patients not interviewed due to lack of a suitable interpreter. Exclusion of this latter group might be particularly significant, given that poor English speakers were found to be at higher risk. This undersampling of immigrants who are at higher risk, however, has again likely decreased the observed difference between the study and control groups.

Finally, data collection was achieved by survey of individual patients and is subject to the shortcomings inherent in such data. Specifically, despite as-

surances of confidentiality, patients may have had reservations about revealing certain information due to fears regarding immigration status, billing, and eligibility for public assistance and services. The survey questions also required collection of information that may be difficult for an individual to recall, such as childhood immunizations and testing. Finally, many surveys were administered via interpreters to patients who spoke minimal or no English. Errors due to language barriers and cultural differences in question interpretation and comprehension may have occurred.

## CONCLUSIONS

In patients presenting to a large inner-city municipal ED, marked differences exist between the socioeconomic profiles, behavioral risk profiles, and preventive health care practices of immigrant and non-immigrant patients. Immigrants are less likely than non-immigrants to receive basic preventive health services even when confounding factors such as income, educational level, health coverage, language, and length of residence are considered. As a result, immigrants may be at higher risk for preventable diseases and for transmissible illnesses with significant public health implications.

This study demonstrates the complexity of caring for a growing immigrant population with varying backgrounds and health needs. The demands placed upon society, and particularly on public hospitals, cannot be overemphasized. As immigrant access to medical care and social services is increasingly restricted, the health care needs of immigrants will increasingly be addressed in the context of the urban ED; currently the sole point of universal health care access in the United States. More work must be done to further elucidate the impact of a growing immigrant population on our health care system, and efforts must be made to identify and address the specific needs of different subgroups of a diverse immigrant population.

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