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Trends and disparities in socioeconomic and behavioural characteristics, life expectancy, and cause-specific mortality of native-born and foreign-born populations in the United States, 1979–2003

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Background Immigrants are a growing segment of the US population. In 2003, there were 33.5 million immigrants, accounting for 12% of the total US population. Despite a rapid increase in their numbers, little information exists as to how immigrants' health and mortality profile has changed over time. In this study, we analysed trends in social and behavioural characteristics, life expectancy, and mortality patterns of immigrants and the US-born from 1979 to 2003.

Methods We used national mortality and census data (1979–2003) and 1993 and 2003 National Health Interview Surveys to examine nativity differentials over time in health and social characteristics. Life tables, age-adjusted death rates, and logistic regression were used to examine nativity differentials.

Results During 1979–81, immigrants had 2.3 years longer life expectancy than the US-born (76.2 vs 73.9 years). The difference increased to 3.4 years in 1999–2001 (80.0 vs 76.6 years). Nativity differentials in mortality increased over time for major cancers, cardiovascular diseases, diabetes, respiratory diseases, unintentional injuries, and suicide, with immigrants experiencing generally lower mortality than the US-born in each period. Specifically, in 1999–2001, immigrants had at least 30% lower mortality from lung and oesophageal cancer, COPD, suicide, and HIV/AIDS, but at least 50% higher mortality from stomach and liver cancer than the US-born. Nativity differentials in mortality, health, and behavioural characteristics varied substantially by ethnicity.

Conclusions Growing ethnic heterogeneity of the immigrant population, and its migration selectivity and continuing advantages in behavioural characteristics may partly explain the overall widening health gaps between immigrants and the US-born.

Keywords Immigrant, ethnicity, mortality, life expectancy, cancer, cardiovascular, cause of death, socioeconomic, health behaviour, cancer screening, morbidity, time trend

Immigrants represent an important and growing segment of the US population. In 2003 there were 33.5 million immigrants in the US, an increase of 23.9 million since 1970.[1] Despite the rapid increase in the immigrant population, little information exists as to how their health and mortality profile has changed over time relative to the US-born population. Although previous studies have shown lower mortality, higher life expectancy, and better overall health status among immigrants compared with their US-born counterparts, it is not known as to whether the relative health advantage of immigrants has widened or become smaller over time.[2–7] The main purpose of

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this study is 2-fold: (i) to provide current estimates of and trends in important social, behavioural, and health characteristics, life expectancy, and all-cause and cause-specific mortality rates for US-born and foreign-born populations and (ii) to estimate the extent to which nativity differentials in health, life expectancy, and mortality rates have changed over time.

Most national data systems in the US do not routinely report and analyse health statistics by immigrant status.[4] Trend data on immigrant health are particularly lacking because of the unavailability of the appropriate population denominator data and because of an incomplete reporting of immigrant status in national mortality and disease registries. The substantial ethnic and cultural diversity of the US immigrant population adds further to the difficulty in tracking immigrant health and well-being on a systematic basis. To attempt to fill such analytic gaps, this study examines the extent to which US-born and foreign-born individuals in major racial/ethnic groups differed from 1979 to 2003 in their important social, behavioural, health and health care characteristics, and in life expectancy and mortality patterns, using three large federal data systems: the national mortality database, the National Health Interview Survey (NHIS), and the US decennial census.

Data and methods

For the purposes of this study, in both mortality and census records individuals born in the 50 states, District of Columbia, Puerto Rico, or other US territories were defined as US-born. Immigrants refer to those born outside these territories. Trend data on key socioeconomic and demographic characteristics were drawn from the 1980, 1990, and 2000 US censuses, and 1980 and 2003 Current Population Surveys (CPS).[1,8–12] The census, a complete count of the US population, has been conducted every 10 years by the US Census Bureau since 1790. The decennial census includes extensive socioeconomic, demographic, and housing characteristics for the nation as a whole as well as for various geographic areas.[13] The CPS, a sample household and telephone survey of the civilian non-institutionalized population in the US, is conducted by the US Census Bureau to produce monthly and annual national statistics on unemployment and the labour force.[12,13] For the 2000 census, only limited sociodemographic data for ethnic-nativity groups have been published to date. Therefore, the 2003 CPS with greater ethnic-nativity details was used to describe recent socioeconomic patterns.

Temporal data on selected behavioural and health characteristics were derived from the 1993 and 2003 NHIS.[14–16] Specifically, cigarette smoking, obesity, hypertension, elevated cholesterol levels, disability and chronic conditions, self-assessed health status, health-care coverage, and cervical, breast, colorectal, and prostate cancer screening rates were among the behavioural and health measures examined. The NHIS is a national sample household survey in which data on socioeconomic, demographic, behavioural, morbidity, health, and health care characteristics are collected via personal household interviews.[16] The survey uses a multistage probability design and is representative of the civilian non-institutionalized population of the US.[16]

Trend data for life expectancy and mortality analyses came from the 1979–2001 national mortality database, detailed descriptions of which are provided elsewhere.[17] To obtain stable estimates for sex, ethnic and nativity groups, death rates and life expectancy estimates were computed by pooling 3 years of mortality data around the decennial census years of 1980, 1990, and 2000. Population denominator data by age, sex, and nativity came from the 1980, 1990, and 2000 decennial censuses.[8–11] While age-specific and sex-specific populations were available for the overall US-born and foreign-born groups for all three decennial censuses, such population data were only available for the 1990 census for the four major racial/ethnic groups: non-Hispanic whites, blacks, Asians, and Hispanics.[10,11] For the 2000 census, we developed age-sex-nativity population estimates for the four ethnic groups in two steps. First, we used the 1% public use microdata sample to derive weighted age-sex-ethnicity-nativity population estimates using single race definitions.[18] We then prorated these age-sex-specific population estimates using the published grand population totals (for all ages) from the Census 2000 Summary File 4 for each sex-nativity group.[19] No such age-sex-ethnicity-nativity-specific population estimates could be derived for the 1980 census. Consequently, life expectancy and mortality rates for the 1979–81 period are only shown for the overall nativity groups.

All death rates were age-adjusted by the direct method using the 2000 US population as standard.[17] We computed average annual rates of mortality from all-causes combined and from all major cancers and causes of death, including diabetes, cardiovascular diseases (CVDs), respiratory diseases, cirrhosis, nephritis, infectious diseases and HIV/AIDS, suicide, homicide, and unintentional injuries. These underlying causes of death were coded according to the International Classification of Diseases, Ninth Revision (ICD-9) for the 1979–81 and 1989–91 periods and by the tenth revision (ICD-10) for the 1999–2001 period.[17] Since we used broad, leading cause-of-death categories instead of specific diseases, the comparability between ICD-9 and ICD-10 was not affected, except for nephritis, nephrotic syndrome, and nephrosis, which had a 23% increase in mortality in ICD-10 because of the inclusion of deaths from end-stage renal disease.[20,21] Trends in mortality from nephritis during a period covering the two revisions should, therefore, be interpreted with caution because of this break in disease classification.

Life expectancy estimates were calculated via the standard life table methodology by converting observed age-specific death rates into life table probabilities of dying.[22] To estimate probability of dying in the first year of life, infant mortality rates, stratified by maternal nativity status and ethnicity and derived from the linked birth and infant death records, were used as the input in the life table construction.[23] Nativity differences in health behaviours, health status, and mortality were described by rate ratios (RRs), which were tested for statistical significance at the 0.05 level. Moreover, nativity differences in the odds of behavioural and health characteristics were estimated using the NHIS by logistic regression after adjusting for age, sex, marital status, family size, place and region of residence, education, employment status, and family income. To account for the complex sampling design of the NHIS, SUDAAN software was used to compute prevalence rates and standard errors and adjusted odds ratios and 95% confidence intervals (95% CIs) for each behavioural and health status outcome.[24]

Results

Differentials in socioeconomic and demographic characteristics

Table 1 shows changes in selected socioeconomic and demographic characteristics for US-born and foreign-born populations that may help explain ethnic-nativity differentials in life expectancy and mortality rates shown in Figure 1 and Tables 4–6. The doubling of the immigrant population between 1980 and 2003 was largely due to increased immigration from Latin America and Asia. Immigrants from Latin America and Asia now account for more than 78% of all US immigrants. Europeans, who accounted for 39% of all immigrants in 1980, represented <14% of the total US immigrant population in 2003.

Immigrants and natives vary widely in their living arrangements. There has been a substantial increase in single-person households, with immigrants 35% less likely to live in such households in 2003 than their US-born counterparts. However, in 2003, immigrants were twice as likely as the natives to live in households with 5 or more people. Immigrants have a lower likelihood of marital dissolution but are more likely to reside in urban and inner-city metropolitan areas than the natives. Immigrants overall have lower levels of socioeconomic achievement than natives, as measured by their lower educational attainment, family income, occupational status, and homeownership rates, and higher poverty and unemployment rates. However, there are important exceptions, such as Asian and black immigrants who tend to have higher socioeconomic achievement levels than their US-born counterparts. Asian immigrants in particular have the highest education and occupation levels of any ethnic-immigrant group.

Differentials in behavioural and health characteristics

Table 2 shows prevalence rates of selected behavioural, health, and health care characteristics for various ethnic-nativity groups in 1993 and 2003. Table 3 shows crude prevalence RRs and adjusted odds for each outcome. The adjusted odds ratios will be used here to discuss nativity differentials for each ethnic group and time period. The adjustment for socioeconomic and demographic factors tended to increase nativity differentials in several of the behavioural and health outcomes. In 2003, immigrants overall were 50% less likely to report smoking cigarettes than US-born individuals of similar socioeconomic and demographic background. Of all ethnic-nativity groups, black immigrants had the lowest smoking prevalence; they were 74% less likely to smoke than US-born blacks. Immigrants overall had a 32% lower obesity rate in 2003 than natives. Asian, Hispanic, black, and Non-Hispanic white immigrants were, respectively, 79, 48, 42, and 36% less likely to be obese than their US-born counterparts.

Compared with their US-born counterparts, immigrants also reported lower rates of hypertension, elevated cholesterol, poor health status, activity limitation, bed disability, asthma, heart disease, and diabetes prevalence. Adjusted differentials in activity limitation, asthma, and heart disease prevalence were particularly marked.

Although immigrants in each ethic group generally had better health status and behavioural outcomes, the extent of nativity differentials in several of these indicators tended to be the largest for blacks, Hispanics, and Asians and smallest for non-Hispanic whites. In terms of health care access and utilization, however, immigrants fared worse than their US-born counterparts. For example, in 2003, immigrants overall were 2.65 times more likely to be without health insurance than the US-born. Immigrants were also significantly less likely than the US-born to use Pap tests, mammography, prostate and colorectal cancer screening. Of all groups, Asian immigrant women had the lowest rates of Pap tests and mammography use, 67 and 55%, respectively, in 2003. After the multivariate adjustment, black, non-Hispanic white, and Hispanic immigrants in 2003 were, respectively, 61, 37, and 31% less likely to use Pap tests than their US-born counterparts. Immigrants overall were 23 and 16% less likely than the US-born to use prostate cancer screening (PSA tests) and colorectal cancer screening (sigmoidoscopy, colonoscopy, or proctoscopy), respectively.

Between 1993 and 2003, marked increases in obesity, diabetes, and asthma prevalence were observed across most ethnic-nativity groups. In just 10 years, obesity prevalence increased 2-fold among US-born Asians and by 2.5 times among black immigrants. Asthma and diabetes rates increased more than 3-fold for US-born Asians and Asian immigrants, respectively. Although adjusted nativity differentials appear to be greater for several of the health and behavioural indicators in 2003 than in 1993, only those in activity limitation and health insurance increased significantly between 1993 and 2003.

Differentials in life expectancy

During 1979–81, immigrants overall had 2.3 years longer life expectancy at birth than did the US-born (76.2 vs 73.9 years). The difference increased to 3.4 years in 1999–2001 (80.0 vs 76.6 years). The nativity difference in life expectancy was greater for males than for females during each period, and the difference increased more for males than for females (Table 4).

Nativity differentials in life expectancy varied substantially by ethnicity (Figure 1). In 1999–2001, the male life expectancy varied from a low of 67.5 years for US-born blacks to a high of 80.7 years for Asian immigrants. The female life expectancy varied from a low of 74.6 years for US-born blacks to a high of 86.0 years for US-born Asians. In 1999–2001, black, Hispanic, and non-Hispanic white immigrant men and women had, respectively, 8.1, 3.8, 0.8, 6.4, 2.1, and 0.4 years longer life expectancy than their US-born counterparts. While Asian immigrant men had higher life expectancy than US-born Asian men, Asian immigrant women had lower life expectancy than US-born Asian women. During 1989–2001, nativity differences in life expectancy decreased among black men and women, and Hispanic women and widened among Asian men and women.

Differentials in all-cause and cause-specific mortality rates

During 1979–81 immigrants had 10% lower overall mortality (both sexes combined) than the US-born (RR = 0.90; 95% CI 0.89–0.90), but this gap widened to 16% (RR = 0.84; 95% CI 0.84–0.84) in 1989–91 and to 19% (RR = 0.81; 95% CI

Table 1 Selected socioeconomic and demographic characteristics[a] of US- and foreign-born populations by ethnicity or world region of birth, 1980–2003

	1980		1990		2003	
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
Total population	212 467 094	14 079 906	228 942 557	19 767 316	252 463 000	33 471 000
Percent of total population	93.8	6.2	92.1	7.9	88.3	11.7
Northeast region	90.8	9.2	89.7	10.3	86.3	13.7
Midwest region	96.4	3.6	96.4	3.6	94.1	5.9
South region	96.2	3.8	94.6	5.4	90.4	9.6
West region	89.4	10.6	85.2	14.8	80.8	19.1
Percent non-citizen	NA	49.5	NA	59.5	NA	61.6
Percent from Latin America	NA	33.1	NA	42.5	NA	53.3
Percent from Asia	NA	19.3	NA	25.2	NA	25.0
Percent from Europe	NA	39.0	NA	22.0	NA	13.7
% Speaking language other than English at home	9.0	70.2	7.8	79.1	9.3	83.0
Median age	29.0	37.0	31.4	37.3	35.1	38.4
% Population aged 18–64 years	60.5	67.1	60.7	75.8	60.0	80.1
% Population aged 65+ years	10.4	18.1	12.4	13.6	12.1	11.1
% One-person households	8.1	9.8	24.8	19.6	27.7	17.9
% Households with 5+ people	26.9	29.4	10.1	22.8	12.5	25.0
White/Europe region of birth	24.0	17.1	DA	8.4	DA	9.8
Black/Africa region of birth	38.3	31.7	DA	16.8	DA	26.4
Asian/Asia region of birth	37.7	43.2	DA	24.5	DA	19.1
Hispanic/Latin America region of birth	48.0	42.0	DA	47.7	DA	32.9
% Currently married	59.0	61.9	55.1	60.0	52.2	61.0
% Never married	25.9	21.0	26.7	24.1	29.2	25.3
% Divorced/separated	8.2	6.8	10.8	8.3	12.2	8.8
% Metropolitan, inside central city	26.1	45.6	29.7	47.8	26.9	44.4
% Metropolitan, outside central city	39.4	42.0	48.5	47.2	52.9	50.3
% <High school education	29.9	45.6	23.0	41.2	12.5	32.8
White/Europe region of birth	27.1	40.1	DA	36.5	DA	15.1
Black/Africa region of birth	48.2	32.1	DA	12.1	DA	19.6
Asian/Asia region of birth	17.8	27.4	DA	24.2	DA	12.6
Hispanic/Latin America region of birth	46.6	64.9	DA	75.7	DA	50.9
% 16+ years of education	17.0	15.8	20.3	20.4	27.2	27.3
White/Europe region of birth	18.3	16.3	DA	18.0	DA	35.4
Black/Africa region of birth	8.0	16.4	DA	47.1	DA	23.8
Asian/Asia region of birth	27.1	34.4	DA	38.4	DA	50.0
Hispanic/Latin America region of birth	7.4	6.9	DA	3.5	DA	11.6
% Family income <$10 000	25.7	34.4	15.3	17.0	4.7	6.0
%Family income ⩾$50 000	4.2	3.9	24.5	24.6	54.6	43.7
White/Europe region of birth	4.8	5.5	DA	23.6	DA	54.2
Black/Africa region of birth	0.8	1.2	DA	27.1	DA	47.7
Asian/Asia region of birth	7.3	5.7	DA	33.7	DA	61.4
Hispanic/Latin America region of birth	1.4	1.2	DA	11.7	DA	31.8
Median family income (current dollars)	20 674	18 266	35 508	31 785	54 686	42 980
White/Europe region of birth	22 118	20 887	DA	40 428	DA	53 184
Black/Africa region of birth	12 637	15 097	DA	36 783	DA	46 977
Asian/Asia region of birth	26 312	20 855	DA	39 395	DA	61 792
Hispanic/Latin America region of birth	15 715	13 723	DA	21 585	DA	34 798

Table 1 Continued

	1980		1990		2003	
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
Home ownership rate (%)	DA	DA	65.5	49.7	78.7	56.2
White/Europe region of birth	DA	DA	DA	67.6	DA	72.3
Black/Africa region of birth	DA	DA	DA	34.5	DA	47.9
Asian/Asia region of birth	DA	DA	DA	49.8	DA	64.3
Hispanic/Latin America region of birth	DA	DA	DA	38.5	DA	47.3
% Unemployed	7.2	7.7	6.2	7.8	6.2	7.5
White/Europe region of birth	6.2	5.4	DA	4.8	DA	4.3
Black/Africa region of birth	14.4	9.4	DA	6.8	DA	DA
Asian/Asia region of birth	3.9	7.5	DA	5.6	DA	6.7
Hispanic/Latin America region of birth	10.1	10.7	DA	11.3	DA	8.7
% Managerial and professional oocupations	25.8	23.9	26.8	22.2	36.2	26.9
White/Europe region of birth	27.7	31.3	DA	30.1	DA	41.3
Black/Africa region of birth	13.6	18.6	DA	36.6	DA	27.3
Asian/Asia region of birth	32.4	33.8	DA	31.5	DA	47.0
Hispanic/Latin America region of birth	15.2	10.9	DA	5.8	DA	12.7
% Service oocupations	12.7	15.7	12.7	18.1	14.9	23.3
White/Europe region of birth	11.5	13.3	DA	14.5	DA	15.4
Black/Africa region of birth	21.3	26.5	DA	16.4	DA	27.5
Asian/Asia region of birth	10.8	16.9	DA	14.8	DA	15.0
Hispanic/Latin America region of birth	14.5	16.5	DA	21.0	DA	29.3
% Population below poverty level	13.6	18.8	12.7	18.2	11.5	16.6
White/Europe region of birth	DA	DA	DA	8.3	DA	8.7
Black/Africa region of birth	DA	DA	DA	15.7	DA	16.7
Asian/Asia region of birth	DA	DA	DA	16.2	DA	11.1
Hispanic/Latin America region of birth	DA	DA	DA	29.7	DA	21.6

[a] Derived from the 1980 and 1990 decennial censuses and 1980 and 2003 Current Population Surveys. NA, not applicable; DA, data not available. Ethnicity was used for 1980 and region of birth for 1990 and 2003. Mean family income estimates were derived for 1980. It was not possible to perform statistical tests for nativity differences in socioeconomic and demographic characteristics.

0.81–0.81) in 1999–2001. The nativity differential was greater for males than for females. Male and female immigrants experienced, respectively, 23 and 16% lower all-cause mortality in 1999–2001 than their US-born counterparts (Tables 5 and 6). The nativity differential was greatest for younger male and female immigrants aged <65 whose mortality rates were 37–52% lower in 1999–2001 than their US-born counterparts.

US-born and foreign-born Asian men and women, and Hispanic immigrant women had the lowest all-cause mortality rates of all ethnic-nativity groups. Nativity differentials, however, were largest for blacks—37–40% lower mortality among black immigrants than US-born blacks. Nativity differentials did not widen significantly during 1989–2001 for any of the groups, except for Asian men.

Overall nativity differentials in mortality increased for most cancers and other chronic diseases (Tables 5 and 6). To conserve space, ethnic-specific rates are shown for selected cancers and major causes of death. In 1999–2001, male and female immigrants had, respectively, 25 and 20% lower overall cancer mortality than their US-born counterparts. Asian and Hispanic immigrants had the lowest total cancer mortality rates of all groups, and immigrants in each ethnic group, except for non-Hispanic white females, had lower cancer mortality than their US-born counterparts.

Differences were particularly pronounced in mortality from tobacco-related cancers, such as lung and oesophageal cancer. For example, immigrants, regardless of sex, had at least 28% lower lung cancer mortality in 1979–81 but had at least 42% lower mortality in 1999–2001. The other cancers for which immigrants experienced substantially lower mortality included colorectal, prostate, breast, kidney, non-Hodgkin's lymphoma, and brain cancers. The nativity patterns differed for stomach and liver cancers. Immigrants in 1989–91 had at least a 52% higher risk of stomach cancer mortality than the US-born. The differential grew in 1999–2001, with immigrants experiencing a nearly 2-fold higher risk of stomach cancer mortality than the US-born. US-born and foreign-born Asians, black, and non-Hispanic white immigrants had all significantly higher rates of stomach cancer mortality than US-born whites. Immigrants had at least 52% higher liver cancer mortality in 1999–2001 than US-born men and women, and the excess mortality risk among female immigrants increased significantly during 1989–2001. Asian immigrants, in particular, had the highest rates of liver cancer mortality; they experienced more than 3

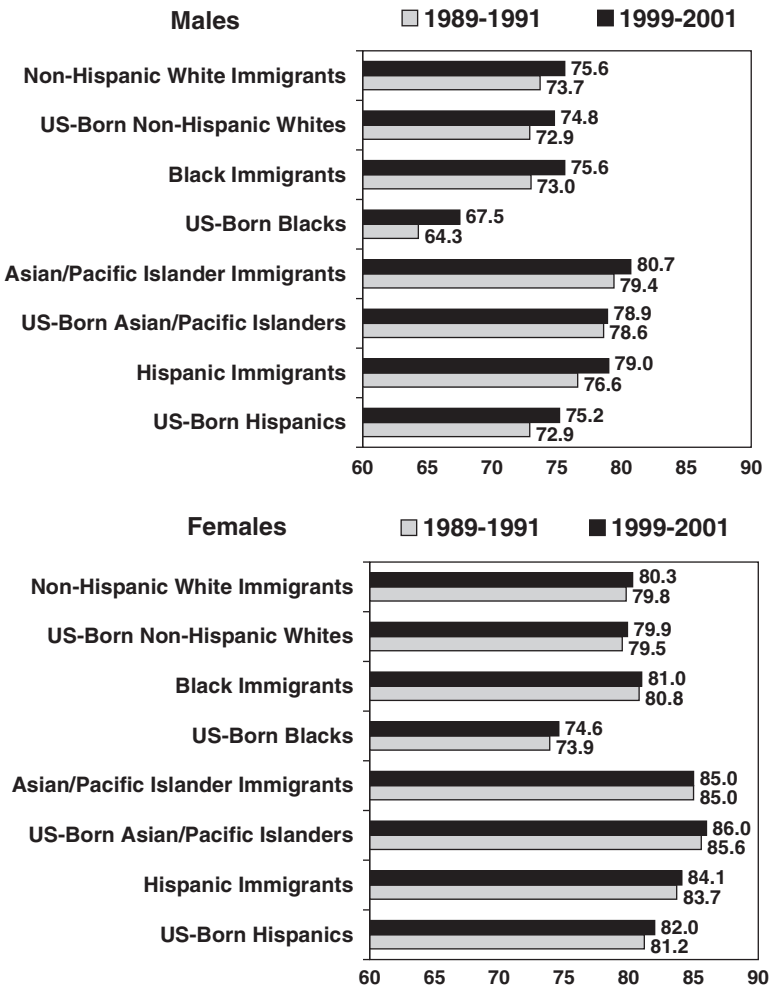

Figure 1 Life expectancy at birth (average lifetime in years) by ethnicity and immigrant status, United States, 1989–2001. The total number of deaths used to calculate life expectancies for various ethnic-immigrant groups in the order shown above were as follows. Males: 145 837; 175 188; 2 674 774; 2 516 456; 15 547; 11 508; 415 174; 419 483; 40 672; 24 936; 16 087; 11 586; 75 789; 55 694; 104 078; 83 266. Females: 194 870; 218 064; 2 833 276; 2 382 802; 14 712; 9179; 403 724; 350 179; 36 079; 18 857; 12 124; 7849; 62 788; 38 945; 79 695; 54 496. Source: Based on data from the US National Vital Statistics System, 1989–2001

times higher mortality than US-born whites and 2 times higher mortality than US-born Asians.

Compared with US-born women, immigrant women had 15% lower cervical cancer mortality in 1979–81, but they had 17% higher mortality in 1999–2001.

While Asians and Hispanics, regardless of nativity, had the lowest CVD mortality rates, US-born blacks had the highest rates. In 1999–2001, black immigrants had at least 31% lower CVD mortality than US-born blacks, while non-Hispanic white and Asian immigrant women had, respectively, 9 and 15% higher mortality than their US-born counterparts. Immigrants in 1999–2001 had at least 18% lower mortality from kidney diseases and at least 24% lower mortality from liver cirrhosis. Although mortality from chronic obstructive pulmonary diseases (COPD) increased substantially particularly among women, the mortality rate for immigrants was half that of the US-born in 1999–2001.

Mortality from tuberculosis, viral hepatitis, and other infectious diseases grew substantially over the 20 year period for both immigrants and the US-born, with immigrants in 1999–2001 experiencing at least 18% lower mortality. HIV/AIDS mortality has declined faster among men than among women, with immigrant men and women in 1999–2001 experiencing, respectively, 34 and 52% lower mortality than their US-born counterparts. Overall nativity differentials in unintentional injuries and in suicide also widened over time, with immigrants experiencing at least 31% lower mortality from suicide and at least 23% lower mortality from unintentional injuries in 1999–2001. Nativity patterns in suicide varied by ethnicity and sex. In 1999–2001, compared with their US-born counterparts, Asian, black, and Hispanic immigrant men had at least 22% lower suicide rates, while non-Hispanic white and Asian immigrant women had, respectively, 15 and 38% higher suicide rates. Immigrant men had a 57% higher homicide rate than the US-born in 1979–81, but this excess risk decreased to 8% in 1999–2001. This is because of a faster decline in homicide mortality for immigrant men than for US-born men during the study period. Immigrant women,

Table 2 Selected behavioural and health characteristics[a,b] of US- and foreign-born populations by ethnicity, 1993 and 2003

	Total		White[c]		Black[c]		Asian[c]		Hispanic	
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
1993										
% Current smokers aged 18+ years	25.8	18.7	25.5	22.9	27.4	9.6	23.1	16.6	23.4	18.3
% Overweight (BMI ⩾ 25) population aged 18+ years	47.3	41.1	45.5	43.1	58.5	50.7	33.7	21.4	52.3	49.7
% Obese (BMI ⩾ 30) population aged 18+ years	15.4	10.5	13.9	10.8	24.2	9.2	9.2	3.7	19.5	14.6
% Hypertensive/elevated blood pressure aged 18+ years	23.7	16.0	23.1	22.6	29.8	21.7	20.2	9.4	18.8	14.1
% With high blood cholesterol level aged 18+ years	25.4	22.7	26.1	25.7	21.1	15.5	21.5	22.4	22.0	22.6
% Population aged 18+ years in fair or poor health	13.1	13.4	11.8	13.2	21.4	8.8	7.5	10.4	14.3	16.3
% With activity imitation population aged 18+ years	19.3	14.3	19.2	19.7	21.6	9.4	12.3	9.1	14.6	14.1
Mean bed disability days in the past year age 18+	6.6	5.2	6.2	6.6	9.2	3.5	4.1	4.1	6.1	4.8
% Asthma prevalence in population aged 18+ years	7.9	4.6	7.8	5.0	9.5	5.5	3.8	3.5	7.2	4.5
% Diabetes prevalence in population aged 18+ years	4.6	3.8	4.4	3.2	6.4	4.4	6.9	1.6	4.6	5.8
% Chronic disease prevalence in population aged 18+ years[d]	47.7	35.0	48.6	45.2	45.1	29.1	38.3	28.7	40.1	32.0
% Without health insurance population aged 18+	22.8	37.6	20.1	22.5	31.7	38.6	18.8	34.6	33.6	50.3
% Women 18+ with a Pap test in the last 3 years	78.1	74.7	77.4	73.6	82.9	78.6	71.4	68.2	76.5	77.6
% Women 40+ with a mammogram in the last 2 years	60.3	54.8	60.7	58.8	59.9	47.2	51.5	55.8	50.4	51.2
2003										
% Current smokers aged 18+ years	22.9	14.1	23.0	17.3	23.1	8.1	18.7	11.5	19.7	14.5
% Overweight (BMI ⩾ 25) population aged 18+ years	59.8	54.4	58.3	54.2	68.8	62.8	47.1	30.2	64.8	62.7
% Obese (BMI ⩾ 30) population aged 18+ years	24.4	16.7	22.4	15.1	34.7	23.3	17.8	5.0	30.7	21.1
% Hypertensive/elevated blood pressure aged 18+ years	26.6	17.8	26.1	24.6	34.1	25.6	16.4	13.4	17.7	15.5
% With high blood cholesterol level aged 18+ years	30.0	24.9	31.1	27.2	24.6	20.3	29.3	25.4	22.2	24.3
% Population aged 18+ years in fair or poor health	11.9	11.2	12.0	10.1	19.7	8.5	7.6	7.8	14.9	15.2
% With activity imitation population aged 18+ years	15.7	8.0	18.5	13.0	20.9	6.5	6.7	6.2	13.7	8.7
Mean bed disability days in the past year age 18+	5.2	3.6	5.1	7.4	6.2	1.8	1.6	2.4	5.2	2.7
% Asthma prevalence in population aged 18+ years	10.5	5.3	10.3	6.6	11.1	6.8	11.9	5.0	11.8	4.7
% Diabetes prevalence in population aged 18+ years	7.8	6.1	7.4	6.5	10.0	8.2	6.5	5.8	7.6	5.9
% Heart disease prevalence in population aged 18+ years[e]	12.0	6.0	12.7	11.2	9.2	5.0	7.9	3.6	7.1	4.8
% Without health insurance population aged 18+	13.1	34.2	11.3	15.0	19.4	28.8	12.7	20.0	25.0	48.7
% Women 18+ with a Pap test in the last 3 years	80.3	71.9	79.7	72.1	84.6	76.2	76.8	66.9	78.8	73.2
% Women 40+ with a mammogram in the last 2 years	70.7	63.9	71.0	66.9	71.3	66.6	70.6	55.3	65.0	65.4
% Men 50+ having a PSA test within the past year[e]	44.8	34.7	45.6	41.9	41.6	40.0	31.6	31.4	28.3	30.0
% Population 50+ having colorectal cancer screening within the last 5 years[e]	36.3	29.1	37.2	39.7	32.3	27.8	36.7	21.5	24.7	23.8

[a] These weighted estimates are derived from the 1993 and 2003 National Health Interview Surveys, respectively.
[b] For statistical significance of the nativity differences, see crude prevalence RRs and associated 95% confidence intervals in Table 3.
[c] Excludes Hispanics.
[d] Not available for the 2003 survey.
[e] Not available for the 1993 survey.

on the other hand, had a 14% lower homicide rate than their US-born counterparts. Asian immigrant men and non-Hispanic white immigrant men and women had significantly higher homicide rates than their US-born counterparts. Of all groups, US-born and foreign-born blacks had the highest homicide rates, although foreign-born blacks experienced at least 42% lower risk than their US-born counterparts.

Discussion

Despite continuing increases in the immigrant population both in terms of absolute numbers and a relatively larger share of the total US population, few national data systems present contemporary and historical health statistics for immigrant populations in the US. Although there exist a number of US studies that examine nativity differentials in health and mortality at a specific point in time,[2–7,25–27] the present study, to our knowledge, is the first comprehensive effort to look at recent time trends in immigrant health and its social determinants. The National Vital Statistics System and the NHIS are unique data sources that permit analyses of time trends in immigrant health status and health-risk behaviours. However, the vital statistics system, in particular, lacks several key immigration-related variables, such as length of immigration, citizenship, naturalization and legal status, and English language proficiency, all of which may influence health and social status of immigrants.[4] Despite these limitations, they remain the only national databases for assessing changes

Table 3 Crude prevalence rate ratios (RRs) and covariate-adjusted[a] odds[b] of behavioural and health characteristics for immigrants relative to those for the US-born populations by ethnicity: the 1993 and 2003 US National Health Interview Surveys

	Total population				Non-Hispanic white population				Black population			
	Crude		Adjusted		Crude		Adjusted		Crude		Adjusted	
	RR	95% CI	OR	95% CI	RR	95% CI	OR	95% CI	RR	95% CI	OR	95% CI
1993												
Smoking prevalence	0.72	0.64–0.81	0.60	0.51–0.71	0.90	0.77–1.03	0.90	0.73–1.11	0.35	0.19–0.51	0.26	0.13–0.51
Overweight (BMI ⩾ 25)	0.87	0.84–0.90	0.75	0.70–0.79	0.95	0.90–0.99	0.88	0.80–0.96	0.87	0.80–0.94	0.75	0.60–0.94
Obesity (BMI ⩾ 30)	0.68	0.62–0.75	0.58	0.52–0.64	0.78	0.69–0.87	0.75	0.65–0.84	0.38	0.26–0.50	0.35	0.24–0.50
Hypertension	0.68	0.58–0.76	0.68	0.58–0.80	0.98	0.83–1.13	0.89	0.74–1.08	0.73	0.38–1.07	0.76	0.42–1.39
High blood cholesterol	0.89	0.80–0.99	0.99	0.87–1.14	0.98	0.85–1.12	0.99	0.81–1.20	0.73	0.10–1.37	0.85	0.32–2.27
Fair or poor health	1.03	0.93–1.13	0.84	0.75–0.94	1.12	0.95–1.29	0.92	0.79–1.08	0.41	0.30–0.53	0.57	0.44–0.76
Activity imitation	0.74	0.68–0.80	0.58	0.53–0.64	1.03	0.91–1.15	0.79	0.68–0.92	0.44	0.32–0.55	0.62	0.44–0.87
Mean bed disability days	−1.4	−2.1 to −0.7	−2.8	−3.5 to −2.2	0.4	−0.9 to 1.7	−0.9	−2.2 to 0.4	−5.7	−7.1 to −4.4	−3.2	−4.3 to −2.1
Asthma prevalence	0.58	0.46–0.71	0.49	0.39–0.63	0.64	0.41–0.88	0.58	0.39–0.86	0.58	0.05–1.11	0.50	0.18–1.38
Diabetes prevalence	0.83	0.60–1.06	0.82	0.62–1.09	0.73	0.43–1.03	0.62	0.41–0.95	0.69	0.10–1.26	0.71	0.27–1.87
Chronic disease prevalence	0.73	0.70–0.76	0.56	0.53–0.59	0.93	0.88–0.98	0.72	0.66–0.80	0.65	0.54–0.75	0.67	0.52–0.86
Lack of health insurance	1.65	1.55–1.76	1.62	1.48–1.77	1.12	0.98–1.25	1.31	1.15–1.50	1.22	1.01–1.44	1.43	1.09–1.88
Pap test use	0.96	0.91–0.99	0.81	0.65–1.00	0.95	0.88–1.02	0.90	0.66–1.22	0.95	0.84–1.06	0.55	0.26–1.17
Mammography use	0.91	0.83–0.98	0.92	0.76–1.12	0.97	0.86–1.08	0.96	0.71–1.29	0.79	0.47–1.11	0.51	0.26–0.98
2003												
Smoking prevalence	0.62	0.56–0.67	0.50	0.45–0.56	0.75	0.63–0.87	0.83	0.67–1.04	0.35	0.22–0.48	0.26	0.19–0.43
Overweight (BMI ⩾ 25)	0.91	0.88–0.94	0.77	0.70–0.84	0.93	0.86–1.00	0.87	0.74–1.03	0.91	0.81–0.99	0.72	0.56–0.92
Obesity (BMI ⩾ 30)	0.68	0.63–0.74	0.58	0.52–0.65	0.67	0.56–0.79	0.64	0.52–0.79	0.67	0.51–0.83	0.58	0.42–0.80
Hypertension	0.67	0.62–0.72	0.71	0.64–0.79	0.94	0.82–1.06	0.89	0.73–1.08	0.75	0.62–0.88	0.83	0.65–1.05
High blood cholesterol	0.83	0.77–0.90	0.88	0.78–0.99	0.87	0.74–1.01	0.85	0.68–1.07	0.83	0.56–1.09	1.03	0.71–1.51
Fair or poor health	0.94	0.87–1.01	0.81	0.74–0.90	0.84	0.66–1.04	0.83	0.64–1.07	0.43	0.25–0.61	0.56	0.34–0.91
Activity imitation	0.51	0.46–0.55	0.41	0.37–0.46	0.70	0.56–0.83	0.54	0.43–0.69	0.31	0.18–0.45	0.41	0.24–0.68
Mean bed disability days	−1.6	−2.6 to −0.7	−1.4	−2.5 to −0.4	2.3	−1.2 to 5.8	2.1	−1.0 to 5.1	−4.4	−5.8 to −3.0	−2.9	−4.6 to −1.3
Asthma prevalence	0.50	0.44–0.58	0.43	0.37–0.51	0.64	0.48–0.80	0.59	0.44–0.78	0.61	0.33–0.89	0.59	0.36–0.97
Diabetes prevalence	0.78	0.69–0.89	0.94	0.81–1.09	0.88	0.62–1.13	0.86	0.64–1.16	0.82	0.51–1.13	1.12	0.73–1.72
Heart disease prevalence	0.50	0.43–0.57	0.54	0.46–0.63	0.88	0.71–1.06	0.79	0.63–0.99	0.54	0.22–0.86	0.73	0.38–1.40
Lack of health insurance	2.61	2.47–2.75	2.65	2.46–2.87	1.33	1.13–1.53	1.82	1.52–2.19	1.49	1.31–1.67	1.98	1.66–2.37
Pap test use	0.90	0.87–0.92	0.61	0.53–0.69	0.90	0.84–0.97	0.63	0.48–0.84	0.90	0.81–0.99	0.39	0.24–0.63
Mammography use	0.90	0.86–0.95	0.90	0.77–1.07	0.94	0.86–1.03	0.86	0.64–1.15	0.93	0.78–1.09	0.61	0.35–1.06
Prostate cancer screening	0.77	0.67–0.88	0.77	0.61–0.97	0.92	0.76–1.08	0.85	0.61–1.17	0.96	0.58–1.34	0.51	0.22–1.18
Colorectal cancer screening	0.80	0.72–0.89	0.84	0.72–0.99	1.07	0.92–1.22	1.08	0.85–1.37	0.86	0.47–1.25	0.72	0.36–1.42

Table 3 Continued

	Asian population				Hispanic population			
	Crude		Adjusted		Crude		Adjusted	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
1993								
Smoking prevalence	0.72	0.40–1.04	0.73	0.38–1.43	0.78	0.58–0.99	0.87	0.63–1.21
Overweight (BMI ⩾ 25)	0.63	0.47–0.79	0.46	0.33–0.65	0.95	0.89–1.01	0.72	0.61–0.84
Obesity (BMI ⩾ 30)	0.40	0.17–0.63	0.27	0.13–0.54	0.75	0.65–0.85	0.57	0.47–0.69
Hypertension	0.47	0.19–0.74	0.58	0.25–1.34	0.75	0.51–0.99	0.48	0.30–0.77
High blood cholesterol	1.04	0.59–1.50	0.69	0.36–1.30	1.03	0.75–1.30	0.90	0.61–1.33
Fair or poor health	1.39	0.97–1.82	1.45	0.86–2.44	1.14	0.95–1.34	0.74	0.59–0.93
Activity imitation	0.74	0.48–0.99	0.59	0.40–0.85	0.97	0.80–1.14	0.66	0.53–0.84
Mean bed disability days	0.0	−1.7 to 1.7	−0.3	−2.6 to 2.0	−1.3	−3.0 to 0.3	−2.7	−4.4 to −0.9
Asthma prevalence	0.92	0.01–2.08	0.67	0.15–3.02	0.63	0.34–0.90	0.64	0.32–1.30
Diabetes prevalence	0.23	0.01–0.44	0.10	0.03–0.34	1.26	0.62–1.90	0.89	0.49–1.62
Chronic disease prevalence	0.75	0.64–0.85	0.71	0.56–0.91	0.80	0.74–0.86	0.59	0.52–0.67
Lack of health insurance	1.84	1.29–2.40	2.13	1.47–3.10	1.50	1.37–1.63	1.80	1.58–2.06
Pap test use	0.96	0.77–1.14	0.56	0.14–2.19	1.01	0.91–1.12	1.18	0.68–2.02
Mammography use	1.08	0.56–1.60	5.56	0.29–9.91	1.02	0.76–1.27	1.43	0.75–2.71
2003								
Smoking prevalence	0.61	0.34–0.89	0.64	0.38–1.10	0.74	0.63–0.84	0.59	0.47–0.73
Overweight (BMI ⩾ 25)	0.64	0.48–0.80	0.44	0.29–0.67	0.97	0.92–1.02	0.71	0.62–0.83
Obesity (BMI ⩾ 30)	0.28	0.13–0.43	0.21	0.10–0.41	0.69	0.61–0.76	0.52	0.43–0.62
Hypertension	0.82	0.49–1.15	0.64	0.32–1.26	0.88	0.76–0.99	0.68	0.54–0.85
High blood cholesterol	0.87	0.59–1.15	0.76	0.46–1.25	1.09	0.92–1.26	0.94	0.75–1.18
Fair or poor health	1.03	0.63–1.43	0.81	0.50–1.31	1.02	0.88–1.17	0.82	0.67–1.00
Activity imitation	0.93	0.59–1.27	0.87	0.53–1.42	0.64	0.53–0.75	0.52	0.40–0.66
Mean bed disability days	0.8	−0.6 to 2.2	1.7	−0.7 to 4.0	−2.5	−4.0 to −1.1	−2.2	−4.0 to −0.4
Asthma prevalence	0.42	0.16–0.67	0.48	0.21–1.08	0.40	0.30–0.50	0.38	0.28–0.52
Diabetes prevalence	0.89	0.42–1.38	0.61	0.27–1.35	0.78	0.60–0.95	0.61	0.46–0.80
Heart disease prevalence	0.46	0.06–0.86	0.48	0.20–1.18	0.67	0.50–0.85	0.59	0.42–0.83
Lack of health insurance	1.57	1.14–2.01	2.11	1.45–3.05	1.95	1.80–2.10	2.60	2.31–2.93
Pap test use	0.87	0.74–1.00	0.60	0.32–1.11	0.93	0.88–0.98	0.69	0.54–0.89
Mammography use	0.78	0.62–0.95	0.52	0.23–1.13	1.01	0.90–1.11	1.11	0.77–1.59
Prostate cancer screening	0.99	0.48–1.51	1.78	0.33–9.53	1.06	0.72–1.40	1.36	0.84–2.2
Colorectal cancer screening	0.59	0.30–0.87	1.29	0.56–2.98	0.96	0.73–1.19	1.05	0.74–1.49

See Table 2 for the definition of and population universe for each of the health and behavioural characteristics. OR = odds ratio; 95% CI = 95% confidence interval.

[a] Adjusted for age, sex, marital status, family size, place and region of residence, education, employment status, and family income.

[b] Adjusted odds ratios were estimated by logistic regression, while nativity differences in mean bed disability days were estimated by weighted least squares regression.

in immigrant health over time. Other disease surveillance systems in the US, such as cancer registries, are inadequate for examining immigrant health or cancer incidence trends, because a large proportion of patient records lack place (country) of birth information.[4,28,29]

Not only have immigrants maintained higher life expectancy and lower overall mortality than the US-born during the last two decades, but the overall immigrant advantage has also widened over time with respect to life expectancy and mortality from most chronic diseases, unintentional injuries, and suicide. Between 1979–81 and 1989–91, the nativity differentials in mortality widened at ages ⩾65 years. In contrast, between 1989–91 and 1999–2001, nativity differentials, while increasing in every age group, increased much more at ages <45 than at ages ⩾45 years. These differential age-specific patterns are reflected in changes in the cause-specific mortality rates, i.e. greater widening of the nativity differentials in mortality from chronic diseases such as cancer, CVD, and diabetes in the first period and greater widening of the differential in unintentional injuries and violence, HIV/AIDS, COPD, and liver cirrhosis in the second period.

Table 4 Life expectancy (in years) by sex and immigrant status, US, 1979–2001

	1979–81		1989–91		1999–2001		Absolute difference[a]		
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born	1979–81	1989–91	1999–2001
Both sexes									
At birth	73.9	76.2	75.3	78.1	76.6	80.0	2.3	2.8	3.4
At age 25	50.8	53.0	51.9	54.7	52.9	56.1	2.2	2.8	3.2
At age 45	32.3	34.1	33.4	35.9	34.2	37.0	1.8	2.5	2.8
At age 65	16.8	17.1	17.4	18.6	17.8	19.3	0.3	1.2	1.5
Males									
At birth	70.1	72.8	71.7	74.9	73.8	77.8	2.7	3.2	4.0
At age 25	47.3	50.1	48.6	51.8	50.2	54.1	2.8	3.2	3.9
At age 45	29.1	31.6	30.6	33.5	31.9	35.2	2.5	2.9	3.3
At age 65	14.3	15.1	15.2	16.7	16.0	17.9	0.8	1.5	1.9
Females									
At birth	77.8	79.4	78.8	81.1	79.4	82.0	1.6	2.3	2.6
At age 25	54.3	55.7	55.0	57.2	55.3	57.8	1.4	2.2	2.5
At age 45	35.3	36.4	36.0	37.9	36.3	38.4	1.1	1.9	2.1
At age 65	18.8	18.8	19.2	20.1	19.3	20.3	0.0	0.9	1.0

US- or native-born are individuals born in the 50 states, District of Columbia, Puerto Rico, and other US territories. Immigrants refer to those born elsewhere. The total number of deaths used to calculate life expectancies for US- and foreign-born individuals were as follows: 5 223 160 and 625 396 in 1979–81; 5 850 910 and 553 013 in 1989–91; and 6 581 830 and 585 335 in 1999–2001.

[a] Difference in life expectancy in years between foreign- and US-born individuals.

Source: Based on data from the US National Vital Statistics System, 1979–2001.

Nativity differentials in mortality varied substantially by ethnicity. Largest differentials were observed for blacks and Hispanics and in causes of death (e.g. lung, oesophageal, stomach, and liver cancer, COPD, cirrhosis, injuries, and suicide) that are more closely associated with behavioural and lifestyle factors. Immigrant men in each ethnic group had lower overall mortality than their US-born counterparts. However, non-Hispanic white and Asian immigrant women did not differ significantly in their overall mortality risks from their US-born counterparts.

During the last decade, immigrants in each ethnic group have also maintained a significant health advantage over the US-born, as evident by their lower rates of smoking, obesity, disability, and chronic disease prevalence. Indeed, the estimated ethnic-nativity patterns in mortality may largely reflect those in behavioural and health indicators as derived from the NHIS. For instance, when compared with other ethnic-nativity groups, US-born blacks fare poorly in terms of most of the socioeconomic, behavioural, and health indicators, and they also experience comparatively higher all-cause and cause-specific mortality risks. Despite the overall advantage, certain adverse health patterns for immigrants, such as relatively higher homicide rates in black and Hispanic men, higher stomach and liver cancer mortality in Asians, and higher suicide rates in non-Hispanic white and Asian women, should be noted. Trends that have adversely affected both immigrants and natives similarly include rising mortality rates from infectious diseases, diabetes, COPD, kidney diseases, and female lung cancer. Consistent with these mortality trends are rising trends in obesity prevalence, and in diabetes and asthma morbidity rates for most ethnic-nativity groups.

As data in Tables 1–3 indicate, US immigrants face important challenges in their socioeconomic attainment, labour force participation, and health care utilization patterns, as they grapple with relatively higher poverty and unemployment rates, and lower rates of health insurance coverage and use of such preventive health services as breast, cervical, prostate, and colorectal cancer screening. If immigrants and natives had similar health care access and utilization levels, immigrant mortality would perhaps be lower and the nativity differentials wider than those reported here, *ceteris paribus*.

Among the likely explanations often put forth for higher immigrant life expectancy and lower mortality include positive immigrant selectivity (in terms of health, education, skills, and ambition), more favourable health behaviours (as shown in Tables 2 and 3), and higher levels of social and familial support, social integration, or social capital among immigrants compared with the native-born.[2–5,30–33] While socioeconomic position is strongly and inversely associated with overall mortality rates and mortality from CVD, stomach and lung cancer, social integration, and social support may be more strongly linked to positive health behaviours such as reduced smoking and drinking levels, and to lower mortality from suicide, liver cirrhosis, unintentional injuries, and respiratory diseases.[2,3,34,35] Higher homicide victimization rates for immigrants may partly reflect their greater propensity to live in inner-city urban environments. In a previous US study that adjusted for place of residence and socioeconomic factors, immigrant men and women did not differ from natives in their homicide risks.[2] High liver and stomach cancer mortality rates among first-generation Asian immigrants and still elevated mortality rates observed among the second generation Asian immigrants

Table 5 Average annual age-adjusted death rates for major causes of death by nativity/immigrant status, US men, 1979–2001

	1979–81					1989–91					1999–2001					Percentage change in mortality rate during 1979–2001	
	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate		
Cause of death	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	US-born	Foreign-born
All-cause mortality, All ages	1331.86	0.82	1157.16	2.04	0.87*	1217.68	0.71	995.57	1.89	0.82*	1092.81	0.60	846.61	1.59	0.77*	−17.95	−26.84
Non-Hispanic White						1169.60	0.74	1088.59	2.98	0.93*	1019.61	0.60	992.96	2.60	0.97*		
Black						1682.18	2.70	1016.75	11.45	0.60*	1463.82	2.31	883.29	8.17	0.60*		
Asian/Pacific Islander						754.88	8.82	713.08	4.81	0.94*	744.84	6.13	666.59	3.51	0.89*		
Hispanic						1052.03	4.71	827.26	3.89	0.79*	937.82	3.35	736.38	3.02	0.79*		
Age group 0–24 years	53.04	0.12	40.51	0.59	0.76*	43.39	0.11	35.00	0.48	0.81*	32.60	0.09	20.45	0.28	0.63*	−38.54	−49.52
Age group 25–44 years	75.80	0.17	55.35	0.51	0.73*	78.59	0.15	60.71	0.39	0.77*	63.28	0.13	39.02	0.24	0.62*	−16.52	−29.50
Age group 45–64 years	264.67	0.31	166.25	0.93	0.63*	222.20	0.28	137.09	0.71	0.62*	188.32	0.23	113.45	0.50	0.60*	−28.85	−31.76
Age group 65+ years	938.35	0.73	895.04	1.64	0.95*	873.49	0.62	762.76	1.64	0.87*	808.60	0.53	673.69	1.47	0.83*	−13.83	−24.73
Infectious diseases	11.03	0.08	9.98	0.21	0.90*	34.68	0.11	31.48	0.33	0.91*	27.34	0.10	21.42	0.25	0.78*	147.87	114.63
Excluding HIV/AIDS	11.03	0.08	9.98	0.21	0.90*	16.10	0.09	14.86	0.25	0.92*	19.31	0.08	16.11	0.23	0.83*	75.07	61.42
HIV/AIDS						18.59	0.08	16.62	0.23	0.89*	8.03	0.05	5.31	0.10	0.66*	−56.80	−68.05
Cancer	269.75	0.37	238.70	0.95	0.88*	282.63	0.34	222.74	0.93	0.79*	257.58	0.29	193.45	0.78	0.75*	−4.51	−18.96
Non-Hispanic White						274.53	0.36	248.84	1.32	0.91*	247.07	0.30	237.57	1.28	0.96*		
Black						403.91	1.38	227.43	5.71	0.56*	355.31	1.19	218.82	4.17	0.62*		
Asian/Pacific Islander						181.51	4.09	166.86	2.29	0.92*	180.40	3.08	161.51	1.69	0.90*		
Hispanic						216.72	2.21	176.30	1.87	0.81*	193.39	1.56	158.73	1.43	0.82*		
Esophagus	6.62	0.06	4.81	0.14	0.73*	7.41	0.05	4.48	0.13	0.61*	8.17	0.05	4.47	0.12	0.55*	23.41	−7.07
Stomach	9.75	0.07	15.94	0.25	1.63*	8.45	0.06	12.84	0.22	1.52*	5.92	0.04	10.83	0.18	1.83*	−39.28	−32.06
Non-Hispanic White						7.06	0.06	13.00	0.30	1.84*	4.92	0.04	11.61	0.28	2.36*		
Black						17.59	0.29	15.57	1.46	0.89	12.95	0.23	14.19	1.05	1.10		
Asian/Pacific Islander						26.36	1.91	23.13	0.85	0.88	13.88	0.86	12.51	0.47	0.90		
Hispanic						14.44	0.68	9.63	0.44	0.67*	10.64	0.37	8.85	0.33	0.83*		
Colon/rectum	32.66	0.13	33.78	0.35	1.03*	30.67	0.12	26.47	0.32	0.86*	25.78	0.09	20.65	0.26	0.80*	−21.07	−38.87
Liver and intrahepatic bile duct	3.78	0.04	5.35	0.15	1.42*	4.84	0.04	8.63	0.18	1.78*	6.44	0.05	9.79	0.17	1.52*	70.37	82.99
Non-Hispanic White						4.21	0.04	5.88	0.23	1.40*	5.75	0.05	7.42	0.24	1.29*		
Black						7.84	0.19	9.07	1.03	1.16	9.39	0.18	9.95	0.81	1.06		
Asian/Pacific Islander						7.00	0.77	18.56	0.69	2.65*	9.14	0.69	19.04	0.53	2.08*		
Hispanic						8.54	0.41	7.08	0.38	0.83*	13.87	0.39	7.90	0.31	0.57*		
Pancreas	13.04	0.06	13.35	0.23	1.02	12.65	0.07	11.32	0.21	0.90*	12.51	0.06	10.56	0.18	0.84*	−4.06	−20.90
Lung and bronchus	85.95	0.20	61.96	0.49	0.72*	92.92	0.19	57.57	0.47	0.62*	80.03	0.16	46.25	0.38	0.58*	−6.89	−25.36
Prostate	33.23	0.15	27.97	0.31	0.84*	39.12	0.14	30.77	0.35	0.79*	31.76	0.11	25.33	0.30	0.80*	−4.42	−9.44
Urinary bladder	8.92	0.07	9.45	0.18	1.06*	7.94	0.06	7.45	0.17	0.94*	7.88	0.05	6.59	0.15	0.84*	−11.66	−30.26
Kidney and renal pelvis	5.40	0.05	4.94	0.14	0.91*	6.23	0.05	4.79	0.14	0.77*	6.35	0.05	4.51	0.12	0.71*	17.59	−8.70

Table 5 Continued

Cause of death	1979–81					1989–91					1999–2001					Percentage change in mortality rate during 1979–2001	
	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate		
	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	US-born	Foreign-born
Brain and other nervous system	5.39	0.05	4.82	0.16	0.89*	6.02	0.05	5.01	0.15	0.83*	5.76	0.04	4.44	0.11	0.77*	6.86	−7.88
Non-Hodgkin's lymphoma	7.41	0.06	6.91	0.17	0.93*	10.02	0.06	8.81	0.19	0.88*	10.48	0.06	8.48	0.16	0.81*	41.43	22.72
Leukemia	11.00	0.08	10.69	0.22	0.97*	10.71	0.07	9.39	0.19	0.88*	10.52	0.06	8.69	0.17	0.83*	−4.36	−18.71
Diabetes	17.65	0.10	16.58	0.25	0.94*	21.89	0.10	18.40	0.27	0.84*	28.71	0.10	24.44	0.28	0.85*	62.66	47.41
Major cardiovascular diseases	672.19	0.62	602.58	1.44	0.90*	517.52	0.49	437.47	1.27	0.85*	420.44	0.39	354.41	1.08	0.84*	−37.45	−41.18
Non-Hispanic White						509.39	0.52	487.19	1.71	0.96*	392.40	0.39	411.17	1.61	1.05*		
Black						636.00	1.78	418.07	8.06	0.66*	533.86	1.48	353.20	5.45	0.66*		
Asian/Pacific Islander						326.46	6.24	306.13	3.31	0.94*	310.67	4.09	279.62	2.39	0.90*		
Hispanic						400.80	3.23	326.89	2.61	0.82*	339.19	2.18	293.02	2.04	0.86*		
Pneumonia and influenza	39.12	0.16	37.38	0.37	0.96*	47.08	0.16	43.26	0.41	0.92*	29.06	0.11	27.94	0.32	0.96*	−25.72	−25.25
COPD	50.45	0.17	33.16	0.34	0.66*	57.25	0.16	35.45	0.37	0.62*	59.67	0.15	32.76	0.34	0.55*	18.28	−1.21
Chronic liver disease and cirrhosis	20.70	0.09	17.18	0.28	0.83*	15.81	0.08	13.38	0.22	0.85*	13.68	0.06	10.34	0.16	0.76*	−33.91	−39.81
Nephritis, nephrotic syndrome and nephrosis	12.15	0.09	10.51	0.19	0.87*	12.48	0.08	10.66	0.20	0.85*	17.71	0.08	14.53	0.23	0.82*	45.76	38.25
Unintentional injuries	69.87	0.17	60.89	0.57	0.87*	54.31	0.14	49.90	0.45	0.92*	51.27	0.13	39.65	0.33	0.77*	−26.62	−34.88
Non-Hispanic White						51.53	0.15	56.56	1.17	1.10*	49.65	0.14	51.39	0.82	1.04*		
Black						75.34	0.52	43.23	1.95	0.57*	62.82	0.43	36.30	1.47	0.58*		
Asian/Pacific Islander						26.25	1.42	33.08	0.94	1.26*	28.45	1.11	25.36	0.65	0.89*		
Hispanic						56.00	0.86	55.44	0.81	0.99	48.77	0.61	42.50	0.55	0.87*		
Suicide	20.06	0.09	15.26	0.26	0.76*	21.72	0.09	15.25	0.23	0.70*	18.88	0.07	11.30	0.16	0.60*	−5.88	−25.95
Non-Hispanic White						22.02	0.09	22.36	0.52	1.02	20.56	0.09	20.60	0.45	1.00		
Black						13.23	0.20	9.35	0.72	0.71*	10.68	0.16	8.35	0.53	0.78*		
Asian/Pacific Islander						10.46	0.79	9.58	0.43	0.92	13.23	0.72	8.65	0.31	0.65*		
Hispanic						16.04	0.42	12.88	0.40	0.80*	11.85	0.28	9.24	0.27	0.78*		
Homicide	15.56	0.07	24.37	0.34	1.57*	13.73	0.06	22.91	0.27	1.67*	9.76	0.05	10.52	0.15	1.08*	−37.28	−56.83
Non-Hispanic White						5.35	0.04	11.05	0.46	2.07*	4.45	0.04	8.42	0.34	1.89*		
Black						64.14	0.41	52.23	1.47	0.81*	39.47	0.29	22.90	0.84	0.58*		
Asian/Pacific Islander						4.08	0.37	9.52	0.38	2.34*	4.56	0.38	5.68	0.24	1.24*		
Hispanic						22.66	0.40	31.28	0.48	1.38*	12.81	0.24	12.23	0.23	0.95		

US- or native-born are individuals born in the 50 states, District of Columbia, Puerto Rico, and other US territories. Immigrants refer to those born elsewhere. All percent changes in mortality rates for the overall US- and foreign-born groups during 1979–2001 were statistically significantly different from 0 ($P < 0.05$), except for immigrant mortality from COPD. Death rates are per 100 000 population and are age-adjusted by the direct method to the 2000 US standard population. SE = standard error; RR = ratio of mortality rate for immigrants to that for the US-born; COPD = Chronic obstructive pulmonary diseases.
*$P < 0.05$.

Source: Based on data from the US National Vital Statistics System, 1979–2001.

Table 6 Average annual age-adjusted death rates for major causes of death by nativity/immigrant status, US women, 1979–2001

	1979–81					1989–91					1999–2001					Percentage change in mortality rate during 1979–2001	
	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate		
Cause of death	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	US-born	Foreign-born
All-cause mortality, all ages	802.82	0.51	740.94	1.39	0.92*	755.13	0.44	645.87	1.25	0.86*	734.77	0.39	619.03	1.09	0.84*	−8.48	−16.45
Non-Hispanic White						728.41	0.46	711.31	2.16	0.98*	717.25	0.42	716.28	1.79	1.00		
Black						988.16	1.65	609.15	6.59	0.62*	971.47	1.49	614.03	5.25	0.63*		
Asian/Pacific Islander						474.61	6.28	462.39	0.97	0.97	463.20	4.38	467.98	2.6	1.01		
Hispanic						628.00	3.07	516.50	2.61	0.82*	604.37	2.25	507.15	2.04	0.84*		
Age group 0–24 years	31.15	0.09	17.40	0.46	0.56*	25.10	0.08	15.25	0.39	0.61*	19.44	0.07	9.37	0.23	0.48*	−37.59	−46.15
Age group 25–44 years	36.83	0.12	25.01	0.33	0.68*	33.37	0.10	22.78	0.24	0.68*	33.99	0.10	18.18	0.17	0.53*	−7.71	−27.31
Age group 45–64 years	138.73	0.21	93.54	0.63	0.67*	126.05	0.20	79.68	0.49	0.63*	115.53	0.17	69.13	0.36	0.60*	−16.72	−26.10
Age group 65+ years	596.10	0.44	604.99	1.11	1.01*	570.60	0.37	528.16	1.05	0.93*	565.82	0.33	522.35	0.99	0.92*	−5.08	−13.66
Infectious diseases	7.23	0.05	6.94	0.17	0.96	13.56	0.06	11.60	0.18	0.86*	17.15	0.06	14.09	0.17	0.82*	137.21	103.03
Excluding HIV/AIDS	7.23	0.05	6.94	0.17	0.96	11.35	0.06	9.99	0.17	0.88*	14.48	0.06	12.81	0.17	0.88*	100.28	84.58
HIV/AIDS						2.21	0.03	1.61	0.07	0.73*	2.67	0.03	1.27	0.05	0.48*	20.81	−21.12
Cancer	165.95	0.24	152.29	0.68	0.92*	176.72	0.22	145.85	0.63	0.83*	169.28	0.20	135.75	0.53	0.80*	2.01	−10.86
Non-Hispanic White						174.93	0.24	170.28	1.03	0.97*	169.56	0.22	171.43	0.94	1.01		
Black						206.16	0.77	130.06	2.96	0.63*	203.74	0.70	140.37	2.42	0.69*		
Asian/Pacific Islander						121.48	2.95	102.74	1.58	0.85*	122.20	2.33	107.18	1.14	0.88*		
Hispanic						136.62	1.40	114.60	1.22	0.84*	119.42	0.99	104.57	0.91	0.88*		
Esophagus	1.81	0.02	1.52	0.06	0.84*	1.85	0.02	1.36	0.06	0.73*	1.83	0.02	1.42	0.05	0.77*	1.10	−6.58
Stomach	4.62	0.04	8.62	0.15	1.86*	3.77	0.03	6.85	0.13	1.82*	2.88	0.03	5.75	0.11	2.00*	−37.66	−33.29
Non-Hispanic White						3.15	0.03	6.48	0.17	2.06*	2.40	0.03	5.44	0.16	2.27*		
Black						7.40	0.15	8.88	0.80	1.20	6.36	0.13	7.33	0.57	1.15		
Asian/Pacific Islander						15.40	1.27	14.97	0.62	0.97	7.26	0.56	7.45	0.31	1.03		
Hispanic						6.89	0.33	5.32	0.26	0.77*	5.45	0.22	5.08	0.20	0.93		
Colon/rectum	24.42	0.09	22.99	0.25	0.94*	20.89	0.08	17.96	0.21	0.86*	17.63	0.06	15.27	0.18	0.87*	−27.81	−33.58
Liver and intrahepatic bile duct	1.94	0.03	2.51	0.09	1.29*	2.28	0.02	3.58	0.10	1.57*	2.73	0.03	4.81	0.10	1.76*	40.72	91.63
Non-Hispanic White						2.04	0.03	2.63	0.12	1.29*	2.54	0.03	3.47	0.13	1.37*		
Black						3.32	0.10	4.19	0.55	1.26	3.88	0.10	4.66	0.44	1.20		
Asian/Pacific Islander						3.55	0.51	6.30	0.38	1.78*	4.06	0.42	8.06	0.31	1.98*		
Hispanic						3.54	0.24	4.38	0.24	1.24*	4.81	0.20	5.16	0.21	1.07		
Pancreas	8.73	0.05	9.59	0.16	1.10*	9.24	0.05	8.79	0.15	0.95*	9.31	0.05	8.87	0.14	0.95*	6.64	−7.51
Lung and bronchus	24.49	0.09	16.85	0.23	0.69*	38.05	0.10	21.88	0.24	0.57*	42.80	0.10	22.49	0.22	0.53*	74.77	33.47
Breast	32.02	0.10	27.52	0.30	0.86*	33.43	0.10	26.52	0.27	0.79*	26.99	0.08	21.12	0.21	0.78*	−15.71	−23.26
Cervix uteri	4.51	0.04	3.85	0.12	0.85*	3.54	0.03	3.61	0.10	1.02	2.71	0.03	3.17	0.08	1.17*	−39.91	−17.66
Ovarian	9.34	0.06	8.91	0.17	0.95*	9.41	0.05	8.27	0.15	0.88*	9.02	0.05	7.56	0.12	0.84*	−3.43	−15.15

Table 6 Continued

Cause of death	1979–81					1989–91					1999–2001					Percentage change in mortality rate during 1979–2001	
	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate	US-born		Foreign-born		Rate		
	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	Rate	SE	Rate	SE	Ratio	US-born	Foreign-born
Urinary bladder	2.73	0.03	2.52	0.08	0.93*	2.42	0.03	1.95	0.07	0.80*	2.30	0.02	1.94	0.06	0.85*	−15.75	−23.02
Kidney and renal pelvis	2.45	0.03	2.19	0.08	0.89*	2.88	0.03	2.34	0.08	0.81*	2.82	0.03	2.10	0.07	0.74*	15.10	−4.11
Brain and other nervous system	3.55	0.03	3.13	0.11	0.88*	4.05	0.03	3.28	0.11	0.81*	3.77	0.03	2.99	0.08	0.79*	6.20	−4.47
Non-Hodgkin's lymphoma	5.20	0.04	4.75	0.12	0.91*	6.95	0.04	5.87	0.12	0.90*	6.74	0.04	5.74	0.11	0.85*	29.62	20.84
Leukemia	6.36	0.05	6.53	0.16	1.02	6.25	0.04	5.99	0.14	0.96*	5.95	0.04	5.47	0.11	0.92*	−6.45	−16.23
Diabetes	17.32	0.08	17.34	0.21	1.00	19.91	0.07	16.44	0.20	0.83*	23.14	0.07	20.63	0.21	0.89*	33.60	18.97
Major cardiovascular diseases	427.60	0.38	422.75	0.97	0.99*	338.78	0.30	312.39	0.82	0.92*	286.26	0.24	274.61	0.7	0.96*	−33.05	−35.04
Non-Hispanic White						328.32	0.31	334.24	1.09	1.02*	277.97	0.26	303.95	1.02	1.09*		
Black						442.84	1.14	291.60	4.69	0.66*	397.91	0.98	275.75	3.62	0.69*		
Asian/Pacific Islander						209.05	4.46	214.28	2.55	1.03	181.37	2.79	209.33	1.82	1.15*		
Hispanic						269.13	2.17	236.28	1.82	0.88*	230.92	1.47	218.90	1.38	0.95*		
Pneumonia and influenza	22.99	0.09	22.44	0.24	0.98	29.48	0.09	28.72	0.25	0.97*	19.88	0.06	20.32	0.20	1.02	−13.53	−9.45
COPD	15.03	0.07	9.30	0.16	0.62*	27.81	0.09	16.09	0.20	0.58*	38.99	0.09	20.58	0.2	0.53*	159.41	121.29
Chronic liver disease and cirrhosis	9.65	0.06	7.68	0.17	0.80*	7.12	0.05	6.15	0.13	0.86*	6.31	0.04	4.80	0.10	0.76*	−34.61	−37.50
Nephritis, nephrotic syndrome and nephrosis	7.30	0.05	6.00	0.13	0.82*	7.80	0.05	6.50	0.12	0.83*	11.67	0.05	9.28	0.14	0.80*	59.86	54.67
Unintentional injuries	26.78	0.09	22.97	0.35	0.86*	22.88	0.08	20.29	0.30	0.89*	22.87	0.07	16.89	0.21	0.74*	−14.60	−26.47
Non-Hispanic White						22.53	0.09	25.54	0.83	1.13*	23.17	0.09	22.98	0.54	0.99		
Black						26.03	0.26	18.08	1.22	0.69*	23.60	0.23	15.31	0.89	0.65*		
Asian/Pacific Islander						12.54	0.91	18.05	0.68	1.44*	13.07	0.70	14.11	0.44	1.08		
Hispanic						19.54	0.46	17.08	0.48	0.87*	17.93	0.34	14.90	0.34	0.83*		
Suicide	5.97	0.05	5.86	0.15	0.98	4.82	0.04	4.30	0.11	0.89*	4.18	0.03	2.87	0.08	0.69*	−29.98	−51.02
Non-Hispanic White						5.03	0.04	7.05	0.31	1.40*	4.74	0.04	5.46	0.23	1.15*		
Black						2.31	0.08	1.62	0.25	0.70*	1.81	0.06	1.51	0.20	0.84		
Asian/Pacific Islander						3.06	0.40	4.91	0.30	1.61*	2.54	0.29	3.51	0.18	1.38*		
Hispanic						2.84	0.14	2.07	0.14	0.73*	2.11	0.10	1.43	0.09	0.68*		
Homicide	4.22	0.04	4.01	0.14	0.95	4.06	0.03	3.92	0.13	0.97	3.02	0.03	2.59	0.09	0.86*	−28.44	−35.41
Non-Hispanic White						2.39	0.03	3.20	0.26	1.34*	2.13	0.03	2.90	0.21	1.36*		
Black						13.11	0.17	6.70	0.61	0.51*	7.86	0.12	4.23	0.39	0.54*		
Asian/Pacific Islander						2.35	0.32	3.36	0.26	1.43	2.16	0.26	2.25	0.15	1.04		
Hispanic						4.60	0.17	4.05	0.20	0.88*	3.34	0.12	2.55	0.14	0.76*		

Death rates are per 100 000 population and are age-adjusted by the direct method to the 2000 US standard population. US- or native-born are individuals born in the 50 states, District of Columbia, Puerto Rico, and other US territories. Immigrants refer to those born elsewhere. All percentage changes in mortality rates for the overall US- and foreign-born groups during 1979–2001 were statistically significantly different from 0 ($P < 0.05$), except for esophageal cancer for the US-born and esophageal, kidney and brain cancers for immigrants. SE = standard error; RR = ratio of mortality rate for immigrants to that for the US-born; COPD = Chronic obstructive pulmonary diseases. *$P < 0.05$.

Source: Based on data from the US National Vital Statistics System, 1979–2001.

are consistent with the patterns observed previously among Chinese and Japanese Americans and may reflect, respectively, higher incidence of hepatitis-B virus, *Helicobacter pylori* infection, and greater intake of salted, pickled, or smoked foods among them.[4,28,36] Higher cervical cancer mortality among immigrant women reported here is consistent with their lower use of Pap smears and with previous findings showing increased incidence and mortality among such ethnic minority groups as blacks, Hispanics, and Asians, particularly Vietnamese.[4,28] Ethnic-nativity differentials in cervical cancer mortality may also reflect differences in the prevalence of human papillomavirus infection.[36] In most instances, socioeconomic characteristics do not seem to account for the health and mortality differentials, as immigrants retain higher health levels despite having lower levels of socioeconomic status. This has been noted here and also observed in previous studies.[2–6,30] If immigrants and natives had similar socioeconomic achievement levels, the immigrant health advantage would indeed be even greater than those reported here, all else being equal.

Contemporary immigrant health and social patterns shown here differ markedly from those observed prior to the Second World War, when immigrants, particularly white immigrants who came mostly from Eastern and Southern Europe, reportedly had higher death rates than native whites presumably due to their lower socioeconomic status, material hardship, and lack of health care access.[25,37] During the early 20th century, infectious diseases were a prominent cause of death, and overall mortality levels then were particularly sensitive to economic conditions and access to medical services. In contrast, those migrating to the US in recent decades are predominantly from Latin America and Asia, who appear to be a much healthier group with a relatively higher socioeconomic standing than those who remain in their countries of origin. Given the US immigration laws of the past four decades, most immigrants today are chosen (rather than randomly self-selected) based primarily on their skill criteria. Asian immigrants, in particular, are a highly selective group with relatively high levels of socioeconomic achievement.[3,33,38]

The US immigrant population has become more heterogeneous over time in its ethnic composition and in its representation of various nationalities. The ethnic-immigrant subgroups in the US, such as Asian, Hispanic, and black immigrants, as shown here, vary greatly in their socioeconomic, behavioural, and health characteristics.[1,3,4,33] Unfortunately, the misclassification of ethnicity on the death certificate results in an underestimation of mortality for Asians and Hispanics, which could affect ethnic-immigrant comparisons in mortality over time.[39] Trends in ethnic-specific nativity patterns in mortality are further limited by the unavailability of population denominator data for the 1980 census.

Nativity differentials in mortality reported here may partly be due to inconsistencies in the coding of immigrant status in the census (the source of the population denominator data) and on death certificates (the source of the mortality numerator data). However, US immigrant mortality patterns derived from cohort studies are consistent with those reported here.[2,3] Immigrant mortality would be overestimated and nativity differentials in health and mortality understated if some immigrants because of real or perceived risks reported themselves as US-born in the census, CPS, or NHIS.[2,3] Immigrant mortality would be underestimated if sicker immigrants returned to their countries of origin prior to their death. Such a phenomenon, referred to as the salmon-bias effect, could account for some of the reported mortality differentials.[40] However, a similar immigrant advantage is observed for most of the health indicators derived from the NHIS, where the salmon-bias effect cannot operate.

Monitoring health and social well-being of immigrants in the US and other industrialized countries such as Canada, Australia, the UK, Germany, and France is important in that changes in immigrant health can have a substantial impact on overall population health and on the magnitude of health inequalities.[3,4,31,32,41,42] Additionally, immigrant health studies can provide important insights into the role of social, cultural, and lifestyle factors in disease aetiology and in changing health levels and patterns.[43] Growing ethnic heterogeneity of the immigrant population as well as its migration selectivity and continuing advantages in behavioural characteristics may partly explain the overall widening health gaps between immigrants and the US-born. As the US immigrant population becomes more diverse in its ethnic and country of birth composition, both acculturation and cultural pluralism could serve as complementary theoretical perspectives in explaining changing behavioural and health disparities between immigrants and natives.[4,44,45] Acculturation, the process by which immigrants adopt the behavioural and lifestyle practices of the native-born, does play an important role in modifying the health and behavioural characteristics of immigrants, leading to a decrease in their health and mortality advantage over time.[3,4,30–32] However, the impact of acculturation may vary by ethnicity, and health advantage of certain US immigrants, particularly those of Asian and Hispanic origins, as shown here, may persist into the second generation or beyond.[3,4,6] For many of today's Asian and Hispanic immigrants, acculturation may not necessarily accompany other forms of assimilation, such as social and structural assimilation.[44] In this regard, cultural pluralism, whereby groups retain significant ties with their ethnic and cultural heritage, may provide a more adequate explanation of why immigrants continue to maintain better health status than their US-born counterparts.[4,45]

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KEY MESSAGES

- In 2003, there were 33.5 million immigrants in the US, accounting for 12% of the total population. Immigrants from Latin America and Asia account for more than 78% of all US immigrants.
- During 1979–81, immigrants had 2.3 years longer life expectancy than the US-born (76.2 vs 73.9 years). The difference increased to 3.4 years in 1999–2001 (80.0 vs 76.6 years). Life expectancy varied from a low of 67.5 for US-born black men to a high of 86.0 for US-born Asian women.
- Nativity differentials in mortality increased over time for major cancers, cardiovascular diseases, diabetes, respiratory diseases, unintentional injuries, and suicide, with immigrants experiencing generally lower mortality than the US-born in each period. Differentials in health, mortality, and life expectancy varied by ethnicity, with the largest differentials occurring between US-born and foreign-born blacks.
- In terms of health care access and utilization, immigrants fared significantly worse than their US-born counterparts. In 2003, immigrants overall were 2.65 times more likely to be without health insurance than the US-born. Immigrants were also significantly less likely than the US-born to use Pap tests, mammography, prostate and colorectal cancer screening.
- Growing ethnic heterogeneity of the immigrant population, and its migration selectivity and continuing advantages in behavioural characteristics may partly explain the overall widening health gaps between immigrants and the US-born.

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Commentary: Of salmon and time travellers—musing on the mystery of migrant mortality

Oliver Razum

Paradoxes abound

Socioeconomic status is known to be strongly and inversely associated with mortality: those who are poor, unemployed, or have a low educational attainment experience higher mortality than the rich, employed, and well-educated. Immigrants tend to have, on average, a lower socioeconomic status than the majority population of the destination country. And yet, their mortality, overall as well as for certain specific causes, is often lower in comparison—a paradox.[1] In this issue of the journal, Singh and Hiatt[2] report similar findings from the US. Foreign-born persons of all four major racial/ethnic groups—Asians, blacks, Hispanics, and non-Hispanic whites—have a mortality advantage relative to the US-born. Levels of socioeconomic achievement among many immigrant groups, however, are comparatively lower. The reasons for this puzzling finding again remain elusive. What implications for future migrant research in epidemiology should this have?

Effects of study design?

To begin with, the question has to be resolved whether the observed mortality advantage of immigrants is real or due to bias. Singh and Hiatt attempt to arrest the usual suspects, first and foremost the 'salmon bias'. Its underlying claim is that gravely ill immigrants tend to return to their countries of origin. This leads to a numerator–denominator mismatch and thus to an underestimation of mortality. Singh and Hiatt's study design, a repeated cross-sectional analysis, is prone to this type of bias. For example, in a similar type of study a considerably lower all-cause mortality was observed among male Turkish migrants in Germany than among German men.[3] In a longitudinal design, however, their peers in The Netherlands had a higher mortality than Dutch men.[4] Still, this

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