

Estimated Prevalence of Chronic Hepatitis B (CHB) in Foreign-Born (FB) Persons Living in the United States (U.S.) by Country/Region of Origin

S Welch¹, B Chiang², P Shadday², and CL Brosgart²

¹Plan A, Sunnyvale CA; ²Gilead Sciences, Foster City CA, U.S.A.



Gilead Sciences, Inc.
333 Lakeside Drive
Foster City, CA 94404
Tel: (650)574-3000
Fax: (650)578-9264

Introduction

- Centers for Disease Control (CDC) report that <0.5% of the U.S. population (800,000–1.4 million) are living with CHB¹⁻⁴
- CDC estimates are based on multiple data sources including NHANES national health surveys, country-specific CHB prevalence rates reported in the literature, and estimates of the U.S. population by country of birth.
- Published estimates of CHB in foreign-born (FB) populations in the U.S. vary and are limited to Asians and Pacific Islanders⁵⁻⁷
- Recent studies taking into account the FB population estimate the total prevalence of CHB in the U.S. is about 2.0 million persons^{5,6}

Objectives

- To estimate the number of FB persons living with CHB in the U.S. in 2008 by country/region of origin on the basis of the following:
- Number of FB persons living in the U.S. from different countries or regions of origin and;
 - CHB rates in each country or region of origin

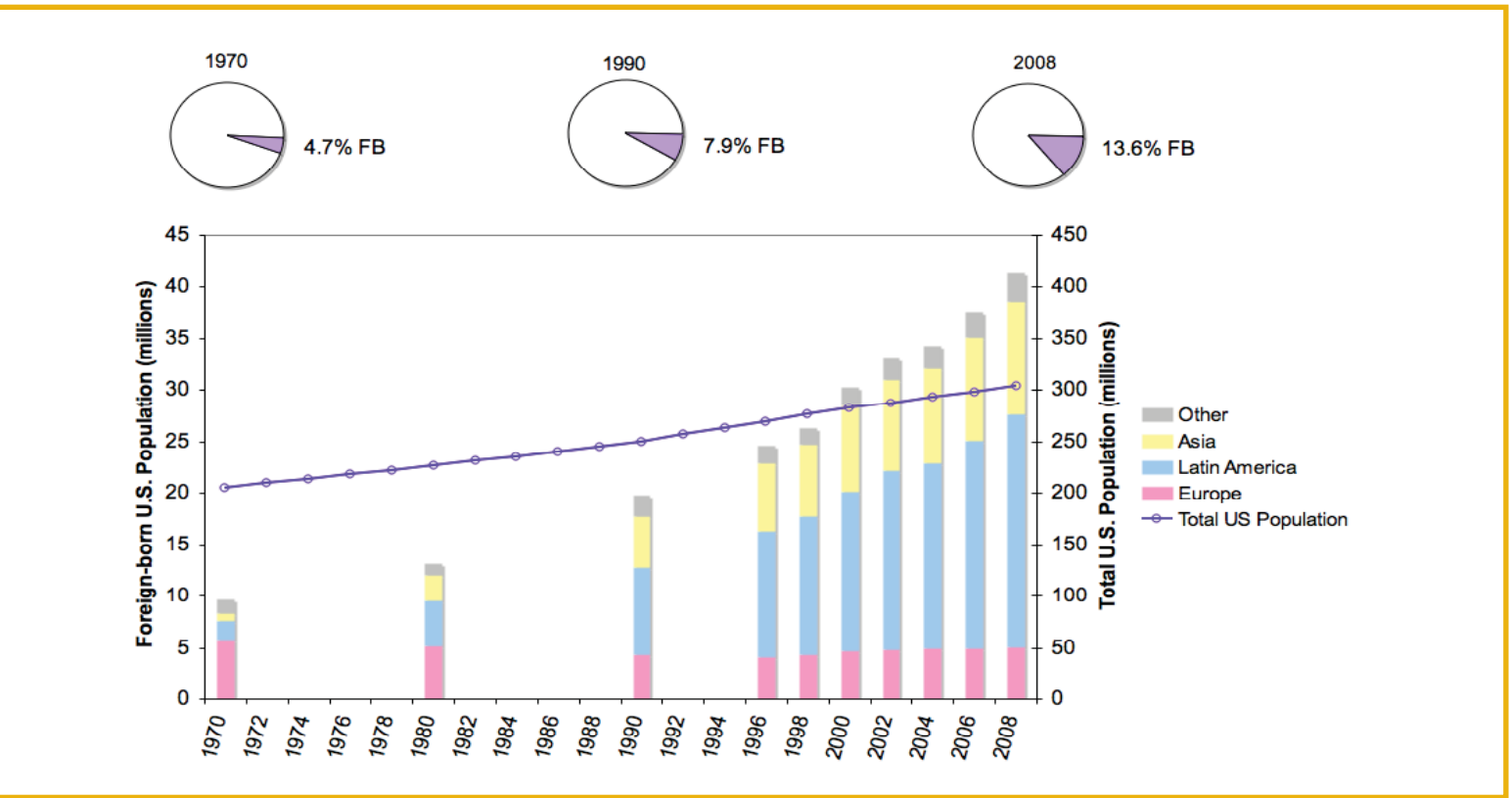
Methods

- U.S. Census data were used to estimate the number of FB persons from 93 countries/regions living in the U.S. in 2008
- The secondary literature on the prevalence of CHB for each country/region was reviewed
- >900 studies were reviewed, many of which are included in a published database⁸
- The percentage of the population that is HBsAg-positive is assumed to reflect the CHB prevalence rate
- Investigators made subjective assumptions for low, mid, and high CHB prevalence rates for each country/region to generate a plausible range of rates for emigrants to the U.S.
- Preference was given to large, peer-reviewed, English-language studies of cohorts representative of the general population and review articles, meta-analyses, and modeling studies
- Demographic data (e.g., age, gender, urban or rural residence) were considered as available
- CHB rates in high-risk populations (e.g., prisoners, sex workers, injection drug users) and sub-populations known to have higher rates of CHB (e.g., certain indigenous peoples) were excluded
- The number of FB persons with CHB was estimated by multiplying each FB population by its prevalence rate

Results

Figure 1. Total and Foreign-Born U.S. Population, 1970-2008

- The number of FB persons living in the U.S. increased from 20 million in 1990 to 41 million in 2008
- 40% of U.S. population growth from 1990 to 2008 was due to the FB population
- Each year since 2001, >1 million FB persons became legal permanent residents



U.S. Census Bureau American Community Survey FB data from 2004 and 2006 were extrapolated to 2008 assuming the same rate of growth for 2006 to 2008. ACS data exclude populations living in institutions and group quarters. Respondents were asked to report the U.S. state, U.S. Island area, or foreign country where they were born. Respondents were not asked about immigration status⁹⁻¹¹

Limitations:

- Published CHB prevalence rates in many countries/regions vary widely and CHB rate assumptions used for estimating CHB prevalence may not be representative of the FB populations living in the U.S.
- The CHB prevalence calculation does not differentiate FB persons by age, gender, or year of entry to the U.S.
- U.S. Census data may underestimate the FB population
- FB persons living in institutions and group quarters are not included in U.S. Census data^{13, 14}
- Persons with limited English language skills are probably under-represented
- Undocumented FB persons may be underrepresented because of language limitations or reluctance to participate in census surveys
- Further analysis is needed on temporal and demographic patterns of:
 - HBV infection, including vaccination programs, in countries of origin
 - Emigration to the U.S. from countries of origin

Figure 2. Published CHB Rates in Different Sub-Populations in Country/Region of Origin

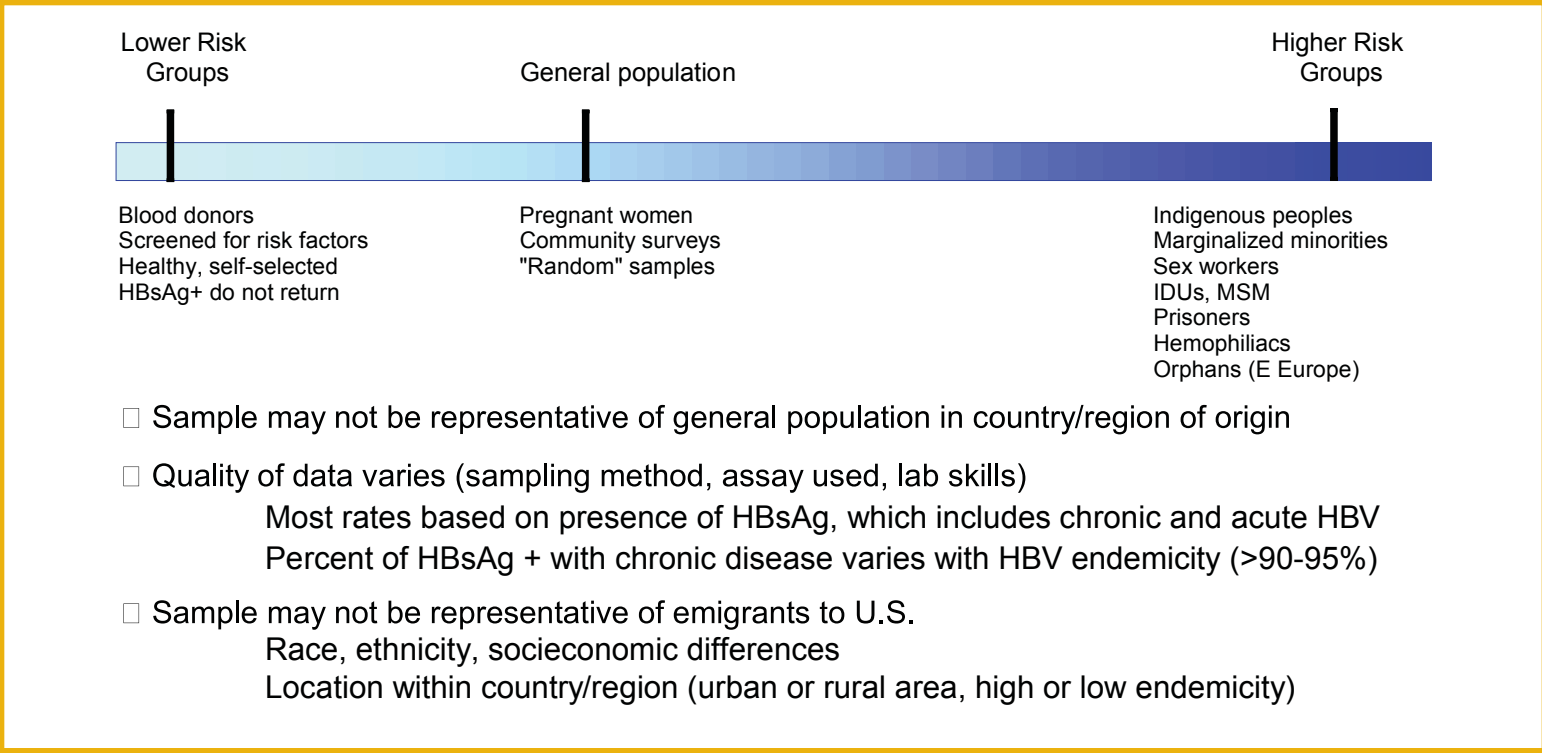


Figure 3. Published CHB Prevalence Rates and Low, Mid, and High CHB Rate Assumptions Used in this Study: Selected Countries

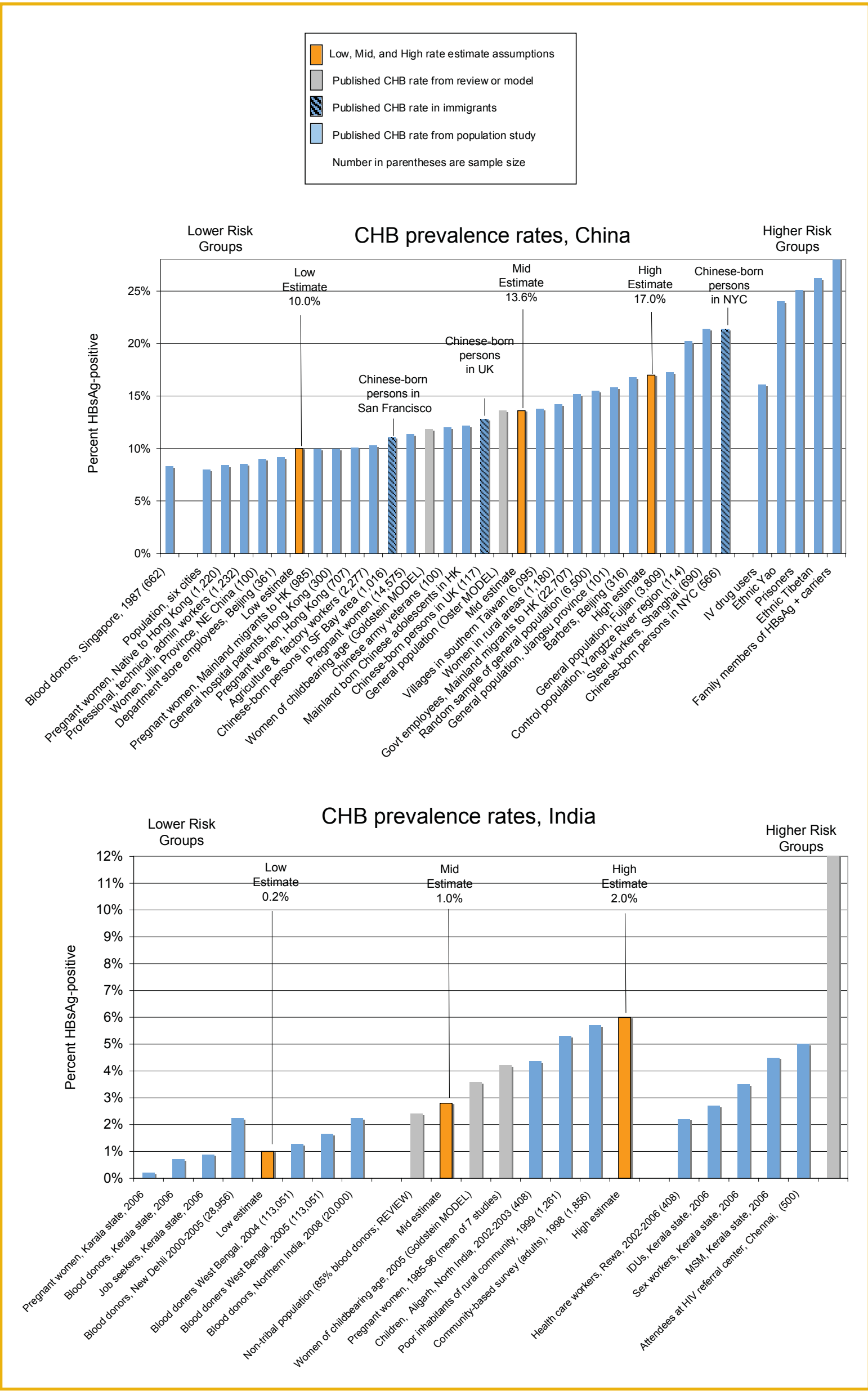


Table 1. FB Population and CHB Prevalence in the U.S. by Place of Birth

Place of Birth	Population	CHB Prevalence Rate			CHB Prevalence in the U.S.		
		Low	Mid	High	Low	Mid	High
FB from all regions	41,329,349	2.0%	3.7%	5.4%	847,145	1,522,798	2,243,767
Asia	10,970,572	4.8%	7.9%	10.6%	521,244	862,779	1,163,700
Central America	16,068,537	0.4%	1.3%	2.3%	71,902	208,804	398,598
Caribbean	3,588,352	1.1%	2.3%	3.9%	38,902	82,000	140,074
South America	2,856,583	1.0%	1.6%	2.4%	28,258	46,614	69,783
Africa	1,669,101	7.8%	11.8%	16.8%	130,722	196,338	280,196
Europe	5,113,072	0.9%	2.2%	3.4%	48,073	114,174	174,361
Oceania	174,814	4.1%	5.4%	7.7%	7,156	9,424	13,490
North America	888,318	0.1%	0.3%	0.4%	888	2,665	3,553
Asia	10,970,572	4.8%	7.9%	10.6%	521,244	862,779	1,163,700
Eastern Asia	3,490,940	7.5%	10.6%	13.5%	261,579	368,783	472,293
China	2,040,477	10.0%	13.6%	17.0%	204,048	277,709	346,881
Korea	1,084,859	5.0%	8.0%	11.0%	54,243	86,789	119,334
Iran	344,270	2.0%	3.3%	4.0%	6,885	11,326	13,771
Other Eastern Asia	14,793	8.0%	10.0%	15.0%	1,183	1,479	2,219
South Central Asia	2,748,463	1.7%	3.5%	6.1%	45,411	95,556	168,467
India	1,689,162	1.0%	2.8%	6.0%	47,297	101,350	210,350
Pakistan	261,466	2.0%	4.9%	5.5%	5,229	12,864	14,381
Iran	344,270	2.0%	3.3%	4.0%	6,885	11,326	13,771
Bangladesh	179,323	3.5%	5.0%	8.0%	6,276	8,966	14,346
Afghanistan	56,084	2.5%	3.6%	5.0%	1,402	2,013	2,804
Other South Central Asia	218,159	4.0%	6.0%	10.0%	8,726	13,090	21,816
South Eastern Asia	3,817,072	5.2%	9.6%	12.4%	197,160	366,083	473,966
Vietnam	1,201,462	6.0%	13.0%	15.0%	72,088	156,190	216,263
Philippines	1,777,009	4.2%	7.0%	9.0%	74,634	124,391	169,931
Laos	180,016	10.0%	11.8%	13.0%	18,002	21,296	23,402
Cambodia	174,345	8.0%	11.8%	13.0%	13,948	20,625	22,665
Thailand	220,476	1.5%	9.0%	10.0%	3,307	19,843	22,048
Indonesia	99,684	7.0%	9.0%	10.0%	6,973	9,972	9,969
Other South Eastern Asia	164,081	5.0%	9.0%	12.0%	8,204	14,767	19,690
Western Asia	863,542	1.9%	3.6%	5.5%	16,589	31,093	47,456
Iraq	120,734	2.2%	4.3%	5.0%	2,656	5,216	6,037
Turkey	98,031	3.8%	4.0%	7.0%	3,725	3,960	6,862
Syria	73,875	2.5%	3.8%	4.0%	1,847	2,907	3,955
Lebanon	111,882	1.0%	2.5%	3.0%	1,119	2,797	3,356
Israel	148,786	0.4%	0.8%	1.8%	655	1,205	2,678
Armenia	77,936	1.0%	1.5%	3.0%	779	1,169	2,338
Other Western Asia	232,289	2.5%	6.0%	10.0%	5,807	13,938	23,230
Asia n.e.c.	50,554	1.0%	2.5%	3.9%	505	1,264	1,417
Central America	16,068,537	0.4%	1.3%	2.3%	71,902	208,804	398,598
Mexico	12,973,160	0.2%	1.0%	2.0%	25,946	129,332	259,463
El Salvador	1,169,978	1.6%	2.5%	5.0%	18,720	29,249	58,499
Guatemala	881,462	1.6%	2.5%	5.0%	14,103	22,037	44,073
Honduras	522,812	1.6%	3.5%	5.0%	8,365	18,298	26,141
Nicaragua	281,393	0.9%	2.0%	2.0%	2,533	5,628	5,628
Costa Rica	99,119	0.9%	1.6%	2.0%	892	1,596	1,862
Other Central America	63,531	0.9%	1.6%	2.0%	572	1,023	1,271
Caribbean	3,588,352	1.1%	2.3%	3.9%	38,902	82,000	140,074
Haiti	585,916	2.0%	5.6%	10.0%	11,718	32,811	58,592
Cuba	946,772	0.7%	1.6%	2.0%	6,627	15,243	18,935
Dominican Republic	853,917	1.0%	1.6%	4.0%	8,539	13,748	34,157
Jamaica	684,323	1.0%	1.6%	2.0%	6,843	11,018	13,686
Barbados	56,149	1.0%	1.6%	2.0%	561	904	1,123
Trinidad and Tobago	243,500	1.0%	1.6%	2.0%	2,435	3,920	4,870
Other Caribbean	217,777	1.0%	2.0%	4.0%	2,178	4,356	8,711
South America	2,856,583	1.0%	1.6%	2.4%	28,258	46,614	69,783
Colombia	702,496	1.0%	1.6%	2.0%	7,025	11,240	14,050
Peru	430,624	1.5%	2.2%	3.8%	6,459	9,474	16,364
Ecuador	451,640	1.5%	2.0%	2.5%	6,775	9,033	11,291
Guayana	296,287	1.0%	1.6%	2.0%	2,563	4,126	5,128
Venezuela	172,711	0.5%	2.0%	2.5%	864	3,454	4,318
Brazil	416,459	0.5%	0.8%	2.5%	2,082	3,332	10,411
Argentina	148,567	0.5%	1.6%	2.5%	743	2,392	3,714
Bolivia	67,680	0.5%	2.0%	2.5%	338	1,354	1,692
Uruguay	99,501	1.0%	1.6%	2.0%	595	958	1,190
Chile	92,330	0.3%	0.3%	0.5%	231	314	462
Other South America	58,289	1.0%	1.6%	2.0%	583	938	1,166
Africa	1,669,101	7.8%	11.8%	16.8%	130,722	196,338	280,196
Western Africa	585,032	7.0%	14.1%	20.6%	40,952	82,541	120,795
Nigeria	254,631	7.0%	11.5%	15.0%	17,824	29,283	38,195
Ghana	104,968	7.0%	15.0%	25.0%	7,348	15,745	26,242
Liberia	73,963	7.0%	15.0%	25.0%	5,177	15,743	18,491
Other Western Africa	151,469	7.0%	15.0%	25.0%	10,603	22,720	37,867
Eastern Africa	466,564	10.0%	11.8%	17.0%	46,566	55,241	79,316
Ethiopia	156,636	10.0%	11.8%	17.0%	15,664	18,546	26,628
Kenya	97,903	10.0%	11.8%	17.0%	9,790	11,592	16,644
Other Eastern Africa	212,025	10.0%	11.8%	17.0%	21,203	25,104	36,044
Northern Africa	310,612	4.0%	7.1%	10.0%	12,424	21,898	31,061
Egypt	163,958	4.0%	7.1%	10.0%	6,558	11,559	16,396
Other Northern Africa	146,654	4.0%	7.1%	10.0%	5,866	10,339	14,665
South Africa	95,090	10.0%	10.9%	17.0%	9,509	10,365	16,165
South Africa	95,090	10.0%	10.9%	17.0%	9,509	10,365	16,165
Other Southern Africa	4,510	10.0%	10.9%	17.0%	451	492	767
Middle Africa	54,437	10.0%	13.6%	17.0%	5,444	7,409	9,254
Africa n.e.c.	187,365	10.0%	12.0%	15.0%	15,737	18,884	23,605
Europe	5,113,072	0.9%	2.2%	3.4%	48,073	114,174	174,361
Eastern Europe	2,219,731	1.6%	3.5%	5.4%	36,346	82,083	120,123
Poland	504,268	2.0%	3.5%	5.0%	10,085	17,649	25,213
Russia	304,054	2.0%	4.0%	5.0%	7,881	25,763	19,783
Romania	177,020	1.5%	5.0%	7.5%	2,655	8,851	13,277
Ukraine	343,524	1.0%	1.8%	4.0%	3,435	6,183	13,741
Bosnia-Herzegovina	106,169	2.0%	5.0%	6.0%	2,123	5,308	6,370
Yugoslavia	125,205	1.0%	2.0%	5.0%	1,252	2,504	6,886
Hungary	173,552	1.0%	2.0%	3.0%	736	1,471	2,207
Croatia	44,533	1.0%	3.0%	5.0%	445	1,336	2,227
Czechoslovakia	86,349	0.5%	1.3%	1.5%	432	1,114	1,295
Other Eastern Europe	365,047	2.0%	6.0%	8.0%	7,301	21,903	29,204
Southern Europe	875,150	0.9%	2.0%	3.2%	7,860	17,558	28,350
Italy	410,351	0.7%	2.4%	3.7%	3,872	9,807	14,982
Greece	153,675	1.0%	2.3%	5.0%	1,537	3,458	7,684
Portugal	210,038	0.9%	1.0%	1.4%	1,911	2,100	2,941
Spain	92,152	0.7%	1.1%	2.0%	645	977	1,843
Other Southern Europe	8,841	10.0%	13.6%	17.0%	894	1,217	1,520
North and West Europe	2,006,068	0.2%	0.7%	1.3%	1,319	14,472	25,768
Germany	627,375	0.2%	1.3%	1.8%	1,255	7,842	11,293
United Kingdom	727,113	0.2%	0.5%	0.8%	1,454	3,636	5,817
Ireland	139,443	0.2%	0.5%	0.8%	279	697	1,116
Netherlands	85,554	0.2%	0.8%	1.6%	177	664	1,594
Austria	63,464	0.2%	0.7%	1.8%	127	463	1,142
France	145,615	0.2%	0.3%	1.8%	291	364	2,621
Other Northern Europe	128,898	0.1%	0.1%	0.5%	64	180	644
Other Western Europe	85,006	0.2%	0.7%	1.8%	171	625	1,541
Europe n.e.c.	12,116	0.4%	0.5%	1.0%	48	61	121
Oceania	174,814	4.1%	5.4%	7.7%	7,156	9,424	13,490
North America	888,318	0.1%	0.3%	0.4%	888	2,665	3,553
Canada	881,800	0.1%	0.3%	0.4%	882	2,645	3,527
Other North America	6,518	0.1%	0.3%	0.4%	7	20	26

2008 FB populations extrapolated from US Census Bureau American Community Surveys 2004 and 2006

Figure 4. Percent of Total FB Population and FB with CHB Living in the U.S. by Place of Birth

