10-20-2021

Health of Asylees Compared to Refugees in the United States Using Domestic Medical Examination Data, 2014-2016: A Cross-Sectional Analysis.

Gayathri S Kumar
Centers for Disease Control and Prevention

Clelia Pezzi
Centers for Disease Control and Prevention

Colleen Payton
Thomas Jefferson University

Blain Mamo
Minnesota Department of Health

Kailey Urban
Minnesota Department of Health

Recommended Citation
See next page for additional authors
Kumar, Gayathri S; Pezzi, Clelia; Payton, Colleen; Mamo, Blain; Urban, Kailey; Scott, Kevin; Montour, Jessica; Cabanting, Nuny; Aguirre, Jenny; Ford, Rebecca; Hughes, Stephen E; Kawasaki, Breanna; Kennedy, Lori; and Jentes, Emily S, "Health of Asylees Compared to Refugees in the United States Using Domestic Medical Examination Data, 2014-2016: A Cross-Sectional Analysis." (2021). *College of Population Health Faculty Papers.* Paper 135.
https://jdc.jefferson.edu/healthpolicyfaculty/135

Authors

Gayathri S Kumar, Clelia Pezzi, Colleen Payton, Blain Mamo, Kailey Urban, Kevin Scott, Jessica Montour, Nuny Cabanting, Jenny Aguirre, Rebecca Ford, Stephen E Hughes, Breanna Kawasaki, Lori Kennedy, and Emily S Jentes

Clinical Infectious Diseases

MAJOR ARTICLE

Health of Asylees Compared to Refugees in the United States Using Domestic Medical Examination Data, 2014–2016: A Cross-Sectional Analysis

Gayathri S. Kumar,[1] Clelia Pezzi,[1] Colleen Payton,[2,3] Blain Mamo,[4] Kailey Urban,[4] Kevin Scott,[2] Jessica Montour,[5] Nuny Cabanting,[6] Jenny Aguirre,[7] Rebecca Ford,[8] Stephen E. Hughes,[9] Breanna Kawasaki,[10] Lori Kennedy,[10] and Emily S. Jentes[1]

[1]Centers for Disease Control and Prevention, Atlanta, Georgia, USA; [2]Thomas Jefferson University, Philadelphia, Pennsylvania, USA; [3]Moravian College, Bethlehem, Pennsylvania, USA; [4]Minnesota Department of Health, Saint Paul, Minnesota, USA; [5]US Committee for Refugees and Immigrants, Austin, Texas, USA; [6]California Department of Public Health, Sacramento, California, USA; [7]Illinois Department of Healthcare and Family Services, Chicago, Illinois, USA; [8]Kentucky Office for Refugees, Louisville, Kentucky, USA; [9]New York State Department of Health, Albany, New York, USA; and [10]Colorado Department of Public Health and Environment, Denver, Colorado, USA

Background. Between 2008 and 2018, persons granted asylum (asylees) increased by 168% in the United States. Asylees are eligible for many of the same domestic benefits as refugees under the US Refugee Admissions Program (USRAP), including health-related benefits such as the domestic medical examination. However, little is known about the health of asylees to guide clinical practice.

Methods. We conducted a retrospective cross-sectional analysis of domestic medical examination data from 9 US sites from 2014 to 2016. We describe and compare demographics and prevalence of several infectious diseases such as latent tuberculosis infection (LTBI), hepatitis B and C virus (HBV, HCV), and select sexually transmitted infections and parasites by refugee or asylee visa status.

Results. The leading nationalities for all asylees were China (24%) and Iraq (10%), while the leading nationalities for refugees were Burma (24%) and Iraq (19 %). Approximately 15% of asylees were diagnosed with LTBI, and 52% of asylee adults were susceptible to HBV infection. Prevalence of LTBI (prevalence ratio [PR] = 0.8), hepatitis B (0.7), hepatitis C (0.5), and *Strongyloides* (0.5) infections were significantly lower among asylees than refugees. Prevalence of other reported conditions did not differ by visa status.

Conclusions. Compared to refugees, asylees included in our dataset were less likely to be infected with some infectious diseases but had similar prevalence of other reported conditions. The Centers for Disease Control and Prevention's *Guidance for the US Domestic Medical Examination for Newly Arrived Refugees* can also assist clinicians in the care of asylees during the routine domestic medical examination.

Keywords. asylees; asylum seekers; refugees; domestic medical examination; health screening.

Refugees and asylees are persons who are outside their countries of nationality and who are unable to return to their countries of nationality because of persecution or a well-founded fear of persecution on account of race, religion, nationality, membership in a particular social group, or political opinion [1, 2]. Applicants for refugee status are outside their host country and are typically planned migrations, whereas applicants seeking asylum are already present in their host country or are seeking admission at a port of entry [2].

In 2018, the number of persons granted asylum (now asylees) (38 687) surpassed the number of refugee arrivals (22 405) for the first time since 2003 [2]. This was likely related to the steady reduction in planned US refugee admissions since 2016. Countries of origin for individuals granted asylum and refugees vary each year. In 2014, the leading countries of origin for asylees were China (35.0%) and Egypt (10.1%) [3], whereas in 2018, the leading countries were China (17.8%) and Venezuela (15.7%) [2]. In contrast, the leading countries of origin for refugees resettling in the United States from 2008 to 2018 included Burma, Iraq, Bhutan, Somalia, and Democratic Republic of the Congo [4].

Refugees and other immigrants receive a medical screening exam overseas according to the Technical Instructions written by the US Centers for Disease Control and Prevention (CDC) [5] and have access to overseas health interventions, such as vaccines or parasite treatments before departure to the United States [6]. However, asylees do not receive an overseas medical screening exam or access overseas health interventions because they seek asylum after US arrival. After being granted asylum, asylees are eligible for many of the same domestic benefits as refugees under the US Refugee Admissions Program (USRAP), including health-related benefits in the United States [7, 8].

The CDC recommends that asylees receive a domestic medical examination soon after being granted asylum status [9]. Refugees are recommended to receive the examination within 90 days after arrival in the United States [9]. Clinicians conducting the domestic medical examination for asylees

Received 20 January 2021; editorial decision 20 May 2021; published online 27 May 2021.
Correspondence: G. S. Kumar, MD, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Atlanta, GA 30329 (wiz3@cdc.gov).

Clinical Infectious Diseases® 2021;73(8):1492–9

DOI: 10.1093/cid/ciab502

have been encouraged to follow CDC's *Guidance for the US Domestic Medical Examination for Newly Arrived Refugees* [10]. Because the CDC guidance were originally developed for refugee populations, reporting on the guidelines' effectiveness in capturing health conditions among asylee populations is limited [10]. Minimal information about the health of asylees exists in the literature [11–13]. Increasing clinician knowledge about common health conditions encountered in asylees may facilitate diagnostic screening, targeted clinical evaluation, and referrals to additional healthcare providers in the United States. In addition, more data are needed comparing the health of asylees and refugees given the potential similarities in reasons for US resettlement and because both populations are eligible to receive the domestic medical examination. However, differences due to countries of origin and conditions of emigration or transit likely exist between these 2 populations and can contribute to differences in risks of disease exposure. Assessing differences in health profiles between these populations can inform clinical management and whether public health interventions, including domestic medical examination guidance, should be tailored to specific groups.

Therefore, the purpose(s) of this analysis are 2-fold: 1) describe the frequency and prevalence of screened medical conditions among asylees during the domestic medical examination and 2) compare the prevalence of medical conditions in asylees and refugees during domestic medical examinations.

METHODS

Analysis Design, Participants, and Setting

A cross-sectional analysis was conducted to examine the prevalence of medical conditions among asylees compared to refugees during the domestic medical examination. Participants included asylee and refugee adults (≥18 years old) and children and adolescents (<18 years old) who received a domestic medical examination in the United States between January 2014 and December 2016. Sites were not able to provide information about whether asylees were principal asylees or derivative asylees. CDC collaborated with 7 states (California, Colorado, Minnesota, New York, Kentucky, Illinois, and Texas), 1 county (Marion County, Indiana), and 1 academic medical center in Philadelphia, Pennsylvania, to collect domestic medical examination data for analysis. These sites provided their data as part of a CDC-funded nonresearch cooperative agreement. Although this was a convenience sample, the data set includes data from 3 states (California, Texas, and New York) with the highest volume of refugee and/or asylee arrivals between 2014 and 2016. Further details about partners and methodology can be found elsewhere [14, 15]. This project was reviewed in accordance with CDC institutional review policies and procedures and was determined to be nonresearch.

Data Sources

Each site collected domestic medical examination data, including basic demographic information, anthropometric measurements (ie, body measurements for assessing growth and body fat distribution), and results of laboratory testing. CDC guidance recommend screening for both communicable (eg, tuberculosis [TB] and hepatitis B) and noncommunicable (eg, elevated blood lead levels) conditions during the domestic medical examination [10]. Details on diagnosis and categorization of each condition are described further in Tables 2 and 3.

Measures

Demographic information provided included sex, age, nationality, and primary language spoken by the applicant or used by an interpreter. We examined the results of laboratory testing for tuberculosis, hepatitis B, hepatitis C, malaria, strongyloidiasis, schistosomiasis, other pathogenic intestinal parasites, syphilis, chlamydia, and human immunodeficiency virus (HIV); most outcomes were categorized as either "screened and positive" or "screened and negative." For hepatitis B, we also analyzed the proportion of individuals who were susceptible to hepatitis B (ie, at risk for infection with hepatitis B), where the results of hepatitis B surface antigen (HBsAg), hepatitis B core antibody (anti-HBc), and hepatitis B surface antibody (anti-HBs) were all negative (further details on how we categorized hepatitis B status are outlined in Table 2). During the period of data collection, CDC guidance recommended screening blood for lead in children aged six months to 16 years, with elevated blood lead levels [EBLL] defined as ≥ 5 mcg/dL [10]. For most conditions, we were unable to collect detailed information on the method of screening (ie, type of test) used by sites. Persons who were not screened, or those who were screened but whose results were unknown, were excluded from the outcomes analysis.

Statistical Methods

Frequencies and proportions were calculated to describe demographic characteristics and prevalence of medical conditions; results were stratified by asylee or refugee status and age at screening visit (adult ≥ 18 years, child < 18 years). We used χ^2 tests or Fisher exact tests to compare each medical condition by refugee/asylee status. Fisher exact tests were used if the frequency per cell was <5. Statistical significance was noted at a P value < .05. Denominators for medical conditions varied because of missing data and screening differences across sites.

A modified Poisson regression was used to model the adjusted prevalence ratio (adjusting for age and sex) while accounting for state-level clustering. Status at entry (refugee status as reference) was the primary exposure variable, and select medical conditions (ie, latent tuberculosis infection [LTBI], hepatitis B virus [HBV], hepatitis C virus [HCV], strongyloidiasis,

schistosomiasis, and elevated blood lead levels [EBLL]) were the primary outcome variables. We excluded medical conditions with 5 or fewer cases or that were not statistically significant in the bivariate analysis (Table 2).

RESULTS

Of the 78 062 individuals included in our analysis, 4044 (5%) were asylees and 74 018 (95%) were refugees (Table 1). Among the 4044 asylees, there were 2901 adults and 1143 children. The median age for refugees was 23 years (interquartile range [IQR]: 10–36), and the median age for asylees was 27 years (IQR: 16–38). There were 88 nationalities represented by asylees, and 82 primary languages spoken by or used by an interpreter. There were 115 nationalities represented by refugees. The leading nationalities for all asylees were China (24%), Iraq (10%), and Iran (9%), whereas the leading nationalities for refugees were Burma (24%), Iraq (19 %), and Somalia (11%). Both asylee and refugee populations had 6 nationalities in common (Iraq, Iran, Somalia, Syria, Afghanistan, and Eritrea) among the top 10 nationalities represented by both populations.

Asylees Not Screened for a Particular Condition

The proportion of all asylees who were not screened for a particular medical condition were as follows: LTBI (6%); HBV (2%); HCV (32%); malaria (50%); strongyloidiasis (81%); schistosomiasis (95%); other intestinal parasites (21%); syphilis (22%); chlamydia (80%); HIV (7%); and elevated blood lead level (children only: 22%). The proportion of refugees who were not screened for a particular medical condition and any differences in proportions screened for a medical condition by visa status have been reported elsewhere [14].

Adults

Overall, 1787 (84%; 95% confidence interval [CI]: .83–.86) asylee adults (vs 76% [95% CI: .75–.76] of refugee adults) had no evidence of tuberculosis infection, and 15% (vs 22%) were diagnosed with LTBI (Table 2). Approximately 52% (95% CI: .50–.53) of asylee adults were susceptible to HBV infection compared to 40% (95% CI: .40–.41) of refugee adults (Table 2). In the adjusted analysis, there were no differences in status of susceptibility to HBV infection between asylees

Table 1. Demographic Characteristics of Asylees and Refugees Who Resettled to the United States, 2014–2016

	All		Adults ≥18 years old		Children <18 years old	
Demographic Characteristics	Asylee n (%)	Refugee n (%)	Asylee n (%)	Refugee n (%)	Asylee n (%)	Refugee n (%)
Total	4044	74 018	2901	45 113	1143	28 905
Sex[a]						
Female	1933 (47.8)	35 973 (48.6)	1390 (47.9)	21 882 (48.5)	543 (47.5)	14 091 (48.8)
Male	2111 (52.2)	38 033 (51.4)	1511 (52.1)	23 226 (51.5)	600 (52.5)	14 807 (51.2)
Age, y[a]						
0–2					92 (8.1)	5081 (17.6)
3–5					203 (17.8)	5697 (19.7)
6–17					848 (74.2)	18 127 (62.7)
18–44			2267 (78.2)	34 508 (76.5)		
45–64			552 (19.0)	8258 (18.3)		
≥65			82 (2.8)	2347 (5.2)		
Nationality						
China	950 (23.5)	132 (0.2)	645 (22.2)	94 (0.2)	305 (26.7)	38 (0.1)
Iraq	389 (9.6)	14 170 (19.1)	323 (11.1)	9368 (20.8)	66 (5.8)	4802 (16.6)
Iran	367 (9.1)	6392 (8.6)	319 (11.0)	5488 (12.2)	48 (4.2)	904 (3.1)
Egypt	337 (8.3)	60 (0.8)	204 (7.0)	27 (0.06)	133 (11.6)	33 (0.1)
Ethiopia	208 (5.1)	905 (1.2)	150 (5.2)	530 (1.2)	58 (5.1)	375 (1.3)
Afghanistan	191 (4.7)	2396 (3.2)	104 (3.6)	1407 (3.1)	87 (7.6)	989 (3.4)
Syria	190 (4.7)	4136 (5.6)	134 (4.6)	1873 (4.2)	56 (4.9)	2263 (7.8)
Nepal	173 (4.3)	288 (0.4)	113 (3.9)	160 (0.4)	60 (5.3)	128 (0.4)
Eritrea	154 (3.8)	950 (1.3)	133 (4.6)	526 (1.2)	21 (1.8)	424 (1.5)
Somalia	110 (2.7)	8288 (11.2)	101 (3.5)	4332 (9.6)	9 (0.8)	3956 (13.7)
Burma	29 (0.7)	17 674 (23.9)	19 (0.7)	10 764 (23.9)	10 (0.9)	6910 (23.9)
Democratic Republic of the Congo	28 (0.7)	6387 (8.6)	18 (0.6)	3074 (6.8)	10 (0.9)	3313 (11.5)
Ukraine	6 (0.2)	167 (0.2)	6 (0.2)	108 (0.2)	--	59 (0.2)
Bhutan	6 (0.2)	4200 (5.7)	4 (0.1)	2938 (6.5)	2 (0.2)	1262 (4.4)
Other nationalities	906 (22.4)	7873 (10.6)	628 (21.7)	4424 (9.8)	278 (24.3)	3449 (11.9)

Percentages may not add up to 100% because of rounding.

Abbreviation: SD, standard deviation.

[a]Number missing: Sex (n = 5 for refugee adults and n = 7 for refugee children); age (n = 7 for refugee children).

Table 2. Domestic Medical Examination Results Among Asylees and Refugees Who Resettled to the United States, 2014–2016

	Adults ≥ 18 years old			Children < 18 years old		
Medical Screening Characteristic	Asylee n (%)	Refugee n (%)	*P* value	Asylee n (%)	Refugee n (%)	*P* value
Total						
Tuberculosis[a]	n = 2123	n = 28 350	<.0001	n = 822	n = 17 193	<.0001
No evidence of tuberculosis	1787 (84.2)	21 526 (75.9)		783 (95.3)	15 654 (91.1)	
Clinically active	1 (0.1)	54 (0.2)		0	14 (0.1)	
Not clinically active	10 (0.5)	423 (1.5)		0	88 (0.51)	
Latent tuberculosis infection	325 (15.3)	6347 (22.4)		39 (4.7)	1437 (8.4)	
Hepatitis B[b]	n = 2757	n = 42 770	<.0001	n = 1040	n = 25 955	.004
Susceptible	1422 (51.6)	17 172 (40.2)		286 (27.5)	6346 (24.5)	
Uninfected, susceptibility unknown	304 (11.0)	6892 (16.3)		308 (29.6)	8081 (31.1)	
Infected	75 (2.7)	1579 (3.7)		7 (0.7)	351 (1.3)	
Immune						
Natural infection	266 (9.7)	4832 (11.3)		12 (1.2)	458 (1.8)	
Hepatitis B vaccination	663 (24.1)	10 395 (24.3)		423 (40.7)	10 363 (39.9)	
Not specified	27 (1.0)	1810 (4.2)		4 (0.4)	356 (1.4)	
Hepatitis C[c]	n = 2065	n = 24 603	.002	n = 698	n = 11 320	.24
Screened, positive	26 (1.3)	561 (2.3)		2 (0.3)	81 (0.7)	
Malaria[d]	n = 1491	n = 7582	.74	n = 518	n = 3252	.03
Screened, positive	3 (0.2)	13 (0.2)		0	29 (0.9)	
Strongyloidiasis[e]	n = 581	n = 8724	.02	n = 192	n = 6890	1.0
Screened, positive	11 (1.9)	331 (3.8)		2 (1.0)	83 (1.2)	
Schistosomiasis[e]	n = 143	n = 4306	.02	n = 41	n = 4135	1.0
Screened, positive	20 (14.0)	303 (7.0)		1 (2.4)	128 (3.1)	
Pathogenic intestinal parasites[f]	n = 2286	n = 21 139	.52	n = 907	n = 13 164	.93
Screened, positive	7 (0.31)	50 (0.24)		7 (0.77)	98 (0.74)	
Syphilis[g]	n = 2609	n = 31 270	.83	n = 527	n = 5960	1.0
Screened, positive	23 (0.9)	294 (0.9)		2 (0.4)	26 (0.4)	
Chlamydia[g]	n = 631	n = 8363	.07	n = 160	n = 1823	.69
Screened, positive	18 (2.9)	150 (1.8)		2 (1.3)	19 (1.0)	
HIV[g]	n = 2771	n = 36 365	.26	n = 1003	n = 19 969	.73
Positive, screened/unscreened (type 1, type 2, or unknown)	27 (1.0)	283 (0.8)		1 (0.1)	47 (0.2)	
Blood lead level (mcg/dL)[h]				n = 845	n = 24 757	<.0001
<5	N/A	N/A		787 (93.1)	21 709 (87.7)	
5–9	N/A	N/A		52 (6.2)	2707 (10.9)	
10–19	N/A	N/A		6 (0.7)	293 (1.2)	
20–44	N/A	N/A		0	43 (0.1)	
45–70	N/A	N/A		0	5 (0.02)	

Percentages may not add up to 100% because of rounding. We used χ^2 or Fisher exact tests to compare characteristic or disease condition by status at entry (asylee vs refugee). Fisher exact tests were used if frequency per cell was < 5. Statistical significance was noted at a *P* value < .05. Proportion of all asylees who were not screened for a particular medical condition: latent tuberculosis infection (6%); hepatitis B virus (2%); hepatitis C virus (32%); malaria (50%); strongyloides (81%); schistosomiasis (95%); other intestinal parasites (21%); syphilis (22%); chlamydia (80%); human immunodeficiency virus (HIV) (7%); and elevated blood lead level (children only: 22%).

Abbreviations: HBc, hepatitis B core antibody; HBs, hepatitis B surface antibody; HBsAg, hepatitis B surface antigen; N/A, not applicable.

[a]For tuberculosis (TB), information on diagnosis was reported and categorized as no evidence of TB, clinically active, not clinically active and latent tuberculosis infection (LTBI) [25]. TB disease diagnosis was made by a positive smear, culture, or clinical diagnosis of pulmonary TB. A classification of not clinically active TB was made when a person had a history of previous episode(s) of TB or abnormal stable radiographic findings and had a positive reaction to tuberculin skin test (TST), negative cultures, and no clinical and/or radiographic evidence of current disease. Diagnosis of LTBI was made by a positive interferon gamma release assay (IGRA) or TST and negative diagnostic workup for TB. The majority of asylee adults (99%) were tested using IGRA. Among children tested for LTBI, 92% were tested using IGRA and 8% were tested using TST. Data were included if states provided information about TB diagnosis for an individual.

[b]Hepatitis B virus status was categorized as susceptible (HBsAg, anti-HBc, and anti-HBs all negative), uninfected/susceptibility unknown (HBsAg negative, anti-HBc and anti-HBs unknown), infected (HBsAg positive), immune through natural infection (HBsAg negative, anti-HBc positive and anti-HBs positive), immune through hepatitis B vaccination (HBsAg negative, anti-HBc negative, and anti-HBs positive) and immune but not specified (HBsAg negative, anti-HBs positive and anti-HBc unknown) [26].

[c]Hepatitis C was diagnosed by any of the following: detection of antibody to hepatitis C virus (anti-HCV), a positive recombinant immunoblot assay (RIBA) result, or a positive HCV RNA polymerase chain reaction (PCR) result.

[d]Malaria diagnosis was laboratory-confirmed using either microscopy or by a rapid diagnostic test.

[e]*Strongyloides* and schistosomiasis diagnoses were laboratory-confirmed using either microscopy or by serology testing.

[f]Intestinal parasite infection diagnoses were laboratory-confirmed using stool ova and parasite testing.

[g]Syphilis diagnosis was made via a positive nontreponemal test (Venereal Disease Research Laboratory [VDRL] or rapid plasma reagin [RPR]) followed by a positive confirmatory treponemal test (eg, *Treponema pallidum*-particle agglutination [TP-PA], microhemagglutination assay for *Treponema pallidum* [MHA-TP]). Syphilis testing is recommended in all persons ≥15 years of age if no overseas testing results are available, and in persons <15 years of age if sexually active. Chlamydia and HIV diagnoses were made via laboratory-confirmed testing.

[h]Blood lead level screening applies to children from 6 months up to 16 years of age only.

and refugees. However, another 11% of asylee adults and 16% of refugee adults had unknown susceptibility to HBV (ie, HBsAg negative, status of anti-HBc and anti-HBs unknown); therefore, the proportion of each population susceptible to hepatitis B may differ. Compared to refugees, asylees were less likely to have LTBI (prevalence ratio [PR]: 0.8; 95% CI: .6–.9), HBV (PR: 0.7; 95% CI: .5–.97), HCV (PR: 0.56; 95% CI: .5–.7), and *Strongyloides* infection (PR: 0.5; 95% CI: .3–.8) in the adjusted analysis (Table 3). Although a greater proportion of asylee adults screened positive for schistosomiasis (PR: 14%; 95% CI: .08–.20) compared to refugee adults (PR: 7%; 95% CI: .06–.08), there were no differences in the prevalence of schistosomiasis in the adjusted analysis. There were no differences in the prevalence of malaria, other pathogenic intestinal parasites, syphilis, chlamydia, and HIV between asylees and refugees.

Children

Overall, 783 (95%; 95% CI: .94–.97) asylee children (vs 91% [95% CI: .91–.92] of refugee children) had no evidence of tuberculosis infection, and 5% (95% CI: .03–.06) (vs 8% [95% CI: .08–.09] of refugee children) had a diagnosis of LTBI (Table 2). Asylee children were less likely to have LTBI compared to refugee children (PR: 0.7; 95% CI: .5–.96). About 28% of asylee children (vs 25% of refugee children) were susceptible to HBV infection, although this proportion may differ given that 30% of asylees were uninfected, with their susceptibility unknown. Approximately 0.7% (95% CI: .003–.012) of asylees (vs 1% [95% CI: .012–.015] of refugees) were HBV-infected, whereas 42% (95% CI: .37–.43) were immune (vs 43% [95% CI: .42–.44]). Compared to refugees, asylees were less likely to be infected with HBV (PR: 0.4; 95% CI: .2–.8). Approximately 7% (95% CI: .05–.09) of asylees (vs 12% [95% CI: .12–.13]) had EBLL. In adjusted analysis, there was no difference in the prevalence of HCV, strongyloidiasis, schistosomiasis, other pathogenic intestinal parasites, syphilis, chlamydia, HIV, and EBLL between asylee and refugee children who were screened for each condition (Table 3).

DISCUSSION

In our analysis, about 15% of adult asylees were diagnosed with LTBI, as compared to 22% of adult refugees. About half of asylee adults and over a quarter of asylee children were susceptible to HBV infection. When compared to refugee adults, asylee adults were less likely to be infected with LTBI, HBV, HCV, and *Strongyloides* but had similar prevalence of other reported conditions, such as other pathogenic intestinal parasites. Compared to refugee children, asylee children were less likely to have LTBI or HBV infection but had a similar prevalence of other reported conditions. The majority of asylees who received a domestic medical examination between 2014 and 2016 were from China, Iraq, and Iran.

Few published studies exist describing the physical health profile of asylee populations in the United States [11–13, 16], although it is possible that asylees were included in other studies of newcomer populations, but not specifically identified. To the authors' knowledge, this is one of few analyses among asylee populations in the United States that reports screening data for most of the conditions screened as part of the domestic medical examination. In contrast to other published studies, our analysis included data from multiple sites across the country.

Prevalence of reported communicable diseases among asylees varied across studies with LTBI ranging from 5% to 41% [11–13], and HBV infection ranging from 2% to 9% [11, 12]. Differences in estimates between our analysis and other studies

Table 3. Adjusted Prevalence Ratios for Select Medical Conditions Among Asylees and Refugees Who Resettled to the United States, 2014–2016

	All	Adults ≥18 years old	Children <18 years old
Medical Conditions	aPR (95% CI) Ref: Refugee	aPR (95% CI) Ref: Refugee	aPR (95% CI) Ref: Refugee
Latent tuberculosis infection	0.76 (.62–.94)	0.76 (.63–.94)	0.70 (.52–.96)
Hepatitis B[a]			
Susceptible	1.19 (.93–1.52)	1.21 (.93–1.57)	1.08 (.85–1.36)
Infected	0.73 (.55–.98)	0.72 (.54–.97)	0.43 (.23–.83)
Immune through vaccination	0.89 (.73–1.09)	0.83 (.60–1.16)	0.97 (.85–1.11)
Hepatitis C	0.54 (.46–.63)	0.56 (.46–.67)	0.38 (.14–1.04)
Strongyloides	0.53 (.36–.80)	0.50 (.33–.75)	0.79 (.50–1.26)
Schistosomiasis	2.06 (1.01–4.20)	1.88 (.99–3.57)	…
Elevated blood lead level (≥ 5 mcg/dL)	N/A	N/A	0.6 (.3–1.1)

Poisson regression was used to model the adjusted prevalence ratios (adjusted for age and sex) to assess association of status at entry (asylee vs. refugees) and outcomes. Refugee status was used as reference.

Abbreviations: aPR, adjusted prevalence ratio; CI, confidence interval; HBc, hepatitis B core antibody; HBs, hepatitis B surface antibody; HBsAg, hepatitis B surface antigen; N/A, not applicable.

[a]Hepatitis B virus status was categorized as susceptible (HBsAg, anti-HBc, and anti-HBs all negative), infected (HBsAg positive), and immune through hepatitis B vaccination (HBsAg negative, anti-HBc negative, and anti-HBs positive).

could be related to sample size, the definition of "asylee" used (eg, not differentiating between asylum-seekers and asylees or primary and derivative asylees), nationalities of asylees receiving a health examination during the time period of the study, and the average duration of US residence of asylees. For example, disease exposures in countries with high incidence or prevalence of conditions, such as tuberculosis disease and HBV infection before emigration or during transit and the availability of and accessibility to vaccination programs and health care before and after journey to the United States can influence the presence of some health conditions among asylees [17, 18].

Asylees in our analysis had either a lower or similar prevalence of reported conditions (eg, similar prevalence of pathogenic intestinal parasites) compared to refugees. Asylees also had a similar susceptibility to HBV infection. This is despite refugees having access to the overseas presumptive parasite treatment program and the voluntary Vaccination Program for US-bound Refugees, which was created to provide 1–2 doses of certain vaccines overseas (including hepatitis B vaccine) [6]; however, both of these programs were still in the early stages of global expansion during the data collection period, and hence the current picture may differ. These results are consistent with findings in a smaller study comparing prevalence of certain conditions between asylees and refugees from 2003 to 2007, including tuberculosis and HBV infection [11]. Differences between asylees and refugees could be due in part to the different prevalence of/risk of exposure to certain conditions, such as hepatitis B, intestinal parasites, and tuberculosis, in the countries of emigration or transit and availability and access to clinical and preventive health services prior to or after US arrival (in the case of asylees). Principal asylees who have been present in the United States for any significant period of time—because the length of the asylum process can vary between 6 months and several years [19]—may have had access to healthcare services [12], and it is possible that any identified health conditions and vaccinations were addressed before the domestic medical examination.

Given the potentially serious outcomes of some medical conditions identified during the domestic medical examination (such as tuberculosis and HBV infection) if not evaluated and managed promptly, US clinicians should refer to CDC's *Guidance for the US Domestic Medical Examination for Newly Arrived Refugees* to screen for and manage conditions found in asylees and offer vaccinations to those without laboratory evidence or a historical record of vaccination for conditions such as HBV infection [10]. Because asylees do not receive predeparture presumptive parasite treatment, and because the majority of asylees did not receive screening for strongyloidiasis and schistosomiasis (although it is possible some asylees were not recommended for screening due to countries of origin or transit or were presumptively treated after arrival), US clinicians should strongly consider screening and treating for intestinal parasites, including strongyloidiasis and schistosomiasis, according to CDC guidance, to prevent further transmission or complications.

Of note, although the leading nationalities of asylee populations who received a domestic medical examination and were included in our analysis were China, Iraq, and Iran, the leading nationalities of all persons granted asylum between 2014 and 2016 were China (22–34%), Egypt (12%), and El Salvador (8–11%). Therefore, our findings may not be representative of the characteristics of all asylee populations over the time period [20]. It is possible that asylees of other nationalities did not reside in the states included in our analysis or were not captured in the data set, even if they received a domestic medical examination [21]. It is also possible that asylees of other nationalities did not access or minimally accessed healthcare benefits or services. Many asylees may be unaware that they are eligible for healthcare benefits, including the domestic medical examination, or how to access health services and other benefits upon being granted asylum [7, 8]. Language barriers and social exclusion or discrimination by members of their own or other communities may also prevent asylees from accessing benefits and services [22]. Some asylees may have already accessed healthcare if they have been present in the United States for some time before being granted asylum [19]. Therefore, greater outreach to individuals who were recently granted asylum could be conducted to improve awareness of benefits and identify and resolve access barriers. These efforts may require collaboration across different entities, including legal organizations processing asylum cases, resettlement agencies, the US Citizenship and Immigration Services, community-based organizations working with asylum seeker populations, and state refugee health programs. Outreach efforts may include providing information regarding healthcare services and providers when individuals are awarded asylum status. Groups conducting outreach to asylee populations can emphasize messaging such as how the domestic medical examination is an opportunity for earlier identification and management of conditions not typically screened for during a routine primary care visit.

Limitations

This analysis has several limitations. First, health screening data were not collected and reported uniformly across all 9 sites; therefore, denominators across medical conditions and diagnoses varied. Generally, although screening and testing were conducted according to CDC guidance, variation by location existed, as the guidance are meant to be customized in each jurisdiction. Second, the CDC domestic medical examination guidance [10] differentiate screening according to nationality, age of patient, and availability of overseas health records; thus, not all tests were conducted for all asylees and refugees. These could be reasons why many asylees were not screened for some

conditions. For some conditions, they may have also been given presumptive treatment after arrival instead of being screened. Third, as noted previously, we do not have domestic medical examination data for all individuals granted asylum, considering that the leading populations from our data set differ from leading populations granted asylum in the United States during the similar time period covered by this analysis. Because data from asylees who did not receive the domestic medical examination or who did receive one but were not captured in the data set were not available, estimates of medical conditions among all asylees and any reported differences in estimates between asylees and refugees may be under- or overestimated. Fourth, sites only shared whether asylees and refugees screened positive or negative for different infections, but the tests used were not reported; therefore, we may be unable to determine if the person has a current infection. Therefore, based on the screening test used, the prevalence estimates reported in this analysis may be under- or overestimated. Finally, compared to the number of refugees included in our analysis, the number of asylees included was much smaller, representing 5.2% of the entire sample. Due to the large number of countries represented by asylee and refugee populations and the few numbers of individuals from several of these countries, we were unable to adjust for nationality, which can serve as a potential confounder, in our regression models.

CONCLUSION

In our analysis, we observed that 15% of asylees were diagnosed with LTBI and 52% of asylee adults were susceptible to HBV infection. Compared to refugees, asylees included in our data set were less likely to be infected with LTBI and HBV but had similar prevalence of other reported conditions. However, estimates for LTBI and HBV are higher than for the general US population (US, LTBI: up to 5%; HBV: <2%) [23, 24]. Therefore, in addition to guiding screening for refugees, CDC domestic medical examination guidance can also assist refugee health programs and clinicians in the care of asylees during the routine domestic medical examination [10]. Based on the results of this analysis, clinicians should ensure that asylees receive the appropriate screening procedures and follow up (including vaccines) as indicated, paying attention to conditions such as LTBI, HBV, and, among children, EBLL. With the help of community and public health partners, greater outreach to asylees when asylum status is awarded and ongoing communication after being granted asylum may be needed to ensure awareness of available benefits and identify and resolve barriers to accessing benefits, including the domestic medical examination. Future analyses can explore other aspects of health among asylee populations, including noncommunicable diseases and vaccination coverage, as well as identify any existing barriers to receiving healthcare and accessing benefits. It may also be valuable to repeat our analysis every few years, given the changing demographic landscape of asylee populations in the United States.

Notes

Acknowledgments. The authors would like to thank Allison Pauly (formerly with the Kentucky Office for Refugees) for her contributions to the project design and data acquisition from her program. The authors would also like to thank Melissa Titus, Kenneth Mulanya (formerly with Marion County, IN) and Shandy Dearth (Marion County, IN) for their contributions to data acquisition, data stewardship, and direction of grant activities, respectively. The authors wish to acknowledge Marc Altshuler, MD, and Christine Murto, PhD, for their support of this collaboration and review of the manuscript. The authors also wish to thank the Colorado Department of Public Health and Environment Disease Control and Environmental Epidemiology Division programs for data partnership and subject matter expertise and Carol Tumaylle, MPH, Colorado State Refugee Health Coordinator, Colorado Department of Human Services for the administration of the overall domestic health screening exam program for all refugees in Colorado.

Disclaimer. The opinions expressed by authors contributing to this journal do not necessarily reflect the opinions of the Centers for Disease Control and Prevention or the institutions with which the authors are affiliated.

Financial support. This work was supported, in part, by the CK12-1205 Strengthening Surveillance for Diseases among Newly Arrived Immigrants and Refugees nonresearch cooperative agreement, which sustained efforts to improve the collection of domestic medical examination data.

Potential conflicts of interest. The authors: No reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest.

REFERENCES

1. United Nations High Commissioner for Refugees, USA. What is a refugee? Available at: https://www.unhcr.org/what-is-a-refugee.html. Accessed 5 February 2020.
2. US Department of Homeland Security, Office of Immigration Statistics. Annual Flow Report, Refugees and Asylees: 2018. Available at: https://www.dhs.gov/immigration-statistics/refugees-asylees. Accessed 28 August 2020.
3. US Department of Homeland Security, Office of Immigration Statistics. Annual flow report, refugees and asylees: 2014. Available at: https://www.dhs.gov/immigration-statistics/refugees-asylees. Accessed 28 August 2020.
4. Refugee Processing Center. Refugee admissions by region. Available at: https://www.wrapsnet.org/admissions-and-arrivals/. Accessed 5 February 2020.
5. US Department of Health and Human Services, CDC. Technical instructions for panel physicians. Available at: https://www.cdc.gov/immigrantrefugeehealth/exams/ti/panel/technical-instructions-panel-physicians.html. Accessed 28 August 2020.
6. US Department of Health and Human Services, CDC. Overseas interventions. Available at: https://www.cdc.gov/immigrantrefugeehealth/guidelines/overseas/interventions/index.html. Accessed 4 September 2020.
7. US Department of Health and Human Services, Office of the Administration for Children and Families, Office of Refugee Resettlement. Asylee eligibility for assistance and services. Available at: https://www.acf.hhs.gov/orr/resource/asylee-eligibility-for-assistance-and-services. Accessed 4 September 2020.
8. US Citizenship and Immigration Services. Benefits and responsibilities of asylees. Available at: https://www.uscis.gov/humanitarian/refugees-and-asylum/asylum/benefits-and-responsibilities-of-asylees. Accessed 4 September 2020.
9. US Department of Health and Human Services, Centers for Disease Control and Prevention (CDC). Refugee health guidelines. Available at: https://www.cdc.gov/immigrantrefugeehealth/guidelines/refugee-guidelines.html. Accessed 4 September 2020.
10. US Department of Health and Human Services, CDC. Guidelines for the U.S. Domestic Medical Examination for Newly Arriving Refugees. Available at: http://www.cdc.gov/immigrantrefugeehealth/guidelines/domestic/domestic-guidelines.html. Accessed 4 September 2020.

11. Chai SJ, Davies-Cole J, Cookson ST. Infectious disease burden and vaccination needs among asylees versus refugees, District of Columbia. Clin Infect Dis **2013**; 56:652–8.
12. Bertelsen NS, Selden E, Krass P, Keatley ES, Keller A. Primary care screening methods and outcomes for asylum seekers in New York City. J Immigr Minor Health **2018**; 20:171–7.
13. Lamb GS, Cruz AT, Camp EA, et al. Tuberculosis in internationally displaced children resettling in Harris County, Texas, USA, 2010–2015. Emerg Infect Dis **2020**; 26:1686–94.
14. Pezzi C, Lee D, Kumar GS, et al. Health screenings administered during the domestic medical examination of refugees and other eligible immigrants in nine US states, 2014–2016: a cross-sectional analysis. PLoS Med **2020**; 17:e1003065.
15. Kumar GS, Pezzi C, Wien S, et al. Health of special immigrant visa holders from Iraq and Afghanistan after arrival into the United States using domestic medical examination data, 2014–2016: a cross-sectional analysis. PLoS Med **2020**; 17:e1003083.
16. Dookeran NM, Battaglia T, Cochran J, Geltman PL. Chronic disease and its risk factors among refugees and asylees in Massachusetts, 2001–2005. Prev Chronic Dis **2010**; 7:A51.
17. World Health Organization. Tuberculosis. Available at: https://www.who.int/tb/data/en/. Accessed 20 August 2020.
18. US Department of Health and Human Services, CDC, Travelers' Health. Hepatitis B. Available at: https://wwwnc.cdc.gov/travel/yellowbook/2020/travel-related-infectious-diseases/hepatitis-b#5182. Accessed 20 August 2020.
19. National Immigration Forum. Fact sheet: U.S. asylum process. Available at: Asylum-Fact-Sheet-_Update_Final.pdf (immigrationforum.org). Accessed 20 October 2020.
20. US Department of Homeland Security, Office of Immigration Statistics. Annual flow report, refugees and asylees: 2016. Available at: https://www.dhs.gov/immigration-statistics/refugees-asylees. Accessed 28 August 2020.
21. US Department of Homeland Security, Office of Immigration Statistics. Annual flow report, refugees and asylees: 2015. Available at: https://www.dhs.gov/immigration-statistics/refugees-asylees. Accessed 28 August 2020.
22. Baranowski KA, Moses MH, Sundri J. Supporting asylum seekers: clinician experiences of documenting human rights violations through forensic psychological evaluation. J Trauma Stress **2018**; 31:391–400.
23. US Department of Health and Human Services, CDC. Latent TB infection in the United States – published estimates. Available at: https://www.cdc.gov/tb/statistics/ltbi.htm. Accessed 25 September 2020.
24. US Department of Health and Human Services, CDC. Global viral hepatitis: millions of people are affected. global viral hepatitis: millions of people are affected | CDC. Available at: https://www.cdc.gov/hepatitis/global/index.htm. Accessed 25 September 2020.
25. American Thoracic Society. Diagnostic standards and classification of tuberculosis in adults and children. Am J Respir Crit Care Med **2000**; 161:1376–95.
26. Mitruka K, Pezzi C, Baack B, et al. Evaluation of hepatitis B virus screening, vaccination, and linkage to care among newly arrived refugees in four states, 2009-2011. J Immigr Minor Health **2019**; 21:39–46.