ORIGINAL ARTICLE

Pediatric Refugee Health and Patterns of Health Care Utilization in Durham, North Carolina

Emily Esmaili, Ishaq Winters, Rayan Kaakati, Andrew Lee, Arun Augustine, Nathan Thielman

BACKGROUND This study explored the health needs, trends of health care utilization, and barriers to care of a diverse population of refugee children resettled in Durham County, North Carolina.

METHODS Researchers conducted a retrospective chart review of 327 pediatric (aged 0-21 years) refugee patients who received care at Lincoln Community Health Center from 2016 to 2018.

RESULTS Results describe a low prevalence of infectious diseases, such as human immunodeficiency virus (0%), hepatitis B (2%), and tuberculosis (5%), but a high prevalence of nutritional problems, such as growth stunting (17%), overweight (21%), Vitamin D insufficiency (79% of the 39 tested), and anemia (13%). Subspecialty care was frequently utilized, despite prolonged appointment delays and frequent missed visits.

LIMITATIONS Limitations of the study included a small sample size that only considered refugees in one geographic area and one primary care clinic, as well as variability in physician documentation.

CONCLUSION These findings highlight the need for tailored programs and processes, such as dedicated case management and improved screening practices, in order to facilitate integrated care and promote wellness among this vulnerable group of young refugees.

Migration is one of the most pressing issues facing global society and local communities today. Among 25 million refugees worldwide, more than half (52%) are persons younger than the age of 18 [1]. These children and their families are forced from their homes due to conflict, persecution, and environmental disasters. Prolonged exposure to adverse experiences creates unique challenges to the short- and long-term health of refugee children. Physical and mental illnesses—both acute and chronic in nature—spawn from a range of factors, including witnessed or direct violence, poor sanitation, food and water scarcity, and inadequate medical care during the path of flight [2, 3].

Resettlement countries such as the United States are home to a small percentage (less than 1%) of all refugees [4, 5]. However, the United States receives the largest number of refugee applications worldwide, spanning 168 nationalities [1]. The total number of refugees resettled in the United States since the beginning of the resettlement program exceeds 3 million [1], a significant sub-population of Americans. Following resettlement, many of these newcomers face multiple barriers to care, resulting in neglected health needs and poor health outcomes. The precise needs of this vulnerable population are poorly understood by the medical community.

Children are a particularly vulnerable subset of the refugee population and present health needs that are distinct from conditions common among United States-born pediatric populations [3]. Previous studies have demonstrated that resettled pediatric refugee populations carry high rates of tuberculosis, hepatitis, malaria, helminth infections, nutritional deficiencies, developmental delays, and mental health disorders [2, 3, 6, 7].

Following resettlement, social disadvantages and cultural incongruities create additional challenges for refugee children. Previous research has highlighted numerous barriers to care post-resettlement relating to language [2, 8, 9], transportation [2, 10], time constraints, and discrimination and lack of cultural competence among health providers [2, 10-12]. Social inequities related to socioeconomic status, education level, and insurance status exacerbate these barriers and further hinder refugees' ability to navigate the health care system following resettlement [10, 13, 14]. Cultural beliefs and practices, including stigmatization of certain illnesses and use of complementary and alternative therapies, may shape health-seeking behaviors and lead to misconceptions about health services [2, 15, 16]. These barriers to care collectively shape patterns of health care utilization and can result in additional problems such as delayed care, inadequate preventive care, and poorly treated conditions [17, 18]. These poor health outcomes are amplified among young refugees, who experience negative sequelae of adverse childhood experiences throughout their lifetimes, placing them at higher risk for chronic diseases in adulthood [19, 20].

There is a pressing need for the health care community to better understand how to deliver quality care to this vulnerable population in a culturally appropriate, accessible manner. Previous research evaluating barriers to care in refugee populations has largely centered on adults rather than pediatric

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Address correspondence to Emily Esmaili, Duke Global Health Institute, 310 Trent Dr, Box 9051, Durham, NC 27708 (bee6@duke.edu).

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refugee populations. We sought to understand the health needs, trends of health care utilization, and barriers to care among pediatric refugees in one resettlement area: Durham County, North Carolina. In 2018, North Carolina ranked seventh in the nation for accepting new refugee arrivals, with Durham receiving approximately 10%-15% of state totals [21, 22]. While different states and counties have concentrations of refugees from different backgrounds, Durham's refugee population largely mirrors demographic trends seen nationwide [22]. By examining the burden of documented illness among Durham's refugee children as well as trends in health care utilization, this study sought to provide evidence to inform improved models of pediatric refugee health care in Durham and similar resettlement areas.

Conceptual Framework/Methodology

In order to identify and quantify health needs and examine potential system-level barriers to care among this population, we conducted a comprehensive, retrospective electronic medical record review using the Epic Maestro Care database. Refugees settling in Durham County are required to receive an initial medical screening exam at the Durham County Department of Public Health (DCDPH) within 30 to 90 days of arrival, evaluating for infectious conditions such as tuberculosis (TB), hepatitis B, and human immunodeficiency virus (HIV) [6, 7]. Thereafter, many refugees in Durham access care through Lincoln Community Health Center (LCHC), a federally qualified health center that has a satellite clinic also housed within DCDPH. Refugee patients also access care at the nearby Duke University Medical Center Emergency Department (DUMC ED) for both acute and routine conditions. In order to consider a range of health problems both upon arrival and after resettlement, this study examined patient records from pre-immigration documentation (completed by the International Organization of Migration or the US Department of State and scanned into the patient's electronic record), the DCDPH screening exam, LCHC clinic visits, and DUMC ED visits.

Researchers identified patients as refugees using the ICD 9 code (V70.5) or ICD 10 code (Z02.89) for Refugee Health Examination, and confirmed refugee status using pre-immigration documentation. The study included all pediatric refugee patients aged 0-21 years who presented to LCHC during a two-year period, April 30, 2016 to May 1, 2018. Exclusion criteria consisted of those patients whose records were not contained in Epic Maestro Care or those who did not access care through LCHC. The research study was reviewed and approved by the Duke University Health System Institutional Review Board. In addition, both LCHC and DCDPH approved the project and provided a data usage agreement in collaboration with DUMC.

Data Collection, Measures, and Analysis

Researchers systematically reviewed electronic medical records for basic demographic information, including age at first encounter, gender, country of origin, and language spoken. Records were also reviewed for data on the prevalence of certain diagnoses, including: screened infectious diseases; elevated lead levels; growth and nutritional problems; utilization of subspecialty care and DUMC ED care; frequency of missed appointments and referral delays; and costs of ED utilization. Researchers extracted reasons for seeking care using ICD 10 diagnosis codes documented in LCHC clinic visits. We compiled unique diagnoses per patient and listed most common diagnoses.

The authors manually abstracted the following information from patient records into a RedCap database: pre-immigration health information, which included results from the tuberculin spot test (T-SPOT.TB); chest radiograph results if obtained; HIV antibody reactivity; hepatitis B surface antigen and total core antibody; country of origin; lead level; date of initial LCHC health exam; and dates of referrals to and appointments with specialists. We stored and analyzed all data in Protected Analytics Computing Environment (PACE), and performed data formatting and analysis using JMP software Version 14 and Microsoft Excel.

The authors summarized data using standard descriptive statistics including the mean, standard deviation, median, quartiles and range for continuous variables, and counts and percentages for categorical data.

Results

The study identified 327 pediatric refugee patients, with slightly more females (53%) than males (47%). At their first clinical encounter with a LCHC provider, the majority of children were aged 6 years or older (63.3%). Country of origin was most frequently within the Eastern Mediterranean region (48%), with most from Syria and Afghanistan. Refugees from the African region accounted for 36% of the sample population, with most from Tanzania and the Democratic Republic of the Congo. The remainder represented a wide range of other countries (Table 1). Accordingly, languages spoken included Arabic (28%), Swahili (21%), and an array of others (Figure 1).

DCDPH medical screening exams, which follow guidelines given by the Centers for Disease Control and Prevention, tested for communicable diseases commonly reported in refugee populations. Results demonstrated a notably low prevalence of these diseases: no patients tested positive for HIV infection; hepatitis B infection was identified in 1.2%; syphilis (RPR) testing was positive in one patient (only those aged 15 or older were routinely tested), though confirmatory testing was not found; and intestinal parasites were identified in 2% of cases. Of note, parasite screening was not routinely performed as most refugees are pre-treated for presumptive parasitic infections before immigration. The tuberculin spot test (T-SPOT.TB) was positive in 5% of patients, all of whom were found to have latent disease.

Laboratory results from LCHC clinic visits revealed anemia (low hemoglobin or hematocrit) in 13% (41/327) of

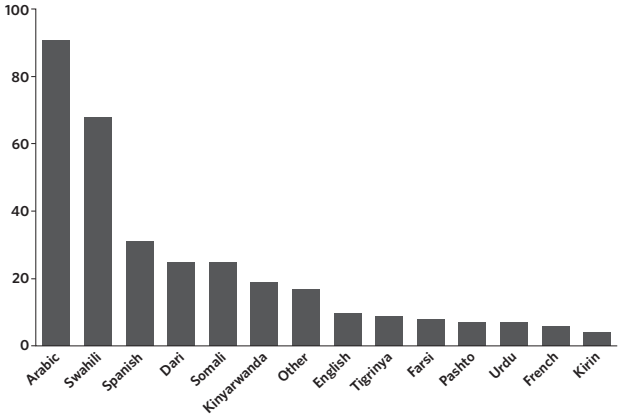
patients. Among the 39 children who had vitamin D levels measured, insufficiency (25OH vitamin D levels less than 20 ng/mL) was identified in 79% (31/327) of cases, though levels were not measured in 88% of the sample (288/327). Lead levels were elevated (> 5 μg/dL) in 5% (15/327) of patients, although lead screening results were not documented in 23% (74/327) of patient records. Eosinophilia (absolute eosinophil count of ≥ 500 eosinophils/microL) was present in 5% (15/327) of patients but was not assessed in 9% (30/327).

TABLE 1.
Demographic Characteristics of Pediatric Refugee Patients (N = 327)

Variable	n	%
Age (years)		
0-1	25	7.7%
2-5	95	29.1%
6-10	51	15.6%
10-15	69	21.1%
16-21	87	26.6%
Gender		
Male	153	46.8%
Female	174	53.2%
WHO Regions		
Eastern Mediterranean	**155**	**47.4%**
Syria	63	19.3%
Afghanistan	44	13.5%
Somalia	15	4.6%
Iraq	11	3.4%
Pakistan	10	3.1%
Jordan	9	2.8%
Sudan	3	0.9%
Africa	**107**	**32.7%**
Tanzania	38	11.6%
Democratic Republic of the Congo	18	5.5%
Kenya	17	5.2%
Rwanda	17	5.2%
Eritrea	6	1.8%
South Africa	4	1.2%
Uganda	4	1.2%
Zambia	3	0.9%
Americas	**31**	**9.5%**
Cuba	13	4.0%
El Salvador	10	3.1%
Colombia	5	1.5%
Honduras	3	0.9%
South-East Asia	**7**	**2.1%**
Thailand	7	2.1%
Western Pacific	**7**	**2.1%**
Malaysia	7	2.1%
European	**5**	**1.5%**
Turkey	5	1.5%
Other*	**15**	**4.6.%**

*Other: Burma, Cameroon, Chad, Ethiopia, Nigeria, Burundi, Central African Republic, Egypt, Israel, Sri Lanka

FIGURE 1.
Languages Spoken



*Other: Burmese, Kinyamulenge, Maly, Rohingya, Amharic, Mandarin, Turkish

The authors reviewed growth parameters using standards established by the World Health Organization. Anthropometric measurements from LCHC clinic visits revealed an overall prevalence of stunting (low height for age) on arrival in 17% of patients, reflecting chronically poor nutritional status. When we further examined growth parameters by region of origin, we identified stunting in 40% of children from the Southeast Asia region, 21% from the African region, 15% from the Eastern Mediterranean, 14% from the Western Pacific, and 6% from the Americas. In subsequent measurements taken over the course of the study period, height recovered in 16% of patients but remained low for age in 84% of patients, most of whom were over age 5 (Table 2).

Authors also reviewed body mass index (BMI) on arrival for patients over age 2. Overall, 8% of patients were underweight (BMI less than 5th percentile), 72% had normal weight (BMI 6th to 84th percentile), 13% were overweight (BMI 85th to 94th percentile), and 7% were obese (BMI greater than 95th percentile). We further examined BMI on arrival by country of origin, showing more overweight and obesity in children originating from the Eastern Mediterranean region, the Western Pacific, and the Americas. More European children were found to be underweight, and a mix of under- and overweight status was found in children from the African region (Table 3). When we examined subsequent BMI measurements, the majority of children had no change in their BMI category. However, 7% of patients moved from normal to overweight or obese categories, and 2% moved from normal to underweight. Two percent of children who were overweight or obese eventually had a normal BMI, and 3% of underweight children also had a normal BMI over the study period (Table 3).

Finally, authors assessed health care utilization patterns, including clinic visits, emergency department visits, and subspecialist referrals and visits. Pediatric refugee patients visited the LCHC clinic an average of 3.6 times per patient,

TABLE 2.
Nutritional Status of Pediatric Refugee Patients

	Stunting (N=327)		Recovery Among Those Under-height (n = 56)	
	Normal	Under-Height	Recovered	Non-Recovered
Overall	270 (82.6%)	56 (17.1%)	9 (16.1%)	47 (83.9%)
Region of Origin				
Africa	92 (78.6%)	25 (21.4%)	2 (8.0%)	23 (92.0%)
Americas	29 (93.6%)	2 (6.5%)	0 (0.0%)	2 (100.0%)
Eastern Mediterranean	132 (84.6%)	24 (15.4%)	6 (25.0%)	18 (75.0%)
Europe	6 (83.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Southeast Asia	6 (60.0%)	4 (40.0%)	0 (0.0%)	4 (100.0%)
Western Pacific	6 (85.7%)	1 (14.3%)	1 (100.0%)	0 (0.0%)
Age Bracket				
0-1 year			2 (100.0%)	0 (0.0%)
2-5 years			4 (33.3%)	8 (66.7%)
6-10 years			1 (10.0%)	9 (90.0%)
11-15 years			2 (9.5%)	19 (90.5%)
16-21 years			0 (0.0%)	11 (100.0%)

and a maximum of 18 times in one case. We also examined the timeliness of follow-up clinic visits, showing that out of 1,229 total clinic visits completed during the study period, 68% (835) happened on time, 20% (244) were delayed over one month beyond their intended next visit, and 12% (150) never occurred. Reasons for seeking care at the LCHC clinic, based on most frequently documented ICD 10 codes, included a range of common pediatric disorders such as acute upper respiratory infection, viral infection, dental carries, and asthma (Table 4). Nutritional problems, including short stature, anemia, vitamin D deficiency, and low weight, were also frequently diagnosed. Behavioral or mental health diagnoses were infrequently documented. During the two-year study period, 25.4% of this pediatric refugee population (83/327 patients) subsequently visited DUMC ED. Patients in the cohort presented to DUMC ED an average of 0.3 times per patient, and a maximum of six times in one patient. Despite the low average frequency of DUMC ED use, ED visits accrued total charges of $203,999 during the study period, and total adjustments for health insurance equaled $174,260.

The study cohort frequently utilized subspecialty care. The most frequent referrals were made to ophthalmology (most from failed vision screening), behavioral health, otolaryngology, and audiology (due to failed hearing screening) (Table 5). During the study period, a total of 252 referrals were made to subspecialists, meaning 143 patients (44%) had at least one referral. However, additional repeat referrals were often made due to long delays or failure to schedule an appointment initially. The time interval between when the first referral was made by the ordering provider and when the patient saw the subspecialist ranged from 0 to 447 days, with a median of 41 days. Subspecialty visits happened successfully in 134 cases (53%), while 118 initial referrals (46%) were never fulfilled during the study period.

Discussion

This study describes the demographic characteristics, health status, and health care utilization patterns of a pediatric refugee population in Durham, North Carolina, highlights their health care needs, and provides insight for ways to improve services. Comprised of children from 32 different countries (most from Eastern Mediterranean and African regions) and speaking 21 different languages, this diverse population suffered from relatively few infectious diseases but demonstrated notable levels of nutritional problems, such as stunting, anemia, and, when measured, vitamin D insufficiency. Their primary care providers frequently sought subspecialty input for their care, but referrals were completed with varying success.

Despite thorough screening, rates of TB, hepatitis B, and HIV were low in Durham's pediatric refugee population, and clinic visit diagnoses document a relatively high prevalence of routine pediatric conditions. The study also found a high prevalence of nutritional problems such as vitamin D deficiency, anemia, stunting, and obesity, all of which reflect poor nutrition and suboptimal lifestyle factors prior to immigration. These findings suggest the need for targeted nutrition education and weight management programs that are culturally appropriate and accessible to refugee children. Given the higher prevalence of overweight and obesity among Eastern Mediterranean children, for example, weight management programs could be tailored specifically to children from those backgrounds. Our study adds to a study by Ankoor and coauthors that examined nutritional status of refugee children resettled in the state of Georgia and found a high prevalence of low weight and anemia in African, Bhutanese, and Burmese refugee children [23]. Another study by Olson and coauthors demonstrated rapid weight gain after immigration among refugees from the Africa

TABLE 3.
BMI on Arrival and After Resettlement Among Pediatric Refugee Patients > 2 Years Old (n = 297)

	Underweight	Normal	Overweight	Obese
Overall	24 (8.1%)	214 (72.1%)	38 (12.8%)	21 (7.1%)
Region of Origin				
Africa	8 (7.3%)	86 (78.9%)	13 (11.9%)	2 (1.8%)
Americas	0 (0.0%)	17 (54.8%)	10 (32.3%)	4 (12.9%)
Eastern Mediterranean	14 (10.0%)	98 (70.0%)	14 (10.0%)	14 (10.0%)
Europe	2 (66.7%)	1 (33.3%)	0 (0.0%)	0 (0.0%)
Southeast Asia	0 (0.0%)	8 (100.0%)	0 (0.0%)	0 (0.0%)
Western Pacific	0 (0.0%)	4 (66.7%)	1 (16.7%)	1 (16.7%)
Changes in BMI After Resettlement				
	n	%		
No Change	255	85.7		
Normal	186	62.5		
Overweight/Obese	55	18.5		
Underweight	14	4.7		
Normal to Overweight/Obese	20	6.7		
Normal to Underweight	6	2.0		
Overweight/Obese to Normal	7	2.4		
Underweight to Normal	10	3.4		

TABLE 4.
Most Common Clinic Diagnoses Among Pediatric Refugee Patients (N = 327)

Diagnosis (ICD 10 codes)	n
Acute upper respiratory infection, unspecified	64
Short stature (child)	47
Anemia, unspecified	45
Dental caries, unspecified	43
Underweight	34
Tinea corporis, capitis, barbae	25
Acute pharyngitis, unspecified	22
Asthma, unspecified	21
Abnormal lead level in blood	21
Constipation, unspecified	20
Allergic rhinitis	18
Viral infection, unspecified	16
Cough	16
Vitamin D deficiency, unspecified	14
Body mass index (BMI) pediatric, less than 5th percentile for age	14
Dysmenorrhea	13
Otitis media	12
Acne	12
Conjunctivitis	11
Pain in extremities	11
Nocturnal enuresis	11
Rash and other nonspecific skin eruption	11
Anorexia	11
Epistaxis	10
Other viral warts	9
Eosinophilia	7
Expressive language disorder	7

region [24]. Therefore, clinicians should consider assessing and following nutritional status, especially in regard to country of origin. In addition, considering the evidenced association between malnutrition (both under- and overweight) and Vitamin D deficiency, Vitamin D levels should be checked more routinely in all refugee children. This becomes especially important when considering the long-term effects of vitamin D upon innate immunity and prevention of diseases such as diabetes and cancer [25, 26, 28, 29].

While this study did not reveal a high frequency of documented behavioral or mental health diagnoses, referrals to behavioral health specialists were among the most common subspecialty referrals made, suggesting possible underreporting or lack of clinician awareness. Given their common exposure to adverse childhood experiences prior to immigration, refugee children are at a particularly high risk for behavioral and mental health problems [3, 20, 27]. Routinized screening and documentation of behavioral and mental health problems following resettlement is warranted.

This study also revealed the need for improved referral processes within the local health system. Despite a demonstrated high need for subspecialty care, patients experienced prolonged appointment delays and frequent missed appointments. This may be attributed to a number of patient-level and system-level barriers, such as language barriers resulting from automated scheduling and reminder phone calls conducted in English, and unaddressed transportation barriers. Additionally, financial barriers may result from a number of factors: lack of health insurance; the complex Medicaid renewal process that often results in loss of coverage; and limited household income, with additional appointments meaning employment absenteeism and fur-

ther lost wages. Finally, cultural barriers may be present, as the concept of multilevel, dispersed care may be new to many families. These multidimensional, multiplicative barriers have been described in similar refugee populations in the United States and Europe [30-32]. Therefore, refugee patients in various resettlement locations could benefit from dedicated case management services that might remove some of these complex barriers that lead to inadequate care and eventually to poor health outcomes. Our results may thus also encourage health policymakers in North Carolina to support legislation and funding for tailored resources for this diverse, high-risk population, in order to improve access to care across our state.

Additional research is needed to further deepen current knowledge of refugee child health needs in various settings and to test potential solutions. By developing informed programs and processes to facilitate integration and promote wellness among refugee children—such as dedicated case management, updated and improved health screening practices, and tailored nutrition education and health promotion programs—refugee children in Durham County and similar resettlement areas could receive the quality health care that is well deserved and long awaited. It should be noted that while multiple complex barriers to care do exist, community health centers such as LCHC make great strides toward overcoming these obstacles. For example, LCHC offers broad translation services, transportation assistance, and steeply discounted fees for patients without insurance coverage.

Several limitations warrant consideration when interpreting the results of this study. This study only considered refugee patients seen in one geographic area who accessed care in one primary care clinic. However, the study did examine a heterogeneous population that comprised 10%-15% of state refugee population totals. In addition, the study period was limited to a two-year window, which may not encompass all events affecting the health of the study cohort. For example, the large percentage of patients who were referred but never seen by a specialist might reflect some referrals that were made at the end of the study window. However, referrals were evenly distributed throughout the study. Additionally, due to the heterogeneity of ICD coding and variability in physician reporting, all diagnoses may not have been captured in this study. Lastly, many patient records were found to have missing lead level results, which may have affected findings on lead levels in our cohort. An important strength is that consultative services for this cohort are concentrated within the Duke University Health System, and thus all subspecialist referrals would have been captured in this study. Therefore, data on referrals should be encompassing.

In summary, this study highlights the health status and health care utilization of a diverse group of pediatric refugee patients in Durham, North Carolina, documenting relatively few imported infectious diseases, but finding substantial sequelae of nutritional deficiencies, including stunting, vitamin D insufficiency, and anemia. Patients needed referrals to a wide range of subspecialists, including behavioral health specialists, but prompt fulfillment of referrals was rare. Improved models of care for pediatric refugees should address nutritional issues, should routinize screening for behavioral disorders, and must reduce barriers to accessing subspecialty care. NCMJ

TABLE 5.
Subspecialty Referrals Among Pediatric Refugee Patients (N = 327)

Subspecialty Referrals	Total Count
Pediatric Ophthalmology	33
Behavioral Health	26
Pediatric ENT	21
Pediatric Audiology	19
Pediatric Orthopedics	19
Pediatric Gastroenterology	14
Pediatric Dermatology	13
Optometry	11
Pediatric Speech Pathology	11
Pediatric Cardiology	10
Pediatric Physical Therapy	9
Pediatric Urology	8
Pediatric Hematology Oncology	7
Pediatric Pulmonary and Sleep Medicine	7
Pediatric Genetics	6
Pediatric Neurodevelopment	5
Dentistry	4
Obstetrics and Gynecology	4
Pediatric Endocrinology	4
Pediatric Neurology	4
Pediatric Surgery	4
Pediatric Allergy and Immunology	3
Pediatric Occupational Therapy	3
Pediatric Infectious Disease	2
Other*	4

Emily Esmaili, DO, MA, FAAP adjunct assistant professor, Duke Global Health Institute, Durham, North Carolina; Lincoln Community Health Center, Durham, North Carolina.
Ishaq Winters, MD resident physician, Department of Neurology, Yale University, New Haven, Connecticut.
Rayan Kaakati, MD resident physician, Department of Internal Medicine, University of Michigan, Ann Arbor, Michigan.
Arun Augustine, MA student, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin.
Nathan Thielman, MD, MPH professor, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin.

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