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## Incentives for Bushmeat Consumption and Importation among West African Immigrants, Minnesota, USA

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The knowledge, attitudes, and practices surrounding bushmeat consumption and importation in the United States are not well described. Focus groups of West African persons living in Minnesota, USA, found that perceived risks are low and unlikely to deter consumers. Incentives for importation and consumption were multifactorial in this community.

**B**ushmeat hunting and butchery are risk factors for zoonotic disease transmission (1–3). However, less is known about health risks to those who consume products that are already butchered when purchased. Bushmeat in this report refers to meat from wild African animals such as rodents, hooved animals, carnivores, primates, and bats (3).

Thousands of pounds of bushmeat are illegally imported into the United States annually (4), mostly from West

Africa (5). A previous study of bushmeat consumption by African immigrants in the United States described mixed perceptions regarding the risks and benefits of consuming bushmeat (5). Improved understanding of the complex social drivers of these practices is needed to better characterize risk and formulate communication strategies.

To identify the cultural perspectives and knowledge, attitudes, and practices surrounding bushmeat importation and consumption, we held focus groups with members of the Liberian community living in the Minneapolis–St. Paul area of Minnesota, USA. Minneapolis–St. Paul has the largest Liberia-born population in the United States, and ranks fifth in overall African populations in US metropolitan areas (6). Recognizing the history of stigmatization associated with increased risk for Ebola virus among persons from West Africa, we engaged a community-based organization to partner in the planning and execution of this study (7,8). Creating a comfortable environment where participants share personal experiences and insights freely is a key tenet of focus group methodology (9); this partnership was essential in gaining trust and maintaining cultural sensitivity.

Inclusion criteria for participant selection included: 1) minimum age 18 years, 2) self-identification as West African, and 3) willingness to discuss bushmeat in a group setting. The partner organization recruited community members by using a combination of purposeful sampling and social media advertisement and facilitated 3 focus groups (10–12 participants, each for 90 min) in January and February 2016; a designated research team member attended each session. A standard guide for questions was used for each session (online Technical Appendix, <https://wwwnc.cdc.gov/EID/article/23/12/17-0563-Techapp1.pdf>). The University of Minnesota Institutional Review Board approved this study.

Sessions were audio recorded and transcribed; participants were not identified. Nonverbal cues (i.e., gestures, emotions, points of hesitation, nods of agreement) and other participant interactions were added to the transcript by a notetaker. We analyzed the collected data by using a modified grounded theory method with inductive analysis as previously described (10). Two authors (E.W., J.D.A.) analyzed each transcript by using an open and selective coding approach. Subsequently, all transcripts were analyzed together by using axial coding further describing relationships among themes (Table); representative quotes from participants were selected to exemplify a relationship or common theme (9) (Table). We supported validity of findings by using member-checking, triangulation of findings with multiple sources, and peer debriefing (9). Many themes were repeated in all groups; however, this study was limited by inability to confirm that we had reached saturation of perspectives. According to Creswell, it is ideal

<sup>1</sup>These senior authors contributed equally to this article.

**Table.** Representative quotations and associated themes discussed by Liberian immigrants in bushmeat focus groups, Minnesota, USA\*

Theme	Key quotation
1. Nostalgia/cultural connection is a driver for consumption	"So it goes back to the cultural thing, like she said. The taste and that which you're used to. I mean it's how you're brought up, and all that stuff. <b>It's just something like you go away to school and you just miss your mom's cooking.</b> So that's just what it is."
2. Bushmeat is readily accessible and consumed when visiting friends/relatives in West Africa	Moderator: So for those that I hear, you know, about the regulations, about disease and all of that, do you think that if they were to go back home, would they still eat <b>bushmeat</b> ? <b>"Oh yeah."</b> <b>"Yeah." (Many others nodding)</b>
3. Skepticism over potential zoonoses from bushmeat	"I don't believe that monkey or bat is carrying this virus. But these beliefs come from my experience. When I was growing up, I would talk to my grand uncle and we used to walk in the forest, teaching me how to survive in the forest... And he taught me one thing, anything that can kill any animal can kill you. And anything an animal carries that can kill it... When you see the animal, you'll see it's sick and you see it dead. So <b>anything that can kill me, the animal will not survive. So monkey cannot carry a virus that can kill me [and not look sick].</b> "
4. Cooking and proper food preparation can mitigate disease risk	"When you kill the bushmeat in Africa, before you even eat it, it goes over the fire, they dry the meat, and there it goes in the pot and we are cooking it in Africa—we are not cooking for five minutes. I <b>don't care how the virus or bacteria is, when you put it in the fire it will not survive for a minute. When we start talking about Ebola, well, Ebola did not come from eating bushmeat, but the Ebola virus might have been on the meat, but when you put it on the fire, I don't think that the Ebola virus could survive.</b> "
5. African bushmeat may be banned in the United States due to human health risks	"So if you tell somebody, you know someone who don't know anything about Africa or West Africa and you tell a person, 'I eat bushmeat,' right, and they think 'do you know how many animals over there... who have XYZ, difficult diseases?' So, from their perspective, I'm going to freak out, like, <b>why are you bringing this into my country, where most likely, I don't know what it carries, or it could be transmitted and there'll be a big epidemic.</b> "

\*Bold text indicates emphasis of quotation.

to repeat focus group sessions with new participants until novel perspectives no longer arise (9).

Participants had resided in the United States from 6 months to 35 years; approximately half were female (online Technical Appendix Table 1). All had consumed bushmeat, either abroad or in the United States. The 2 fundamental drivers of consumption in the United States were to 1) strengthen connection with African roots or 2) share the social experience with friends or relatives (Table). Many participants also reported frequent consumption of bushmeat while visiting West Africa (Table).

Most participants reported preference for what they described as "dried bushmeat." "Drying" involved varying degrees of smoking, aging, and desiccation. Dried bushmeat, compared with raw or partially smoked products, was preferred for importation because its decreased odor is believed to reduce detection.

Concern about zoonotic or foodborne disease dissuaded few participants from obtaining or consuming bushmeat, despite heightened awareness that wildlife could harbor Ebola virus. Among those who acknowledged this potential, most believed careful preparation and thorough cooking mitigated risk. For instance, participants cited traditional Liberian cooking techniques (extensive boiling for long durations) as a protective factor (Table).

Some participants were knowledgeable of hunting and butchering techniques, but most participants purchased dried consumer products and had not participated in the processing of carcasses. Although there were consistent gaps in knowledge of import regulations, it was

commonly perceived that political, public health, or discriminatory (e.g., racist, xenophobic) justifications were factors (Table).

These focus groups yielded detailed and nuanced information on the knowledge, attitudes, and practices related to bushmeat use and consumption among Liberians and Liberian Americans in a US metro area. Although this study did not directly enumerate the volume and type of bushmeat imported into the United States, our results provide a description of sociocultural factors involved on the demand side of the supply chain, a common gap in most risk assessments, and give insight into potential education and risk management strategies. We found that engaging the community in a culturally appropriate manner encouraged open dialogue, creating opportunities for education regarding import regulations and risk mitigation strategies (e.g., careful preparation and thorough cooking).

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# Porcine Astrovirus Type 3 in Central Nervous System of Swine with Polioencephalomyelitis

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Using next-generation sequencing, we identified and genetically characterized a porcine astrovirus type 3 strain found in tissues from the central nervous system of 1 piglet and 3 sows with neurologic signs and nonsuppurative polioencephalomyelitis. Further studies are needed to understand the potential for cross-species transmission and clinical impact.

Astroviruses have been identified in a variety of mammals and birds; infection is often asymptomatic (1). Recently astroviruses have been implicated in cases of encephalomyelitis in humans, mink, cattle, and sheep (2–5). We describe the use of unbiased next-generation sequencing to identify and genetically characterize a porcine astrovirus type 3 (PoAstV-3) in central nervous system (CNS) tissues of a 5-week-old piglet and 3 sows with neurologic signs and histopathologic lesions compatible with a neurotropic viral infection.

A multisite swine production farm submitted swine neurologic cases on 3 different occasions over a 9-month period to the Iowa State Veterinary Diagnostic Laboratory (Ames, Iowa, USA); 1 submission (2 live piglets) represented a population of 4–12-week-old pigs and 2 submissions (submission 2, two live sows; submission 3, head and tissue of sow) representing sows. In all cases, affected swine exhibited clinical signs that ranged from hind limb weakness to quadriplegia and occasionally convulsions (Video, <https://wwwnc.cdc.gov/EID/article/23/12/17-0703-V1.htm>). The sow farm reported a case-fatality rate of 100%. The young pigs, which were farrowed from sows from the aforementioned sow farm, originated

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## Technical Appendix

### Focus group question guide

1. Please tell us your name, how long you've lived in Minnesota, and what country you are from.
2. Can you describe what the term 'bushmeat' means to you?
  - Probe 1: What other wild animal foods have you seen or heard of someone bringing back to the U.S. from West Africa?
  - Probe 2: What medicines or other things do you take that are made with wild animal products?
3. What do people living in the U.S. from your community like about bushmeat?
4. What do people living in the U.S. from your community dislike about bushmeat?
5. How do you or people you know use or eat bushmeat in MN?
  - Probe- are there other times people like to eat bushmeat in MN?
6. Can you describe for me how bushmeat gets to MN?
  - Probe- is that process different than how you get bushmeat in West Africa?
7. It seems like getting bushmeat in MN is sometimes more complicated than just going to the supermarket. What are some of the important factors someone thinks about when deciding if bushmeat is worth this extra effort?
8. Is there anything else you'd like to mention on the topic we've discussed today?

**Technical Appendix Table 1.** Aggregated self-reported demographic characteristics of focus group participants.  
Demographic characteristics of focus group participants (n = 32)

Gender	
Male	44%
Female	56%
Age	
Minimum (years)	18
Maximum (years)	70+
Years residing in USA	
Mean (years)	13
Minimum (years)	0.5
Maximum (years)	35
Country of birth	
Liberia	97%
Sierra Leone	3%

**Technical Appendix Table 2.** Open and selective codes (with definitions) used in analysis of bushmeat focus group transcripts

Defining bushmeat	
Bushmeat is from the countryside	Bushmeat is animals hunted in countryside (rather than city)
Bushmeat is hunted animals	Bushmeat is a species that a hunter kills and brings back for food
Bushmeat is wild animals	Bushmeat is wild animals hunted from forest or bush
City vs forest animals as bushmeat	Wild animals hunted in cities might also be defined as bushmeat
U.S. 'domestic' bushmeat	U.S. wildlife (such as deer) is a type of 'domestic' bushmeat that I could eat
Food of rural poor	Eating bushmeat is associated with not having options and living in rural area in Liberia
Definition by species	Bushmeat can be defined as the following species
Cultural definition of bushmeat	The species defined as bushmeat or as a source of food varies by culture and perspective
Individual species preferences	Which species are defined as desirable foods may just be individual or local preference
Primitive	People may avoid bushmeat because it is seen as primitive or not Western
Stigma against talking about it	No one wants to talk about bushmeat, or people aren't talking about it because they emotional response to the subject
Taboo or religion influence	Eating some species is taboo for religious or cultural reasons
America as melting pot	U.S. culture and food is an amalgamation of things brought by different immigrant groups
Western perception of bushmeat	What Liberians think Americans or other 'Westernized' people think about bushmeat
Strong smell	Bushmeat products can have a strong/distinctive smell
Bushmeat for non-food purpose	Some African bushmeat species can also be used for non-food purposes
Drivers for consumption in U.S.	
Bushmeat is cheaper	In Africa, bushmeat is less expensive than domesticated meats
Good taste or smell	Positive sensory traits of bushmeat
Natural or organic	Bushmeat is desirable because it is natural
Supports health	Consuming bushmeat has special health properties
Tastes like home	Eating bushmeat reminds me of home and invokes connections with home
Wild taste	Preference for bushmeat because the taste is better than domesticated animal meat
Laws and regulations around bushmeat	
Educate doctors	Doctors need to know about how bushmeat is used; they're clueless
Legalizing bushmeat	If bushmeat could be tested or regulated, it could become legal
Liberian government	People don't trust the Liberian government to self-regulate meat for export
Regulations needed	Regulations are needed to ensure meat/foods are safe to eat
Ways bushmeat gets to the U.S.	
Airline luggage	You could bring bushmeat to the U.S. on a plane in airline luggage
Airline luggage- not anymore	One used to be able to bring in bushmeat in airline luggage, but not anymore
Available in town	Yes, African origin bushmeat is available in MN and I have eaten it
Not available in town	We don't eat bushmeat because it isn't available in MN
Buying bushmeat in African countries	Experiences purchasing bushmeat to bring back to U.S.
Get from friend or relative	Can acquire bushmeat in MN from friend or relative who had traveled home to Liberia
Postal service	You could mail bushmeat to the U.S. using the postal service
U.S. stores	You could purchase bushmeat at some U.S. stores
Zoonoses risk: skepticism and support	
Bushmeat has never caused disease	Experiences eating bushmeat for years and never had an issue
Confusion	Confusion or unsure if bushmeat has been linked to disease
Cooking cannot inactivate disease	Bushmeat could carry disease, and risks cannot be mitigated by cooking
Cooking inactivates disease	Bushmeat could carry disease, but risk can be mitigated by proper cooking
Food preparation	Food preparation and sanitation are key to preventing disease or illness when eating bushmeat
Worth the risk	If there is a risk to eating bushmeat, it is still worth it
Zoonosis origin stories	Explanations or examples about how disease has transferred from animals to people, usually focused on Ebola
Other themes	
Preparation of bushmeat	The ways to prepare bushmeat vary by preference