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Assessments of Ebola knowledge, attitudes and practices in Forécariah, Guinea and Kambia, Sierra Leone, July–August 2015

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The border region of Forécariah (Guinea) and Kambia (Sierra Leone) was of immense interest to the West Africa Ebola response. Cross-sectional household surveys with multi-stage cluster sampling procedure were used to collect random samples from Kambia ($n = 635$) in July 2015 and Forécariah ($n = 502$) in August 2015 to assess public knowledge, attitudes and practices related to Ebola. Knowledge of the disease was high in both places, and handwashing with soap and water was the most widespread prevention practice. Acceptance of safe alternatives to traditional burials was significantly lower in Forécariah compared with Kambia. In both locations, there was a minority who held discriminatory attitudes towards survivors. Radio was the predominant source of information in both locations, but those from Kambia were more likely to have received Ebola information from community sources (mosques/churches, community meetings or health workers) compared with those in Forécariah. These findings contextualize the utility of Ebola health messaging during the epidemic and suggest the importance of continued partnership with community leaders, including religious leaders, as a prominent part of future public health protection.

This article is part of the themed issue ‘The 2013–2016 West African Ebola epidemic: data, decision-making and disease control’.

1. Introduction

The Ebola Virus Disease (Ebola) outbreak in West Africa was the most protracted and devastating Ebola outbreak in history [1]. As of March 2016, the countries that were most heavily affected by Ebola—Sierra Leone, Guinea and Liberia—had reported 28 646 cases and 11 323 deaths. Sierra Leone recorded 14 124 cases and 3956 deaths while Guinea reported 3811 cases and 2536 deaths. There are 3032 registered survivors in Sierra Leone and 1268 in Guinea [2].

The border region of Forécariah (Guinea) and Kambia (Sierra Leone) was of immense interest to the regional Ebola response, as Ebola cases and contacts had moved between the two countries in the past [3,4]. Longstanding cultural and familial ties, coupled with ongoing trade between Forécariah and Kambia,

posed unique challenges to effective cross-border Ebola control [5]. In 2015, the governments of Guinea and Sierra Leone recognized these challenges by jointly signing a Memorandum of Understanding to improve the prevention and control of Ebola cases at the Forécariah–Kambia border. Areas of cooperation included information sharing through cross-border visits and coordination of surveillance and contact tracing [6]. Now that Sierra Leone and Guinea have ended their epidemics, countries in the region are building systems to support their capacity to prevent, detect and respond to future Ebola and other outbreaks within country and across borders.

Following containment of the initial outbreak in the region, there have been seven flare-ups of confirmed Ebola cases between March 2015 and March 2016 in Guinea, Sierra Leone and Liberia [7]. While these flare-ups were promptly detected and contained, they are reminders of the ongoing risk of Ebola transmission in the sub-region and the need for ongoing, robust viral haemorrhagic fever surveillance in accordance with the International Health Regulations [8–10]. For instance, even though the most recent flare-up in Guinea and Liberia in March 2016 was contained to just 13 confirmed cases, it resulted in over 1200 contacts who required identification and monitoring [7]. Cross-border collaborations took centre stage in responding to the flare-up as a missing high-risk contact from the Guinea cluster fled to Liberia with her three children, where she eventually died of Ebola and sparked a flare-up of new cases across the border [11].

On 27 March 2016, the World Health Organization—acting on the recommendation of the International Health Regulations Emergency Committee—declared an end of the Public Health Emergency of International Concern relating to Ebola in West Africa [2]. As Guinea, Liberia, Sierra Leone and their neighbours struggled with health system recovery, a crucial regional priority for joint public health protection remained: strengthening surveillance systems to more promptly detect Ebola and other health threats and cross-border collaboration to effectively respond.

While ‘community resistance’ has been broadly characterized and documented in the Forécariah–Kambia border area [12], limited data are available to quantifiably describe public perceptions, attitudes and practices relating to Ebola prevention and control bordering this region. Against this background, we conducted additional data analysis on national datasets from the Sierra Leone and Guinea Knowledge, Attitudes and Practices (KAP) surveys administered between July and August 2015 after the containment of the primary Ebola epidemic in the sub-region [13]. The analysis focused on describing knowledge, attitudes and behavioural intentions related to traditional burials, health seeking practices, stigmatization of Ebola survivors and sources of information on Ebola in the two border locations. The aim was to identify tangible information and actions that could be targeted to improve public health protection, including outbreak preparedness and response.

2. Methods

A cross-sectional household survey was conducted in July 2015 in Sierra Leone and another cross-sectional KAP survey was conducted in August 2015 in Guinea. Both used multi-staged cluster

sampling procedures. At the time of data collection, both countries had largely contained their primary epidemics, with only a few clusters of cases being reported in the Forécariah–Kambia area [3].

The Sierra Leone KAP assessment was conducted using a national random sample of 3560 respondents, that included 635 selected from Kambia district. The Guinea KAP assessment comprised a national random sample of 6168 respondents, of whom 502 were selected from Forécariah. All 14 districts in Sierra Leone and eight administrative regions in Guinea were included in the respective samples. In both surveys, enumeration areas (clusters) were randomly selected from national sampling frames [14] with probability proportional to size (PPS), and the household was the primary sampling unit (PSU). In each cluster, households were selected using a random walk method [15], a form of systematic random sampling. Two individuals were then interviewed from each household. The household head was always interviewed in addition to a second, randomly selected household member who was either an adult woman or a young person aged 15–24 years. All interviews were conducted in the respective local languages. In Forécariah, interviews were mostly conducted in Susu or French while in Kambia they were predominantly conducted in Krio, Temne or Susu.

Data collection instruments were developed based on the existing literature of related KAP surveys and global frameworks for HIV/AIDS monitoring and evaluation in sub-Saharan Africa [16–22]. The items included in the respective survey questionnaires relate to the key messages and information communicated to the public during social mobilization and communication campaigns in Guinea and Sierra Leone. Data collection teams were trained via a week-long workshop on the proper administration of the survey, which included translating items from English and French to various local languages. Each team comprised a supervisor and three data collectors. Regional supervisors conducted spot visits and helped assure data quality and completeness.

Data collection was done using Open Data Kit® (ODK)—an open source digital application installed on portable tablet computers. ODK-collected data were automatically uploaded to a secure web-based hosting server, and subsequently imported to SPSS v. 22 for management and analysis. A total of 29 variables that were captured using identical questionnaire items in both datasets were identified for inclusion in the analysis. These items were consistently phrased using exact wording and response options in the respective survey questionnaires. Two additional variables on Ebola misconceptions captured in the Guinea survey but not in Sierra Leone were also included. Subsets of the respective Guinea and Sierra Leone KAP datasets were pooled into a combined dataset in SPSS. A location variable was created (coded 1 = Forécariah; 2 = Kambia) to distinguish the samples. For each of the included variables ($n = 29$), the sample proportion (by location) and its corresponding 95% confidence interval were calculated. We then compared the two sample proportions from Forécariah and Kambia using the two-sample Z-test (χ^2 distribution with 1 degree of freedom). Significance was set at alpha less than 0.05.

3. Results

Respondents’ socio-demographic characteristics are described in table 1. A total of 1137 respondents from Forécariah, Guinea ($n = 502$) and Kambia, Sierra Leone ($n = 635$) consented to participate in the respective surveys. Males comprised 52% of the respondents in Forécariah and 54% in Kambia ($p < 0.387$). Respondents from the two locations significantly differed in their religious affiliations, education and age. The majority of respondents self-identified

Table 1. Distribution of respondents' socio-demographic characteristics, assessments of Ebola knowledge, attitudes and practices in Forécariah, Guinea and Kambia, Sierra Leone, July–August 2015.

	total sample <i>N</i> = 1137	Forécariah, Guinea <i>N</i> = 502		Kambia, Sierra Leone <i>N</i> = 635		χ^2 <i>p</i> -value
	%	%	<i>n</i>	%	<i>n</i>	
<i>sex</i>						
male	53.0	51.6	259	54.2	344	0.387
female	47.0	48.4	243	45.8	291	
<i>religion</i>						
Islam	91.4	99.2	498	85.2	541	0.000
Christianity	8.6	0.8	4	14.8	94	
<i>education</i>						
no formal education	56.2	61.8	286	52.1	330	0.000
some primary	11.6	13.6	63	10.1	127	
completed primary	12.3	10.8	50	13.4	85	
completed junior secondary school	11.1	6.7	31	14.4	91	
completed upper secondary school	4.3	1.7	8	6.2	39	
diploma/post-secondary	3.0	2.6	12	3.3	21	
Bachelors	0.6	1.3	6	0.2	1	
Masters/PhD	0.9	1.5	7	0.5	3	
<i>age (years)</i>						
15–20	15.4	6.2	31	22.7	144	0.000
21–35	34.7	32.3	162	36.7	233	
36–49	24.5	29.3	147	20.6	131	
50+	25.4	32.3	162	20.0	127	

as Muslim in both Forécariah (99%) and Kambia (85%; $p < 0.001$). Respondents with no education were proportionally higher in Forécariah (62%) compared with Kambia (52%; $p < 0.001$). The median age of respondents in Forécariah was 40 years compared with 35 years in Kambia ($p < 0.05$). Questionnaire items and additional data tables are provided in the electronic supplementary material.

Table 2 presents a comparison of differences in KAP relating to Ebola between the two locations. Table 3 provides a comparison of differences in Ebola sources of information between the two locations.

(a) Knowledge

Overall, Ebola-related knowledge was high in both Forécariah and Kambia. Knowledge that Ebola could be prevented by avoiding traditional burials that involve washing or touching of the corpse was reported by respondents in Forécariah (90%) and Kambia (97%; $p < 0.001$). Nearly all respondents in Forécariah (98%) and Kambia (97%; $p = 0.267$) knew that seeking early medical care improves one's chance of surviving the disease. When asked in an open-ended, unprompted manner, a similar proportion of respondents named 'bats, monkeys or wild animals' as the cause or origin of Ebola in both Forécariah (81%) and Kambia (79%; $p = 0.542$). A higher proportion cited 'virus' as the cause of Ebola in Kambia (44%) compared to Forécariah (26%; $p < 0.001$). 'God or

higher power' was more frequently cited as the cause of Ebola in Forécariah (31%) than in Kambia (8%; $p < 0.001$).

(b) Misconceptions

Though not measured in Kambia, in Forécariah 61% ($N = 498$) of respondents believed that Ebola can be transmitted through mosquito bites and 25% ($N = 498$) believed that it is airborne. The belief that Ebola can be prevented by washing with salt and hot water was prevalent in 13% of respondents in Forécariah and 17% ($p = 0.037$) in Kambia. Only a small proportion of respondents believed that spiritual or traditional healers could successfully treat Ebola in both Forécariah (3%) and Kambia (1%; $p = 0.113$).

(c) Behavioural intentions if family member suspected of Ebola

When asked in an unprompted, open-ended format, intention to call the health facility or Ebola hotline when a family member is suspected of Ebola was higher in Kambia (94%) compared with Forécariah (53%; $p < 0.001$). In Forécariah, 14% of respondents reported an intention to directly take a family member suspected of Ebola to a health facility, whereas only 5% ($p < 0.001$) reported such intention in Kambia.

Table 2. Comparison of differences in respondents' knowledge, attitudes and practices relating to Ebola prevention and medical care, assessments of Ebola knowledge, attitudes and practices in Forécariah, Guinea and Kambia, Sierra Leone, July–August 2015. Percentages presented in table account for valid responses and exclude those that declined to respond/missing data.

indicator	Forécariah, GN, August 2015 overall			Kambia, SL, July 2015 overall			Z-test p-value
	%	N	95%CI	%	N	95%CI	
<i>knowledge: proportion of respondents who knew that...</i>							
Ebola caused by a virus	26.3	498	22.4–30.2	44.4	635	40.5–48.3	0.000
Ebola caused by bats/monkeys/wild animals	80.5	498	77.0–83.9	79.1	635	75.9–82.3	0.542
Ebola caused by God or higher power	31.3	498	27.2–35.4	7.7	635	5.6–9.8	0.000
Ebola preventable by avoiding physical contact with corpse	90.2	498	87.6–92.8	96.5	633	95.1–97.9	0.000
early medical care for Ebola improves chance of survival	97.8	498	96.5–99.1	96.7	634	95.3–98.1	0.267
<i>misconceptions: proportion of respondents who believed that...</i>							
Ebola preventable by bathing with salt and hot water	12.6	494	9.7–15.5	17.1	630	14.2–20.0	0.037
Ebola treated successfully by spiritual/traditional healers	2.6	496	1.2–4.0	1.3	612	0.4–2.2	0.113
<i>proportion of respondents who reported their intentions if a family member were sick or suspected of Ebola...</i>							
call the hospital/ health facility/Ebola phone line	53.2	498	48.8–57.6	94.2	635	92.4–96.0	0.000
directly take the person to the hospital	13.7	498	10.7–16.7	4.7	635	3.1–6.4	0.000
<i>proportion of respondents who reported their attitudes regarding modifications to traditional burials...</i>							
accept burial alternatives that do not involve contact with corpse	61.6	492	57.3–65.9	80.9	633	77.8–84.0	0.000
prefer a religious leader to give final prayer	56.6	498	52.3–60.9	68.0	512	63.9–72.0	0.000
prefer to observe from safe distance	60.2	498	55.9–64.5	52.9	512	48.6–57.2	0.019
prefer to know the location of the burial site	25.9	498	22.1–29.8	39.6	512	35.4–43.8	0.000
prefer a name plate at the funeral site	1.0	498	0.0–1.9	14.6	512	11.5–17.7	0.000
<i>proportion of respondents who reported various attitudes toward Ebola survivors...</i>							
survivors cannot spread Ebola through casual contact	80.5	498	77.0–84.0	88.8	633	86.3–91.3	0.000
would not buy vegetables from a shopkeeper who survived Ebola	14.5	498	11.4–17.6	13.4	633	10.8–16.1	0.595
would not welcome Ebola survivor into community	11.4	498	8.6–14.2	9.3	632	7.0–11.6	0.247
<i>proportion of respondents who self-reported their Ebola prevention practices...</i>							
avoid physical contact with people suspected of Ebola	72.7	494	68.8–76.6	24.8	616	21.4–28.2	0.000
wash hands with soap and water more often	98.2	494	97.0–99.4	93.0	616	91.0–95.0	0.000

Table 3. Comparison of Ebola information sources, assessments of Ebola knowledge, attitudes and practices in Forécariah, Guinea and Kambia, Sierra Leone, July–August 2015.

sources of Ebola information (open-ended, unprompted format)	Forécariah, Guinea August, 2015 (N = 498)		Kambia, Sierra Leone July 2015 (N = 635)		Z-test p-value
	%	95%CI	%	95%CI	
radio	82.3	78.9–85.7	87.7	85.2–90.3	0.011
television	6.4	4.3–8.6	1.3	0.4–2.2	0.000
health workers	6.6	4.4–8.8	44.9	41.0–48.8	0.000
mosques/churches	1.0	0.0–1.9	47.4	43.5–51.3	0.000
community meetings	0.2	0.1–3.2	30.9	27.3–34.5	0.000
print sources	0.0	0.0–0.0	2.4	1.2–3.6	—

(d) Attitudes: alternatives to traditional burials

Acceptance of alternatives to traditional burials that would usually involve physical contact with the corpse was a marked area of difference between respondents in the two locations: 81% accepted safe alternatives in Kambia compared with 62% ($p < 0.001$) in Forécariah. When followed-up in an open-ended format, having a religious leader give a final prayer was viewed as the most frequently cited preferred alternative to traditional burials in Kambia (68%) compared with Forécariah (57%; $p < 0.001$). On the other hand, the ability to observe the burial from a safe distance was more preferred in Forécariah (60%) compared with Kambia (53%; $p = 0.019$). Furthermore, in Kambia, 40% of respondents would want to know the location of the burial site whereas only 26% of those in Forécariah ($p < 0.001$) expressed such a desire. The least preferred alternative in both Forécariah (1%) and Kambia (15%; $p < 0.001$) was having a name plate at the burial site of the deceased family member.

(e) Attitudes toward Ebola survivors

While a high proportion of respondents did not believe that Ebola survivors can transmit the virus through physical contact in both Kambia (89%) and Forécariah (81%; $p < 0.001$), there remained some discriminatory attitudes toward survivors. Similar to Forécariah (15%), in Kambia, 13% ($p = 0.595$) of respondents reported that they would not 'buy fresh vegetables from a shopkeeper who survived Ebola.' Moreover, there remained some resistance to 'welcome survivors back into communities' in both Forécariah (11%) and Kambia (9%; $p = 0.247$).

(f) Prevention practices

Nearly all respondents from Forécariah and Kambia reported that they have taken some action to avoid being infected with Ebola. When asked in an open-ended manner, hand washing with soap and water was the most frequently cited prevention practice in both Forécariah (98%) and Kambia (93%; $p < 0.001$). Respondents in Forécariah (73%) were more likely to report avoiding physical contact with a suspected Ebola patient when compared with their counterparts in Kambia (25%; $p < 0.001$).

(g) Information sources on Ebola

While there were significant differences found in how respondents from the two locations received information about Ebola, radio had the highest reach in both Kambia (88%) and Forécariah (82%; $p = 0.011$) when asked in an unprompted, open-ended manner. In Kambia, 47% of respondents cited receiving information from mosques/churches, whereas only 1% ($p < 0.001$) did so in Forécariah. Similarly, 31% of respondents in Kambia cited receiving information through community meetings compared to less than 1% ($p < 0.001$) in Forécariah. Health workers in Kambia reached 45% of respondents with Ebola information compared with 7% ($p < 0.001$) in Forécariah. Printed sources and television were very rarely cited by respondents in both Forécariah (0%) and Kambia (2%).

4. Discussion

Our findings, measured after widespread Ebola transmission had ended in the region and after many months of efforts to educate and engage communities, revealed a high level of knowledge on Ebola prevention and treatment in the border area of Forécariah, Guinea and Kambia, Sierra Leone. Despite geographical proximity and sociocultural similarities, there were important differences between locations in behavioural intentions if a family is suspected of Ebola, acceptance of safe alternatives to traditional burials, prevention practices and sources of receiving information on Ebola. These findings point to the need for community-level data on KAP during an outbreak in order to develop more tailored risk communication strategies as part of future outbreak control for Ebola as well as other endemic and emerging health threats. We expect that such KAP findings would likely vary across different settings and communities, and therefore require local adaptations and interpretations for public health protection.

Respondents in Kambia, compared with Forécariah, were more likely to report their intention to call the health facility or emergency help line if a family member were suspected of Ebola. Even though these differences in behavioural intention cannot be explained from the current data, it should be noted that in Sierra Leone the National Ebola Call Centre was a central component of the response and heavily promoted

through social mobilization efforts. In addition, around the time of data collection, the Kambia District Ebola Response had recently launched ambulance tours during which communities and their local leaders had the opportunity to go through the 'Ambulance Project' and see that they were safe, clean and staffed by caring professionals [23].

Cultural practices such as traditional burials that involved washing and touching of the corpse were another high-risk behaviour that contributed to Ebola transmission [24]. The similarities in preferred alternatives to traditional burials—such as having a religious leader say a prayer and allowing family members to observe the burial from a safe distance—highlight practical opportunities for incorporating culturally and religiously accepted alternatives into medical burials during future Ebola or haemorrhagic fever outbreaks in these settings.

In both Guinea and Sierra Leone, response interventions included engagement with religious leaders to promote key Ebola prevention measures—especially around halting traditional burials and improving acceptance of safe medical burials [25–28]. Although religious leaders were targeted in both locations, very few respondents in Forécariah, Guinea reported receiving Ebola information from mosques or churches compared with those in Kambia, Sierra Leone. This cross-border comparison highlights how countries may employ similar community engagement strategies with varying degrees of reach. While outside the scope of the present analysis, there is a need to examine factors that contribute to successful engagement with religious and other community leaders so as to identify opportunities for robust community engagement strategies in future outbreak response.

The Theory of Planned Behaviour suggests that attitudes toward a particular behaviour, subjective norms and perceived behavioural control are predictors of behavioural intentions and actual behaviours [29,30]. Religious leaders may be viewed as trusted sources of information on modifying traditional burial norms by shifting attitudes to accept safe burials, as well as addressing broader transmission risk behaviours linked to other infectious disease outbreaks in the future. If sustained, the various community engagement platforms on Ebola—including networks of religious and traditional leaders—may be leveraged to address other endemic and emerging health threats in domestic and international settings; especially those requiring modifications in traditional, cultural or religious practices [31]. In addition, finding ways to sustain the high prevalence of hand-washing found during a period of low Ebola transmission would offer protection against endemic diarrheal diseases such as cholera.

Finally, a marked difference was found in the sources of receiving Ebola information such that radio had the highest reach in both places but health workers, community meetings and places of worship had a lower reach in Forécariah when compared with Kambia. Television and printed sources were very rarely cited as a source of information on Ebola. The Socio Ecological Model, a framework for planning health promotion programmes, suggests that interventions are more successful when they are targeted beyond the individual level to include interpersonal, community and policy layers [32]. It is unclear what factors influenced the reach of the various reported information sources. With more than half of respondents in both surveys not having any education, health

communicators should consider potential literacy issues when developing education and community engagements. Similar to the rest of Sierra Leone and Guinea, the wide reach of radio in both these settings can serve as a valuable tool for awareness raising and information dissemination in the event of an outbreak or other emergencies. While radio could be quite useful in rapidly sharing information with the public in near real-time during outbreaks [33], it should be further harnessed as a tool to get feedback from communities and help monitor emerging rumours, myths and misconceptions.

5. Limitations

The respective cross-sectional assessments in Sierra Leone and Guinea were not designed for a comprehensive cross-border analysis. The surveys were conducted after more than a year into the epidemic in the sub-region, and at a time of intensified communication and social mobilization efforts. Participants may have provided socially desirable responses to reflect health promotion messages received as opposed to their true individual practices. It should be further noted that the surveys were not designed to specifically evaluate any particular communication or social mobilization campaign. Doing so would not have been feasible as there were various simultaneous campaigns across the districts. In addition, other factors may have influenced KAP [34] that were not captured by the assessments such as financial constraints, levels of trust in local authorities and having some direct Ebola experience (e.g. witnessing a loved one or neighbour become infected or die from Ebola). The variability in socio-demographic characteristics in samples from the two locations may have influenced the results. There was also a limitation in the number of survey items identically measured that could be appropriately included in the analysis. The analysis did not include perceptions and knowledge around sexual transmission linked to viral persistence in some survivors [35]. Even though only low levels of stigmatization of survivors were reported in both locations at the time of the study, it is not feasible to discern how much of that may be a result of social desirability. While the design of the assessments was guided by the existing literature on the utility of KAP surveys, questionnaire items were not validated due to the urgency of the epidemic. It should be noted that both surveys were conducted at a time when the major focus was still on the outbreak, and did not explore some other key areas such as community-based surveillance and ways of re-integrating survivors into communities.

6. Conclusion

Overall, our results demonstrated high knowledge of Ebola and widespread handwashing practices during a period when the initial Ebola outbreak had been contained, but during which active transmission and ongoing community engagement were occurring in the Forécariah–Kambia border area between Guinea and Sierra Leone. Religious leaders, who may be the most prominent community leaders in these and other similar locations, have an important role in community-level health responses to Ebola and other emerging disease outbreaks. However, further investigation is needed to assess the effectiveness of specific engagement strategies with religious and traditional leaders. Using radio

as a key source of information offers the advantages of being trusted and wide reaching in low-literacy settings. It can be leveraged to rapidly disseminate health messages to the public while also generating feedback loops with communities. Such existing community assets could be beneficial in strengthening community-based surveillance and engagements to prevent, detect and respond to health threats.

The Ebola outbreak was a tragic example of how easily pathogens can cross borders. It is a reminder of our interconnectedness and interdependence in addressing national, regional and global health threats [36,37]. Our findings suggest that practical opportunities exist to influence knowledge, attitudes, behavioural intentions and prevention practices during periods of outbreak responses. Interventions targeting these factors can play an important role in protecting and saving lives during epidemics.

Ethics. The Sierra Leone KAP Assessment was approved by the Sierra Leone Ethics and Scientific Review Committee. The Guinea KAP Assessment was approved by the Guinea Research Ethics Committee. In both assessments, all participants provided consent to be interviewed.

Data accessibility. All requests to access the data must be processed through the multi-partner data sharing mechanism. All data

accessibility requests should be directed to the corresponding author: mjalloh@cdc.gov.

Authors' contributions. All authors made substantial contributions in one or more of the following areas: conception and design, acquisition of data, analysis or interpretation of data. In addition, all authors made contributions in preparing the draft manuscript, and gave their approval to submit the final version for publication.

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