Anatomy of an asymptomatic Ebola 'hotspot': transmission mapping and epidemiologic risk estimates

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BACKGROUND

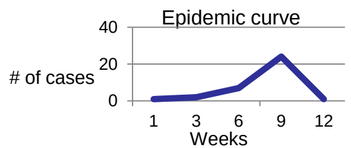
- Asymptomatic Ebola virus infection was an under-recognized phenomenon of the 2014-2016 West African Ebola epidemic.
- Studies have yet to consider asymptomatic infection in Ebola-related transmission maps and epidemiologic risk estimates
- Study aim 1 was to identify factors associated with the risk of Ebola infection from exposure and mortality from infection.
- Study aim 2 was to determine whether food insecurity was associated with the risk of Ebola infection from exposure and mortality from infection.

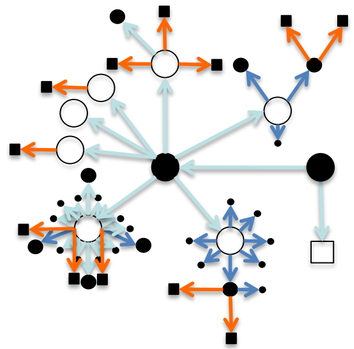
METHODS

- 223 persons were exposed to Ebola virus in the village of Sukudu in Kono District, Sierra Leone.
- 48 Ebola infections (36 symptomatic and 12 asymptomatic; 20 alive and 28 dead) were identified by serosurvey and Ebola response center records. Ebola response efforts intensified after week 8 of the village outbreak.
- Transmission mapping was depicted using the parameters of space and time. Asymptomatic infections were geospatially grouped to the nearest transmission node. Epidemic curve was depicted based on number of cases per epidemic week.
- Outcomes were people who were infected with Ebola virus or people who died of Ebola virus.
- Exposures were self-reported. Food insecurity was reported by a group of people who shared meals (pot-level).
- Bivariate and multivariate analyses were conducted using a logistic regression model. A cluster-adjusted analysis was performed on the food insecurity variable.

TRANSMISSION MAP

- Index cases in Koidu Town
- Cases went to Sukudu
- Unreported case went to Sukudu
- Community members
- Asymptomatic cases
- Known transmission
- Asymptomatic transmission





RISK OF INFECTION FROM EXPOSURE

		Unadjusted OR		Adjusted OR	
Characteristics		OR	95% CI	OR	95% CI
Gender	Female	0.97	0.51-1.84	1.08	0.45-2.59
Age	≥ 45	4.36	1.62-11.70	19.24	2.72-135.9
Job	At home	3.46	1.07-11.16	2.29	0.45-11.67
Highest school completed	> Primary	2.86	1.44-5.65	2.72	1.18-6.28
Cohabited with EVD case	Yes	15.15	6.07-37.79	33.76	10.04-113.46
Food insecurity	Moderate or severe	2.65	0.55-12.69	2.53	0.42-15.14

RISK OF MORTALITY FROM INFECTION

		Alive (n=20)		Dead (n=28)		
Characteristics		N	%	N	%	p-value
Gender	Female	9	45	13	36	0.36
Age	≥ 45	1	5	9	32	0.06
Job	At home	2	33	4	14	0.61
Highest school completed	> Primary	8	40	11	39	0.59
Cohabited with EVD case	Yes	6	30	13	46	0.20
Food insecurity	Moderate or severe	17	85	28	100	0.10

CONCLUSIONS

- There were 48 (21.5%) infections among 223 exposed participants in this village 'hotspot'.
- Ebola transmission stopped about a month after intensification of Ebola response efforts and public health containment strategies.
- The high risk of Ebola virus infection in people cohabiting a room with a case deserves attention in containment strategies.
- Food insecurity was not associated with risk of Ebola virus infection but 100% of people with food insecurity died compared to 85% of people without food insecurity (p=0.10).
- Larger studies should examine the risk of food insecurity on Ebola-related mortality.