

# COMMUNITY AWARENESS AND PERCEPTION TOWARDS RODENT CONTROL: IMPLICATIONS FOR PREVENTION AND CONTROL OF LASSA FEVER IN URBAN SLUMS OF SOUTHWESTERN NIGERIA

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**Abstract.** Domestic rodents have been implicated in the community transmission of Lassa fever (LF). Community awareness of vector control could lead towards control of LF, most especially in densely populated and overcrowded slums. The aim of the study was to assess knowledge and attitude towards rodent control in relation to LF in Southwestern Nigeria. This descriptive cross-sectional study of LF and rodent control was carried out among 500 community members selected using a multistage sampling method. The research instrument was a self-administered semi-structured pre-tested questionnaire. Data were analysed using SPSS software. 101 participants (20.2%) had heard about LF. Mean composite scores showed 19.4%, 14.1%, 17.0% and 13.9% of respondents to have good knowledge of occurrence, causes, disease transmission, as well as prevention and control of LF respectively. 215 participants (43.0%) lived in overcrowded rooms and only 36 (9.1%) claimed to never have seen a rat in their houses. 206 respondents (41.2%) said they often saw rats crossing between houses. Some recommendations for rodent control were suggested. It was concluded that poor awareness and knowledge of LF, together with poor housing facilities, characterised the communities studied. There is a need for relevant stakeholders to ensure better community health education and improved housing conditions in Southwestern Nigeria, with an emphasis on slum areas.

**Keywords:** Lassa fever, slum communities, rodent control, poor housing

## 1 Introduction

The environment in which a man lives could influence his development and health. Among the common environmental determinants of health, poor hygiene and poor housing are pressing problems facing the urban cities (Karija, Shihua & Lukaw, 2013). The resulting problem of unplanned urbanisation and subsequent un-

precedented population growth become more relevant to developing countries where policy for physical development and control merely exist on paper, without being implemented (Hala, 2013). Nigeria, with a population of about 140 million, an annual urban growth of 3.8% and a poor solid waste management system, could inevitably witness an upsurge in her number of urban slums (Omole, 2003). By the year 2025, about 61% of the world's population will be living in urban areas, especially in developing countries. The urban population will double from 2.4 billion in 1995 to an estimated 5 billion by 2025. In addition, 72% of the population in sub-Saharan Africa, or 166 million people, live in slums or informal settlements. These settlements are characterised by housing of poor quality, thus putting the lives and health of the residents in continuous dangers (United Nations, 2010).

Improper waste disposal results in breeding places for vectors of disease, while poor levels of housing offer easy access to rodents, which is more common in urban areas. These problems result in a significant spread of communicable diseases or new syndromes, thus adding to the local disease burden (United Nations Human Settlements Programme (UN-HABITAT), 2003; Rodhain 1996). Lassa fever (LF) transmission can occur by direct contact or with the environmental contact of an arthropod vector (UN-Habitat, 2003).

LF is caused by a single-stranded RNA virus (Lopez & Mathers, 2006; Lopez et al., 2001). The main feature of the fatal illness is impaired or delayed cellular immunity leading to fulminant viraemia (Daniel et al., 2013). The natural hosts for the virus are multimammate rats (*Mastomys natalensis*), which breed frequently and are distributed widely throughout West, Central and East Africa (Lopez & Mathers, 2006).

In slum communities where poverty prevails and standards of living are low, overcrowding subsists and rodents often move across from house to house, spreading the virus. Many studies have reported poor community awareness and knowledge of LF (Richmond & Bagloe, 2003; Tobin et al., 2014). Thus, there is a need to improve community attitudes to preventive measures in relation to rodent control in households and communities. This could assist in ensuring better prevention and control of LF through environmental means. The aim of this study is to assess knowledge and attitudes towards rodent control in relation to LF in Southwestern Nigeria.

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## 2 Methods

The study was carried out in Osogbo metropolis, the capital of Osun State in Southwestern Nigeria. The city has a population of about 750,000 people (National Population Commission [Nigeria], 2006), divided among three Local Governments (LGs), namely Osogbo, Egbedore and Olorunda LGs. It is inhabited mainly by people of the Yoruba-speaking ethnic group, with trading being their major occupation. There are about six slum settlements in two of the LG areas and none in Egbedore LG area. These slums are characterised by overcrowding of both houses and humans. There is a general and a teaching hospital, as well as numerous primary health care centres and private hospitals providing health services within the city.

### 2.1 Participants

The target population was made up of adult men and women within the age group of 18-65 years and living in slum areas in Osogbo. Eligible respondents should have been living in a slum community for a period of about 5 years. Using the formula for the estimation of sample size for populations greater than 10,000 (Araoye, 2004), and a community awareness prevalence rate of 48.0% (Richmond & Bagloe, 2003), a sample size of 384 was calculated. This was increased to 500 after adjusting for non-response and attrition.

A multistage sampling technique was employed. Osogbo was purposively divided into two groups, namely the slum wards ( $N = 6$ ) and the non-slum wards ( $N = 24$ ). Slum wards are those wards where slum settlements exist, while there are no slum settlements in the non-slum wards. In Stage 1, four of the six slum wards were randomly selected by random sampling through simple balloting. An equal number of questionnaires (96) was allocated to each of the four slum wards. The enumeration areas (EAs) used for the 2006 national population census were then used to delineate wards into communities. In Stage 2, two communities were randomly selected per ward by employing simple balloting. Subsequently, two streets per community were randomly selected through simple balloting in Stage 3. On a street, houses were selected using a systematic random technique of one in three after obtaining a sampling frame or list of streets and houses, starting with the odd-numbered houses on the right and even numbers on the left in Stage 4. All adults aged between 18 and 65 years in selected houses were interviewed. This process continued until allocated questionnaires were exhausted. In the case of uncompleted questionnaires remaining per street and per community, another EA community was chosen randomly and the sampling procedure repeated again.

### 2.2 Procedure

The study employed a cross-sectional descriptive design. Research instruments used were pre-tested semi-structured interviewer-administered questionnaires. Each questionnaire consisted of four sections. Section A examined the socio-demographic characteristics of the study population. Section B assessed awareness and knowledge about rodents and LF transmission. Section C dealt with awareness of LF, while Section D dealt with rodent control. The questionnaire administration was conducted mainly in the evenings of weekdays and on weekends by trained interviewers, who were community health workers conversant with the area. For the uneducated respondents, a vernacular version of the questionnaire was prepared, translated and back-translated between English and the native Yoruba language, to reduce inter-observer variation in the interpretation of responses during the administration of the questionnaires.

### 2.3 Ethical approval

Ethical approval to conduct the study was obtained from UNIOSUN Health Research Ethics Committee, with further permission from the State Ministry of LG affairs. Written informed consent was obtained from each of the respondents with subsequent signing or thumb printing.

### 2.4 Data analysis

Data collected were checked manually for errors and then double-entered and analysed on a computer using SPSS software. Relevant frequency tables and charts were generated. Composite knowledge and attitude scores were calculated. For knowledge, the 10-point knowledge questions were scored as +1 for a favourable, or positive, or correct answer, while -1 was scored for an unfavourable, or negative, or incorrect answer. Aggregate scores of 5 and above were regarded as 'good' while scores amounting to less than five were regarded as 'poor'. Associations between categorical variables were analysed using the Chi-square test at a level of significance of  $p < 0.05$ . Bivariate and multivariate analyses were carried out, with the statistical level of significance considered at  $p < 0.05$  for all inferential statistics.

**Table 1: Demographic characteristics of respondents.**

Variables	Frequency	Percentage
<b>Age group (years)</b>		
18-30	151	30.2
31-40	147	29.4
41-50	83	16.6
51-60	76	15.2
61-70	43	8.6
<b>Sex</b>		
Male	222	44.4
Female	278	55.6
<b>Marital status</b>		
Single	147	29.4
Married	292	58.4
Other	61	12.2
<b>Educational status</b>		
Nil formal	85	17
Primary	123	24.6
Secondary	222	44.4
Tertiary	45	9
Other	25	5
<b>Occupation</b>		
Artisan	113	22.6
Business	158	31.6
Civil servant	34	6.8
Farmer	66	13.2
Unemployed	104	20.8
Other	25	5
<b>Religion</b>		
Christian	80	16
Muslim	415	83
Traditional	2	0.4
Other	3	0.6

### 3 Results

The mean age of respondents was 39.8 years (+3.2 years), with 151 (30.2%) of respondents being in the 18-30 years age group. 55.6% of the participants ( $N = 278$ ) were females, 58.4% ( $N = 292$ ) were married, while 17.0% ( $N = 85$ ) had no formal education. These results, together with other findings on the participant group characteristics, are listed in Table 1.

Figure 1 shows percentage scores related to participants' knowledge of the epidemiology, causes, transmission as well as prevention and control of LF. The absolute majority of respondents reported poor knowledge related to each component (80.6% for occurrence, 85.9% for causes, 83.0% for disease transmission and 86.1% for prevention and control). Table 2 shows that 101 participants (20.2%) had heard about LF, with television and radio being the source of information among 74 of them (73.3%). Overcrowding (more than two people living with respondents in the same room) was reported in 215 (43.0%) of respondents' houses. Only 201 (40.2%) of respondents said they had separate rooms for keeping their loads and luggage. 171 respondents (43.3%) reported seeing a rat in their houses within the previous 24 hours. Only 36 (9.1%) claimed to never have seen a rat in their houses. 277 participants (55.4%) said that rats moved freely in their houses, while 206 (41.2%) reported that they often saw rats cross between houses. As a means to rodent control, 78 participants (15.6%) reported killing some rats physically, 162 (32.4%) used chemicals, while 143 (28.6%) set traps for them. 60 respondents (12.0%) said

the rats eventually escaped. 256 respondents (51.2%) viewed rats as potential transmitters of diseases.

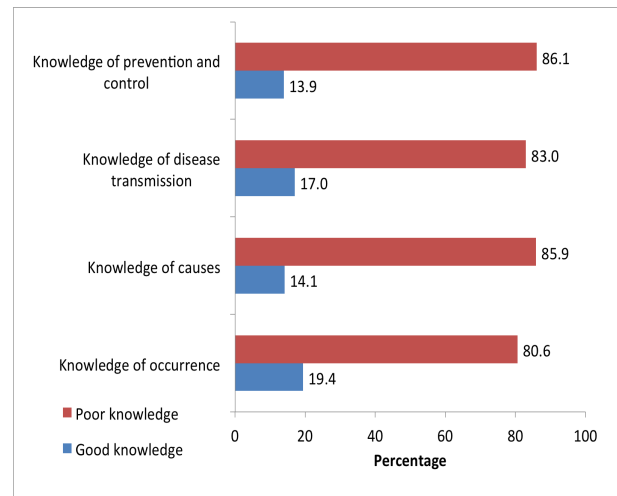


Figure 1: Knowledge of occurrence, causes, transmission and control of Lassa fever.

Table 2: Awareness about rodents and Lassa fever.

Variables	Frequency	Percentage
Heard about Lassa fever		
Yes	101	20.2
No	399	79.8
Sources of information ( $N = 101$ )		
TV/radio	74	73.3
Textbooks	5	4.9
Health care workers	14	13.9
Other	8	7.9
Number of people living with respondents in same room		
0	87	17.4
1	77	15.4
2	121	24.2
>2 (overcrowding)	215	43.0
Respondents having separate room for load or a store	201	40.2
Respondents seeing a rat in their household ( $N = 395$ )		
in the last 24 hours	171	43.3
over the past month	188	47.6
never	36	9.1
Rats move freely in my house	277	55.4
Rats often seen crossing between houses	206	41.2
What do you normally do when you see rats in the house?		
Many escape	60	12.0
Kill some physically	78	15.6
Use chemicals	162	32.4
Set traps	143	28.6
Other	57	11.4
These rats could transmit diseases		
Yes	256	51.2
No	198	39.6
Don't know	46	9.2

**Table 3: Environmental factors and recommendations for rodent control.**

Variables	Frequency	Percentage
Type of toilet		
Pit hole	200	40.0
Ventilated Improved Pit	16	3.2
Water closet	143	28.6
Other	96	19.2
Missing	45	9.0
All food items usually covered/not exposed	395	79.0
Refuse/remaining food disposal		
Dustbin at home	107	21.4
Dustbin outside home	202	40.4
Dustbin far away	145	29.0
Other	46	9.2
How often refuse accumulates		
Daily	296	59.2
Twice a week	56	11.2
Weekly	65	13.0
Monthly	5	1.0
Other	78	15.6
Often eats bush rats	101	20.2
Means of rodent control ( $N = 500$ )		
Personal hygiene	434	86.8
Environmental hygiene	434	86.8
Cover food and water properly	427	85.4
Cook food thoroughly	417	83.4
Block all rat hideouts	352	70.4
Store grains, food items in containers with cover	436	87.2
Proper refuse disposal	446	89.2
Keep pets in the house	315	63.0
Periodic fumigation	332	66.4
Dispose of garbage far away from home	382	76.4
Avoid crowding - loads and people	374	74.8
Public health education	425	85.0
Would like to take every positive step towards rodent control in households and hospitals	313	62.6
Would like to give public health education to households on prevention and control of rodents	192	38.4

Table 3 shows environmental factors favouring rodent transmission of LF and recommendations for rodent control. The type of toilet used by the majority of respondents was the pit latrine ( $N = 200$ ; 40.0%). For disposal of refuse and residual food items, most respondents used a home dustbin placed outside ( $N = 202$ ; 40.4%), despite daily accumulation of refuse noted by 296 (59.2%) of respondents. 101 participants (20.2%) often ate bush rats. There were 313 participants (62.6%) who claimed that they would like to take every positive step towards rodent control in households, while 192 (38.4%) were interested in giving public health education to households on prevention and control of rodents. Recommendations for rodent control made by the re-

spondents included good personal hygiene ( $N = 434$ ; 86.8%), good environmental hygiene ( $N = 434$ ; 86.8%), proper covering of food and water ( $N = 427$ ; 85.4%), cooking food thoroughly ( $N = 417$ ; 83.4%), blocking all rat hideouts ( $N = 352$ ; 70.4%), storing grains and food in containers having a cover ( $N = 436$ ; 87.2%), proper refuse disposal ( $N = 446$ ; 89.2%), keeping pets in the house ( $N = 315$ ; 63.0%), periodic fumigation ( $N = 332$ ; 66.4%), disposing of garbage far away from the house ( $N = 382$ ; 76.4%), avoiding overcrowding in terms of load and people ( $N = 374$ ; 74.8%) and giving public health education ( $N = 425$ ; 85.0%).

**Table 4: Association between awareness of Lassa fever and selected variables.**

Bivariate analysis				
Variables	Have heard about Lassa fever		X <sup>2</sup> value	p-value
	Yes	No		
Sex				
Male	66	156	22.49	<0.001
Female	35	243		
Education level				
Nil formal	17	68	0.003	0.96
Had formal education	84	331		
Ready to take positive steps towards rodent control				
Yes	71	242	3.203	0.074
No	30	157		

**Binary logistic regression: prediction of having heard about Lassa fever by selected variables**

Variables	OR	95% CI		p-value
		Lower	Upper	
Sex (reference category = female)	2.94	1.86	4.636	<0.001
Education (reference category = informal education)	0.98	0.55	1.764	0.96
Ready to take positive steps towards rodent control (reference category = no)	1.54	0.958	2.46	0.075

Table 4 shows a statistically significant association between having heard about LF and respondents' gender ( $p < 0.05$ ), while no such association exists with education level and readiness to take positive steps towards rodent control ( $p > 0.05$ ). Males were three times more likely to have heard about LF compared to females (Odds Ratio (OR) = 2.94, 95% Confidence Interval (CI) = 1.860 - 4.636,  $p < 0.001$ ). Thus, male gender predicted awareness of LF. There was no difference in the likelihood of respondents with formal education being aware of LF compared to those with informal education (OR = 0.98, 95% CI = 0.550 - 1.764,  $p = 0.960$ ). Respondents who had heard about LF were 1.54 times more likely to be willing to take every positive step towards rodent control in households (OR = 1.5, 95% CI = 0.958 - 2.460,  $p = 0.075$ ).

## 4 Discussion

In this study, about one-fifth of respondents were aware of LF. This figure is lower compared to a study that reported a community figure of about half of respondents, though endemic communities were studied with a sample size of 231 (Cohen, 2003). Awareness can be described as a precursor of seeking more in-depth knowledge about the core subject under consideration, LF in this case. The sources of information on LF identified in this study agreed with findings from another similar study by Aigbiremolen et al. (2012). The media remain a veritable means of disseminating information about health and health-related events, although bias of perception may result (Wilson et al., 2004; Young, Norman & Humphreys, 2008).

Most studies reviewed did not break down the knowledge of LF into occurrence, causes, transmission and prevention and control, as in the present study. Rather, they addressed generalised knowledge towards LF as a disease. However, less than one fifth of the respondents in the current study had good knowledge in each of the four categories examined. This is rather low when compared with another community-based study in which just under half of the respondents had good knowledge of LF (Richmond & Bagloe, 2003). However, our figure was higher when compared with another community-based Nigerian study ( $N = 380$ ) that reported 7.4% of respondents having good knowledge of LF (Oladeinde, Omoregie & Odia, 2014). While these differences in figures call for concern, they point towards a growing need to step up awareness and, subsequently, in-depth knowledge of LF and rodent control.

Governments' commitment to all citizens of the world towards assisting them to live a socially acceptable and economically productive life includes safe and quality housing. Thus, poor quality housing is an infringement on the rights of all humans to a standard of living that is adequate for health. Among the vulnerability of those without adequate shelter is the risk of spreading of disease by rodents and other pests. Thus, the overcrowding (more than two people living together in a room) reported in the homes of just less than half of the respondents in this study suggests that houses in slums are inadequate in terms of space and, perhaps, facilities. Only about two-fifths of participants reported having a separate room for loads. This arrangement could favour breeding and movement of rodents within the house, as well as cross-breeding from one house to the other. In this study, half of the

respondents reported that rats moved freely in their house, two-fifths said they crossed between houses, while another half said they can transmit disease. This supports another study in which respondents associated rodents' free movement and consumption with occurrence and outbreak of LF infection (El-Yuguda, Baba & Aliyu, 2009). A relationship also exists between housing quality and risk of LF in underserved communities (Bonner et al., 2007). Houses in slums, like those in camps, are usually constructed primarily of mud bricks and are less likely to have adequate facilities for waste management. In support of findings from this research, other studies have shown that houses of good quality and external hygiene are more likely to have multimammate rat infestation than houses built of mud brick or mud and wattle walls (Innebah, Brewah & Francis, 2004; Moses et al., 2009). Thus, the ability of respondents to observe the numerous rodent control measures identified may depend on the adequacy of their houses and their attitude towards waste management. Infection gaps have also been found to exist in areas with poor waste management and sanitation (Hodges, 2001). Among the many ways of rodent contact control is the protection of food and the provision of adequate food storage facilities. This is also supported by another study (World Health Organization, 2005), thus stressing the need to put food away from contact with rodents.

## 5 Conclusions

Poor awareness and knowledge of LF was found among community members studied in this investigation. Overcrowding and poor housing facilities can only worsen the risk of breeding and free movement of rodents in these slum communities. Poor housing may not guarantee respondents the important task of executing all the rodent control strategies mentioned in this study. It is thus important to raise community awareness about LF. It is important for the concerned authorities to assist in providing adequate housing for all, as this can lead to better rodent control and thus a reduction in prevalence of LF in our societies.

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## 8 Conflicts of Interest

The author reports no conflicts of interest.

## References

- Aigbiremolen, A.O., Duru, C.B., Awunor, N.S., Abejegah, C., Abah, S.O., Asogun, A.D. & Eguavoen, O.L. (2012) Knowledge and application of infectious disease control measures among primary care workers in Nigeria: the Lassa fever example. *International Journal of Basic, Applied and Innovative Research*, 1(4), pp. 122-129.
- Araoye, M.O. (2004) *Research Methodology with Statistics for Health and Social Sciences*. Ilorin, Nigeria: Nathadex Publishers.
- Bonner, P.C., Schmidt, W.P., Belmain, S.R., Oshin, B., Baglolle, D. & Borchert, M. (2007) Poor housing quality increases risk of rodent infestation and Lassa fever in refugee camps of Sierra Leone. *American Journal of Tropical Medicine and Hygiene*, 77 (1), pp. 169-175.
- Cohen, B. (2003) Urban growth in developing countries: a review of current trend and a caution regarding existing forecasts. *World Development*, 32(1), pp. 23-51.
- Daniel, K.J., Bailor, M.B., Ross, R.A., Temple, B.A., Moses, L.M. & Bausch, D.G. (2013) Housing equity for health equity: a rights-based approach to the control of Lassa fever in post-war Sierra Leone. *BMC International Health and Human Rights*, 13(2), pp. 36-43.
- El-Yuguda, A.D., Baba, S.S., & Aliyu, A.M. (2009) Peridomestic rodents and Lassa fever virus infection of humans in urban and rural communities in Borno state, Nigeria. *Nigerian Veterinary Journal*, 30(2), pp. 65-70.
- Hala, I.A. (2013) Health effect of slums: a consequence of urbanization. *Scholarly Journal of Medicine*, 3 (1) pp.7-14.
- Hodges, A.O. (2001) *Children's and Women's Rights in Nigeria: A wake-up call*. Abuja: National Planning Commission, Nigeria/UNICEF 2001.
- Innebah, T., Brewah, F. & Francis, T. (2006) *The 2004 Population and Housing Census: Analytical report on poverty*. Republic of Sierra Leone.
- Karija, M.K., Shihua, Q.I. & Lukaw, Y.S. (2013) The impact of poor municipal solid waste management practices and sanitation status on water quality and public health in cities of the least developed countries: the case of Juba, South Sudan. *International Journal of Applied Science and Technology*, 3(4), pp.87-99.
- Lopez, A.D. & Mathers, C.D. (2006) Measuring the global burden of disease and epidemiological transitions: 2002-2030. *Annals of Tropical Medicine and Parasitology*, 100 (5 & 6), pp. 481-99.
- Lopez, A.D., Mathers, C.D., Ezzati, M., Jamison, D.T. & Murray, C.J. (2006) Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet*, 367(9524), pp.1747-57.
- Moses, L.M., Adams, K.L., Kargbo, K., Koninga, J., Veltus, E., Lewinski, J.P., Fonnies, R., Kanneh, L.D., Robert, W., Bangura, J.J., Lungay, V.K., Garry, R.F., Rogers, D.S. & Bausch, D.G. (2009) Household predictors of abundance of the Lassa virus reservoir, *Mastomys natalensis*, in the Eastern Province of Sierra Leone. Abstract, *58th Annual Meeting of the American Society of Tropical Medicine and Hygiene*. Washington, DC.
- National Population Commission [Nigeria] (2006) *Nigeria Demographic and Health Survey*. Calverton Maryland: National Population Commission and ORC Macro.
- Oladeinde, B.H., Omoregie, R & Odia, I. (2014) Public awareness of Lassa fever in three rural communities of Nigeria. *International Journal of Health Promotion and Education*. doi: 10.1080/14635240.2014.968288.
- Omole, E.K. (2003) Urban renewal theory and practice: some lessons from Nigeria. *International Journal of Environmental Issues*, 1(1), pp.115-123.
- Richmond, K. & Bagloe, D.J. (2003) Lassa fever: epidemiology, clinical features, and social consequences. *British Medical Journal*, 327(7426), pp. 1271-1275.
- Rodhain, F. (1996) Les zoo-anthropozoonoses impliquant des rongeurs: considérations épidémiologiques. *Bulletin of the Exotic Pathology Society*, 89, pp.5-11.
- Tobin, E.A., Asogun, D., Happi, C., Ogbaini, E. & Gunther, S. (2014) Risk factors for Lassa fever in endemic communities of Edo State, Nigeria. *International Journal of Infectious Diseases*, 21(1), pp. 258-259.
- United Nations (2010) *World Urbanization Prospects: The 2009 revision*. [Online] Available from: <http://esa.un.org/unpd/wup/index.htm> [Accessed 12th June 2014].
- United Nations Human Settlements Programme (UN-HABITAT)

- (2003) Monitoring housing rights. *United Nations Housing Rights Programme, Working Paper, No.1*. Nairobi: UN-HABITAT Information Services Section.
- World Health Organization (2005) Update on Lassa fever in West Africa. *WHO Weekly Epidemiologic Records*, 10(11), pp. 86-87.
- Wilson, K., Code, C., Dornan, C., Ahmad, N. & Hebert, P. (2004) The reporting of theoretical health risks by the media: Canadian newspaper reporting of potential blood transmission of Creutzfeldt-Jakob disease. *BMC Public Health*, 4(1), doi: 10.1186/1471-2458-4-1.
- Young, E.M., Norman, R.G. & Humphreys, R.K. (2008) Medicine in the popular press: the influence of the media on perceptions of disease. *PLOS One*, 3(10), doi: 10.1371/journal.pone.0003552.