Setting priorities for surveillance, prevention, and control of zoonoses in Bogotá, Colombia

Natalia Cediel,[1] *Luis Carlos Villamil,*[2] *Jaime Romero,*[2] *Libardo Renteria,*[3] *and Daniele De Meneghi*[1]

Suggested citation Cediel N, Villamil LC, Romero J, Renteria L, De Meneghi D. Setting priorities for surveillance, prevention, and control of zoonoses in Bogotá, Colombia. Rev Panam Salud Publica. 2013;33(5):316–24.

ABSTRACT

Objective. *To establish priorities for zoonoses surveillance, prevention, and control in Bogotá, Colombia.*

Methods. *A Delphi panel of experts in veterinary and human medicine was conducted using a validated prioritization method to assess the importance of 32 selected zoonoses. This exercise was complemented by a questionnaire survey, using the knowledge, attitudes, and practices (KAP) methodology, administered in 19 districts of Bogotá from September 2009 to April 2010 to an at-risk population (workers at veterinary clinics; pet shops; butcher shops; and traditional food markets that sell poultry, meat, cheese, and eggs). A risk indicator based on level of knowledge about zoonoses was constructed using categorical principal component and logistic regression analyses.*

Results. *Twelve experts participated in the Delphi panel. The diseases scored as highest priority were: influenza A(H1N1), salmonellosis,* Escherichia coli *infection, leptospirosis, and rabies. The diseases scored as lowest priority were: ancylostomiasis, scabies, ringworm, and trichinellosis. A total of 535 questionnaires were collected and analyzed. Respondents claimed to have had scabies (21%), fungi (8%), brucellosis (8%), and pulicosis (8%). Workers with the most limited knowledge on zoonoses and therefore the highest health risk were those who 1) did not have a professional education, 2) had limited or no zoonoses prevention training, and 3) worked in Usme, Bosa, or Ciudad Bolívar districts.*

Conclusions. *According to the experts, influenza A(H1N1) was the most important zoonoses. Rabies, leptospirosis, brucellosis, and toxoplasmosis were identified as priority diseases by both the experts and the exposed workers. This is the first prioritization exercise focused on zoonoses surveillance, prevention, and control in Colombia. These results could be used to guide decision-making for resource allocation in public health.*

Key words Zoonoses; health priorities; health knowledge, attitudes, practice; Colombia; South America.

The lack of effective and sensitive surveillance systems combined with low awareness of the risks associated with zoonoses contributes to a general underestimation of the importance of zoonoses in developing countries (1–4). In Colombia, the national zoonoses surveillance system is characterized by under-reporting of human cases of zoonoses (5); lack of veterinary public health policy; weak and fragmented epidemiological surveillance systems; and lack of laboratory networks (5–9). As noted by several authors, priority setting is necessary to ensure that both planning and resources allocation are rational, explicit, and transparent, but there is still no gold standard or best practice for this step (10–14). As research on surveillance prioritization ideally begins with a review of national priorities (15), the authors examined the Colombian national health plan (*Plan Nacional de Salud Pública*, PNSP). They also conducted a literature review on health prioritization in South America. Results indicated that 1) decreasing com-

[1] Dipartimento di Scienze Veterinarie, Università degli Studi di Torino, Torino, Italy. Send correspondence to: Natalia Cediel, swasanata@gmail.com, nataliacediel@uan.edu.co
[2] Facultad de Ciencias Agropecuarias, Universidad de La Salle, Bogotá, Colombia.
[3] Sección de Vigilancia en Salud Pública, Secretaria Distrital de Salud, Bogotá, Colombia.

municable diseases and zoonoses is one of the five main national health priorities in Colombia (16), and 2) most countries in South America, including Colombia, lack experience in identifying health priorities (17). Brazil was the only country that had published an institutional technical report about the national agenda for health research priorities (18). No scientific reports were found on the prioritization of diseases, including zoonoses, in Colombia or its neighboring countries, indicating a knowledge gap in this area at the regional level. Only one report was found on prioritization of zoonoses for South America (describing pathogenic strains of *Escherichia coli* and non-poultry *Salmonella* spp. as World Organisation for Animal Health (OIE) priority pathogens) (19). The objectives of the current research were to identify priority zoonoses for surveillance purposes, and most-at-risk worker groups and their training needs, to generate baseline information for future national and regional zoonoses surveillance program activities.

MATERIAL AND METHODS

Study area

Colombia is located in the northwestern region of South America. The capital city of Bogotá accounts for 7 363 782 inhabitants (2005 census) and is the third-highest capital city in South America at 2 625 meters (8 612 ft) above sea level. Dry and rainy seasons alternate throughout the year. Bogotá has 20 localities or districts that form an extensive network of neighborhoods. Areas of higher economic status tend to be located in the north and northeast and the poorer neighborhoods in the south and southeast.

Method 1: Expert panel for zoonoses prioritization

The research protocol described by Krause et al. (12) was adapted using a Delphi panel of experts who volunteered to participate. The authors used this method because 1) it offers a systematic and reproducible methodology to define priority pathogens/diseases in different epidemiological settings, 2) it can be adapted according to local epidemiologic situations, 3) it offers the possibility of making adjustments if certain conditions change, and 4) it allows for weighing of the prioritization criteria. To ensure optimum transparency in the expert selection process, the authors created inclusion criteria based on 2006 World Health Organization (WHO) guidelines for setting priorities in communicable disease surveillance (10). A person was considered an expert in the field when he/she met at least three of the following four conditions: 1) demonstrated relevant experience in zoonoses research, surveillance, prevention, and control in the last five years in Colombia; 2) worked as a qualified professional in public health disciplines; 3) participated as a speaker in conferences or congresses on zoonoses; and 4) published at least one scientific paper or carried out a study on zoonoses in Colombia. The authors identified 21 experts to participate in the Delphi panel. Each Delphi panel expert was contacted by the research team through an institutional letter of invitation from the Health District Secretariat and by e-mail.

The list of zoonoses (n = 32) was compiled using criteria described by Krause et al. (12), Havelaar et al. (20), and the WHO guidelines (10). A zoonotic disease was added to the list if it met at least one of the following conditions: 1) classifiable as a notifiable disease according to Colombian law (21); 2) listed in national surveillance system reports on infectious diseases by the National Institute of Health (*Instituto Nacional de Salud*, INS) during the past five years (2006–2010) (6); 3) quoted in publications on zoonoses epidemiology in Colombia; or 4) caused by a pathogen with potential for emergence.

Each selected zoonotic disease was rated for each of the 12 criteria (described by Krause et al. (12) and adapted by the authors for the local conditions) using a numerical score of +1 (indicating the zoonosis was considered to be of "high importance"); 0 (meaning "average importance" or "lack of knowledge/opinion precluded another score"); or –1 ("low importance"). Each expert was asked to assign a value from 0 to 12 to each criterion indicating its contextual importance for surveillance and epidemiological research, with 0 meaning the lowest and 12 the highest level of importance of a given criterion (22). Weighting was obtained by adding the median value of all weights assigned by the experts. The total score was then normalized between the unweighted and the weighted scores, and the weighted scores were rescaled (from 0 to 100) to facilitate interpretation of the final score. Final scores were defined as the sum of the scores for all 12 categories, per disease, multiplied by the weight. Final scores were interpreted using equal ranges between percentiles 0.33, 0.66, and 100, as described by Balabanova et al. (22), corresponding to high-, medium-, and low-priority groups.

Method 2: KAP related to zoonoses risk

Using the knowledge, attitudes, and practices (KAP) methodology (23, 24), a semi-structured questionnaire was administered to the population exposed to occupational risks for zoonoses in Bogotá. The questionnaire was designed and validated using a survey on the level of knowledge on zoonoses previously applied by the principal author (NC) in the Piedmont region of northwestern Italy (25). It included three categories of questions: 1) general information; 2) health status, self-perceived risk at work, and use of personal protective equipment (PPE); and 3) food and hygiene behaviors, and knowledge of the mechanism of zoonoses infection.

Purposive non-probabilistic voluntary sampling was used with each target population. Questionnaires were administered by previously trained operators and by the lead author in 19 districts of Bogotá. The Sumapaz district was excluded due to 1) lack of information about the target population, and 2) difficulties in accessing the results of the fieldwork and carrying out the required sampling. The target population was divided into two groups: 1) those working in veterinary practices and pet shops (Population A), and 2) those working in butcher shops and traditional food markets that sell poultry, meat, cheese, and eggs (Population B). The sample size was defined using the software Epidat 3.1® (SERGAS-PAHO, 2006).[4] The parameters were size of Population A (n = 667); size of Population B (n = 2 942); 95% confidence intervals (CIs); error: 5%; 90% probability of knowledge about zoonoses for those in the first group, and 20% for those in the second group; and

[4] www.sergas.es/MostrarContidos_N3_T01.aspx?IdPaxina=62715

design effect adjustment: 1.5. The likelihood of knowledge about zoonoses was estimated based on the literature review (Marvin et al. (26), and Umar and Nura (27)). A total of 514 questionnaires had to be collected according to the sample calculation (173 in Population A, and 341 in Population B). Data were collected during working hours to allow for direct observation of safety practices at work. Once the research team arrived in a specific district, the closest workplace with access to Populations A and B was selected and proportional sampling was begun as soon as the survey respondents were available and willing to participate. The collected data were initially stored using Microsoft Excel® (Windows) (Redmond, WA, USA) and analyzed by SPSS® statistical package, version 17 (Chicago, IL, USA). A logistic regression model was used to identify the variables related to knowledge on zoonoses. A categorical principal component analysis (CATPCA) method was then selected for synthesizing a large number of quantitative variables and categorizing them into numeric variables. This technique was selected because it is a useful and powerful tool for creating indicators (28, 29). One of three possible scores (0.0, 0.5, and 1.0) was assigned based on level of knowledge of zoonoses. Data collection was completed between September 2009 and April 2010.

RESULTS

Expert panel for zoonoses prioritization

The Delphi panel included 12 experts from Bogotá: seven researchers and professors (physicians, veterinarians, and biologists) from public and private universities; four veterinary officials from national and local public health offices; and one veterinarian from the Colombian Agricultural Institute (*Instituto Colombiano Agropecuario*, ICA). Survey results were presented to and discussed with the experts to determine the weighted criteria values (Table 1). As shown in the table, the criterion experts deemed most important for prioritizing zoonoses in Bogotá was "preventability," which was given a weighted score (WS) of 9.3. The importance given to disease preventability in public health decision-making in Colombia may be attributed to the moderate incidence of infectious diseases. Other criteria the experts rated most important were "incidence" (WS = 8.7) and "severity" (WS = 7.5). The "trend" and "evidence for pathogenesis" criteria were rated least important (WS = 5.0 and 4.3 respectively), which suggests that the panel experts' approach to zoonotic diseases was more epidemiological than clinical. These results suggest that (despite the fact that zoonotic diseases are under-reported in Colombia) public health resources in Bogotá should be steered toward preventing and controlling the zoonotic diseases with the highest incidence and severity.

TABLE 1. Weighted criteria values assigned by panel of experts for zoonoses prioritization exercise, Bogotá, Colombia, September 2009–April 2010

Criteria	Weighted score
Preventability	9.3
Incidence	8.7
Severity	7.5
Evidence of risk factors / risk groups	7.3
Mortality/fatality	6.9
Emerging potential	6.9
Outbreak potential	6.5
Validity of epidemiologic information	6.3
Treatability	6.2
International duties and public attention	6.0
Trend	5.0
Evidence for pathogenesis	4.3

The surveillance prioritization rankings for all 32 zoonoses (rescaled to a score of 0 to 100) are shown in Table 2. The diseases that received the highest scores during the study period were influenza A(H1N1), salmonellosis, *E. coli* infection, leptospirosis, and rabies. The medium-priority group included listeriosis, anthrax, campylobacteriosis, zoonotic tuberculosis, and Western equine encephalitis. Those with the lowest scores were ancylostomiasis, scabies, dermatophytosis (ringworm), and trichinellosis.

TABLE 2. Expert panel ranking of 32 zoonotic diseases for surveillance prioritization (rescaled to score of 0 to 100), Bogotá, Colombia, September 2009–April 2010

Ranking	Disease	Rescaled score (0 to 100)
High-priority value (from percentile 0.66 to maximum score)	Influenza A(H1N1)	100
	Salmonellosis	97
	E. coli infection	94
	Leptospirosis	90
	Rabies	87
	Hantavirus infection	84
	West Nile disease	80
	Spotted fever, tick-borne	77
	Brucellosis	74
	Toxoplasmosis	71
	Venezuelan equine encephalitis	68
Medium-priority value (from percentile 0.66 to percentile 0.33)	Listeriosis	65
	Anthrax	61
	Campylobacteriosis	58
	Zoonotic tuberculosis	54
	Western equine encephalitis	52
	Flea- and lice-borne typhus	48
	Yersiniosis	43
	Cysticercosis	43
	Trypanosomiasis (Chagas)	39
	Yellow fever	36
Low-priority value (from percentile 0.33 to minimum score)	Echinococcosis	32
	Criptosporidiosis	28
	Chlamydiosis	28
	Cat scratch disease	23
	Toxocariasis	20
	Leishmaniasis	16
	Borreliosis	13
	Trichinellosis	9
	Dermatophytosis (ringworm)	6
	Scabies	3
	Ancylostomiasis	0

KAP related to zoonoses risk

A total of 535 questionnaires related to level of knowledge of zoonoses were administered to the target population in 19 districts of Bogotá. The authors increased the sample size beyond that initially calculated (514 questionnaires). The results on respondents' self-perceived health status, and zoonoses risk at work; use of PPE; most recent type of medical services; and demographic and personal characteristic are shown in Table 3 and Annex 1.

Almost half of the survey respondents (48%) said they had visited medical services for a checkup or preventative reasons in the past year; most (69%) perceived their health status as "good"; 86% said they had completed courses on the use of PPE at their workplace; and most (69%) said they only participated in no-risk or low-risk activities at their workplace (no-risk, 36%; low-risk, 33%).

The most relevant results on respondents' food and hygiene behaviors and knowledge of the mechanism of zoonoses infection were as follows: 89% said they did not eat raw eggs; 82% said they never drink fresh milk; and 74% considered raw fish and shellfish "dangerous" food. When asked what they would do if they had a tick bite, most respondents (69%) said the first step was "detach the tick from the skin and then flatten it." When asked what they would do to avoid contamination from an infected animal placenta, 7% said they would remove the placenta carefully and place it in a plastic bag. When asked about the presence of dog/cat feces in public parks, about 90% of the respondents stressed the importance of disposing of the fecal material. Most respondents (87%) said they wash their food (mainly vegetables and fruits) before eating it, and 43% said they wash their hands before eating. Most respondents (96%) agreed that animal vaccination and treatment against parasitic diseases are useful disease control tools. Almost half (46%) knew and understood animal health preventive measures (deworming and vaccination programs).

In response to questions designed to capture disease prioritization among the target (exposed) population, 77% of the respondents (95% CI, 73–81) knew that some diseases can be transmitted between animals and humans (zoonoses). Diseases identified as zoonoses by the respondents were rabies (26%), brucellosis (9%), leptospirosis (8%), toxoplasmosis (6%), parasite infestation (5%), scabies (4%), salmonellosis (2%), and fungi (2%). Only 5% (24 respondents) said they had suffered from zoonoses in their working life. Zoonoses reported by this group included scabies (21%); flea infestation (12%); skin fungi (8%); allergies (8%); brucellosis (8%); and leptospirosis, salmonellosis, toxoplasmosis, and toxocariosis (4% each).

The following variables were analyzed: locality; sex; age; place of origin; marital status; children ("yes" or "no"); pet at home ("yes" or "no"); type of work; instruction or education level; use of medical services; reason for last visit to doctor; perceived health status; perceived zoonoses risk at work; type of risk perceived; use of PPE; specific training on use of PPE; and type(s) of PPE used. A logistic regression model was applied to test association with the variable "knowledge of zoonoses." A conditional iterative backward process was carried out, and only two statistically significant variables were found: type of work (B = 1.820; SE = 0.389; Wald = 21.920; df = 1; P-value = 0.000; and Exp(B) = 6.173), and learning how to use PPE to prevent diseases (B = 1.086; SE = 0.370; Wald = 8.637; df = 1; P-value = 0.003; and Exp(B) = 2.964) (Annex 2). A goodness-of-fit test (Hosmer and Lemeshow) was applied, and the significance of the model increased to 0.438 (step = 1; χ^2 = 6.911; df = 7; and P = 0.438), indicating the model has a moderate predictive ability.

The accuracy ratio (AR) was calculated as 49%, indicating there are additional variables that were not taken into account to explain the dependant variable. The results showed that the target population least knowledgeable about zoonoses included people without professional instruction and those who had not received training in the use of PPE at work.

Once the significant variables were found using the CATPCA method, a risk indicator was built using values between 0 and 100 for level of knowledge of zoonoses and their prevention. A box plot was created by crossing the risk indicator with the variables. The target population with the most limited knowledge and thus most likely to be exposed to the highest zoonoses risk included people who 1) worked in Usme, Bosa, or Ciudad Bolívar districts, 2) had no professional instruction, and 3) were 18 years old or younger (Figures 1–3).

TABLE 3. Use of medical services; training on use of personal protective equipment (PPE); and self-perceived health status and zoonoses risk at work among target population of zoonoses prioritization exercise, Bogotá, Colombia, September 2009–April 2010

Variable	%	95% CI[a]
Recent[b] use of medical services		
General checkup or preventative visit	48	43–52
Treatment	36	32–40
Emergency	8	6–10
Other	8	6–11
Health status		
Good	69	64–72
Ideal	28	24–32
Weak	3	1–5
Training on use of PPE		
Yes	86	83–89
No	13	10–15
Did not answer	1	1–2.1
Zoonoses risk at work		
None	36	1–40
Low	33	29–37
Moderate	1	2–1.9
High	27	23–31
Very high	3	1–4

[a] CI: confidence interval.
[b] Within past year.

DISCUSSION

To the best of the authors' knowledge, this study was the first to examine disease prioritization, with a focus on zoonoses surveillance, prevention, and

FIGURE 1. Box plot showing zoonoses risk (%) among the target (exposed) population, by district, Bogotá, Colombia, September 2009–April 2010

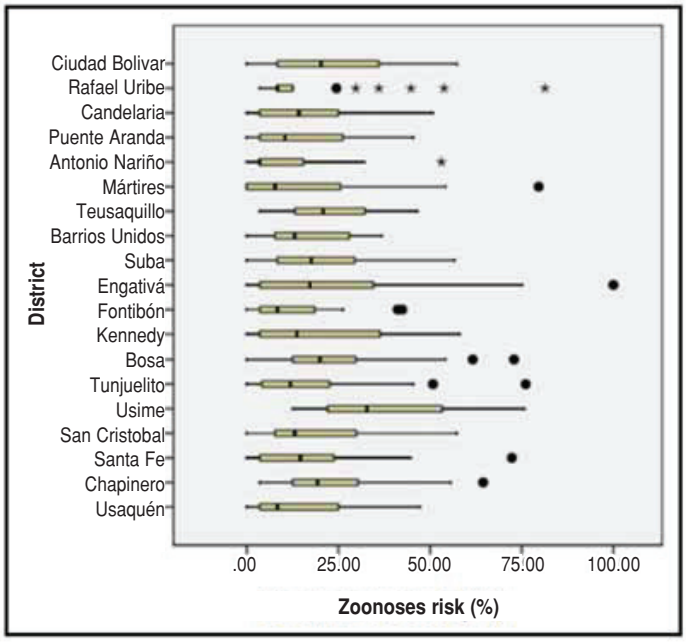
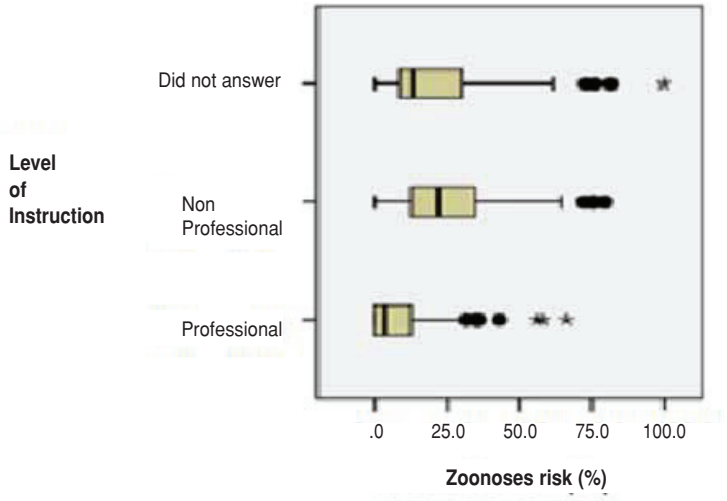


FIGURE 2. Box plot showing zoonoses risk (%) among the target (exposed) population, by level of instruction or qualification, Bogotá, Colombia, September 2009–April 2010



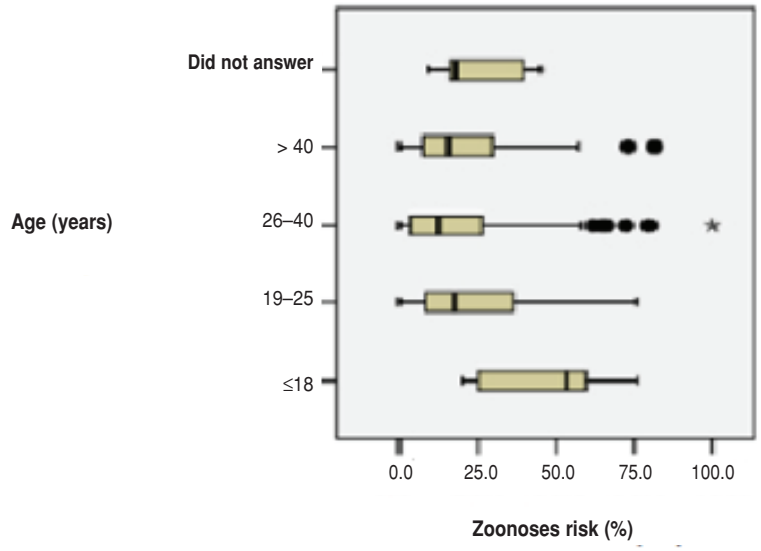
control, in Colombia. Considering the lack of a structured epidemiological surveillance system for zoonotic diseases (5–7), and the limited resources available for the veterinary public health sector, the most important contributions of this study are 1) the integration of two complementary methodologies for setting priorities on zoonoses surveillance, prevention, and control that can be applied in other geographic and socioeconomic contexts, and 2) the scientific data that were generated, which can be used as baseline information for policymaking in zoonoses prevention and control.

Prioritization is a multidimensional and complex problem. Therefore, a standardized tool for prioritizing diseases is not likely to please every stakeholder (30). The results of the current study show that health researchers tend to rank diseases differently than the at-risk population in terms of importance. For example, participants in the KAP exercise reported parasitic zoonoses as the biggest problem, with 21% of respondents reporting cases of scabies; 12% reporting flea infestations; and 4% reporting toxocariosis. This was in sharp contrast to the disease rankings from the panel of experts, who scored parasitic zoonoses as "low priority." This disparity may be attributed to workers' tendency to view the zoonotic diseases that are likely to be acquired during their work activities (e.g., brucellosis and leptospirosis, for butcher shops and food markets) or those they had personally suffered from (e.g., scabies, flea infestations, and skin fungal diseases, for veterinarians) as most important. In this sense, the qualitative answers given by workers about their reasons for behaving as they do in risky situations showed that risk perception is influenced more by habits and previous experiences than by sound knowledge of transmission mechanisms. In his studies on risk perception, Slovic (31) found that "riskiness" means more than "expected number of fatalities" to lay people, who have a broader conception of risk than experts. While they may lack certain information about hazards, lay people's conceptualization of risk is much richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments.

Historically, leptospirosis, brucellosis, rabies, and Venezuelan equine encephalitis are the zoonoses that were usually reported in Colombia and considered high-priority diseases. Most of the abovementioned diseases have been reported in other countries with climatic and epidemiological conditions similar to Colombia in comparable studies on priority diseases (e.g., in India, rabies, leptospirosis, brucellosis, and anthrax were identified as priority diseases (32)). The current results were similar to those reported by Havelaar et al. (20) in the Netherlands, where influenza A(H1N1) was perceived as the most important disease.

Rabies was the most common zoonotic disease cited by participants in the KAP exercise (reported by 26% of respondents), followed by brucellosis (9%) and leptospirosis (8%). It is not surprising that rabies was identified by the at-risk population as the "top zoonosis" as rabies has been the focus of an awareness campaign carried out over the last 50 years by national health authorities, who allocated permanent funds for its preven-

FIGURE 3. Box plot showing zoonoses risk (%) among the target (exposed) population, by age, Bogotá, Colombia, September 2009–April 2010



tion and control (vaccination campaigns, active surveillance on animals and humans, and community education) (9). Some of the rankings of the diseases by the experts might have been influenced by their familiarity with specific diseases due to the attention they received from the international scientific community at the time. For example, public attention toward influenza A at the time of this study was quite high worldwide, likely due to the flu pandemic alert.

Food-borne diseases (FBD) (e.g., salmonellosis, colibacillosis, listeriosis, toxoplamosis, campylobacteriosis, and in some cases, brucellosis and tuberculosis) are significant in the epidemiological profile of Bogotá, as shown in their ranking in the high- and medium-priority groups. These results are analogous to those from other countries where zoonotic agents were prioritized, indicating that FBD represent a challenge for public health systems worldwide, in both low- and high-income countries (20, 32, 33).

The fact that viral vector-borne zoonoses such as West Nile disease, tick-borne spotted fever, and hantavirus infection were ranked by the experts as "high-priority" (Table 2) may be due to the high potential for emergence of vector-borne pathogens in peri-urban and urban settings in Colombia, as in other Caribbean countries, as reported by Berrocal et al. (34) in their study on the ecology and epidemiology of West Nile virus.

Despite the sampling limitations in the KAP segment of the study, the results of the logistic regression were found to be consistent and plausible. The authors suspect that 1) the "age" variable might have been associated with "less knowledge" simply because younger workers were less experienced than older ones, and 2) the limited knowledge of zoonoses among respondents from Usme, Bosa, and Ciudad Bolívar districts might have been due to the fact that those districts are inhabited by people with low socioeconomic status, most of whom have not had an adequate level of professional instruction. Workers from those three districts usually are employed under illegal conditions in butcher shops and food markets and in the meat processing industry, making sanitary control by health authorities difficult.

The "pet at home" variable was not found to be statistically significant, but most respondents (64%) said they did not have pets at home, which could explain some of the incorrect answers to the survey questions, as workers who do not have pets at home would seem less likely to know about zoonoses prevention measures.

To improve the questionnaire, the following variables could be added in future research: economic conditions, employment status, number of years of experience in current job, and previous jobs in the field (29).

The authors recommend that local public health authorities focus on the zoonotic diseases rated as "high priority" but note that special attention should also be given to the diseases ranked as "low priority" (ancylostomiasis, scabies, ringworm, and trichinellosis). These three diseases must be considered for most-at-risk populations in any syndromic surveillance system. The authors also recommend that an education campaign be developed with a focus on the following topics: 1) the use and importance of PPE at work; 2) safety techniques such as cleaning, disinfection, pasteurization, and food preservation; 3) personal hygiene behaviors at work and at home; 4) zoonoses that may be contracted in the workplace; 5) potentially risky foods; and 6) the importance of animal vaccination and deworming.

The lessons learned from this study could be applied in other countries with similar epidemiologic patterns and climatic, geographic, and socioeconomic contexts, such as other countries in the region. As mentioned by Arámbulo and Thakur (35), more than 45% of South America consists of tropical and subtropical regions, which provide more hospitable conditions for disease transmission and emergence. The dynamic force of ecology, demography, economic development, and socio-cultural practices contributes to the unique and peculiar conditions in the region that are conducive to a number of health problems, including zoonotic diseases (35).

Acknowledgments. The authors gratefully acknowledge the support provided by Gérard Krause and the Working Group on Prioritisation at the Robert Koch Institute (RKI) (Berlin), for their valuable contributions to the study design, development, and discussions; the Bogotá District Department of Health (*Secretaría Distrital de Salud)*, and the 19 veterinarians who collaborated in the fieldwork; the 12 experts who volunteered to participate in the prioritization exercise; and the 535 workers from Bogotá's 19 districts who participated in the survey; Laura Tomassone and Valeria Conte from the Faculty of Veterinary Medicine at the University of Turin (Italy), for their great support and valuable contributions during the design phase and the development of the pilot study in Piemonte, Italy; Marcela

Olmedo, socio-anthropologist (Aosta, Italy), and Cristiana Maurella, from the Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta (Turin, Italy), for their useful comments and contribution during the early design of the study; José Pinzon, independent statistician consultant, for his support and guidance in statistic data analysis; Christina Kappaz, for proofreading the manuscript; and The SAPUVETNET III (Veterinary Public Health network) project (EU ALFA n.DCI-ALA/19.09.01/08/19189/169-157/ALFA III-75).

Conflict of interest. None. The authors did not receive any funding for the development of this study.

REFERENCES

1. WHO Study Group on Future Trends in Veterinary Public Health. Future trends in veterinary public health. Report of a WHO study group. WHO Technical Report Series 907. Teramo, Italy: World Health Organization; 2002. Available from: http://whqlibdoc.who.int/trs/WHO_TRS_907.pdf Accessed 8 November 2009.
2. World Health Organization. The control of neglected zoonotic diseases: a route to poverty alleviation. Report of a Joint WHO/DFID-AHP Meeting with the participation of FAO and OIE, Geneva, 20 and 21 September 2005. Geneva: WHO; 2006. Available from: http://www.who.int/zoonoses/Report_Sept06.pdf Accessed 8 November 2009.
3. Zinsstag J, Schelling E, Wyss K, Mahamat MB. Potential of cooperation between human and animal health to strengthen health systems. Lancet. 2005;366(9503):2142–5.
4. Organization Panamericana de la Salud. 14ª Reunión Interamericana a Nivel Ministerial en Salud y Agricultura (RIMSA 14): Agricultura y Salud: sinergia para el desarrollo local, Ciudad de México, D.F., México, 21–22 de abril de 2005. Informe final y documentos seleccionados. Washington: OPS; 2006. Available from: http://www.paho.org/spanish/ad/dpc/vp/rimsa-14.pdf Accessed 8 November 2009.
5. Estepa J. Hacia la construcción de una política integral de salud ambiental. Lineamiento de política línea eventos transmisibles de origen zoonótico. Bogotá: Secretaria Distrital de Salud; 2010. Available from: http://www.saludcapital.gov.co/Publicaciones/Salud%20ambiental/lineamiento%20de%20politica%20zoonosis.pdf Accessed 25 August 2011.
6. Instituto Nacional de Salud (CO). Líneas de acción: vigilancia y análisis del riesgo en salud pública—sivigila: vigilancia rutinaria (2006–2010) [Internet]. Bogotá: INS; c2013. Available from: http://www.ins.gov.co/lineas-de-accion/Subdireccion-Vigilancia/sivigila/Paginas/vigilancia-rutinaria.aspx Accessed 13 November 2011.
7. Vega R. Lineamientos y políticas respecto a las zoonosis: caso Colombiano [PowerPoint presentation]. Memorias de Jornada Nacional de Zoonosis y Enfermedades Emergentes y Re-emergentes. Zoonosis problema común, soluciones interdisciplinarias. Agosto 21 y 22 de 2008, Bogotá: Consejo Profesional de Medicina. Veterinaria y de Zootecnia de Colombia; 2008. Available from: http://www.redsaludpublicaveterinaria.org/images/memorias/3.pdf Accessed 4 April 2010.
8. Rentería L. Zoonosis y enfermedades emergentes y reemergentes, panorama mundial y nacional. Memorias de Jornada Nacional de Zoonosis y Enfermedades Emergentes y Re-emergentes. Zoonosis problema común, soluciones interdisciplinarias. Agosto 21 y 22 de 2008, Bogotá: Consejo Profesional de Medicina. Veterinaria y de Zootecnia de Colombia; 2008. Available from: http://www.redsaludpublicaveterinaria.org/images/memorias/2.pdf Accessed 4 April 2010.
9. Cediel N, de la Hoz F, Villamil LC, Romero J, Díaz A. Epidemiología de la rabia canina en Colombia. Rev Salud Publica (Bogotá). 2010;12(3):368–79.
10. World Health Organization. Setting priorities in communicable disease surveillance. Geneva: WHO; 2006. Available from: http://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_3.pdf Accessed 27 October 2009.
11. Viergever R; World Health Organization. Health research prioritization at WHO: an overview of methodology and high level analysis of WHO led health research priority setting exercises. Geneva: WHO Department of Research Policy and Cooperation; 2010.
12. Krause G; Working Group on Prioritisation at the Robert Koch Institute. Prioritisation of infectious diseases in public health—call for comments. Euro Surveill. 2008;13(40). pii: 18996. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18996 Accessed 27 October 2009.
13. Horby P, Rushdy A, Graham C, O'Mahony M; PHLS Overview of Communicable Diseases Committee. PHLS overview of communicable diseases 1999. Commun Dis Public Health. 2001;4(1):8–17.
14. Rushdy A, O'Mahony M. PHLS overview of communicable diseases 1997: results of a priority setting exercise. Commun Dis Rep CDR Suppl. 1998;8(5):S1–12.
15. Ghaffar A. Setting research priorities by applying the combined approach matrix. Indian J Med Res. 2009;129(4):368–75.
16. Ministerio de la Protección Social (CO). Decreto número 3039 de 2007, Plan Nacional de Salud. Bogotá: MPS; 2007.
17. Agudelo CA, de la Hoz F, Mojica MJ, Eslava JC, Robledo R, Cifuentes P, et al. Prioridades de investigación en salud en Colombia: perspectiva de los investigadores. Rev Salud Publica (Bogotá). 2009;11(2):301–9.
18. Departamento de Ciência e Tecnologia, Secretaria de Ciência, Tecnologia e Insumos Estratégicos, Ministério da Saúde (BR). Saúde define prioridades de pesquisa. Rev Saude Publica. 2008;42(5):974–7.
19. Knight-Jones TJ, Mylrea GE, Kahn S. Animal production food safety: priority pathogens for standard setting by the World Organisation for Animal Health. Rev Sci Tech. 2010;29(3):523–35.
20. Havelaar AH, van Rosse F, Bucura C, Toetenel MA, Haagsma JA, Kurowicka D, et al. Prioritizing emerging zoonoses in the Netherlands. PLoS One. 2010;5(11):e13965. doi: 10.1371/journal.pone.0013965.
21. Ministerio de Salud (CO). Decreto 2257 de 1986 Nivel Nacional. Bogotá: MS; 1986. Available from: http://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=14533 Accessed 27 October 2009.
22. Balabanova Y, Gilsdorf A, Buda S, Burger R, Eckmanns T, Gärtner B, et al. Communicable diseases prioritized for surveillance and epidemiological research: results of a standardized prioritization procedure in Germany, 2011. PLoS One. 2011;6(10):e25691. doi: 10.1371/journal.pone.0025691. Epub 2011 Oct 4.
23. World Health Organization. Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys. Geneva: WHO; 2008. (WHO/HTM/STB/2008.46). Available from: http://www.stoptb.org/assets/documents/resources/publications/acsm/ACSM_KAP%20GUIDE.pdf Accessed 29 May 2008.
24. Launiala A. How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. Anthropol Matters. 2009;11(1):1–13.
25. Cediel N, Conte V, Tomassone L, Tiberti D, Guiso P, Romero J, et al. Risk perception about zoonoses in immigrants and Italian workers in Northwestern Italy. Rev Saude Publica. 2012;46(5):850–7.
26. Marvin DM, Dewey CE, Rajić A, Poljak Z, Young B. Knowledge of zoonoses among those affiliated with the Ontario swine industry: a questionnaire administered to selected producers, allied personnel, and veterinarians. Foodborne Pathog Dis. 2010;7(2):159–66. doi: 10.1089/fpd.2009.0352.
27. Umar AS, Nura A. Training needs and risk assessment among farmers and animal han-

dlers on zoonoses in Sokoto metropolis. Niger Postgrad Med J. 2008;15(3):168–74.
28. Draper NR, Smith H. Applied regression analysis. New York: John Wiley & Sons; 1998.
29. Hosmer D, Lemeshow S. Applied logistic regression. New York: Wiley Interscience; 1989.
30. Sibbald SL, Singer PA, Upshur R, Martin DK. Priority setting: what constitutes success? A conceptual framework for successful priority setting. BMC Health Serv Res. 2009;9:43. doi: 10.1186/1472-6963-9-43.
31. Slovic P. Perception of risk. Science. 1987;236 (4799):280–5.
32. Sekar N, Shah NK, Abbas SS, Kakkar M; Roadmap to Combat Zoonoses in India Initiative. Research options for controlling zoonotic disease in India, 2010–2015. PLoS One. 2011;6(2):e17120. doi: 10.1371/journal.pone.0017120.
33. Cardoen S, Van Huffel X, Berkvens D, Quoilin S, Ducoffre G, Saegerman C, et al. Evidence-based semiquantitative methodology for prioritization of foodborne zoonoses. Foodborne Pathog Dis. 2009;6(9):1083–96. doi: 10.1089/fpd.2009.0291.
34. Berrocal L, Peña J, González M, Mattar S. Virus del oeste del Nilo: ecología y epidemiología de un patógeno emergente en Colombia. Rev Salud Publica (Bogotá). 2006;8(2):218–28.
35. Arámbulo PV 3rd, Thakur AS. Impact of zoonoses in tropical America. Ann N Y Acad Sci.1992;653(1):6–18.

Manuscript received on 4 June 2012. Revised version accepted for publication on 21 December 2012.

ANNEX 1. Demographic and personal characteristics of knowledge, attitudes, and practices (KAP) study respondents for zoonoses prioritization exercise, Bogotá, Colombia, September 2009–April 2010

Characteristic	%	95% CI[a]
Sex		
Female	37	33–41
Male	63	59–67
Place of origin		
Outside Bogotá	56	52–62
Bogotá	44	39–48
Age (years)		
< 25	13	10–16
25–45	66	62–70
≥ 46	20	16–23
Did not answer	1	0.2–2.3
Pet at home		
Yes	36[b]	31–40
No	64	59–68
Type of work		
Food processing chain[c]	51	46–55
Veterinary clinic/pet shop	39	34–43
Traditional food market	8	6–11
Other	2[d]	0.7–3
Level of instruction or education		
Professional	26	22–29
Nonprofessional	47	42–51
Did not answer	27	24–31

[a] CI: confidence interval.
[b] 19% dogs only; 5% dogs and cats; 4% cats only; 2% did not answer; 2% birds; 1% dogs and birds, 1% fish; 1% dogs, cats and birds; and 1% rodent and dog.
[c] Butcher (meat, chicken, or fish) or egg and cheese processing plant.
[d] Disease surveillance.

ANNEX 2. Results of logistic regression model for zoonoses prioritization exercise, Bogotá, Colombia, September 2009–April 2010

	B	SE	Wald	df	*P*-value	Exp(*B*)
Type of work = professional	1.820	0.389	21.920	1	0.000	6.173
PPE courses = yes	1.086	0.370	8.637	1	0.003	2.964
Constant	–0.050	0.376	0.018	1	0.894	0.951

SE: standard error; Wald: wald chi square test; df: degrees of freedom; PPE: personal protective equipment.

Establecimiento de prioridades en la vigilancia, la prevención y el control de las zoonosis en Bogotá, Colombia

RESUMEN

Objetivo. Establecer prioridades en la vigilancia, la prevención y el control de las zoonosis en Bogotá, Colombia.

Métodos. Se constituyó un grupo Delfos de expertos en veterinaria y medicina que utilizó un método validado de asignación de prioridades con objeto de evaluar la importancia de 32 zoonosis seleccionadas. Esta actividad se complementó con una encuesta de cuestionario que utilizó el método de conocimientos, actitudes y prácticas (CAP) y que se administró en 19 distritos de Bogotá, de septiembre del 2009 a abril del 2010, a una población en situación de riesgo (empleados de consultorios veterinarios, tiendas de mascotas, carnicerías y mercados de alimentos tradicionales que venden aves de corral, carne, queso y huevos). Se creó un indicador de riesgo basado en el nivel de conocimiento acerca de las zoonosis mediante análisis de componentes principales para datos categóricos y análisis de regresión logística.

Resultados. En el grupo Delfos participaron doce expertos. Las enfermedades calificadas como de mayor prioridad fueron la gripe A(H1N1), la salmonelosis, la infección por *Escherichia coli*, la leptospirosis y la rabia. Las enfermedades calificadas como de menor prioridad fueron la anquilostomiasis, la escabiosis, la tiña y la triquinosis. Se recopilaron y se analizaron un total de 535 cuestionarios. Los encuestados informaron de que habían padecido escabiosis (21%), infecciones por hongos (8%), brucelosis (8%) y pulicosis (8%). Los trabajadores cuyos conocimientos sobre zoonosis eran más limitados y por consiguiente estaban sometidos a un mayor riesgo para su salud fueron los que 1) no tenían una formación profesional, 2) contaban con poca o nula capacitación en materia de prevención de zoonosis, y 3) trabajaban en las localidades de Usme, Bosa o Ciudad Bolívar.

Conclusiones. Según los expertos, la gripe A(H1N1) fue la zoonosis más importante. La rabia, la leptospirosis, la brucelosis y la toxoplasmosis fueron consideradas como enfermedades prioritarias tanto por los expertos como por los trabajadores expuestos. Esta es la primera actividad de asignación de prioridades centrada en la vigilancia, la prevención y el control de las zoonosis en Colombia. Estos resultados podrían servir de guía en la toma de decisiones para la asignación de recursos en salud pública.

Palabras clave Zoonosis; prioridades en salud; conocimientos, actitudes y prácticas en salud; Colombia; América del Sur.