

PRELIMINARY REPORT¹

A SURVEY OF ZONOSSES PROGRAMMES IN THE AMERICAS

INTRODUCTION

In recent years, global public health security has been threatened by zoonotic disease emergence as exemplified by outbreaks of H5N1 and H1N1 influenza, SARS, and most recently Ebola and Zika. In a 2001 risk assessment, it was estimated that 75% of the emerging pathogens were zoonotic (Taylor et al 2001). Other studies report that 60 to 70% of emerging infectious diseases (EIDs) events in humans are of animal origin (Jones et al., 2008; Wang et al., 2014). The rising number of emerging zoonoses may be driven by “modernization of farming practices, particularly in the developing world, habitat destruction, human encroachment and climate change” (Wang et al 2014) to support a growing population (Cutler et al., 2010). This phenomenon holds true in the Latin American and Caribbean (LAC) countries where 70% of the public health emergencies in the Americas reported to the WHO from 2007 to 2008 were classified as zoonoses or communicable diseases common to humans and animals (Schneider et al., 2011).

While emerging zoonoses are often a greater concern to donors and decision-makers, endemic zoonoses have a greater societal impact on neglected populations than emerging diseases (Grace et al 2012). Many endemic zoonoses are part of the group of neglected tropical diseases (NTDs) that “affect mainly poor and marginalized populations in low-resource settings” (WHO, 2016), with their presence reflecting clear inequalities in health (PAHO, 2016). Due to the still significant number of individuals living in extreme poverty in LAC countries (11.5% according to recent World Bank figures (World Bank, 2015) a focus on endemic zoonoses is required. The burden of NTDs likely exceeds that from malaria, tuberculosis, and possibly HIV in LAC countries (Hotez et al 2008).

Despite the importance of emerging and endemic diseases in LAC countries, there are no national or regional disease burden estimates in the Americas for many zoonoses (Hotez, 2008). To inform the baseline of priority zoonoses and zoonoses-specific capacities and vulnerabilities in LAC countries, the Zoonoses Unit at the Pan-American Center for Foot-and-Mouth Disease (PANAFTOSA from its acronym in Spanish), a center of the Pan American Health Organization (PAHO), conducted a survey to the Ministries of Health and Agriculture in the region. The study complements the information regularly captured by PAHO on the International Health Regulations (IHR) core capacities of the countries. To the best of our knowledge, this is the first time that a region-wide survey on emerging and endemic zoonoses related indicators has been conducted in LACs.

¹ Pan-American Foot-and-Mouth Disease Center (PANAFTOSA) of the Pan American Health Organization, Rio de Janeiro, Brazil; 30 June 2016.

MATERIALS AND METHODS

The zoonosis programme managers of the ministries of health (MOH) and agriculture (MAg) from 33 LAC countries (in South and Central America, Mexico, and the Caribbean) were invited to participate in a survey. The survey collected data on respondent demographics, zoonoses programme resources, priority endemic and emerging zoonotic diseases, prioritization methodologies and criteria, disease specific capacities, current collaborations in zoonotic diseases and suggestions for future technical collaboration. The survey opened in January 2015 and remained open for approximately 5 weeks. Technical support sessions were held during the survey period to assist the completion of the questionnaire. After the official closure of the survey on February 11th, all non-respondents were followed up by email or telephone. The last questionnaire was received April 1, 2015. Exploratory data analyses were performed to show response frequencies aggregated at the regional level and compared by ministry (MOH vs. MAg) and by sub-regions (defined as South America, Central America and Mexico, and the Caribbean). Countries' population, gross domestic product (GDP) and income, as per the World Bank classification (World Bank, 2015) were used to inform countries comparisons.

RESULTS

Resources

Fifty-four ministries (26 MOH, 25 MAg, and 3 combined responses) in 31 (93.9%) of the 33 target LAC countries responded to the survey. Responses from national zoonoses groups with personnel from both ministries were labelled as 'combined' for the purposes of this analysis. Twenty-two (85%) MOH, 5 (20%) MAg, and 2 (67%) combined entities indicated they had specialized zoonoses units. The median number of full-time senior management staff working on the national zoonoses programmes was 1 (range 0-12), 4 for technical staff (range 0-150), and 1.5 for administrative/supporting staff (range 0-57).

Priorities

Thirty-eight Ministries (70%), 20 (77%) MOHs, 16 (64%) MAg, and 2 (66%) combined entities, replied that they perform prioritization exercises for endemic diseases or gave a time frame for prioritization. When asked how often they prioritize, 22 (58%) prioritize annually, 2 (5%) every 2-3 years, and 5 (13%) every 5-10 years. The remaining 4 (11%) ministries responded that they prioritize *after an outbreak* or at *undefined time to next prioritization*. Five ministries responded that they prioritize but did not specify a time frame for prioritization.

Ministries were asked to list the three priority endemic zoonoses. The disease category "rabies" (including rabies (n=24), bovine rabies (n=5) and canine rabies (n=1)), was reported by 30 ministries (55%), followed by leptospirosis (including leptospirosis (24) and *Leptospira icterohemorrhagiae* (1)) (25, 46%), brucellosis (including brucellosis (14), bovine brucellosis (4), and caprine brucellosis (1)) (19, 35%), tuberculosis (including tuberculosis (7), and bovine tuberculosis (6)) (13, 24%), and *Salmonella* ((*Salmonella* (9), *Salmonella enterica* (1) and *Salmonella Enteritidis* (1)) (11, 20%). The most frequently reported priority endemic zoonoses by MOHs were leptospirosis (18, 69%), rabies (15, 58%), brucellosis (4, 15%), and salmonellosis (4, 15%). For MAg, the most frequently reported were brucellosis (15, 60%), rabies (13, 52%), and tuberculosis (10, 40%).

The number of criteria used by the ministries to prioritize endemic zoonoses ranged from 0-14, with 50 ministries (93%) reporting the use of at least one criterion. On average, ministries used 4.72 criteria per zoonosis. The criteria most frequently reported as used by the MOHs in their prioritization exercises were, in order of frequency, human disease incidence, human disease severity, human disease mortality, and human disease prevalence. For MAgS the criteria were economic impact, animal disease prevalence, human disease incidence, and animal disease incidence. Animal welfare, public opinion and DALYs were the criteria least frequently used by both ministries in their prioritizations. Respondents were asked to describe the methodologies used to aggregate the multiple impacts assessments across criteria. Most ministries reported using expert opinion (19, 59%), eight (25%) used multi-criteria decision techniques, five (16%) used *epidemiology values*, and three (9%) reported other approaches (*producer demands, an analysis of indicators, and meetings regarding control and prevention*).

For emerging zoonoses, 31 (57%) ministries, (16 (64%) MAgS, 14 (54%) MOHs, and 1 (33%) combined entity), completed formal prioritization exercises. Each ministry was asked to list the three emerging priority zoonoses. The most frequently reported emerging zoonoses were avian influenza (AI) (avian influenza (21), H5N1 (3), H7N9 (1), and highly pathogenic avian influenza (6)) (31 ministries, 57%), Ebola virus disease (EVD) (19, 35%), and Bovine Spongiform Encephalopathy (BSE) (15, 28%). The most frequently reported emerging zoonoses by MOHs were EVD (14, 54%), AI (11, 42%), and Chikungunya (8, 31%). For MAgS, the most frequently reported were AI (18, 72%), BSE (10, 40%), and West Nile virus (WNV) and rabies (7, 28% each). Of the 31 ministries that completed prioritization exercises for emerging zoonoses, 30 considered the probability of introduction of the emerging condition in their countries as a criterion in their prioritizations, and 29 the impact of such introduction. Impact on public health, society, the economy, and the environment were the most frequently reported by both ministries. Other impacts used by both ministries included the impact on tourism, animal health and agriculture, international relations, and food security. Ministries also considered criteria such as international sanitary regulations and the probability of rapid transmission in their prioritization of emerging zoonoses. Only 18 (33%) of ministries (6 MAg (24%), and 12 MOH (46%)) considered equity as a criterion in their prioritization and allocation of resources for the control of zoonoses, whether endemic or emerging.

Ministries were asked to select from a range (from very probable to very unlikely) the probability of introduction of their priority emerging zoonoses into their countries. Approximately 85% of the ministries reported moderate to very probable the introduction of Chikungunya; 71% moderate to probable the introduction of AI; 56% moderate to probable the introduction of WNV; 36% moderate to very probable the introduction of EVD; and 25% moderate to probable the introduction of BSE. Chikungunya and EVD were the only two conditions reported as of very probable introduction by 43% and 7% of respondents, respectively. While ministries were asked for the timeline regarding the probability of introduction, the majority did not know or chose not to answer this question.

Analysis of capabilities

Surveillance for emerging conditions and diagnostics for endemic conditions were reported as the capabilities most in need of improvement. In more detail, most ministries cited diagnosis and laboratory capabilities as the most important disease-specific capability requiring improvement for rabies, leptospirosis, and brucellosis (Figure 1). Surveillance for AI and EVD, and diagnosis for BSE and WNV were the most demanded capabilities for emerging zoonoses (Figure 2).

Focusing on the priority endemic zoonoses, 93% of respondents prioritizing rabies replied that they had a current formal agreement or Memorandum of Understanding (MoU) with other government ministries for the coordinated prediction, prevention, detection, and intervention of rabies, 67% for tuberculosis, 61% for Brucellosis, 46% for leptospirosis, and 18% for salmonellosis (Figure 3). Ninety percent of the ministries replied that they knew the sensitivity of their rabies surveillance systems, 80% of their salmonella systems, 74% in the case of brucellosis, 54% of tuberculosis, and 44% for leptospirosis (Figure 3). For the priority emerging zoonoses, capacities against AI appear best developed with 58% of respondents prioritizing AI claiming that they had a MoU in place, 68% completed a simulation exercise in the last five years, and 87% had up-to-date contingency plans (Figure 4). In general, MOHs showed greater capacity development than MAgS (Figure 5). Countries capacities scores, aggregated by sub-region show lower overall scores for Caribbean countries (Figure 6). Of a maximum score of 7, the mean capacity score was 4.25, 3.48 and 2.28 in Central-America and Mexico, South America and Caribbean sub-regions, respectively.

Thirty-seven ministries (69%) reported their relationship with the other ministries involved in the control of zoonoses in their countries as productive or very productive, and 17 (31%) as minimally productive with few attempts of coordination. No ministry reported the absence of any coordination with other ministries. Only 24 ministries (44%) have a formal written agreement with universities, 13 (24%) with non-governmental organization, 18 (33%) with the private sector, and 10 (19%) with other organizations including scientific groups, the central government, regional authorities, emergency committees, and the community. Ministries were asked to produce suggestions of activities to improve coordination and collaboration with the other ministries for the control of zoonoses. Fourteen ministries (26%) suggested the formalization of collaboration, such as through an MOU, regular meetings (10, 19%), data sharing (10, 19%), and joint planning (7, 13%). Additional suggestions included forming an interagency group, and joint capacity training. The majority of respondents (48, 89%) allocated very high or high value to a regular report on the occurrence of zoonoses in the Americas region with the information gathered in this report. When asked about the most critical development that the American region requires for the control of zoonoses, 21 (39%) of ministries requested a formal network, nineteen (35%) recommended better regional communication and collaboration, and nineteen (35%) responded with integrated surveillance. Other suggestions included integrated vector control, training of veterinarians and public health professionals, an integrated regional task force for emergencies, effective implementation of International Health Regulations, formal agreements between countries, strengthening current networks such as Caribvet, standardization of current zoonoses programmes, and a regular report on emerging and endemic zoonoses.

DISCUSSION

The present study reports the results of the first survey to Ministries of Health and Agriculture across the American region on priority zoonoses and capacities. The response rate to the survey, 31 countries out of 33, evenly distributed across MoH and MAg adds confidence in the validity of our results. This engagement by the region's Ministries is the most significant output of this study, and correlates with their responses towards building more integrated and regional-wide mechanisms and processes for the control of zoonoses.

At the time of writing (July 2016) the Region does not possess an overarching strategy to, among other objectives, realize the potential benefits of integrating shared resources across vertical zoonoses programmes. Such integration would lead to improved control and eradication programmes as well as conservation of

resources. Numerous activities, some of them captured by our survey, e.g. a regional report on zoonoses and the development of regional mechanisms to manage emerging zoonoses, would be better delivered through such an overarching strategy. The evidence captured here will be used to inform PAHO's regional zoonoses strategy, which will, as part of a One Health vision, constitute an important mechanism to support the organization's commitment towards the Sustainable Development Goals (UN, 2015). This is the theme of the forthcoming 17th Inter-Ministerial Meeting of Health and Agriculture Ministries (RIMSA in Spanish) to be held in Asuncion, Paraguay in July 2016 (PAHO, 2016).

The current survey provides evidence of the region's priority zoonoses, and contributes a baseline of basic zoonoses programme indicators on which to target technical cooperation initiatives. A number of improvements appeared evident: i) standardization of prioritization approaches, surveillance definitions and evaluation processes to support comparisons, ii) greater communication and coordination between countries, and iii) a platform to inform zoonoses occurrence in the region and the status of the region's capacities.

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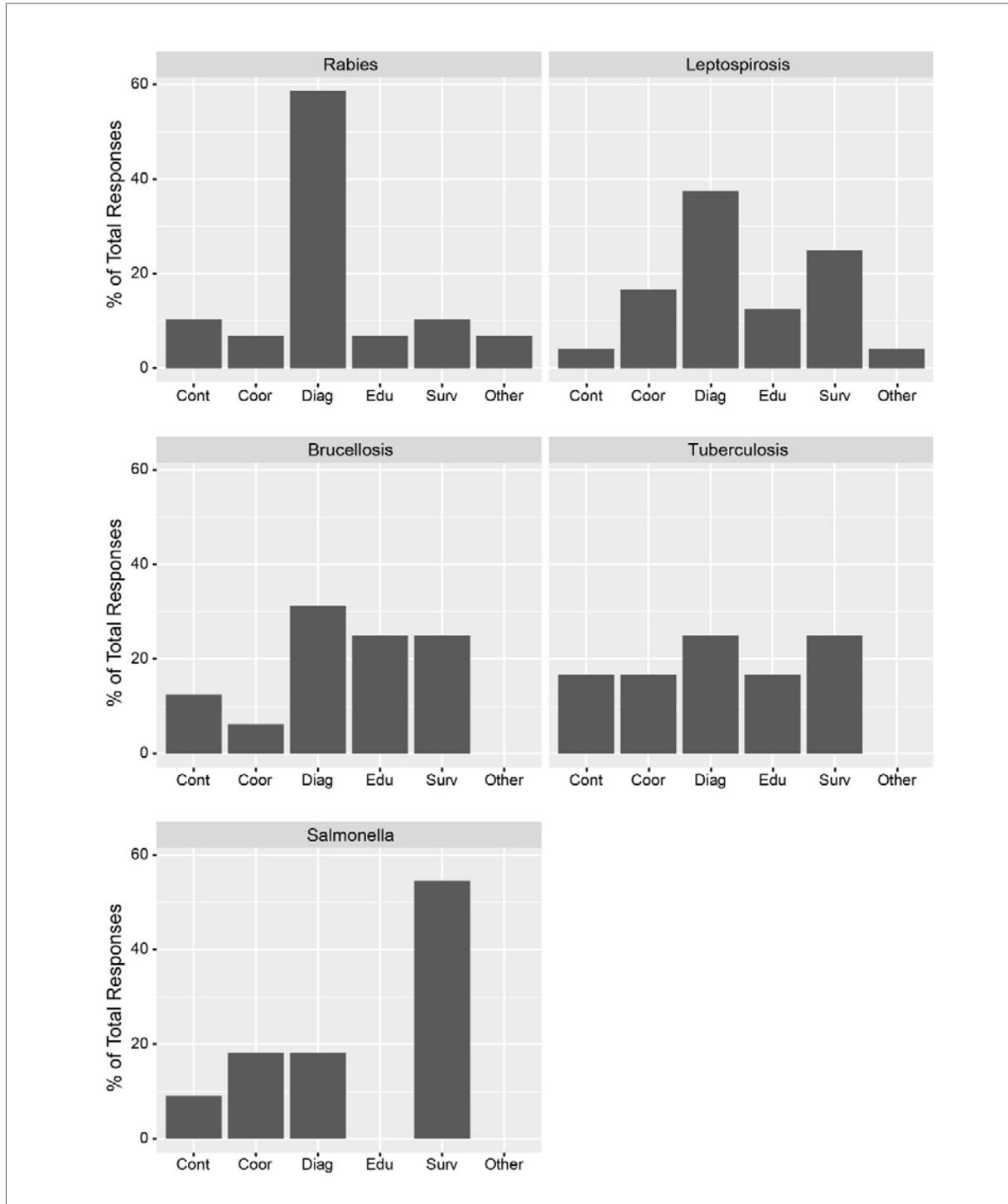


Figure 1: Top capacities that require improvement for each of the top five endemic priority zoonoses based on the opinions of the Ministries of Health and Agriculture and combined entities in Latin American and Caribbean countries (control, *cont*; coordination, *coor*; diagnosis, *diag*; education, *edu*; and surveillance, *surv*). Responses that fell outside these categories were categorized as *other*. Percentage represents total respondents received (n=54).

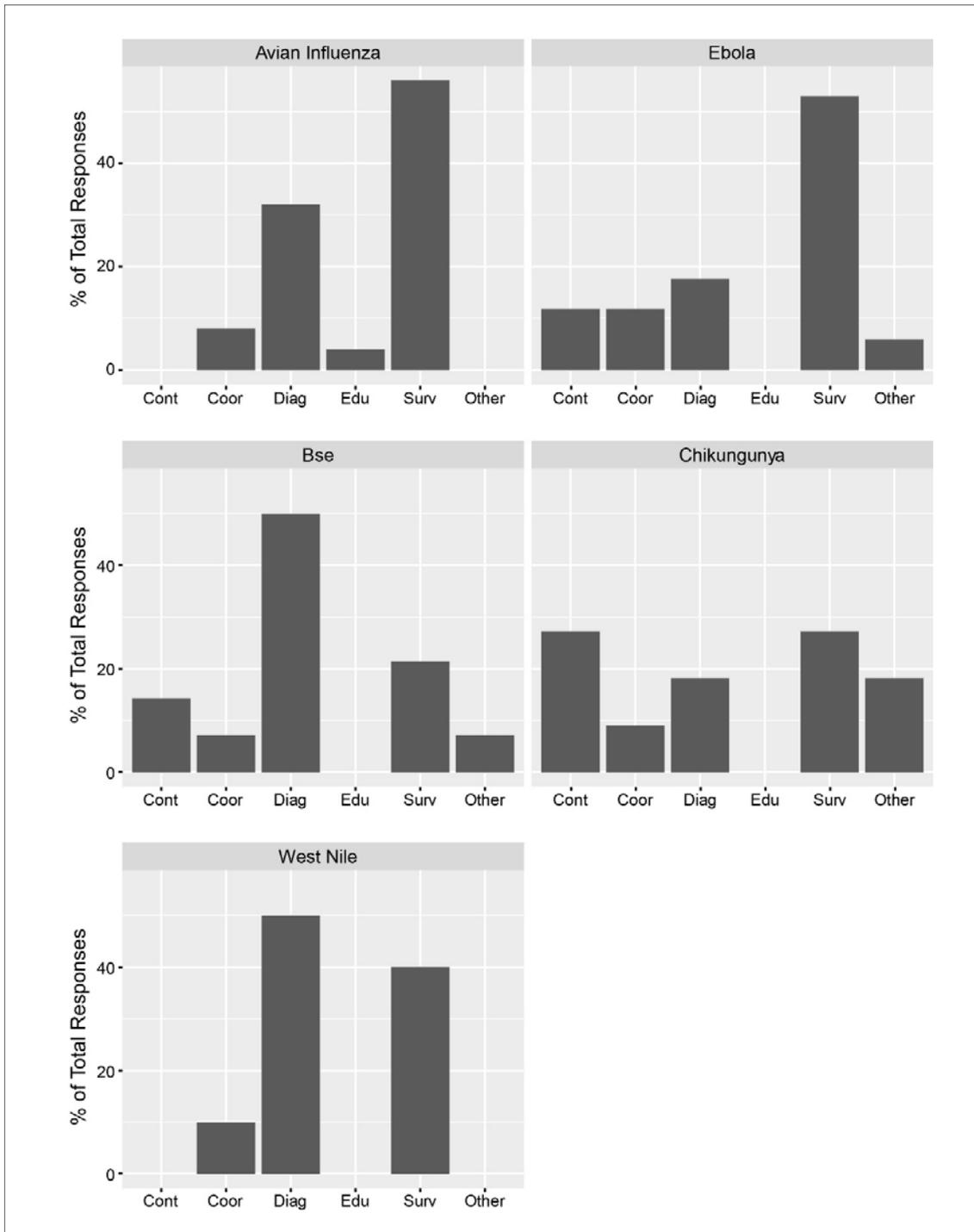


Figure 2. Top capacities that require improvement for each of the top five emerging priority zoonoses based on the opinions of the Ministries of Health and Agriculture and combined entities in Latin American and Caribbean countries (control, *cont*; coordination, *coor*; diagnosis, *diag*; education, *edu*; and surveillance, *surv*). Responses that fell outside these categories were categorized as *other*. Percentage represents total respondents received (n=54).

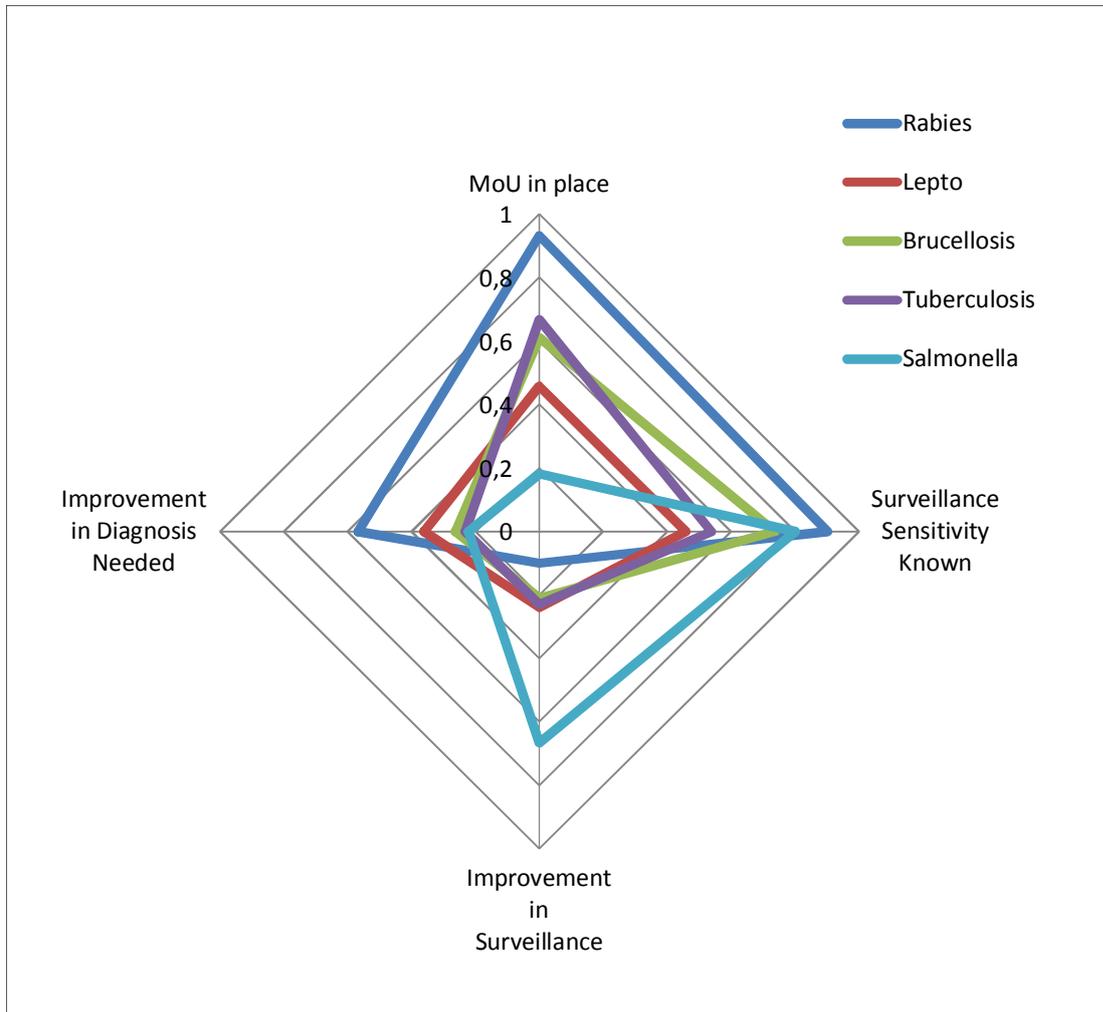


Figure 3. A radar chart comparison of the top five priority endemic zoonoses for Latin American and Caribbean countries in regards to formal collaborations, knowledge of surveillance sensitivity, diagnosis and surveillance needs.

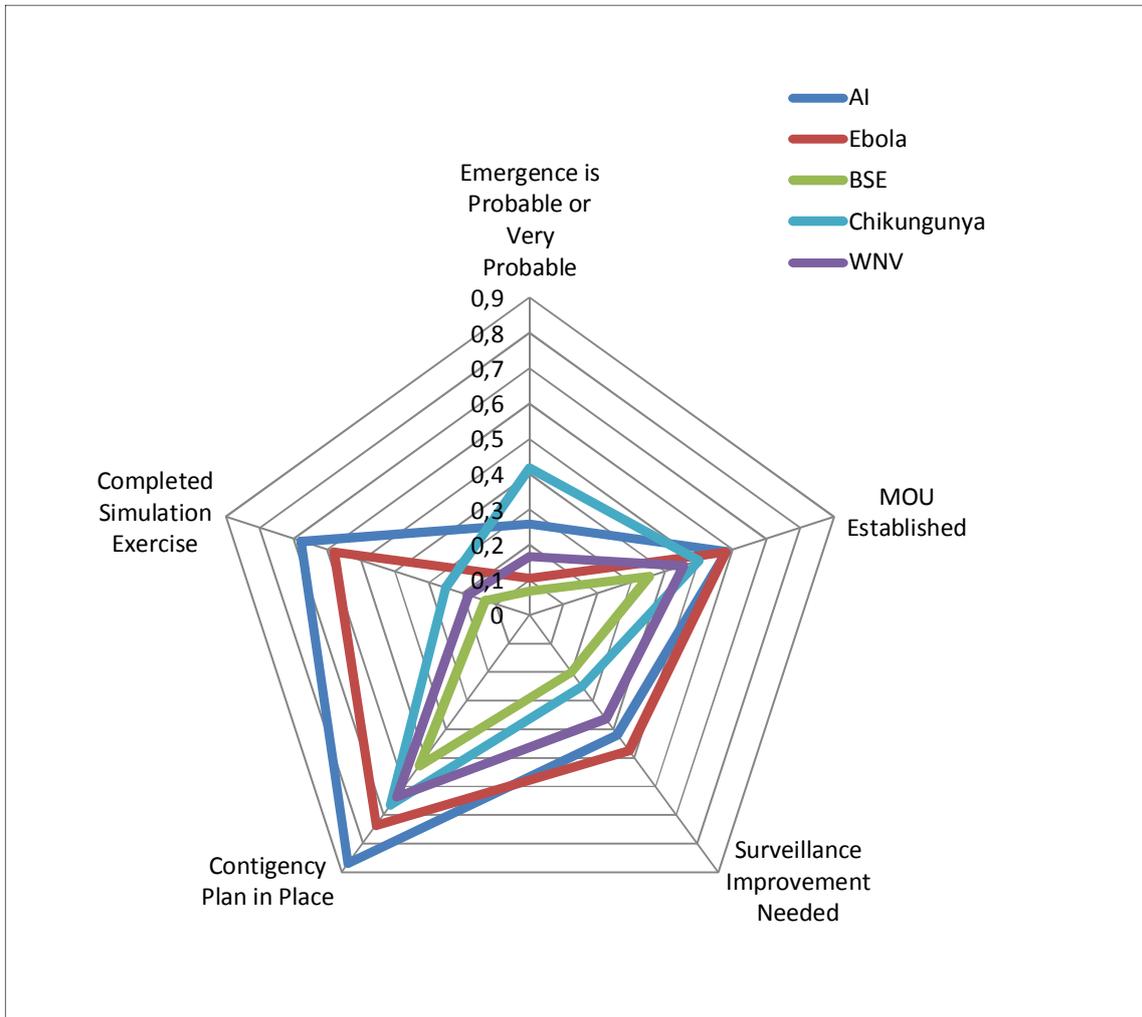


Figure 4. A radar chart comparison of the top five priority emerging zoonoses of Latin American and Caribbean countries in regards to the percentage completing simulation exercises, with a contingency plan, with a formal collaboration, the probability of introduction, and surveillance needs.

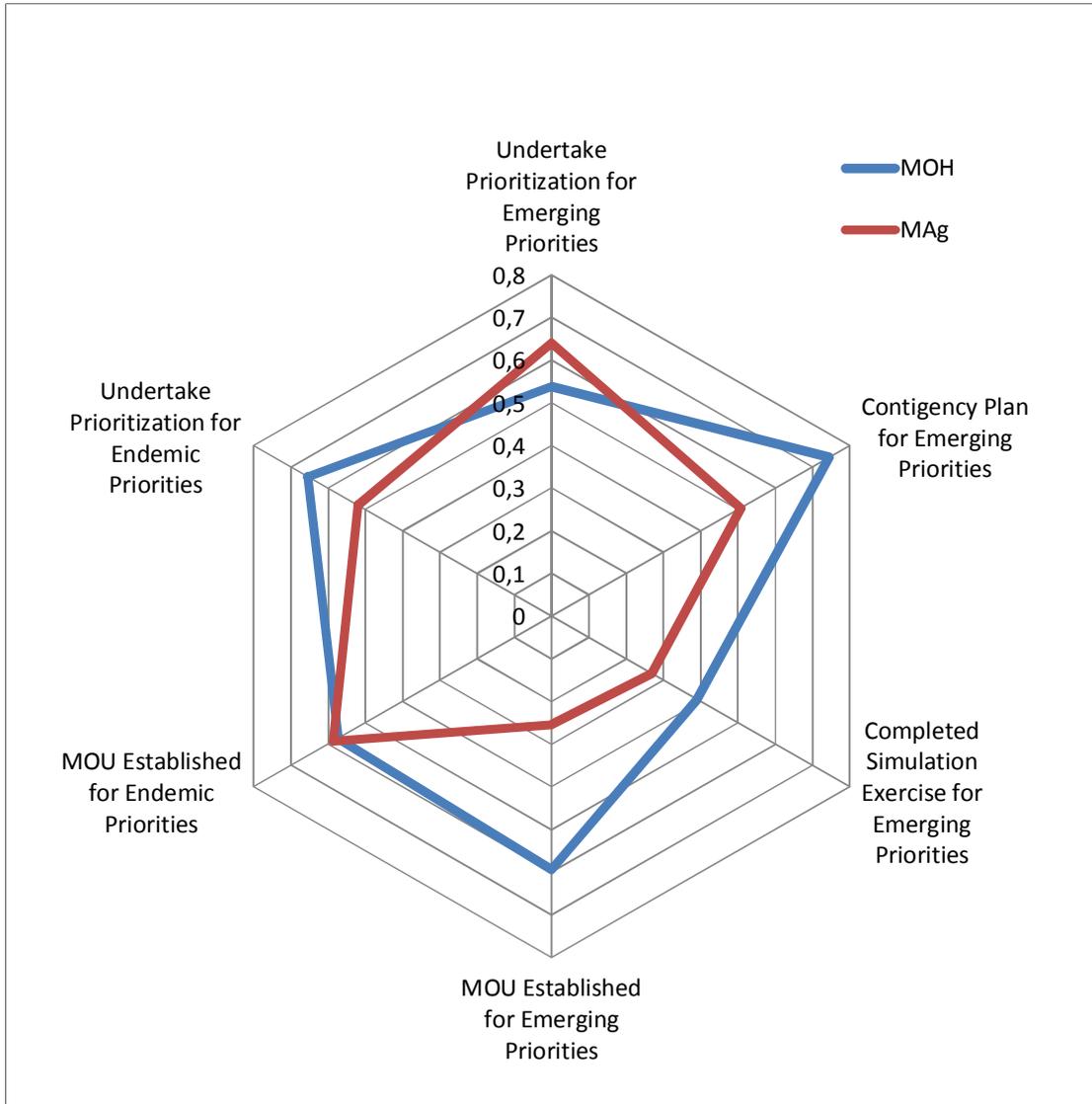


Figure 5. A radar chart comparison of prioritization, planning, and collaboration activities completed by the Ministries of Health and Agriculture in Latin American and Caribbean countries in regards to endemic and emerging zoonoses.

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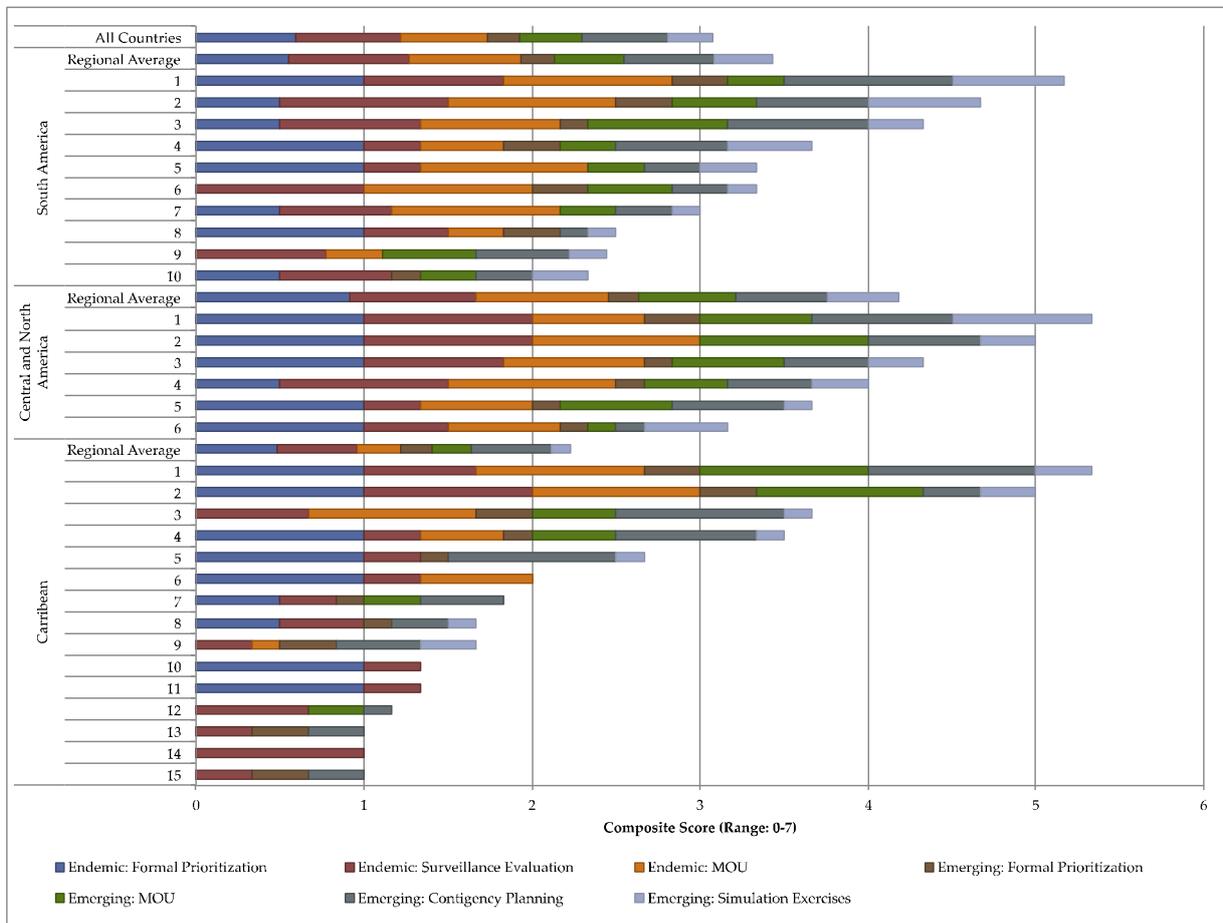


Figure 6. Development of capacities against emerging and endemic zoonoses per country. Seven capacities were assessed for each country. Countries are grouped by sub-region (South America, Central and North America, and the Caribbean). The first bar shows the average capacity development for all countries that responded to the survey (31). Regional averages are also shown for each region to allow comparisons between countries.