

Monitoring and Evaluation of CDC's One Health Zoonotic Disease Prioritization Process

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Abstract

Background: The U.S. Centers for Disease Control and Prevention (CDC) defines One Health as an approach that “is a collaborative, multisectoral, and transdisciplinary approach — working at the local, regional, national, and global levels — with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment” [1]. CDC has been conducted One Health Zoonotic Prioritization workshops in 26 countries thus far to assist multisector leaders with determining where to focus efforts to improve their country’s One Health approach. As there is growing global attention to One Health, it is important to establish methods for how to monitor and evaluate programs using a multisectoral, One Health approach. However, the CDC One Health Zoonotic Disease Prioritization (OHZDP) workshops do not currently include a formalized monitoring and evaluation plan to assess their impact in countries.

Methods and Results: The development of the CDC Prioritization workshop monitoring and evaluation plan involved several steps. First, a logic model was developed to visually represent the process of the OHZDP workshop and the intended theory of change. Second, a bank of indicators was developed for workshop participants to use when measuring progress and outcomes of the workshop. Finally, a pre- and post-workshop assessment was developed to assess knowledge gained by workshop participants. The impact of OHZDP workshops will be assessed in terms of a triangulation of these mixed methods data sources.

Discussion: The goal was not to link OHZDP workshop activities and the causality of outcomes, but rather to demonstrate how this workshop contributes to changes in One Health approaches to controlling zoonotic diseases. With this evaluation plan, participants and facilitators will be able to quantitatively and qualitatively assess the impact of the OHZDP Process and workshop, beyond the ad hoc evaluation data that had been collected in the past. This evaluation plan should be pilot tested, and then refined to be used in other countries or regions, or to be scaled for use in addressing other One Health Issues.

Introduction and Rationale

One Health Approach

The U.S. Centers for Disease Control and Prevention (CDC) defines One Health as an approach that is a collaborative, multisectoral, and transdisciplinary approach — working at the local, regional, national, and global levels — with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment [1]. In using a One Health approach to public health, CDC works at the local, regional, national, and global levels to promote the integration of health efforts for people, animals, plants, and their shared environment [2]. Therefore, One Health is a collaborative, multisectoral, and transdisciplinary approach, and there are inherently many stakeholders involved. Often, the main stakeholders represent human, animal, and environmental health agencies.

There are many different components of One Health; for example, zoonotic diseases, antimicrobial resistance, food safety and security, and safety regarding companion animals. Zoonotic diseases, or zoonoses, are infectious diseases that are spread between animals and people [3]. Zoonotic diseases make up a large portion of all infectious diseases that threaten human health. Approximately six out of every ten infectious diseases are zoonotic, and three out of four emerging infectious diseases are zoonotic in origin [4]. The World Bank estimates the costs of zoonotic diseases from 2000-2010 to be more than \$20 billion in direct costs such as healthcare costs and reduced production of animal products, and over \$200 billion in indirect costs such as a reduction in workforce capacity because of ill workers [5]. Clearly, if zoonotic diseases can be prevented and controlled then there is great potential for drastic reductions in healthcare and other expenditures if.

Global Frameworks to Address Public Health Systems

Many global frameworks have been established to assess and strengthen public health capacity in countries. International public health organizations are working to create these frameworks to improve global health through a One Health approach. When these global frameworks were developed, organizations identified that there is a need for a priority zoonotic disease list from countries.

One Health Zoonotic Diseases Prioritization Workshops

CDC developed a prioritization process for zoonotic diseases that address the needs covered by the global frameworks, specifically, the need to prevent and control zoonoses. The One Health Zoonotic Disease Prioritization (OHZDP) Process was developed by CDC's One Health Office in 2014 to allow subnational, national, and regional levels to prioritize zoonotic diseases. The goals of the OHZDP Process are to use a multisectoral, One Health approach to prioritize zoonotic diseases of greatest concern and develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners [6].

Countries request the assistance of CDC to conduct an OHZDP workshop for a variety of reasons. Many countries want to strengthen One Health collaborations within that country or location. This workshop involves establishing or strengthening relationships between the various sectors of One Health – animal, human, and environmental health and other relevant partners. Another reason for conducting an OHZDP workshop is that many countries have an interest in identifying opportunities to coordinate zoonotic disease prevention and control activities jointly to streamline resources. By developing a list of priority zoonotic diseases, countries can help focus limited resources to build capacity in addressing these zoonoses. Conducting an OHZDP workshop also provides stakeholders with the information necessary to advocate for using a

One Health approach with policy makers and funding partners. Additionally, OHZDP workshops allow countries to highlight further opportunities where a multisectoral, One Health approach can be used to address zoonotic diseases.

Another benefit of conducting OHZDP workshops is that by bringing together all sectors involved in One Health activities, it can serve as a method for strengthening One Health mechanisms in the country or region, which can help to improve One Health infrastructure. One Health infrastructure includes laboratory capacity, a well-trained workforce, and surveillance capacity for zoonotic diseases, along with many other infectious disease related public health activities. Lastly, countries may also be interested in improving their scores on One Health related areas in assessments for international standards, such as the aforementioned JEE and IHR-PVS National Bridging Workshops. The outcomes of the OHZDP workshops are helpful in identifying areas of where to strengthen One Health capacity, including preventing and responding to zoonotic diseases.

Problem statement

As there is growing global attention to One Health, it is important to establish methods for how to evaluate programs using a multisectoral, One Health approach. Currently, after OHZDP workshops are conducted there is no formal, systematic way to monitor or evaluate the activities that stem from the workshop. Without a formal, systematic monitoring and evaluation plan, the full impacts of the OHZDP workshops cannot be formally determined. Additionally, standard indicators for One Health activities are limited and not always generalizable. Without standard indicators for One Health, even if One Health programs are being evaluated, there is little ability to compare results across similar One Health programs because of the lack of standardization.

The lack of standard indicators for One Health is likely due to the limited number of frameworks designed to comprehensively evaluate One Health. An organization called the Network for Evaluation of One Health (NEOH) is working to address this gap and aims to create frameworks for the evaluation of One Health [7]. However, existing frameworks are generally designed to evaluate One Health at the systems level, which means there is little critical examination of individual One Health activities. Because One Health programs and projects are crucial to the system overall, it is important to know whether or not these activities are working as planned and are producing the desired results.

Purpose statement

The OHZDP Process does not currently include a standardized or formalized monitoring and evaluation plan to assess the impact of these workshops in countries. Currently, there is an ad-hoc evaluation completed by participants after the workshop, in addition to debrief calls by CDC facilitators with workshop CPT shortly after the workshop. However, without a comprehensive and standardized monitoring and evaluation plan, it is not possible to determine if the full impacts of the OHZDP workshops.

A proper monitoring and evaluation plan can be directly incorporated into the OHZDP Process and applied to all future workshops. Monitoring and evaluation of these OHZDP workshops will help determine if participants are using recommendations developed in the workshop to take steps towards the desired outcomes. If not, One Health sectors and partners can use monitoring and evaluation data to decide how to address these challenges.

The purpose of this thesis is to develop a thorough and standardized monitoring and evaluation plan for all future OHZDP Workshops in order to assess their impact and develop standard indicators to measure that impact for each workshop's unique needs.

Research Question and Objectives

The research question for this thesis is as follows: How can the OHZDP Process utilize a formal and standardized monitoring and evaluation plan to effectively demonstrate the impact of the OHZDP Workshops in a country, region, or other area?

The objectives that must be met in order to answer this research question are as follows:

- Develop a logic model to visually represent the theory of change of OHZDP Workshops
- Develop a bank of indicators that can be used to systematically monitor impacts after the OHZDP Process has been adopted
- Develop a baseline assessment to be distributed to governments before the workshop to determine what the current status of One Health activities is in the region
- Develop a post-workshop evaluation to gather information from participants before they leave the workshop

Significance statement

CDC's One Health Office does not have a formal monitoring and evaluation plan to formally measure the impact of the OHZDP workshops. Therefore, a formalized structure for conducting monitoring and evaluation is needed and will be created through this thesis to determine the direct and indirect impacts of the workshop. Possible themes from the qualitative and quantitative approach used in the monitoring and evaluation plan include impacts on One Health coordination, surveillance and laboratory capacity for the priority zoonotic diseases, integration of human, animal, and environmental health sectors, and burden of the priority zoonotic diseases.

Public Health Importance

As an interest in One Health continues to grow around the world, many public health challenges are requiring the use of a One Health approach to address these different areas. With the

growing importance on One Health and many global frameworks encouraging countries to identify priority zoonotic diseases, CDC's OHZDP Process meets those needs. The OHZDP Process is currently the most commonly used prioritization process for countries to prioritize zoonotic diseases using a multisectoral, One Health approach. In order to assess the full impact of One Health activities, monitoring and evaluation plans need to be incorporated. A monitoring and evaluation plan for the OHZDP Process is needed to show the importance and assess the impact of addressing zoonotic diseases through a multisectoral, One Health approach. Additionally, the development of this monitoring and evaluation plan can be used as a resource for others when trying to evaluate other One Health activities.

Literature Review

Introduction

A One Health approach can be applied to a variety of issues. The OHZDP Process allows countries to prioritize zoonotic diseases for control and prevention, which is crucial to ensuring the health and safety of its citizens, as well as the global community. Zoonotic diseases pose threats at the local, national, and global levels, and it is important to understand how the OHZDP Process can help countries address these threats.

One Health

One Health is a collaborative, multisectoral, and transdisciplinary approach — working at the local, regional, national, and global levels — with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment [1]. One Health covers a variety of topical issues, from infectious diseases to opioids and obesity, and includes human, animal, and environmental health professionals.

Many organizations in the United States and around the world have a vested interest in One Health and the control of zoonotic diseases, including the U.S. Food and Drug Administration and the U.S. Department of Agriculture [8-11]. Internationally, the World Health Organization, Food and Agriculture Association of the United Nations, and the World Organization for Animal Health are all dedicated to One Health approaches [12].

Sectors Involved in One Health

There are many actors responsible for the One Health approach. The three components of One Health are human, animal, and environmental health, and as such, individuals working in any of these sectors can play a role in advancing One Health. Additional sectors and relevant partners may need to be involved for various One Health issues. Integrating approaches in a One Health

way means that all of these actors must communicate with one another, collaborate on interventions, and coordinate activities to ensure the best use of resources [1]. A description of each of the three components of One Health is provided below [1]:

- *Public Health/Human Health*: This sector includes ministries/departments of health and occupational health organizations, as well as individual medical and public health professionals such as physicians, nurses, veterinarians, laboratorians, and epidemiologists.
- *Animal Health*: This sector includes individuals responsible for the health of companion animals, livestock, and wildlife. It can include ministries of agriculture, fish and wildlife organizations, public health veterinarians, and wildlife biologists.
- *Environmental Health*: This sector includes organizations dedicated to the environment, such as environmental protection agencies, toxicologists, ecologists, conservationists.

Examples of One Health Issues

One Health covers a myriad of issues. These components come from the individual sectors of human, animal, and environmental health, along with issues that arise from considering the integration of the three. These topics include antimicrobial resistance, vectorborne diseases, tuberculosis, human relationships to wildlife, and disease ecology. Some examples of the use of a One Health approach are covered below:

Antimicrobial Resistance

Antimicrobial resistance is a major issue facing global health [13, 14]. Antimicrobial resistance occurs when pathogens change in response to the antimicrobials used to treat them; such as bacteria changing and becoming resistant to an antibiotic used to treat infections with that bacteria [13]. Antimicrobial resistance poses a major threat to public health and global health, because it reduces the number of effective treatments available for infectious diseases.

Antimicrobial resistance can also occur by the improper use of medicines not only in humans, but also in animals. Examples of improper use of medications include using antibiotics to treat

viral infections, the dumping of unused medications into a water supply, or the use of antibiotics in animal feed as an attempt to produce livestock of higher quality, free of disease and allowing for increased profits [15]. While giving animals antibiotics to stave off infectious diseases may be necessary in some instances, using antibiotics unnecessarily is not good antibiotic stewardship. Such practices pose a threat to human and animal health by increasing the potential for antibiotic resistance. As more of the medication is present in the environment, there is more of a risk of bacteria mutating to develop resistance [15].

Vector Borne Diseases

Vector borne diseases are a well-known threat to global health and a major issue that should use a One Health approach to address. Because some vectors can feed on various species, animals and humans are both at risk of being bitten by a vector, and thus exposed to any pathogens the vector may be carrying. Some of these pathogens may be the causative agents of zoonotic diseases and as such can be shared between humans and animals. One such example of this is Rift Valley Fever. One study compared the response to a Rift Valley Fever outbreak in Saudi Arabia with the response to an outbreak of the same disease in Sudan. In Saudi Arabia, surveillance was done on both humans and animals, whereas in Sudan, epidemiological data was only available for human cases. Sudan recorded a higher number of human cases, and the outbreak lasted much longer, potentially in part due to Saudi Arabia's use of a One Health approach [16].

Surveillance

The integration of surveillance systems is crucial in controlling and preventing infectious diseases. Because zoonotic diseases may infect both humans and animals, it is important to understand the incidence and prevalence of a disease in one population to control it in another [17, 18]. By integrating human and animal surveillance systems, data sharing between sectors

is more feasible, and can help target and streamline efforts [19, 20]. This ensures that efforts are not being doubled, but that resources are used in the proper way.

Zoonotic Tuberculosis

Tuberculosis remains a major threat to human health. There are types of tuberculosis, such as *M. bovis* (a part of the *M. tuberculosis* complex), that can be shared between humans and animals. Tuberculosis caused by *M. bovis* occurs across the world, but the African and Southeast Asian regions have the highest burdens of disease [21]. Through a One Health approach, both human and animal cases of tuberculosis can be identified and treated. Because *M. bovis* is inherently resistant to pyrazinamide, a first line drug in the treatment of *M. tuberculosis*, it is crucial to ensure proper diagnosis of *M. bovis* to reduce the risk of pyrazinamide resistance in *M. tuberculosis* [21]. In order to ensure proper diagnosis, a One Health approach of sharing diagnostic tools is necessary.

Emerging Infectious Diseases

As previously mentioned, zoonotic diseases make up 60% of all emerging infectious diseases [4]. There are several different drivers of emergence, and many of the drivers of emergence can be addressed through a One Health approach [22, 23]. There are many categories of zoonotic diseases. There are viral, bacterial, fungal, and protozoal pathogens that can infect both humans and animals. These diseases can be spread through a variety of transmission methods, including direct contact with animals, contaminated food or water, or coming into contact with a vector carrying a vector borne disease [24]. Because of these various modes of transmission, it is important to use a One Health approach to control or eliminate these diseases. As an example, novel strains of influenza originate in animals and then spread to humans [25]. These diseases can then shift to a majority human-to-human transmission, but it is possible for transmission from human-to-animals to occur as well. USAID's PREDICT project uses a One

Health approach to detect potential zoonotic diseases in animals, before they emerge in humans [26].

Impacts of Zoonoses

Zoonotic diseases are a public health risk, as the burden of zoonotic diseases can place a strain on public health and healthcare systems [4, 5]. Many foodborne diseases are zoonotic diseases, including salmonella, campylobacter, and E. coli [27]. These foodborne, zoonotic diseases can be spread from animal-to-human, human-to-human, and even human-to-animal [28]. In order to properly control foodborne outbreaks, it is necessary to understand these modes of transmission. Food and water sources can be contaminated by the feces of an infected animal [29]. There are therefore economic risks associated with zoonotic diseases. If a herd of livestock is infected with a zoonotic disease, it may be necessary to cull the herd to prevent the spread of disease to other animals, or to humans [30, 31]. For this reason, zoonotic diseases pose a risk to food security. For communities who rely on agricultural production for economic and sustenance reasons, the outbreak of a zoonotic disease can lead not only to poverty, but also hunger, malnutrition, and a range of diseases associated with a lack of nutritious foods [32].

While some zoonoses are endemic in certain regions and maintain a manageable, consistent level, some zoonotic diseases can cause major outbreaks in humans and animals that can overwhelm the healthcare systems in the area [33]. Many zoonotic diseases are even listed as potential bioterrorism agents, including anthrax, tularemia, and some viral hemorrhagic fevers such as Ebola [34]. These zoonotic diseases poses a major threat to public health, as well as global health security, because of their high transmissibility, severity of infection, and potential to disrupt societal functioning. Having One Health plans in place to respond to an outbreak of

these diseases, whether through natural circumstances or bioterrorism, is crucial in ensuring limited disruption to society.

Government Agencies Involved in One Health

In the United States, many government agencies are interested in advancing One Health. The U.S. Centers for Disease Control and Prevention (CDC) is the nation's foremost organization for public health [35]. Since 2009, CDC's One Health Office sits within the Office of the Director of the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) [36]. The One Health Office works with domestic and international human, animal, and environmental health partners to advance One Health and raise awareness of One Health approaches. The One Health Office leads projects that cover a variety of One Health issues [37].

Alongside CDC, many U.S. governmental agencies are invested in the promotion of a One Health approach. These include, but are not limited to, the U.S. Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), USAID, the Department of the Interior (DOI). These organizations were involved in the OHZDP process held for the United States, and continue to work to implement surveillance and detection systems for zoonotic pathogens [38].

Governments around the world are also investing into One Health. One study found that zoonotic disease research has increased significantly in East Africa over the past 10 years, with over 460 publications. This study revealed that research and interest in One Health has increased in the region, specifically as it relates to zoonotic diseases [39]. As an example, Kenya has established an office dedicated to One Health, referred to as the Zoonotic Disease Unit, staffed by senior epidemiologists from both the human and animal health sectors of government [40]. Other countries across the continent and around the world, including Sierra

Leone, Liberia, Tanzania, and India, and have also begun establishing One Health offices, national platforms, and coordination mechanisms through their governments [41-43].

There are also many international and global agencies who strongly believe in the necessity for a One Health approach, including the World Health Organization, the Food and Agriculture Organization of the United Nations, and the World Organization for Animal Health. The Tripartite for One Health is composed the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), and the World Organization for Animal Health (OIE) [12]. Together, this collaboration is responsible for producing a guide to preventing and controlling zoonotic diseases at a national level, titled Taking a Multisectoral, One Health Approach: Tripartite Guide to Addressing Zoonotic Diseases in Countries [12]. Henceforth, this collaboration will be referred to as the Tripartite, and the guide produced will be referred to as the Tripartite Zoonoses Guide (TZG). This guide provides countries with approaches to prevent and control zoonotic diseases through various chapter sections, such as Multisectoral, One Health Collaboration; Understanding National Context and Priorities; and Taking a Multisectoral, One Health Approach to Specific Technical Activities (i.e., strategic planning, emergency preparedness, surveillance, coordinated investigation and response, joint risk assessments, risk reduction, risk communication, community engagement, workforce development, and monitoring and evaluation). Prior to the development of this guide, there was not much guidance for countries on how to use a One Health multisector guide, aside from a 2008 guide published by the Tripartite, to which this is an updated and expanded version [44].

Global Health Security and One Health

Because zoonotic diseases are a significant contributor to the burden of infectious diseases worldwide, and can be used as bioterrorism agents, controlling zoonoses through a One Health approach is paramount to improving global health security [3, 24, 34]. Several organizations

have developed evaluations to effectively assess countries on their capacity to handle these public health crises.

One such evaluation system is the World Health Organization's (WHO) International Health Regulations. The IHR is a series of regulations aimed at strengthening and increasing public health capacity; known as the International Health Regulations 2005 (IHR 2005) [45]. Core capacities covered by IHR 2005 include surveillance, preparedness and response to outbreaks of infectious diseases, and coordination. These aspects are also crucial in preparedness for zoonotic diseases. Accompanying the IHR (2005) is the Joint External Evaluation (JEE), an evaluation tool developed by the World Health Organization (WHO). JEEs are voluntary evaluations conducted by trained WHO facilitators to evaluate whether or not countries are meeting these regulations [46]. The JEE rates countries in multiple areas, including capacity to respond to zoonotic diseases. Each capacity is rated on a scale from 1-4, with 1 being the least capacity and 4 being the highest. The capacity areas include prevention, detection, and response activities, as well as security at points of entry [47]. Zoonoses are specifically mentioned as their own topic under the prevention activities, however activities covered in other areas such as diagnostic capacity, surveillance, and preparedness efforts may also involve zoonoses.

In order to help countries improve scores on JEE reports, some additional frameworks have been established to assist countries attempting to address areas for improvement. One of these frameworks is the Global Health Security Agenda (GHSA) which was established in 2014 [48]. The GHSA is a partnership between international governments, public and private stakeholders, and US government agencies, including CDC, to prevent, detect, and respond to infectious disease threats. Within the GHSA, several "Action Packages" were created to help facilitate collaboration, both regionally and globally, towards achieving GHSA objectives [49]. Topics

covered by these action packages include zoonoses, antimicrobial resistance, and other One Health issues [50].

Similar to the IHR 2005, but in the animal health sector, the World Organization for Animal Health (OIE) established a framework known as the Performance of Veterinary Services (PVS) Pathway, a platform meant to help improve capacity in national veterinary services [51]. This pathway includes guidance for countries to improve veterinary services based on international standards and is an important step in ensuring that countries have a strong animal health workforce and a high capacity for addressing zoonotic diseases.

Additionally, a partnership between WHO and OIE led to the International Health Regulations-Performance of Veterinary Services (IHR-PVS) National Bridging Workshop [52]. These workshops are co-facilitated by WHO and The World Organization for Animal Health (OIE). IHR-PVS National Bridging Workshops are intended to improve collaboration between animal health and human health sectors of governments in host countries. OIE has a list of reportable diseases in animals that its member countries are required to report, similar to human reportable disease lists, making it possible to create integrated approaches and strengthening One Health collaborations across sectors.

As the nation's foremost agency for public health, CDC is also committed to strengthening One Health in the United States and around the world to ensure global health security [53, 54]. One such activity that the One Health Office conducts to enhance global health security are One Health Zoonotic Disease Prioritization (OHZDP) workshops. OHZDP workshops can help countries improve their zoonotic disease capacity in response to external evaluations. The OHZDP workshops are not necessarily conducted in conjunction with these evaluations, but if a country has conducted an evaluation, these are incorporated into the OHZDP workshops.

Monitoring and Evaluation in One Health

Monitoring and evaluation resources for One Health are limited. The TZG includes a section on monitoring and evaluation, specifically, monitoring and evaluating of the implementation of the TZG in countries [55]. This is the first known standardized guidance for conducting monitoring and evaluation of One Health programs and activities. Within the monitoring and evaluation sections of the TZG, skeletal outlines of logic models are provided, but these must be specified to fit the program. In addition, the examples of indicators provided within the guide are not necessarily SMART indicators. SMART indicators are specific, measurable, achievable, relevant, and time-bound indicators [56]. Many of the indicators provided within the TZG are missing at least one of these elements, but the majority are missing the time-bound element. Without being time-bound, it is difficult to truly assess how much progress is being made, and if countries are on track to fulfilling the goal in the time allotted.

In addition to the TZG's information on incorporating monitoring and evaluation into One Health, the Network for Evaluation of One Health (NEOH) is the only known organization working on the creation of further monitoring and evaluation in One Health [7]. NEOH has published a handbook entitled, "Integrated approaches to health: A handbook for the evaluation of One Health" [57]. However, the organization is still working to produce usable frameworks for the evaluation of One Health, and has created four working groups, WG1-4, dedicated to different aspects of One Health evaluation.

The purposes of the Working Groups are explained below [7]:

Working Group 1 (WG1)

The mission of WG1 is “to develop (1) the overall evaluation framework, (2) a One Health index and (3) a protocol for systematic evaluation of One Health, taking into account various disciplinary perspectives and resulting complexity.” This working group is responsible for conducting standardized monitoring and evaluation plans for One Health activities, and would consider input from various stakeholders to make it as widely applicable as possible.

Working Group 2 (WG2)

The objective of WG2 is “to apply the framework, protocol and index developed to different One Health initiatives (case studies) using primary and secondary datasets.” This working group would therefore be responsible for testing the evaluation framework created by WG1 and would validate the framework through case studies of various programs.

Working Group 3 (WG3)

The objective of WG3 is “to conduct a meta-analysis of the available case study to facilitate international comparison and the elaboration of policy recommendations.” This working group would be responsible for synthesizing the results of case studies conducted by WG2 and would then use this synthesis to create recommendations for future policies regarding One Health.

Working Group 4 (WG4)

The objective of WG4 is to be “responsible for seeking a dialogue with national governments, NGOs, research organisations, and industry throughout the project to ensure that the evidence produced addresses decision-makers’ needs.” This working group would be responsible for reaching out to governmental, non-governmental, and academic institutions to distribute the findings of the other working groups and ensure that what is produced is relevant to stakeholders.

While there are currently limited resources for monitoring and evaluating One Health, as One Health continues to grow and expand, monitoring and evaluation should be incorporated further into program development.

Studies Investigating Monitoring and Evaluation in One Health

Various studies have been conducted on the economic impacts of using a One Health approach, a compilation of which has been collected by the One Health Commission [58]. It is important to be able to demonstrate the economic benefits of using a One Health approach, in order to justify the economic costs that come from using this approach. A 2012 study by Rushton et al. outlines the economic costs associated with using a One Health approach. These costs stem from the difficulties of integrating efforts from multiple sectors of government, determining where the resources for a One Health approach can be pulled from, and how to integrate these resources into a single approach. The authors assert that the lack of evidence-based monitoring approaches lead to a less than persuasive argument for using a One Health approach and argue that this is needed before One Health can become more mainstream [59].

However, few studies have addressed the need for One Health monitoring and evaluation. A 2016 article by Baum et al. was a scoping review conducted via multiple search engines regarding One Health interventions. Of nearly 4,000 articles identified, only seven articles were found to have any information about quantitative indicators – and these articles did not use any set of shared methodology, demonstrating the lack of a standardized framework [60]. The major finding of this article was the near complete lack of monitoring and evaluation activities being conducted around One Health activities, which supports the need for a standardized monitoring and evaluation plan for OHZDP workshops.

Monitoring and Evaluation in other areas of CDC

Monitoring and evaluation processes are not new to CDC. CDC's Program Performance and Evaluation Office (PPEO) is dedicated to building evaluations for centers and divisions across the agency [61]. For example, CDC's Violence Protection branch conducts monitoring and evaluation for some of their programs with state partners [62]. This evaluation plan relies on continued support from CDC, and continued motivation to conduct monitoring and evaluation activities by the state partners. Similarly, the Field Epidemiology Training Program (FETP) also incorporates a monitoring and evaluation component [63]. The FETP program is conducted by CDC facilitators and country partners around the world and involves a training program comprised of workshops. FETP uses a bank of indicators to measure progress, which requires continued support from CDC facilitators in order to analyze monitoring and evaluation data. It also requires that country partners continue conducting monitoring and evaluation activities.

Conclusion

A One Health approach can be used to tackle many public health issues but is especially necessary in the control of zoonotic diseases. Because zoonotic diseases are a major global health threat, it is important to have a program to help countries increase capacity in surveillance, preparedness and response, and laboratory diagnostics of zoonotic diseases. The OHZDP Process provides countries and regions an opportunity to prioritize zoonotic diseases to focus their efforts on. Currently the OHZDP Process does not have a monitoring and evaluation plan to formally validate the outcomes from OHZDP workshops.

Methodology and Results

Introduction

Incorporating a monitoring and evaluation plan into the OHZDP Process will allow participants to link changes to their zoonotic disease control and prevention plans back to the activities of the OHZDP workshop. In order to properly design a monitoring and evaluation plan, multiple components needed to be analyzed and developed. A logic model was first developed to visually represent the process of the OHZDP workshop and the intended theory of change. Second, a group of indicators were developed to be used by workshop participants when measuring progress and outcomes of the workshop. Finally, a pre- and post-workshop assessment was developed for participants to complete at the start and end of the workshop to demonstrate knowledge gained, as well as perceptions of the workshop. The following is a description of both the methods and results of designing each component of the monitoring and evaluation plan.

Logic model

A logic model was developed to demonstrate the intended theory of change of the workshop. Logic models visually represent resources, processes, and expected outcomes of a project or program. These models are often described as project road maps, as they provide guidance to implementation teams. A basic version of a logic model would consist of inputs, activities, and outcomes. Inputs are the resources needed to conduct the activities, activities are the

procedures that need to occur to achieve outcomes, and outcomes are the intended accomplishments of the program [64].

The logic model created for the OHZDP Process shows the theory of change from inputs through long-term outcomes and helps to demonstrate the timeline which outcomes are expected. For this project, the timeline is essential because it is important to implement control measures for zoonotic diseases. The finalized logic model for the OHZDP Process can be found in Appendix A.

Developing the logic model included a document review, discussion with program leaders and facilitators, and development of a color-coded model that describes pre-workshop, workshop, and post workshop activities and logical links. The first step of development involved reviewing existing program documents, including training and facilitator manuals. The training manual is a document that outlines the entirety of the OHZDP Process, and includes sections for workshop preparation, workshop implementation, and post workshop activities. The facilitator manual is similar but provides more in-depth information on how to guide participants through the OHZDP Process.

Additionally, existing visual guides of the process were reviewed to better understand the flow of the workshop procedures. These visual guides were created by CDC's One Health Office and consist of a flow chart of the OHZDP Process with broad overview topics. The visual guides provided a general structure in the development of the logic model presented.

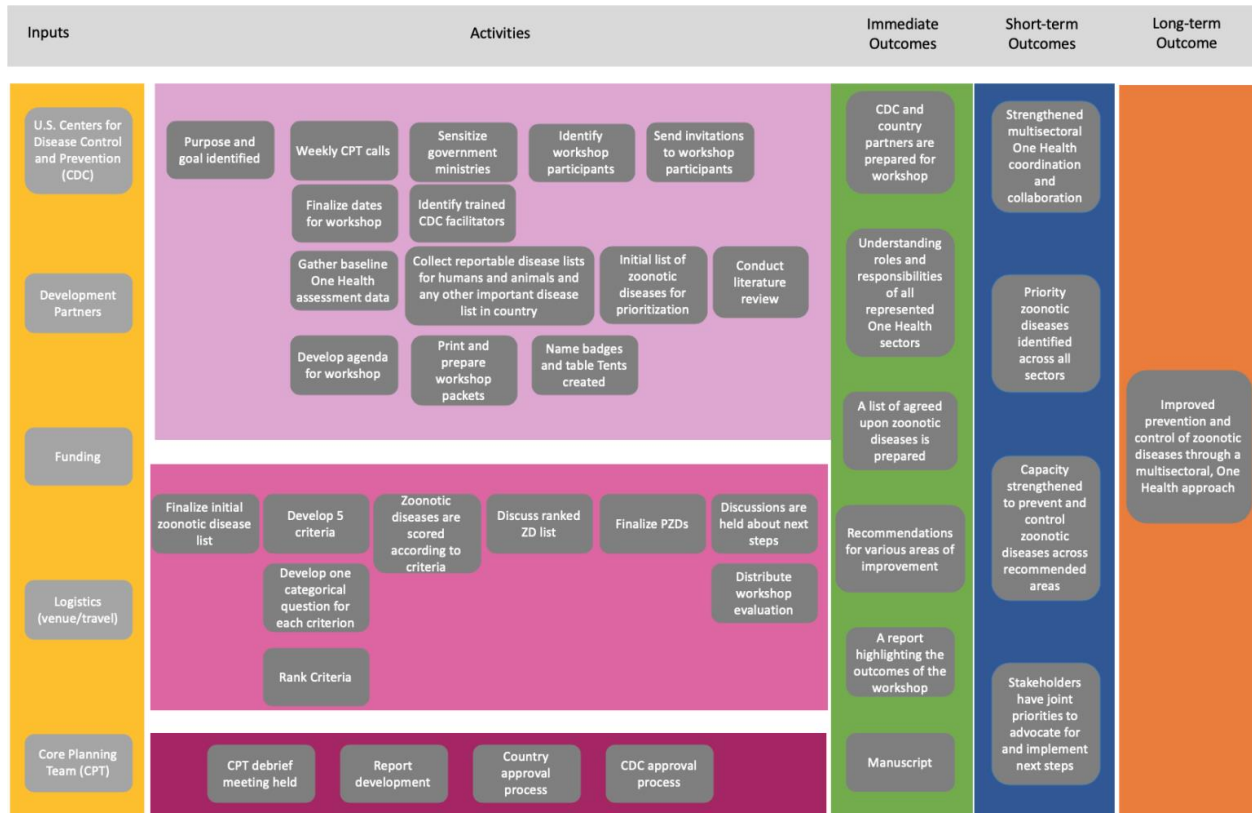
Facilitator Meeting: After reviewing program materials, a weekly meeting lasting one hour was held with the CDC One Health Office to discuss the OHZDP Process to ensure this researcher's understanding of the process. The draft model was presented as a Microsoft PowerPoint slide, and feedback on content and presentation was solicited from CDC's One Health Office. After the meeting, all notes regarding the feedback were typed and stored for future reference.

Major outcomes of the meetings with CDC's One Health Office included ensuring that the details of the OHZDP Process were understood, confirming that language in the logic model matched CDC approved language from existing materials and that the coding for the workshop activities was in chronological order.

Following the document review and facilitator meeting it was determined that the theory of change included the following:

- The OHZDP workshop will result in an educational knowledge transfer, from the facilitators to the participants.
- The OHZDP workshop participants will gain knowledge about One Health, zoonotic diseases, and the other sectors involved in One Health in their country, region, or other area.
- If workshop participants learn about these topics and produce a list of priority zoonotic diseases, then eventually, the burden of zoonotic diseases will be reduced.

Figure 1: Logic Model

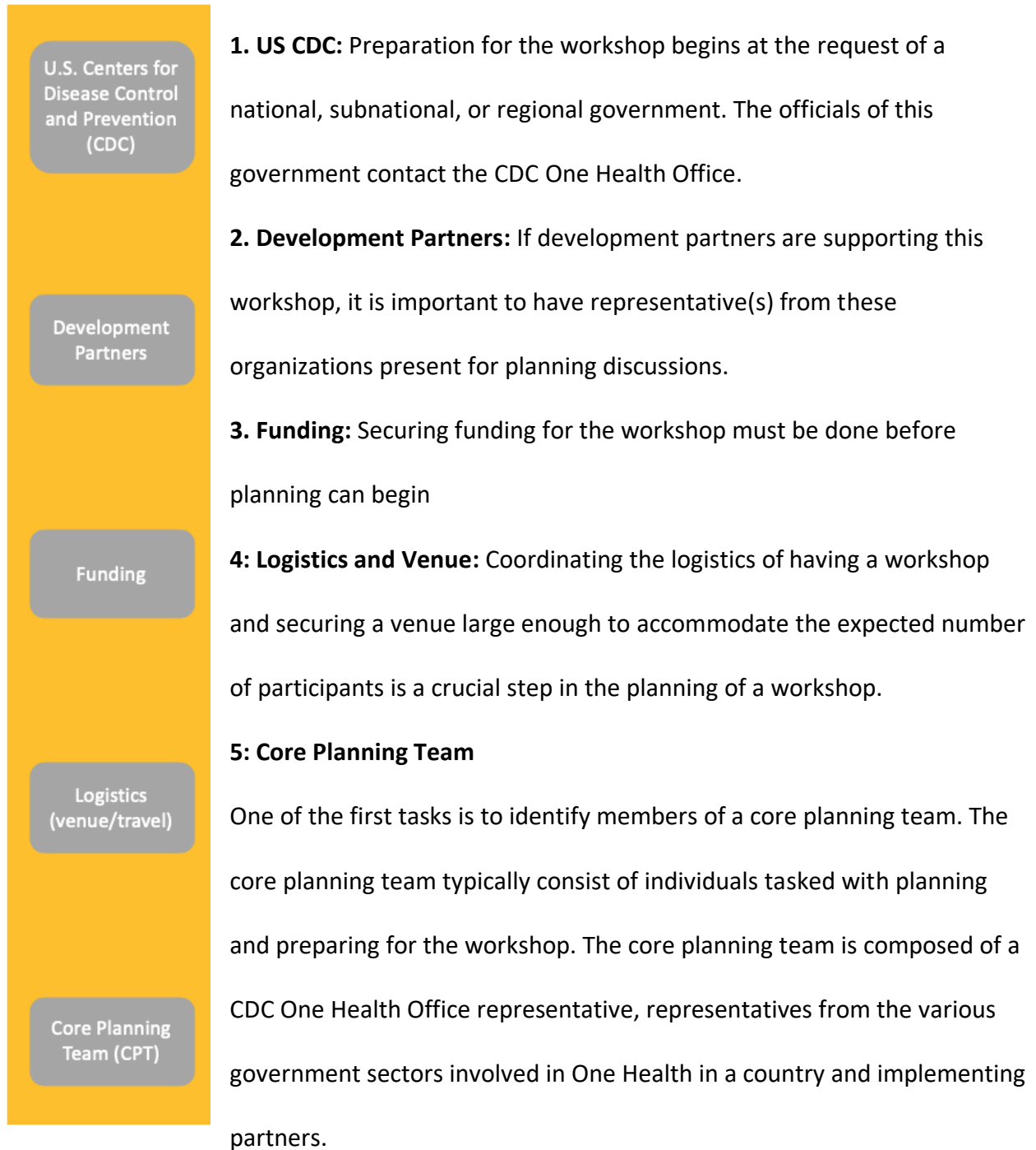


The final logic model was color coded to demonstrate the different components of the OHZDP Process – inputs, pre-workshop activities, workshop activities, post workshop activities, immediate outcomes, short-term outcomes, and one long term outcome. The following is a discussion of each section: Inputs, Activities (pre-, during, and post-workshop), Immediate Outcomes, Short-term Outcomes, and Long-term Outcomes.

Inputs

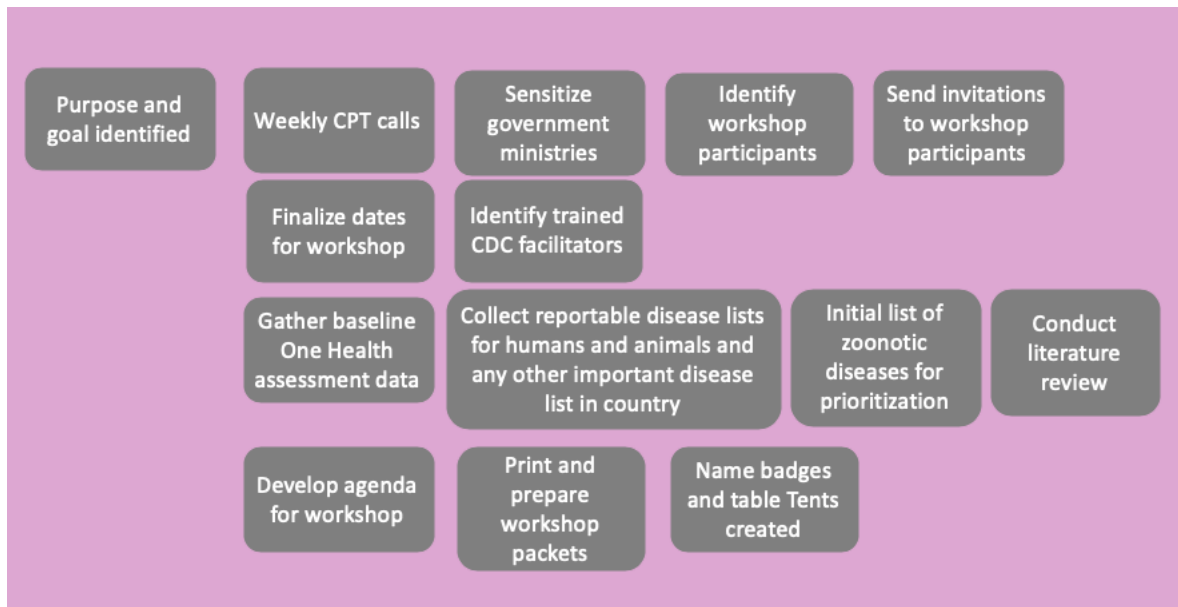
The yellow boxes on the left most column of the current logic model represent inputs. These are resources and activities that are required in order for workshop activities to occur.

Figure 1a: Inputs



Workshop Activities

Figure 1b: Pre-workshop activities



Within the new logic model, the activities that occur during workshop preparation are the lightest pink. The CDC One Health Office will provide trained facilitators who will host facilitator trainings with interested countries or regions to train government representatives from human, animal, and environmental health sectors within a country. For example, government representatives may be from the Ministries of Health, Agriculture, Wildlife, or Environment.

The core planning team works with facilitators from CDC to identify the intended participants of the workshop, finalize dates for the workshop, and secure a venue for the workshop. Workshop participants are nominated by their government ministries so that the government decides who is representing them, which is important to ensure buy-in from the government partners. After these items are finalized, nominated participants are invited to the workshop. Throughout this process all government ministries involved in zoonotic disease prevention and control are

sensitized to the importance of this workshop to encourage attendance and to increase understanding of the goals of the workshop.

While logistics and planning activities are occurring, One Health baseline data in the country is collected by the core planning team. Additionally, reportable disease lists for both human and animal reportable diseases are requested from respective ministries by CDC's OHO to further encourage countries to be involved in the workshop preparation and implementation processes. These lists are analyzed to put together a combined list of zoonotic diseases to be considered for prioritization. Once this initial list of zoonotic diseases is established, an extensive literature review is conducted by CDC and country partners to gather data for global, regional, and local burdens of zoonotic disease.

Administratively, it is important to ensure that an agenda is established for the general workshop. The agendas of the OHZDP workshop are fairly standardized across workshops, however, the agenda can allow for slight modifications by the core planning team.

Activities During Workshop

Figure 1c: Activities that occur during workshop



The activities that occur during the workshop are coded with darker pink. During the workshop, participants are introduced to each other. The participants then review the initial zoonotic disease list and finalize this list for prioritization through facilitated discussions. The OHZDP workshop utilizes both qualitative and quantitative methodologies [65]. Many facilitated discussions are held throughout the entire OHZDP process to reach consensus across all sectors. Once the initial disease list is finalized, participants jointly develop five criteria that will be used to create a prioritized list of zoonotic diseases. These criteria are locally appropriate to the location hosting the workshop, as this is crucial to ensure that the criteria will address the unique needs of the location.

After developing the criteria, participants work together to develop one categorical question that will address each criterion - one question per criterion. After the questions are developed, the criteria are then ranked by a vote among the participants. Each voting member determines their preferred order for the criteria. Because voting members represent different sectors involved in One Health, allowing each member to rank the criteria ensures that each sector will

be able to address their sector's priorities and needs. Individual rankings are then combined through the analytical hierarchy process and each criterion are given a weight based on the combined group ranking [66]. Each zoonotic disease on the initial list is scored by answering the categorical questions that were developed by the participants. The questions are answered using the data identified through the literature search or subject matter expertise. After each potential zoonotic disease is scored, the data is entered into the OHZDP Tool and a ranked zoonotic disease list is produced. This ranked zoonotic disease list is used to facilitate discussions among the participants to determine the final list of priority zoonotic diseases for the country, region, or other area.

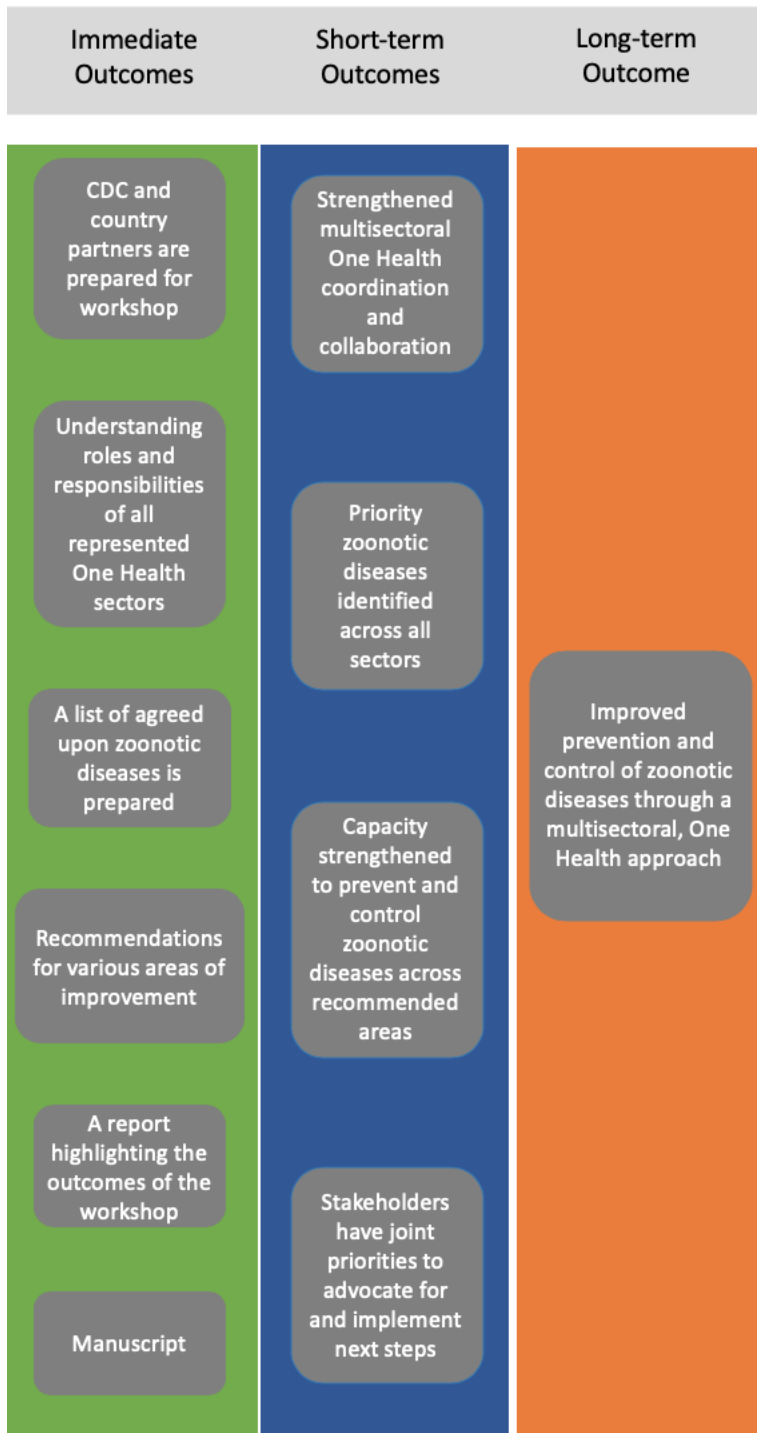
After finalizing the priority zoonotic disease list, participants discuss what next steps should be taken after the workshop and develop action plans for identifying areas for One Health engagement to prevent and control the priority zoonotic diseases. These discussions focus on topical areas like multisectoral, One Health coordination, surveillance capacity, laboratory capacity, workforce capacity, outbreak response, preparedness efforts, research, and education. Armed with the information from the workshop and next steps discussions, stakeholders are then able to develop recommendations for next steps to use a One Health approach for these newly prioritized zoonotic diseases.

Post-Workshop Activities

Figure 1d: Post-workshop activities



The activities that occur after the workshop are coded with the darkest pink. Following the workshop, the country, region, or other area will need to implement the newly developed evaluation plan from this thesis. The first step in this will be to decide how to measure progress towards the goals established during the workshop discussion of next steps. An indicator bank was developed based off of common recommendations that have been made from past OHZDP Workshops. Workshop participants will be able to utilize the indicator bank to identify indicators that can be used to measure progress over time after the workshop. More details on the indicator bank can be found below, and in Appendix B.



Outcomes

The outcomes were broken into immediate, short-term, and long-term outcomes. The *immediate outcomes* are the outcomes that occur as a direct result of the implementation of the workshop. These activities will produce results that occur before the participants leave the venue of the workshop, or very shortly after. *Short term outcomes* are those that will happen because of workshop activities and the continued work of the participants. These outcomes are expected to happen within five years of the workshop. *Long-term outcomes* are those that may take more than five years to

occur. The long-term outcome of this workshop is that the burden of zoonotic diseases will be decreased.

Indicator bank

In addition to the logic model, another important component of the evaluation plan is a sample indicator bank, based on an analysis of themes that commonly arise during next steps discussions at OHZDP workshops. The themes include improvements to laboratory capacity, surveillance systems, and One Health coordination mechanisms between ministries. A bank with a large number of indicators was created in order to allow for the monitoring and evaluation plan to be adjusted to fit the country or region's unique needs after an OHZDP workshop. During the workshop, the bank will be reviewed prior to discussing next steps and action plans for after the workshop. After choosing a few areas the country would like to improve, they will select indicators that map to improvements in those areas. The indicator bank can be found in Appendix B, with sources of data needed to measure these indicators.

These indicators were constructed to be SMART indicators - specific, measurable, achievable, relevant, and time-bound. 'Specific' refers to the indicator being narrow and accurate enough to explain what exactly the indicator is measuring. 'Measurable' means that there is a specific way to measure what the indicator is referring to, and that this will be consistent regardless of who conducts the measurement. 'Achievable' means that it is both possible and realistic to collect the data necessary to measure the indicator. 'Relevant' means that the indicator is related to the goal or outcome of the project. 'Time-bound' gives a timeline to the indicator.

The following is a discussion of four example indicators, and why each meets the SMART criteria. The indicators chosen as examples are:

1. X percentage of laboratories within a country capable of detecting the priority zoonotic diseases within 5 years of the workshop
2. X number of surveillance systems across One Health sectors that include the priority zoonotic diseases are established and operational within 2 years of workshop
3. X number of vaccines for vaccine preventable priority zoonotic diseases are available in the country within X years of workshop
4. X number of sectors involved in One Health are represented by attendees at the OHZDP workshop

The indicator “X percentage of laboratories within a country capable of detecting the priority zoonotic diseases within 5 years of the workshop” is important for those countries that want to improve laboratory capacity, specifically to increase the number of laboratories that are capable of identifying zoonotic diseases across multiple sector’s laboratories. The “laboratory capacity” indicator is considered SMART for the following reasons:

- *Specific*: it outlines the specific goal of increasing the capacity of laboratories in the country.
- *Measurable*: It is measurable by a count of the number of laboratories in the given area.
- *Achievable*: The indicator is achievable because next steps for improving the laboratory’s capacity will be laid out during the workshop.
- *Relevance*: It is relevant because it indicates progress towards laboratory capacity that is relevant for the One Health approach.
- *Time Bound*: it is time-bound, because it specifies that this indicator should be met within five years from the conclusion of the workshop.

This indicator can also be used for monitoring progress during the five-year time frame. For example, if in year 3, the country has verified the existence of less than half (or none) of the desired number of laboratories, it will be a flag towards potential course correction in order to

meet the goal within the designated time frame. Conversely, if the country is close to achieving this goal by year 3, this indicator can show that the country is on track with the established recommendation made and may be able to adjust time frame on future lab capacity goals.

Another example of a SMART indicator from the new indicator bank is “X number of surveillance systems across One Health sectors that include the priority zoonotic diseases are established and operational within 2 years of workshop.” Similar to the first indicator discussed, this indicator also provides an opportunity for course correction if progress is not being made, or verification that progress is on track. Additionally, this indicator does not only address one sector, but addresses capacity building for surveillance across all sectors.

The “surveillance system” indicator is considered SMART for the following reasons

- *Specific*: it describes a goal or outcome of establishing a certain number of priority zoonotic disease surveillance systems.
- *Measurable*: It is measurable by a count of the number of surveillance systems in the given area.
- *Achievable*: The indicator is achievable because the country can outline plans to reach this goal during the workshop.
- *Relevance*: It is relevant because it indicates progress toward an increased surveillance capacity which is important for establishing a One Health approach.
- *Time Bound*: it is time-bound, because it specifies that this indicator should be met within two years from the conclusion of the workshop.

Strengths of this indicator include the inclusion of “operational” as a descriptor for surveillance systems, as a non-operational surveillance system is not very useful. An operational system requires ongoing personnel and infrastructure support. Therefore, this indicator requires the presence of those factors in order to keep the surveillance system running. Potential limitations or risks of this indicator are that it may prove more valuable to integrate multiple surveillance

systems together by mode of transmission or other common feature, which means that while there may be less systems overall, decreased quantity may not be a reflection of improved quality.

The indicator “X number of priority zoonotic diseases that have an available vaccine in the country within X years of the workshop” can be an important indicator that speaks to the country’s preparedness efforts. There are several vaccine preventable zoonoses, and it is important to have a stockpile of these vaccines in the country in case of an outbreak. If there are limited supplies of a vaccine, the country will need to increase production..

- *Specific:* Addresses the importance of vaccines for vaccine preventable zoonotic diseases (VPZD).
- *Measurable:* An inventory of vaccines can be taken to measure this indicator.
- *Achievable:* There are vaccines available for certain zoonotic diseases, and if the country chooses to prioritize one of these VPZDs, it is possible to advocate for the availability of the vaccine in the country.
- *Relevance:* Preparedness for zoonotic disease outbreaks is related to the prevention and control of zoonotic diseases, and vaccines are a crucial preparedness tool.
- *Time Bound:* The country can set a time limit on this indicator, depending on the vaccine approval and production times.

Strengths of this indicator include the fact that this monitoring of available vaccines may encourage participants to address other preparedness supplies. Additionally, it may encourage new research efforts towards the development of effective vaccines for zoonoses. One risk, however, with this indicator is that participants may not have much influence over the approval and inventory of vaccines in their country.

The indicator “X number of sectors involved in One Health are represented by attendees at the OHZDP workshop” is a crucial indicator regarding the workshop itself and can be measured immediately after the workshop

- *Specific*: It is specific because it refers to the OHZDP workshop in question.
- *Measurable*: It is measurable by a count of participants in attendance.
- *Achievable*: It is achievable because facilitators keep an attendance sign-in sheet
- *Relevance*: It is crucial to know how many participants from each sector attended the workshop to ensure multisectoral collaboration
- *Time Bound*: The measurement is taken once, at the end of the workshop.

This indicator is important both for workshop developers and workshop participants. If workshop developers notice that a certain sector is frequently underrepresented in these workshops, it is possible that the facilitators can encourage future CPTs to be more intentional about inviting participants from this sector. For participants, if a sector was underrepresented at the workshop, this signals that a stronger partnership needs to be formed with this sector.

Gantt chart

To accompany these indicators, a Gantt chart was created to establish a suggested timeline of how and when these indicators can be measured. A Gantt chart is intended to visually represent the timeline of the entire project, with specific timing for activities conducted around monitoring and evaluation. Because the indicators should be selected by the country before any action is taken, the indicators will be measured during monitoring activities that occur throughout the project and assessed in depth at each evaluation checkpoint (once every six months). However, since important pieces of monitoring and evaluation must begin before the workshop, this sample timeline begins when the CDC One Health Office is contacted regarding a

workshop, and continues through the third year following the workshop, when the final evaluation report, created by workshop participants with assistance from CDC is finalized. The sample Gantt chart can be found in Appendix E.

Baseline assessment

In order to determine how much progress is made after the workshop, it is important to determine the status of each sector at baseline with regard to the core areas including surveillance, laboratory capacity, and workforce capacity. Because of this, a baseline assessment was developed to administer to the country, region, or other area during the workshop preparation. The assessment includes 20 questions to assess baseline capacity of the country, prior to the workshop implementation. Topics covered by the baseline assessment include questions about funding streams, partnerships with other sectors and other development organizations, and goals of the workshop. The baseline assessment can be found in Appendix C. The plan is for CDC facilitators to review the results of the baseline assessment during the workshop preparation phase and use feedback to ensure that the workshop is tailored to the country's goals and needs.

Post Workshop Assessment

This assessment was created at the request of the CDC One Health Office to receive feedback from participants about the quality of information presented in the workshop. Prior to the creation of this assessment, there was an informal evaluation distributed to participants. The questions developed in this assessment will be used both to assess participant opinions about

the OHZDP workshop as well as to give the facilitators a more accurate idea of how well the participants absorbed the knowledge presented during the workshop. The survey will be given on paper during the last session of the workshop. The survey consists of six questions will be included in the already existing workshop evaluation, shown below:

Table 1: Post-workshop questionnaire

Question Text	Response Type or Set	Rationale for inclusion
1. Please provide the definition of One Health.	Open-ended	Ensuring understanding of One Health is an important indicator for information retention
2. List the zoonotic diseases your country/region chose to prioritize.	List	It is crucial to ensure that all participants know which diseases were prioritized
3. What is the importance of formally coordinating One Health for your country?	Open-ended	It is crucial for workshop participants to understand the value of a multisectoral collaboration mechanism to ensure that sectors work together
4. On a scale of 1-5, to what extent do you feel capable advocating (to funding partners, ministries, etc.) for the use of a One Health approach? 1 being least capable and 5 being most capable	1 – not at all capable 2 – somewhat capable 3 – neutral 4 – fairly capable 5 – extremely capable	Ensuring that participants leave feeling capable of advocating for a One Health approach is an important indicator, as this is a major workshop outcome
5. Please list the most valuable aspect of the workshop.	Open ended	Understanding which sections of the workshop participants see as most valuable is important when considering changes to the workshop
6. Do you have any recommendations for future workshops?	Open ended	Helps facilitators understand what participants would like to get from future workshops on these topics

Participants will be asked to complete the questionnaire before leaving the workshop, to ensure the highest possible response rate. The responses will be reviewed and analyzed by CDC facilitators after the workshop. The facilitators will discuss the responses and review any potential areas for improvement. For example, if many participants leave the workshop feeling as though they do not understand the importance of developing a One Health coordination mechanism, there may be room in future workshop presentations to go into greater depth in covering this topic.

Discussion

The main goal of this thesis was to establish a monitoring and evaluation plan that would enable the CDC One Health Office, as well as workshop participants, to collect data to support effects stemming from utilizing the OHZDP Process. The goal of this monitoring and evaluation plan was not only to establish a process of monitoring and evaluating the workshops themselves, but also to assess the actions that are taken by participants after attending the workshop. Literature on the issue of monitoring and evaluation of One Health make it clear that there is a need to have quantitative ways to measure changes attributable to using a One Health approach. Because this evaluation plan allows participants the ability to select indicators that are created to collect both qualitative and quantitative data, the impact of OHZDP workshops will be formally assessed in terms of a triangulation of mixed methods data sources.

Logic Model

The logic model developed in this thesis is a visualization of the OHZDP Process. By looking at this model, it is possible to see the intended theory of change leading from the initial inputs from participants and CDC through to the short-term and long-term outcomes that stem from the workshop. The ultimate goal is to incorporate a monitoring and evaluation plan into the OHZDP Process and to make this plan standardized across multiple workshops. Because of this process it is important that the process is replicable solely from the materials and training guides available. Having this visual representation will also help ensure that all facilitators and

participants have the same frame of reference of the expected outcomes of the workshop. The creation of this logic model provides a visual guide for to assist with this goal.

Indicator Bank

The indicator bank provides a set of indicators that will be standard for measuring the outcomes of OHZDP workshops in terms of actions taken after the workshop. Deciding which indicators to use before implementing any next steps will help participants to organize their resources around specific goals and collect appropriate data to monitor progress towards these goals. The expectation is that monitoring activities and data from selected indicators will allow for course correction if there is no perceived progress towards goals over time. Because this workshop has been conducted in over 26 countries, data has already been collected on commonly recommended next steps that arise during the next step discussions in the workshop. These common recommendations were used to inform the creation of the indicator bank presented in this thesis. The value of using the common recommendations is that these recommendations were previously developed by workshop participants as important next steps they could undertake following the workshop.

Baseline and Post-Workshop Assessment

The data collected from the baseline assessment will be used as pre-intervention metrics to assess baseline capacity of the country or region. These data will be used to compare to monitoring and evaluation data to determine progress made towards specific goals laid out by workshop participants. This is important to give the facilitators context on the country the

workshop will be held in. Lastly, prior to the conclusion of the workshop, post-workshop surveys will be distributed to participants. This survey will provide a chance for workshop participants to provide facilitators with feedback on the workshop and will serve as a measurement tool for certain indicators and knowledge transfer.

Implementation and Use of Evaluation Plan

As stated, the goal of this thesis was not only to prove causality of outcomes, but to also demonstrate how the OHZDP workshop contributes to changes in One Health approaches to preventing and controlling zoonotic diseases. By using the indicators outlined, it is possible to collect data that would support improvements to One Health approaches and may help highlight areas where further work needs to be done. At the country level, workshop participants will be able to utilize the indicator bank after the workshop to set goals and measure progress towards goals outlined in the next steps section of the OHZDP workshop. Additionally, components of this evaluation plan can assist participants in setting SMART goals, with specific, measurable, attributable, realistic and time-bound features that are important for measurement of progress towards goals.

Though the ideal time to develop this monitoring and evaluation plan would have been prior to the first workshop, it is still possible to collect valuable information from future workshops.

There is also potential to refine the workshop after conducting a pilot test of a workshop that utilizes the monitoring and evaluation plan. Ideally, after pilot testing the monitoring and evaluation plan with a workshop, facilitators will have a sense of how well the activities actually

map to the theory of change and whether there are any gaps in the logic model that should be added or changed. Additionally, it will help the facilitators to understand if the baseline assessment is gathering the proper baseline data, or if it will need to be amended to collect additional or different data needed for evaluations.

Limitations

One major limitation of this project is that monitoring and evaluation activities post-workshop is left to workshop participants. This is a major limitation because it poses a risk to data collection and sharing of monitoring data and evaluation reports, as it requires the participants to continue conducting monitoring and evaluation activities. It also requires that the participants have the staff required to complete the monitoring reports. However, because the OHZDP workshops are conducted exclusively at the request of the host government, it is assumed that the motivation and resources to collect this data will be linked to that country's overall desire to improve One Health. Additionally, CDC's One Health Office is also available to continue providing technical assistance on monitoring and evaluating the OHZDP Process.

Another limitation is that because each OHZDP workshop is tailored to a country, region, or other area's unique needs, the specific outcomes may vary between workshops. In order to address this limitation, an expansive bank of indicators was created for participants to choose the indicators that they want to work towards. Additionally, the logic model is specific enough to demonstrate the theory of change while being general enough to be adaptable to differences in workshops.

Implications and Conclusions

A major implication of this thesis is that it will be possible to implement a monitoring and evaluation plan for all future OHZDP workshops. This means that the participants and facilitators will be able to quantitatively and qualitatively assess the impact of the OHZDP Process and workshop, beyond the ad hoc evaluation data that had been collected in the past. Also, because the evaluation plan is flexible, facilitators have the ability to modify the evaluation plan to better fit the workshops.

This evaluation plan will also be valuable to the global One Health community. With this plan, it will be possible to map improvements and contributions in One Health approaches across the world back to the OHZDP Process. If it is shown that there is a significant change in the indicators selected by participants, this will provide evidence that the OHZDP Process may be contributing, alongside other activities, to this reduction. Because of the flexibility and scalability of the OHZDP Prioritization Process, this process can be used to prioritize other One Health issues and this evaluation plan may also be used as a model for future One Health workshops by conducted by CDC or other One Health actors.

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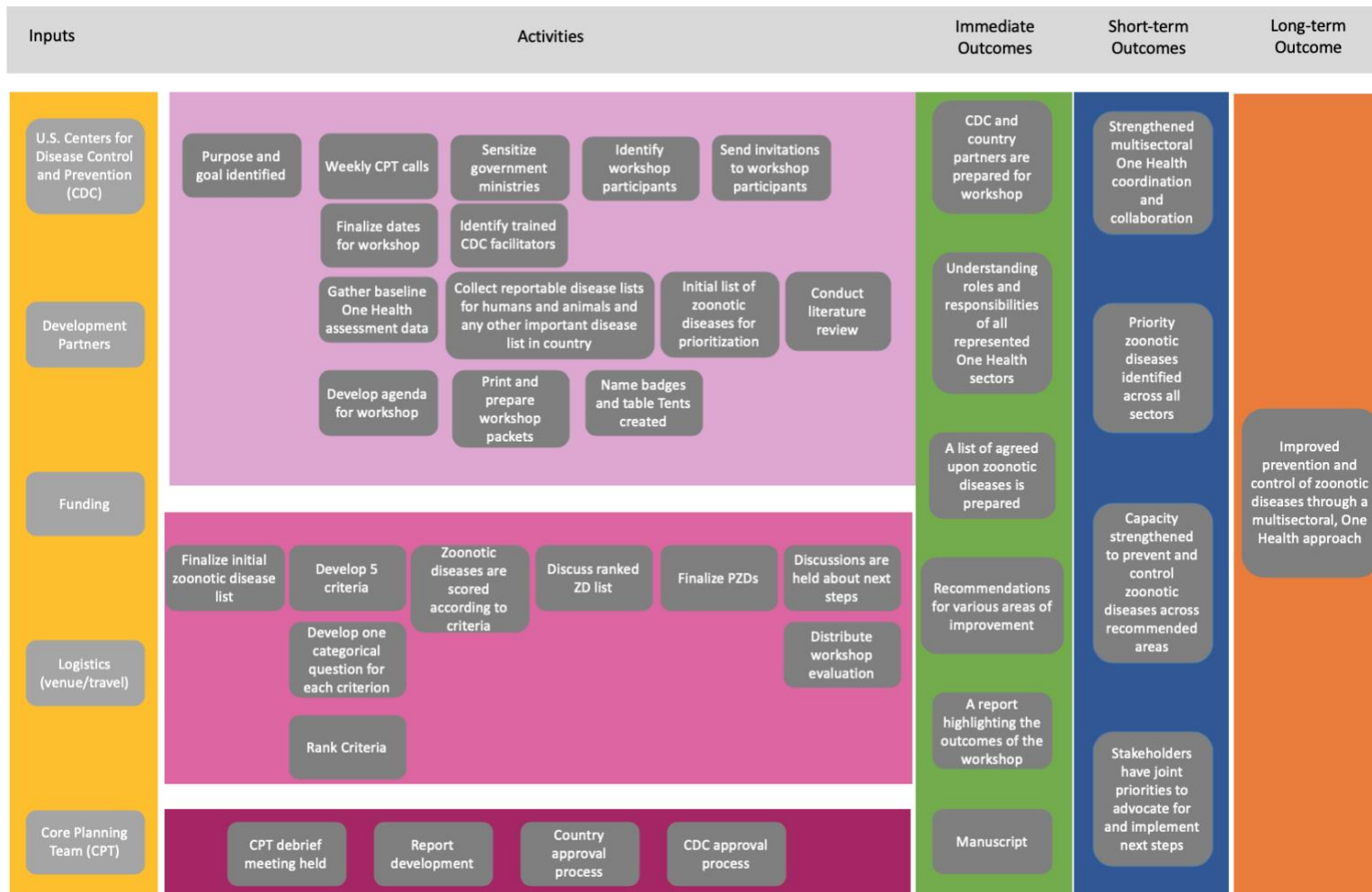
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Appendices

Appendix A: Logic Model



Appendix B: Indicator Bank

#	Indicator	Target	Measurement	Frequency and Proposed Use
Surveillance Capacity				
1	A surveillance system(s) is established that collects data about all priority zoonotic diseases within X months of workshop		Verification of existence of surveillance system by trained facilitators	As needed
Laboratory Capacity				
2	X numbers of laboratories exist in the country with the ability to correctly identify pathogens that cause priority zoonotic diseases within X years of workshop		Verification of existence of labs by trained facilitators	As needed
Workforce Capacity				
3	X number of trained personnel capable of properly responding to priority zoonotic diseases within X months of workshop		Personnel files and records of completion of trainings	As needed
Preparedness				
4	A preparedness plan is in place for responding to an outbreak of specified zoonotic diseases within X months of workshop		Plan is reviewed and verified by preparedness experts	Progress updates monthly, more in-depth check at 6 month mark

5	X number of vaccines for vaccine preventable priority zoonotic diseases are available in the country		Count of vaccines in stockpiles	Quarterly
Community Outreach				
6	Creation of education and awareness campaigns about priority zoonotic diseases within X months of workshop		Existence and viability of campaign verified by trained facilitators	Once, X months after workshop
7	Funding streams to support One Health Programs are secured for the next year by X date of each year		Signed MOU between funding partner and government	Progress checks monthly, more in-depth check at 6 months mark
Workshop Effectiveness				
8	X number of One Health Sectors represented at workshop		Count of participants from attendance sheet	Once, immediately after workshop
9	Action plans are created for each of the proposed next steps before the end of the workshop		Action plans are reviewed by CDC and local facilitators	Once, immediately after workshop
10	A One Health Coordination mechanism is created before the end of the workshop		Mechanism is reviewed by CDC and local facilitators, agreed upon by all sectors	Once, immediately after workshop

Appendix C: Baseline Assessment

1. How many laboratories do you currently have that are capable of testing for and diagnosing zoonotic diseases?
2. What is the current status of your One Health workforce?
3. Are you currently working with any other partners?
4. If yes, do these partners fill roles for the workshop?
5. What partners are you currently trying to engage?
6. Will you be using the OHZDP tool in conjunction with other tools?
7. Do you currently have funding secured to fund the next steps that you determine during this workshop?
8. What sectors will you be involving in this workshop?
9. What do partnerships between sectors currently look like?
10. Do you currently have a One Health Coordination method in place (formal or informal)?
11. Do you currently have any zoonotic disease surveillance systems in place?
12. Do you currently have any preparedness plans/exercises in place?
13. Do you currently have an epidemic response plan?
14. Have you ever done a prioritization workshop before?
15. Are you currently conducting any One Health related research?
16. Do you currently have any One Health
17. What barriers do you foresee in implementing next steps determined at this meeting?
18. Is there currently any national support surrounding One Health efforts?
19. Are there any national or regional obligations that must be fulfilled with this workshop?
20. What has prompted you to have an OHZDP workshop?

Appendix D: Questions to include in Post-workshop evaluation

1. Please provide the definition of One Health.
2. List the zoonotic diseases your country/region chose to prioritize.
3. What is the importance of a One Health Coordination mechanism?
4. On a scale of 1-5, to what extent do you feel capable of advocating (to funding partners, ministries, etc.) for the use of a One Health approach? 1 being least capable and 5 being most capable
5. Please list the most valuable aspect of the workshop.
6. Do you have any recommendations for future workshops?

Appendix E: Sample Gantt Chart

OHZDP Workshop M&E

CDC One Health Office
 (Facilitator
 Name/Country/Region)

Project Start: Mon, 4/27/2020
 Display Week: 1

