

One Health information management: health system reforms to support social well-being in Thailand

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Received: 08-01-2021, **Accepted:** 17-03-2021, **Published online:** 03-05-2021

doi: www.doi.org/10.14202/IJOH.2021.96-103 **How to cite this article:** Youthao S, Amornsiriphong S (2021) One Health information management: health system reforms to support social well-being in Thailand, *Int. J. One Health*, 7(1): 96-103.

Abstract

Background and Aim: The information about the health problems interaction between animal health, ecosystems, and human health that the “One Health (OH)” concept is becoming more complex. This study focused on OH information in Thailand to develop guidelines for establishing a “One Health Information Management (OHIM)” system by drafting the structure of an OH information strategic plan.

Materials and Methods: A mixed methods approach was used and included questionnaires, interviews, focus groups, and observations in agencies across the country to gather evidence about actions relating to the OH concept, such as the Memorandum of Agreements between the Ministry of Public Health and eight main agencies.

Results: The study concentrated on the key issue that understanding the OH concept is difficult, as the environment and human health sectors include less knowledge of this concept than the animal health sector. Further, there are concerns about the comprehension of OH concepts, and high-level information management and data storage relating to OH, including medicine, cattle, wild animal, environment, and environmental resource management. Data from OH researchers and publicly accessible government data are less integrated and inconsistently managed across agencies.

Conclusion: The study of OHIM strategic development should consist of four important points: (1) Clarity in the OH concept, (2) OH staff development, (3) development of an OHIM data network and innovation, and (4) research and academic development, and global OHIM academic exchange. All of these points will lead to health system reforms to support social well-being.

Keywords: health information management, health, one health information, one health, social well-being, Thailand.

Introduction

Health problems are becoming more complex due to the constant interactions between humans, and animals, the environment, and society. The trend of development in many countries highlights the importance of many issues such as population increase, rapid economic expansion in many areas, environmental waste, the emergence of factories [1], and pathogenesis and illness. This also emphasizes the importance of research to resolve illnesses since there is an increase in outbreaks of pathogens passed from animals to humans. These outbreaks are becoming more severe, such as the global COVID-19 pandemic, which has seriously impacted humanity including deaths and the loss of ways of living [2,3]. Therefore, education regarding the interactions between health, infections in humans and animals, and the environmental and social contexts

is becoming more important, which underlies the concept of “One Health (OH)” [4-6].

Nevertheless, the OH concept is not fully understood, despite the growing number of studies on this topic. The term “OH” is used in various contexts and by individuals with diverse backgrounds. However, the meaning of the term is not consistent, and it is used in a wide range of contexts, often including or bordering on concepts in infection biology, contagious diseases, zoonotic infections, evolutionary medicine, comparative medicine, and translational medicine [7]. There are also other related terms, such as “holistic health” and “global health.” Some scholars report that the OH concept, formerly referred to as “One Medicine” in the latter part of the 20th century, has gained extraordinary acceptance in the early 21st century, and many academic and non-academic institutions have developed supposed OH programs [8].

Regarding One Health Information Management (OHIM) policies, there are studies concerning the implementation of public health solutions that require governments to understand techniques including OH. Animal health, ecosystems, and human health must be linked together to solve problems and should be the driving force behind OHIM policies [6]. In particular, cost reduction and increasing acceptance of such policies are important [9]. The implementation of the plan

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is an important management aspect where planning for OHIM is required to perform data-related actions, such as in the dissemination of information. The suggestion to use OH as a tool of government managing is achievable through the planning of laws, protocols, standard operating procedures, flowcharts, and organization charts for the government, private sector, and civil society; public policies at the local, national, and international level, including transdisciplinary actions; and technical strategies for mutual and intersectoral cooperation [10].

Research focused on OH has included many regions, such as the United States, Europe, Australia, New Zealand, and Africa. Most of these studies were activities, training, and research [8,11-16] from organizations, particularly universities, yet a few studies focused on policies [17]. In Asia, there are a select number of studies on OH, and there are a few policy-related studies connected to OH [16]. However, there has been no specific study regarding OHIM or OH-related data management in the current literature.

Therefore, this study focused on developing OHIM and related strategies established in Thailand, which may serve as guidelines for OHIM development to promote OH for staff, data, integration, and OHIM network formation. This approach will generate big data and systematic procedures, driven by strategies from the government and senior officials to ultimately support social well-being.

Materials and Methods

Ethical approval and Informed consent

The study was approved by the Mahidol University, Social Sciences Institutional Review Board (approval No.2015/281.2508 and MU-SSIRB No.2015/307(B2)) and was conducted in full compliance with the international guidelines of human research protection. After the committee authorized the use of informed consent with detailed information risks, the confidentiality of the information, and signing as evidence. It was obtained from the samples, key informants, and authorized persons to allow the collection of data in the sample organization before collecting the data obtained for analysis in this study.

Study period and location

This mixed method study conducted based on survey, interview and observation participation in organizations from all regions of Thailand, from July 2016 to June 2018.

Scope of study

The scope of the study included understanding the OH concepts of human, animal, and environmental health personnel; actions related to OH and OHIM in Thailand; and OHIM strategic development guidelines by studying personnel and experts in OHIM. The entire country was included in the study which will aid in the formation of strategies to perform OHIM to drive OH in Thailand.

Methodology

This research used a mixed methods approach with both quantitative and qualitative research methods. As part of the quantitative design, questionnaires and observation forms were used to understand OH knowledge and related information, and the status of operations related to OH information. Interviews, focus groups, and conference groups were used as part of the qualitative methods to identify guidelines for developing strategic plans of OH information and OHIM systems structured by OH information policy.

For the quantitative study procedures, the questionnaire was conducted in each region with participants recruited using the snowball method. The sample size calculation was performed using the equation: $n = (Z^2/4E^2)$, with a significance level of 0.05. The target sample size was at least 385 participants. Therefore, the study used a sample size of 400 people consisting of 200 human health experts, 100 animal health experts, and 100 environmental health experts.

For the qualitative study procedures, experts in each field (including agencies in four regions) were recruited. A snowball recruitment method was used to obtain a list of individuals in each group and region, until a total of 40 participants were reached. Then, six agencies determined by the experts were selected. Fifty experts were selected to attend a conference. Purposive sampling was used according to the sampling frame, consisting of 20 human health accounting experts, 10 animal health accounting experts, and 10 environmental health accounting experts. Regarding offices, organizations, or agencies in these three fields, there were three agencies at the ministerial level and three agencies at the regional level.

The specific questions including in the questionnaire and discussion points at the conference meetings and focus groups were the problems, strength, weakness, and development approach for OH and OHIM. The data collected were used to prepare a draft prototype of the OH information strategic plan. Then, a focus group was conducted for further information. In addition, a group conference was held to obtain comments on the research work document, to improve the research, and to create a summary.

Statistical analysis

Data analysis included four steps: (1) Content analysis, (2) typology and taxonomy technique, (3) descriptive statistics (frequency distributions, percentages, means, and standard deviations), and (4) means comparison analysis between two groups using *t*-tests, analysis of variance, or *F*-tests (when comparing more than two groups), and multiple comparisons or *post hoc* test at $p < 0.05$ using homogenous subset results.

Results

Comparison of attitudes between staff in each field related to OH in Thailand

As shown in Table-1, there were differences between the staff in each field regarding the

opinion level of information operations using the OH approach. Specifically, the opinions of animal health staff (including veterinarian, researchers, veterinary staff, and livestock staff) were at the highest level, which differed from staff in all other fields. Regarding the environmental staff (academics and environmental workers) and medical staff (doctors, academics, and medical and public health staff), their opinions about information operations in the OH approach were at the same level.

Level of attitudes towards OH implementation in Thailand

As shown in Table-2, the general operations and operating OH information in Thailand remained at the medium level, and the problem of operations (according to the OH approach and the information problem) was at a high level. Moreover, demanding that operations follow the OH approach was also at a high level.

The important status of OH operation in Thailand requires building a network and establishing a mutual agreement between eight agencies, including the Ministries of Education, Interior, Social Development and Human Security, Labor, Agriculture and Cooperatives, Natural Resources and Environment, and Public Health, and the Thai Red Cross Society. OH center has been established within the agencies of the Ministry of Public Health. Researchers in universities joined together to establish the Thailand OH University Network, which operates at the provincial level. It has also been introduced as an operation of the national health assembly. However, there are personnel in affiliated agencies in health and related fields, including the public, who do not quite understand this matter. Regarding this information, disease reports

have been prepared. Data storage has taken place in the OH Village project, but this was only made possible between agencies affiliated with universities and those conducting research.

Regarding health data, there are separate operations in epidemiology involving sickness data from clinics, and environmental data related to health. Database storage from government projects has taken place, such as from the 30-Baht Healthcare Scheme policy, National Health Security Office, and the National Statistics Office and District Health System. Certain provinces such as the Chiang Mai Province allowed people to report diseases from communities through smartphones. Regarding the preparation of epidemiology data during disease outbreaks ordered from the Ministry of Public Health or the government, data management has not been continuously conducted. Data management involved a separation between human health, animal health, and environmental health. Standards are not the same in each field and do not use a mutual database. In addition, data sharing for integrating health has not taken place. There are more connections between the environment and health, according to the legal requirements of the Environmental Impact Assessment and the Environmental and Health Impact Assessment.

A notable problem in operation is the different definitions for both health and OH. There are related words such as holistic well-being and social well-being, among others. Each group mutually agreed that the problem is a lack of coordination among human health, animal health, and environmental health professionals. Each science has different concepts, viewpoints, and operations. There are currently no personnel to act as the center of this collaboration. Therefore, it is essential to establish specific agencies that coordinate collaboration between these fields. Workers tend to perform specific tasks that they are familiar with, and when adaptation is required for mutual operations with more integration, staff face the operation problem. Using the science of medicine for coverage and making an effort to extensively explain health problems may not include animals and the environment. The Ministry of Public Health does not place sufficient importance on environment professionals because the agency thinks that there are environmental health or environmental sanitation workers available who have already addressed connections to the environment. Thus, most operations rarely have participating environment and social sciences personnel.

Moreover, OH also does not include social matters, namely, behaviors, law, economics, and administration. Society is directly involved with health. There is a shortage of experts with direct expertise in OH. There are also problems regarding the work structures of each organization. Excessive division of government agencies brings about areas or responsibilities with no requirement for other agencies to get involved. Introducing OH concepts in courses is difficult because there are already a designated number of credits in each field and subject category. OH is not

Table-1: Multiple comparison of implementation in one health information between workers or staffs in each sector by Duncan method at alpha (α)=0.05.

Sector	Group 1	Group 2
Workers or staffs in the environment related to the health sector	3.858	
Workers or staffs in the human health sector	4.055	
Workers or staffs in the animal health sector		4.150

Table-2: The level of attitudes about the comments on each issue (n=400).

Issue	Mean	SD	Level
The status of implementation in one health	2.63	0.988	Medium
The level of implementation in one health information	2.99	1.144	Medium
The level of the problems according to the one health	3.49	0.914	High
The level of problem to implementation in one health information	3.82	0.867	High
The level of the need according to the one health	4.10	0.787	High

required by law, and if it were, every sector or agency would have to implement it, yet cooperation would be required for its implementation.

Therefore, difficulties with supervision are likely. The lack of data entry regarding epidemiology from every sector was found. Only data from public health were found. In fact, for real operations, there are related data in every sector, which cover more than public health alone.

While developing the OH information strategic plan in Thailand, it is important that the plan be compatible with the operations of every level of agencies, ministries, and regions. The plan should cover the ongoing operations, which are Prevention, Detection, Control, and Response, including the coverage of epidemiology, psychology, and social science. There are solutions that involve removing the cycle of the Host, Agent, and Environment from the full cycle. There should be an implementation plan about the call center or the OH center, which can receive materials for implementation or management. In addition, there should be policy implementation from high levels or national levels.

Moreover, OH should be a part of the mission of the sub-agencies and should be designed to be understood identically in every concept according to current vocabularies, which are health concepts according to the implementation of the strategic plan and data storage of the standard plan or having the same pattern. There should be a plan for another generation having the concept of a multidisciplinary approach to directly create people to work according to the OH concept. This approach can build credibility for the strategic plan in coordinating with agencies that already have available data, and local OH implementation should be enforced. Aside from a short-term plan, a long-term plan should be developed, which will build security and confidence from every joining party. An analysis plan should be developed and closely monitored. Regarding the OH information strategic plan, there should be a study conducted on the data circulation to establish the pattern of implementation and the information system. For this plan, brainstorming should take place to prepare the data system for each issue, such as for finding sick wild animals.

By developing OH entirely in Thailand from an important study, there should be Core Competency implementation by trying to understand personnel from other fields to develop work according to the OH concept. Regarding the need for OH-coordinating network, it should not be operated within the Ministry of Public Health alone, but should be operated under various ministries in collaboration. The objective is to expand the concept in terms of social factors, with more forms of Social Determinants of Health. This objective can be met by inviting every profession to participate (e.g., doctors, veterinarians, environmentalists, and social workers) at the national level.

New fields should be established as being multidisciplinary from the beginning to create the group

with the appropriate multidisciplinary approach to build an OH program from the start. There should be a surveillance center system, which is the only system used to reported on humans, animals, and wild animals so that data mapping can be complete and used efficiently. Information should be shared among organizations. This can begin with the establishment of a data center by gathering professionals from various disciplines to operate the information system together. The OH concept should be included in the courses of all fields, and there should be integration in terms of learning and teaching between fields to improve the understanding of the OH concept. Mutual data collected in the same area can be carried out in an experimental area first. Interest in health among the public should be generated, which can affect health.

For information on human health, animal health, and environmental health, the OHIM strategy should be drafted. This can be achieved by participating in observation and conducting research about the information management of agencies at present related to human health, animal health, wild animals, and environmental health. The important summary consists of:

1. The management of basic medical data to be stored by the Ministry of Public Health and National Health Security Office, which report the number of individual files by having medical records at the center. The main data consists of the outpatient disease group and the inpatient disease group, table of illness causes, epidemiology data, death data, and disease control data
2. The livestock data managed to store farmer data, registration marking, livestock standards for importing, mobility, farms food animal protection and treatment, and the data of rabies
3. The wild animal data regarding research data especially for wild animal research work, Wild Animal Conservation Office, National Parks Department, Wildlife and Plant Conservation, operation data of emerging diseases prevention and control in natural animals, data of a screening survey of emerging diseases in natural animals with the actions taken by the Conservation Area Management Office from across the country
4. The environmental information with various storages of forestry data, water quality, seawater quality at mangrove forests, air quality, garbage data in terms of amount and trend, data from the Pollution Control Department, and data from the Meteorological Department about weather and natural disasters
5. The data for managing natural resources and environment for the database system of Policy and National Resources Plan and Environment for data of environmental impact analysis, data of policies and natural resources plans and the environment, and data of the natural environment for the geomorphic type

6. The data from the research divisions such as the Environmental Research Institutes of Chulalongkorn University, Environment and Health Research Division of Chiang Mai University, Environmental Research Division, National Metal and Material Technology Center, National Science and Technology Development, Energy and Environment Research Center of Thaksin University, Center of Excellence for Ecoinformatics of Walailak University, the Ecoinformatics group of Walailak University
7. Data from the Government Contact Center (GOV Channel), which collects data from government websites, provides services, including data bank, which can be propagated such as data of land used to be checked, geographical information, soil series of the Land Development Department, national water and weather data of Water Resources and Agriculture Information Institute, policy, plan and measure data related to national resources and the environment of National Resources and Environment Policy and Plan Office, water conditions data of Water Resources Agriculture Information Institute, water resources and agriculture data, data of Research and Highland Development Institute, residential data of National Housing, marine and coastal resources of Department of Marine and Coastal Resources, water situations of Royal Irrigation Department and data on projects and research work of Pollution Control Department, Pollution Control Department, and Royal Irrigation Department.

Regarding the summary of drafting the National Strategic Plan on OHIM for various countries, from this study, it can be summarized into four important strategic aspects as follows:

Clear concept

Refers to mutual understanding, pushing the concept of OH information with data and made public proactively with the aim of the first strategy, which is those involved with human health, animal health, and environmental health. Moreover, there are three strategies determined to drive these strategic aspects, as follows: Strategy (1) developing knowledge and clarity regarding the OH concept; strategy (2) developing information to be made public proactively; and strategy (3) information for coordinating the OH concept with the health concept in other aspects to create cohesion.

Producing professionals in every aspect

Refers to producing professionals in every aspect to develop centers to manage OH information collaboratively from every sector, including human health, animal health, and environmental health, with the aim from the second strategy, which is having personnel who can manage OH information together with every sector by covering human health, animal health, and

environmental health. Moreover, there are three strategies determined to drive these strategic aspects consisting of: Strategy (1) human capital development in terms of information management; strategy (2) information development for creating OH personnel; and strategy (3) transdisciplinary integration.

Workflow establishment

Means establishing work systems to develop an information system with quick, correct, and complete management in supporting of the national OH operation. The information system developed under this strategy could support the national OH operation in various countries. Moreover, there are three strategies determined to drive these strategic aspects which are: Strategy (1) data network development; strategy (2) developing the network operating the information system; and strategy (3) OHIM with innovation.

Academic with sustainability

Refers to developing academic content about OHIM for preparing to educate, developing research work, and coordinating agencies with research divisions to operate according to the OH approach in a sustainable manner. The main aim of this strategy is to develop academic content about information management to operate according to the OH approach. Moreover, there are three strategies determined to drive these strategic aspects which are: Strategy (1) integrating and exchanging research data to support the sustainability of OH; strategy (2) strengthening cooperation in developing OH research work; and strategy (3) developing books, textbooks, and academic documents about OHIM.

Discussion

Regarding animal health personnel who had the highest level of understanding the importance of OH, a previous study revealed that veterinarians played an important role in caring for human health, animal health, and environmental health [5]. Based on our result, it was found out that attitudes reflected the importance of OH in the national overall health system and there should be education specific to the OH concept. This is in line with the findings of Osburn *et al.* [18], who showed that actions should be taken for development at the school and university levels to improve mutual working. Moreover, there should be continuous actions from physicians, public health personnel, and veterinarians at the school and university levels as well as by government agencies, agencies under supervision, and researchers including allies of health institutes.

The current study revealed that health has become more complicated. There should be cooperation or integration from every party in carrying out OH to solve the problems. This is similar to the study result of Kamani *et al.* [19], which showed the importance of this concept in conducting the health aspect in

Africa, challenging the operation of the health aspect greatly. Regarding the problem of important diseases, there is a connection between animals and changes in the ecosystem. A study by Meisser *et al.* [20] showed the importance of this concept in managing the health system of Switzerland and in developing the health system with OH based on cooperation from several parties. This was also included in a study by Osburn *et al.* [18], who showed the importance of the health system and how it relies on the interdependence of people, animals, and the environment, with more importance at present. Due to the problems threatening the world, safety must be placed above all else.

In a case study by Torres and Otranto [21], they showed the importance of climatic changes, deforestation in the tropical zone, transforming forest areas into urban areas, migration of population, animal migration, and losses of biodiversity, which can affect behavioral changes and small animals having diseases contagious to humans. Sherman alluded to the fact that OH is important for millions of human lives and has an impact on livestock production and human health, animal health, and environmental health. This is the reason why veterinarians should use the OH concept to address emerging diseases [22].

Chalmers and Dell [23] showed the requirement to work collaboratively in the OH conceptual frame with a connection to the environment with humans and animals. Actions should be performed in taking care of animals by creating an organization that harmonizes with social, cultural, political, economic, and environmental factors. Sherman [22] showed that it is necessary to work together by integrating human health, animal health, and environmental health through modern technology. Increasing or unexpected epidemics of contagious diseases can occur and spread rapidly among the human population and animals around the world through tourism and international trade. Emerging contagious diseases can be complicated and related to humans, animals, and the ecosystem. Therefore, individuals in every affected sector must find a way to prevent the spread of such diseases for the sake of the entire world. Slenning [24] revealed the importance of integration with this matter specifically that OH helps to promote, improve, and protect health and life for humans and animals by building cooperation and mutual working among physicians, veterinarians, and experts in the health sciences and public health. This is in line with a study conducted by Ruscio *et al.* [17], who found out that there was a gathering of regional networks of stakeholders and transdisciplinary experts from the northern hemisphere to deal with threatening climatic conditions related to health risks. They presented the OH concept as having interactions with the people in the arctic area, animals, and the environment to promote understandings about the mentioned principles.

The results of this study revealed that the environment has become more important to health. Therefore,

it is necessary to include environmental professionals so that they can play a more important role. This is in line with the study of Ruscio *et al.* [17], who found out that in the northern hemisphere, there were specific characteristics of risks about health impact caused by climatic changes. When the connection between environmental conditions, plants, animals, and health is taken into consideration, the impact of climatic changes has complexity, and it is difficult to make an accurate prediction in terms of health risks as well as changes in disease dispersion with disease expansion. A study by Mazet *et al.* [25] was conducted on data collection and the demography pattern in the HALI project in Tanzania. They found that environmental changes had an impact on an increasing number of people living close to animals and forest areas. Land use, including raising livestock and increasing crop production, was so great that the natural ecosystem balance was changed, which increased the spread of diseases between animals and humans. Emerging diseases in humans occurred, and over three-fourths of the occurring disease resulted from diseases originating from wild animals. This represents the emergence of new threats and emphasizes the importance of health to a large number of people.

From the study, many problems were revealed in terms of different understandings, including the fact that personnel in several sectors did not quite understand the OH concept. There are needs for knowledge development, and there was a shortage of personnel with the knowledge of OHIM. This result is in accordance with the study by Meisser *et al.* [20]. The findings of this study revealed that there was a shortage of personnel with the knowledge and understandings of OHIM. They were not ready to operate the development of the OH system. This is also in line with Slenning [24], who revealed the lacking of personnel in implementing OH. Previously, 33 states in the United States of America reduced the budget for public health, resulting in a reduction in local personnel of public health agencies. As a result, there was a shortage of continual cooperation among workers regarding human health, animal health, and environmental health. This is regarded as an ideal opportunity for biologists, epidemiologists, and health professionals to apply the OH concept to new healthcare with new perspectives, more coverage, and being united by OH.

Our study found that the government or a national policy should establish the operations to correspond with the OH approach. Our result is similar to that of Hueffer *et al.* [15], who showed the requirement to implement this at levels, including at the national level in the United States of America. From the study by Kamani *et al.* [19], it was revealed that national or international operations pushed by every party and placed importance on would have a chance to succeed. OH operations have brought about a lot of development in addressing health together in Africa, including efficient workplaces between ministries and animal

diseases-to-humans divisions. They have been developed rapidly. A national integrated plan for controlling and eradicating rabies is an example of its success, and it also affects developing and conducting research on mutual innovation among sciences or trans-sciences, as well as opportunities for OH in the African continent by new organizational professionals [18].

The results of this study on policy-making at the national level should be integrated from diversity into a network to be re-implemented together [26]. Because although academic principles dictate a solution to a problem, there are issues that may require political action to develop networks of action and make solutions to national public health policy problems through the implementation of OH [27]. Moreover, the results of this study found that should create policies to educate both learning and training, as well as a policy to support research networks to assist the implementation of OH as a public policy [6]. The government should be responsible for providing a forum and encouraging the exchange of views across all sectors, from the public, private, and civil society sectors to developing the OHIM plan.

Regarding our results of the OHIM approach, this should be developed in earnest due to its importance on health service systems. This is in line with the study by Mazet *et al.* [25], who showed that having health-care data available would help prevent the spread of diseases. Investing in the health project would give the best opportunity to create changes affecting the development of the health system. Moreover, from this study, we found that propagating the data related to the operations, according to the OH concept, would improve understanding and participating of the operation among communities or people. This is in line with the study by Mekar and Brownstein [28] that showed how the media could bring about online communities that are able to build environmental development and to establish OH of communities. The strong point of the media is bringing about more perceptions concerning contagious diseases since website searches can be quickly made. People can access data sources, helping to understand situations and check for diseases. This is regarded as data support for health experts and researchers in performing health tasks. Online media creates important opportunities for participation and extends the OH matter to communities so that they can participate online.

Conclusion

It is evident from studying OHIM that it is necessary to have relevant national strategies and learning exchange programs to clarify the concept of OH from the human and animal health sectors along with the workers or staff members in the environment sector. Notably, most of the actions performed, such as establishing agreements with the Ministry of Public Health and eight main agencies, most of which are at the ministry level; data storage; and establishing

university-level networks; are beneficial to driving the national OH. Unfortunately, the main problem is that stored data are less utilized for driving OH considering that investment in data storage and management is spread, although without integration and consistent management, to many organizations. The aforementioned data include data related to medicine, cattle, wildlife, environment, and environmental resource management; data from OH researches; and open sourced government data. This OHIM strategy development will consider four key issues: (1) Clarifying the concept of OH, (2) development of the OH staff, (3) development of OHIM data network and innovation, and (4) development of research and academic work and global OHIM academic exchange. All parties involved, including senior officials, would need to work together to resolve OHIM problems. This would consequently ensure that health system reforms will be successful, and thereby result in the improvement of social well-being.

Recommendations

Suggestions from the research conducted on OHIM and the results obtained from the study are as follows:

1. Knowledge should be shared and mutual understandings should be made across disciplines in terms of the OH concept. Environmental and social science personnel should work to participate more
2. Given that health data have more complexities, a data system should be developed so that every sector will be connected. Information innovation should be introduced with mutual integration so that data can be exchanged between agencies and sectors
3. The government should emphasize the importance of implementing the health aspect with the OH concept at the national policy level and with more international cooperation
4. Regarding conducting the OHIM, agencies with mutual domestic operations should collaborate, whereby ministries and agencies have equal roles in implementation by complying with the driving plans and strategies, or establishing health agencies with planning to drive health reforms to support social well-being.

Authors' Contribution

SY designed the study, collected the samples, analyzed the data. SA provided manuscript consultation and coordination. Both authors read and approved the final manuscript.

Acknowledgments

This research project received support from the Office of Higher Education Commission and Mahidol University under the National Research University (Grant no. NRU 2558-2559). We would like to thank

the informants and experts, namely, medical personnel, veterinarians, environmental personnel, and medical social science personnel.

Competing Interests

The authors declare that they have no competing interests.

Publisher's Note

Veterinary World (Publisher of International Journal of One Health) remains neutral with regard to jurisdictional claims in published institutional affiliation.

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