

***A mixed-method evaluation of the One Health-ness at  
the Faculty of Veterinary Science, University of  
Pretoria***

**By**

**Dr Aqil Jeenah**

**Submitted in fulfilment of the requirements of the degree of  
Magister Scientiae (Veterinary Science)**

**in the**

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## DECLARATION

I hereby declare that this dissertation, which I submit for the Master of Science degree in the Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, is my own work and has not been submitted previously by me for degree purposes at this or any other tertiary institution.

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Aqil Jeenah

**Date: 27 September 2021**

## **ABSTRACT**

### **A mixed-method evaluation of One Health-ness at the Faculty of Veterinary Science, University of Pretoria**

By

**Dr Aqil Jeenah**

Supervisor: **Prof. A. Michel**

Degree: **MSc (Veterinary Science)**

Department: **Veterinary Tropical Disease**

One Health (OH) is a concept that emphasises the interconnected nature of human, animal and environmental health. To achieve complete health through a OH approach, transdisciplinary work is required to ensure that different fields of health are cognisant of the impact that factors in other fields have on each other and that risks are addressed holistically.

This study intended to create an appropriate understanding of the OH-ness at the Faculty of Veterinary Science, University of Pretoria (FVS) to measure the impact of current and future strategic OH initiatives. The OH-ness refers to the overall orientation of the faculty towards the OH concept, through research and other academic activities.

This study has provided an understanding of the current state of OH-ness at the FVS by examining three main areas that allowed for a comprehensive and diverse evaluation of OH at the FVS. These three areas were evaluated using a combination of quantitative and qualitative data. A systematic review conducted between January 2010 and March 2020 of scientific research publications from the FVS was used to determine if there was an improvement or digression in OH related research publications, as well as an improvement or digression in the focus areas of these publications. Semi-structured interviews were performed with various staff members involved in OH activities

within the FVS in order to determine the drivers, objectives and barriers faced by the various OH activities. A quantitative assessment of the OH activities was performed to evaluate their OH orientation.

Two baselines were created. Data related to the total number of OH-related research publications and the focus of these publications were collected. A second analysis was conducted on the OH orientation of activities at the FVS. These data sets provided a baseline that will allow for future studies to compare the progress of the OH orientation at the FVS.

Over the period under review a total of 1670 articles was published, with 197 (12%) being OH-related. The research identified that while there was an improvement in diversity and transdisciplinary efforts of scientific publications over the last 10 years, the growth fell below the global growth of OH-related research. There was an overreliance of OH research from a single department within the faculty and a lack of focus on environmental health research.

Five OH activities were identified through a review of scientific publications from the FVS. The project leaders of the OH activities were interviewed through a semi-structured approach in order to understand the reasons for initiating the project and potential barriers. Four of the areas were research-driven and did not involve undergraduate veterinary science students. The fifth area was aimed at advancing the knowledge of undergraduate veterinary students about zoonotic diseases. Objectives of the OH activities varied from scientific gap to action. The FVS has the potential to grow its OH-ness because it has the experience, skills and knowledge. However, there was a lack of special OH funds or faculty level OH plans.

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## LITERATURE REVIEW

The following chapter outlines the review of the present literature in two themes. The first theme evaluates the One Health concept, the role-players in the OH concept, where it originates from, and what it seeks to achieve. Furthermore, it evaluates the impact of the absence of a unified definition of OH. The second theme consists of reviewing programmes within different sciences and concludes with an evaluation of what is currently being done within the OH programme.

### **The One Health concept**

The term “One Health” is a recent development, but the concept that human, animal and environmental health is intrinsically linked has been accepted for over two hundred years (Atlas 2013). “One Health” was first described, used, and associated with Severe Acute Respiratory Disease (SARS) in 2003. There was further development and mention of the term “One Health” emerging from a 2004 meeting by the Wildlife Conservation Society that created a series of strategic goals called the “Manhattan Principles” (Mackenzie and Jeggo 2019). In 2009 there was a growing number of detractors of the OH concept who pointed to the lack of action. In response several multi-national work groups were created with the aim being to operationalise the OH concept (Rubin 2013).

Initially, the term “One Health” emerged due to the increasing evidence that over 75% of new infectious diseases found in humans were zoonotic, which means that they originated from animals (Woolhouse et al. 2001). The drivers for the increase in zoonoses had to do primarily with an increase in human activities in sectors such as agriculture, urbanisation, growing populations, and trade, amongst others, and the increasing scale of human and animal interactions (B. A. Jones et al. 2013).

In causal loops, all interventions have effects on other aspects of the system (Haraldsson 2004). OH can be described as a causal loop, where knock-on effects of health intervention are felt across the health system and into other

spheres of health (Destoumieux-Garzón et al. 2018). This has contributed to a deeper understanding that these three spheres of health cannot be treated as individual unconnected silos.

Over the course of history there have been many examples of the detrimental effects of failing to conduct a full evaluation of potential effects on health. For example, dichlorodiphenyltrichloroethane (DDT) had a severe impact on the health of both human and animal populations (O'shaughnessy 2008) where it was originally used to prevent malaria infection through the control of mosquitoes but led to child deformities. The use of diclofenac sodium - a non-steroidal anti-inflammatory - in cattle for medical management of inflammation devastated three vulture populations in Pakistan and India (Ogada et al. 2012).

As described by Zinsstag (2011),(Zinsstag et al. 2011) projects that work together in a OH approach are able to achieve better results than those projects that work individually within their silos of health. The idea of synergy arithmetic, that two silos working seamlessly together is more geared to produce a result far greater than the sum of the individual effects, in other words “1+1=3”, is promoted through the OH approach to health and systems. When evaluating public health networks (PHN), the benefits through collaborative efforts can be seen through lower costs, shared resources and increased knowledge sharing which ultimately increase the value of the PHN (Bevc et al. 2015).

### **Role of Veterinarians in One Health**

The increasingly multifaceted roles played by veterinarians at the intersection of diverse health fields has led to veterinarians playing a pivotal role in the development of the OH concept and the facilitation of it into practical use (Gibbs and Gibbs 2012). While other professions play an important role in the OH concept, the veterinary profession is of central importance (Monath et al. 2010). Veterinarians are located at the intersection of this issue as they are the only healthcare profession to interact with both animals and humans (Frank 2008).

Almost two-thirds (60.3%) of all infectious diseases found in humans are zoonotic (K. E. Jones et al. 2008). Veterinarians also play a vital role in the health of the environment by lowering potential environmental contaminants such as antimicrobial residues in waste water (Thanner et al. 2016).

The utilisation of veterinarians in controlling disease spread in food producing animals and wildlife is essential to food safety and security, especially in sub-Saharan Africa (Kriek and Swan 2009). In addition, when strong veterinary leadership is absent during the planning of health interventions the consequences can be devastating.

While the veterinary profession is a major force within the OH movement, it is at present more fragmented and specialised than previously. In order to ensure that the profession takes advantage of its pivotal role, it needs to be prepared for the future by focusing on five areas, namely: public health, biomedical research, global food safety and security, ecosystem health, as well as its more traditional role of caring for animals (King 2009).

### **Defining One Health**

A matter that persists and grows more extensive with the further development of the OH concept and the involvement therein of multiple professions is the absence of a universally accepted definition of OH. As described in Xie, Liu, Anderson, Liu and Gray (2017), the OH concept was snowballing, and the wide-ranging synergistic field of different disciplines involved in OH was growing. Due to this rapidly growing field, the “interpretation of the OH concept remained unclear because its internal relationships between this growing list of various components have not been systematically described”. The lack of a definition of a concept in research and action has long been associated with the creation of barriers to a successful outcome (Podsakoff et al. 2016).

In an evaluation of One Health Networks (OHN) (Khan et al. 2018) across Africa, Asia and Europe more than 14 different terms in a combination of “and” and “or”

were utilised to identify OHN. While 71% of OHN utilised the term “One Health” to define their approach, 6% utilised the term “Eco Health”, “planetary health” or “One Medicine”. Only 7% of the organisations identified as OHN utilised none of those aforementioned terms. The identified OHNs were involved with thirteen (13) different and distinct activities. Although achieving the aim of the research, this wide variety of terms demonstrates the challenges faced by those attempting to define the OH concept.

Although this variety of definitions presents challenges, it also indicates the different views and understandings of what exactly contributes to health. By having these varying definitions, the need for professionals from different backgrounds to come together to evaluate, design and solve health challenges is emphasised.

The leading organisations that advocate for a OH approach have a variety of definitions, as presented in Table 1 below. The Centers for Disease Control and Prevention (CDC) in the United States of America, which is recognised as a leading scientific organisation, defines OH as follows: “One Health is a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—to achieve optimal health outcomes recognising the interconnection between people, animals, plants, and their shared environment” (Diseases 2021)

One common thread that extends through many of these organisations’ definitions is the link between human, animal and environmental health and highlights the need for an approach that utilises different disciplines working in a transdisciplinary manner to tackle health problems. In the above definitions, environmental health is referenced as a linkage between human and animal health. There is a limited focus on how the degradation of environmental health such as pollution, has an impact on human and animal health. This is seen in those working in the field of OH and the area of research within the OH concept.

**Table 1: Definitions of One Health from various global organisations**

<b>Organisation</b>	<b>Definition</b>
American Veterinary Medical Association (AVMA)	One Health is the integrative effort of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals, and the environment (Association 2021)
World Health Organisation (WHO)	'One Health' is an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcome (Organisation 2021)
Centers for Disease Control and Prevention (CDC)	One Health is defined as a collaborative, multisectoral, and transdisciplinary approach — working at the local, regional, national, and global levels — with the goal of achieving optimal health outcomes recognising the interconnection between people, animals, plants, and their shared environment (Diseases 2021)
World Organisation for Animal Health (OIE)	That human health and animal health are interdependent and bound to the health of the ecosystems in which they exist (Health 2021).
One Health Commission (OHC)	One Health is a collaborative, multisectoral, and trans-disciplinary approach – working at local, regional, national, and global levels – to achieve optimal health and well – being outcomes recognising the interconnections between people, animals, plants and their shared environment (Commission 2021)
One Health Initiative (OHI)	The health of people, animals, and the environment is intertwined. A health hazard for people may likely be a health hazard for animals. For example, smoking is not only harmful to people; it's harmful to pets too. Medical advances in understanding and treating a disease in one species, such as heart disease in people, may be applied to other species. And a change in the environment can affect all living things, from people to animals to plants. (Initiative)

## Thematic approach to One Health

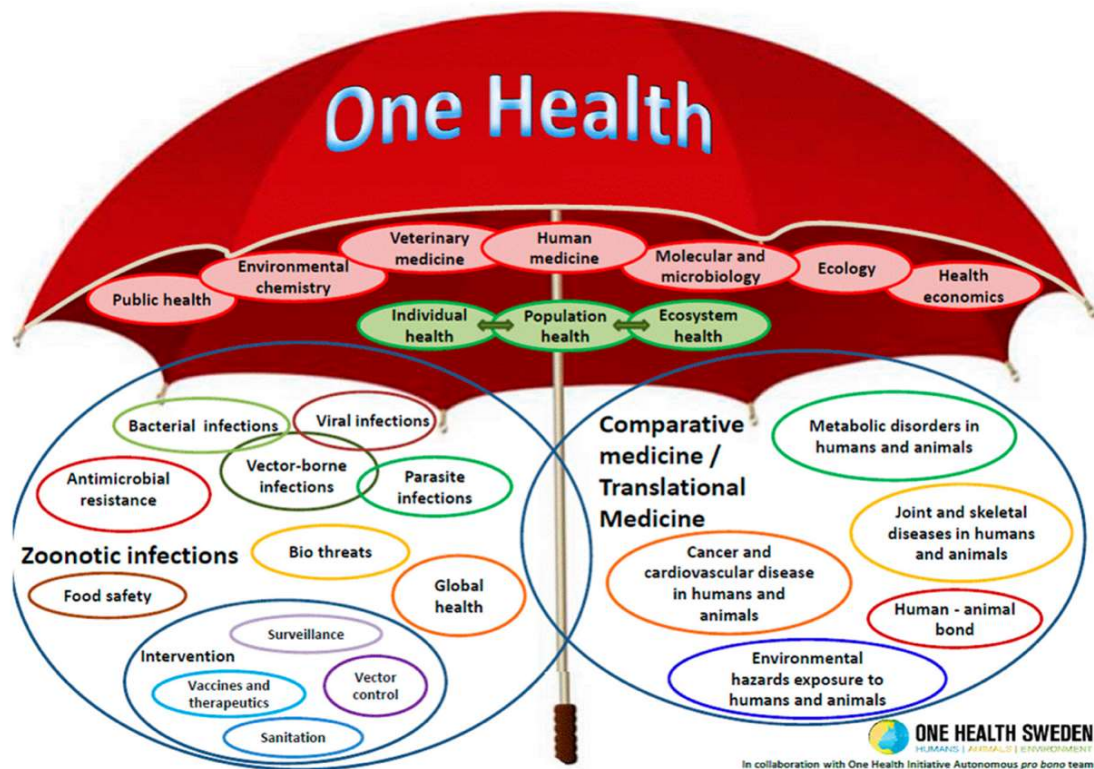
Considering the lack of a universal OH definition, it is necessary to recognise what could fall within the OH concept, so that proper recognition of OH research and activities are taken into account, and gaps within the OH concept are identified. A different outlook, using a thematic approach as described by Braun and Clarke (2006) was used to frame the OH research and activities within the FVS.

The well-recognised “One Health Umbrella” (Initiative) that One Health Sweden and the One Health Initiative developed was utilised to assess the different themes that would fall within the OH concept as depicted in Figure 1 below. Infectious diseases, of both zoonotic and socio-economic importance, have been a consistent theme identified through both the “One Health Umbrella” and as part of the driving force of the OH concept from the outset. As first identified through the umbrella and further expanded on by (Lammie and Hughes 2016) the convergence of food safety, food security and antimicrobial resistance is an issue that spans multiple spheres and aspects of health (Robinson et al. 2016; Yates-Doerr 2015).

The umbrella provides direction to the connection of the three spheres of health and how there is knowledge that can be shared and transferred between humans and animals, both domesticated and wild. In addition it extends research to various aspects of the environment (Stroud et al. 2016b). As described in the report by (Ryu et al. 2017), the emerging threats to public health can be approached through a OH lens.

Themes involved within the OH concept have been continuously expanding. Climate change, which has a significant impact on all three spheres, has been recognised for over ten years as a fundamental threat to the health of all living species, globally (Patz and Hahn 2013); (Yates-Doerr 2015) .

While these broader themes do exist, they are extended aspects. This is not, however, the case with the aforementioned topics, each of which form an integral part in the foundation of the OH approach. Due to their role, these topics have been extensively developed and discussed.



**Figure 1: The One Health Umbrella, developed by One Health Sweden and the One Health Initiative Autonomous pro bono team (Initiative 2021).**

## Evaluation of One Health

A review of current publications evaluating the extent of OH was performed through searching for the term “One Health” and ‘Evaluation’, along with synonyms of these terms through multiple search databases such as google scholar, PubMed, Scopus and Web of Science, returned a limited set of results. Many of the results that were found, were found to be an economic evaluation of a “One Health” approach for a specific disease intervention - such as brucellosis, schistomaiasis, and West Nile Virus amongst others (Baum et al. 2017; Buttigieg et al. 2018; Gower et al. 2017; Patemoster et al. 2017; Wasimuddin et al. 2020). Although a severe limitation on evaluation of OH at academic institutions exists,



there are publications discussing the needs of OH focussed education in academic institutions.

In (Podsakoff et al. 2016), an analysis of what is required to develop transdisciplinary action was performed. Three focus areas for academic institutions were identified that can be utilised as markers for an academic institution's evaluation as presented in Table 2 below.

**Table 2: Three focus areas identified for academic institutions to promote transdisciplinary working and the OH concept (Podsakoff et al. 2016).**

<b>Transdisciplinary Capacity Building Category</b>	<b>Required Change</b>
Enabling Environment	<ol style="list-style-type: none"> <li>1. Ensure the creation of strategic planning documents that articulate transdisciplinary research priorities and include the governance and structural support such as institutions, centres, field schools, research groups, and support for journal and hosting scholarly publication development.</li> <li>2. Create an environment for joint appointments between faculties and disciplines with the express purpose of developing new curricula, task groups, research teams, graduate positions, and postdoctoral fellowships focused on One Health</li> <li>3. Ensure that promotion, award, and recognition criteria include transdisciplinary work as meritorious. This must include recognition that transdisciplinary work takes longer to yield results, that research papers are likely to be multi-authored, that high-impact journals tend to focus on disciplinary science, and that the impact of programs can be challenging to metric within</li> <li>4. university review cycles, especially where long-term sustainability of positive outcome is the goal.</li> </ol>
Developing sources of funding	<ol style="list-style-type: none"> <li>1. Foster networks, professional and research groups, and funding opportunities to identify and provide incentives for leadership in transdisciplinary scholarship locally, nationally and internationally.</li> <li>2. Invest in catalyst funding opportunities for new and emerging One Health teams, students, and conference attendance.</li> <li>3. Advocate One Health funding opportunities from national research organisations that prioritise</li> </ol>

	team science and engagement with communities and policy makers from the beginning.
Training “transmitters”	<ol style="list-style-type: none"> <li>1. Develop mentorship programs that link individuals from different disciplines together</li> <li>2. Provide additional training in research leadership for enhancing transdisciplinary teams that include partnership training, communication, and negotiation skills.</li> <li>3. Develop advocates and specialists who span disciplines and can articulate the value propositions of economic benefits and the risks and benefits of unintended consequences at all levels of the ecosystems to motivate interest and create a sense of urgency</li> </ol>

The Network for Evaluation of One Health (NEOH), which was a 2014 European Union-funded project aimed to create a standardised framework whereby a OH initiative could be evaluated to demonstrate its added value to an initiative through the utilisation of a OH approach (Haxton et al. 2015). An evaluation framework to assess a OH initiative was created from NEOH’s published work (S. R. Rüegg et al. 2017; S. R. Rüegg et al. 2018b). The framework assesses the OH initiative in terms of the degree to which the projects are orientated towards the OH concept. This is done through the evaluation of four different areas within an initiative which are, “ (1) the definition of the OH initiative and its context; (2) the description of its theory of change with an assessment of expected and unexpected outcomes; (3) the process evaluation of operational and supporting infrastructures (the ‘OH-ness’); and, (4) an assessment of the association(s) between the process evaluation and the outcomes produced (S. Rüegg et al. 2018a).” A tool was created to quantitatively evaluate element three, which has been programmed into a Microsoft Excel sheet.

There are no published examples of this framework being utilised to evaluate a OH initiative or an institutional OH-ness level. An additional limitation of the OH evaluation framework developed by NEOH is that the development occurred in the global north with limited focus on OH evaluation in the global south. The lack of evaluation tools focused on the global south’s needs is a problem noted within the methodology for evaluating Africa's academic institutions (Chirau et al. 2018).

In (Frankson et al. 2016), seven core competencies between different OH programs were identified that build on the evaluation tool identified above. These competencies were “management; communication and informatics; values and ethics; leadership; teams and collaboration; roles and responsibilities; and systems thinking.” Many of these competencies identified, were also described, and calculated in the NEOH tool.

Although limited literature and examples exist on evaluation of OH, especially at a tertiary institution, there are tools that can be used to evaluate different parts of an institution. Utilisation of these different tools in combination with each other can be used to create a comprehensive evaluation of OH within a tertiary institution.

## INTRODUCTION

### Background and Justification

Dr Calvin Schwabe, a veterinarian, coined the term “One Medicine” (Schwabe 1964) to promote the inter-connected nature of human and animal health. Over the years since the conception of “One Medicine”, an evolution to the concept of “One Health” has occurred, which encompasses a broader range of issues that promotes the connection between humans, animals, and environment health.

Globally, a push to acknowledge the importance of One Health (OH) has started to occur. The World Health Organisation (WHO), Food and Agriculture Organisation (FAO) and World Animal Health Organisation (OIE) came together to combat the avian influenza pandemic of 2013. This is perhaps what has led the way for such legislation, and the formation of a long term tripartite partnership that promotes the OH concept (Vandersmissen and Welburn 2014). Recently the United States of America Congress introduced a bill that implicitly mentions OH in relation to emergency preparedness (Schrader 2019).

There is a broad overlap of issues between human, animal, and environmental health. Food security, anti-microbial resistance, and zoonotic diseases are some of the most critical issues showcasing the overlap of health between the three spheres. Wildlife-livestock- human conflict is growing due to the population's growth and the increased interaction between humans and animals (Hassell et al. 2017). The COVID-19 pandemic has made it abundantly clear that health pandemics affect all facets of life. Understanding, preventing, and mitigating future health pandemics will require a transdisciplinary approach, that will not only cut across disciplines, but also various health spheres.

Within South Africa (SA), the utilisation of the OH approach has the potential to accelerate economic development, social cohesion and health systems. The wide range of South African issues in all of these areas exists, due to a combination of its tumultuous political past and wide-spread corruption. SA has

been recognised as being in the world's top 10 most biodiverse countries (Hobohm 2003), due to its abundant and diverse; fauna, flora, and wildlife. To overcome these challenges, the South African economy will need to fully utilise its natural resources in a sustainable and healthy way- to allow for tourism to thrive.

In SA, there are extensive examples of issues that intersect between human, animal, and environment health. These place South African tertiary institutions in a unique position; with many SA tertiary institutions being home to the specific skillset, knowledge, and infrastructure; required to conduct research in numerous rural and urban settings. The Mnisi Community program (MCP) which hosts the Hluvukani Animal Clinic is perfectly enabled to achieve this (Berrian et al. 2016).

Leading academic institutions worldwide, understand the need for the teaching and implementation of OH related activities and thinking - to combat the growing trans-disciplinary threats to health. The University of Edinburgh currently has a three-year, taught Masters in One Health programme (Anonymous 2021b) that draws knowledge for teaching from a wide-ranging spectrum of disciplines. It includes students from various backgrounds, to create a melting pot that aims to spark new conversations and thinking around health and health systems. In The Netherlands, Utrecht University has also introduced a two-year master's program to educate and improve OH thinking within the country (Anonymous 2017). Many other leading institutions from the United States of America and other countries have also started One Health programmes to improve awareness, interest, and knowledge around the OH concept (Stroud et al. 2016a).

Within South Africa, only the University of Pretoria currently has a OH programme. It is an undergraduate module only open to Veterinary Science students in their final year. Although no specifically dedicated OH Masters programme exists at the University of Pretoria, the Faculty of Veterinary Science offers a Masters degree in Tropical Animal Health which encompasses and promotes the OH concept (Anonymous 2021a).

ELEPHANT, Empowering universities' Learning and rEsearch caPacities in the one Health Approach for the management of animals at the wildlife, livesTock and human interface in South Africa, is a European Union-funded project that aims to address the growing issues that can encompass the OH concept. The aim of ELEPHANT is to empower South African Higher Education Institutions (SAHEI) through a framework of collaboration within the OH context. To accomplish this, it will focus on strengthening research capacity within SAHEI through training and fostering trans-disciplinary collaboration between, and within SAHEIs. It will also focus on engagement with local communities to raise awareness and participation in the OH approach (<https://www.ufh.ac.za/elephant/>).

Evaluation of the effectiveness of ELEPHANT and other similar interventions aimed at improving OH in tertiary institutions requires a baseline to measure success and performance of the initiative. Without such a baseline, it is not possible to determine if any progress within a SAHEIs and between SAHEIs through the interventions has been made. A comprehensive baseline and evaluation of OH at a tertiary institution allows for self-reflection to identify areas of excellence, growth and risk.

### **Statement of the Problem**

Literature and examples are limited on how to correctly and fully evaluate OH-ness at a tertiary institution. By determining the OH-ness at a HEI, it is possible to drive the concept across all faculties and integrate it into the institutions. Due to the important role veterinarians play within the OH concept, a full understanding of the OH-ness at the veterinary faculty will allow for an institute to efficiently integrate the OH concept and improve on current gaps.

At tertiary level, OH-ness compromises how OH is integrated into the undergraduate curriculum and the OH associated research performed at the institution.

The Faculty of Veterinary Science, University of Pretoria (FVS) at present lacks a comprehensive account of present OH-related activities and collaboration within the faculty. There is a lack of monitoring and analysis of OH-related scientific research publications emanating from the FVS. There is also no current evaluation on the quality of the educational programme provided to undergraduate veterinary science students, who would in the future become custodians of the OH concept.

The absence of a comprehensive account of both OH-related research activities and OH-related research publications within the FVS leads to a lack of appreciation of OH-ness within the research sphere. The absence of the understanding of the current state limits further development of a fully integrated OH approach.

### **Purpose of the study**

This study is aimed at creating the first account of existing OH-related activities and collaboration within the FVS. Accurate evaluation of OH-ness requires an understanding of past, current and transitional OH-related activities within the faculty. In determining OH-ness, various OH-related activities were evaluated to help identify their strengths, weaknesses and gaps so that the FVS may be better tailored to improve their OH-ness.

A systematic review of the scientific research publications from the FVS has allowed for the creation of a baseline to fairly assess what has occurred within this matrix. Through this systematic review, insight into the activities from 2010 to 2020 of OH at the FVS was gained.

A qualitative examination of what the OH activities' current drivers, objectives and barriers are, coupled with a quantitative evaluation of the OH orientation of these activities are integral. These two aspects allow for the evaluation of the current state of OH-ness of research activities at the FVS.

## **Overall aim**

This study was aimed at evaluating the OH-ness at the FVS.

## **Objectives**

The following are the objectives of this research study:

- Determine the numerical change in OH-related scientific publications at the FVS between January 2010 and March 2020
- Evaluate what OH-related scientific publications at the FVS have focussed on between January 2010 and March 2020
- Investigate methods for reducing bias in future evaluations of scientific publications
- Investigate the drivers, objectives and barriers of the OH-related projects and initiatives at the FVS
- Assess the orientation towards OH principles of OH projects and initiatives at the FVS.



## METHODOLOGY

The study was broken down into three different matrices for the evaluation of OH-ness, namely (1) the systematic review of the scientific research publications at the FVS; (2) interviews with staff members involved with OH initiatives within the faculty to gain an understanding of the problems, drivers and objectives of the various projects and initiatives; and (3) scoring of these projects and initiatives.

### **A. Scientific Research Output**

A systematic review to evaluate all scientific research publications emanating from the FVS was conducted. The systematic review aimed to identify and collate all scientific publications that fall within the OH concept that previously might not have been identified as being OH-related.

Due to the previously identified lack of a single universally accepted OH definition, there were significant challenges encountered in attempting to categorise the scientific publications from the FVS. To overcome this lack of a universal definition, the publications were categorised according to the various thematic areas identified as being the foundations of the OH concept through the literature review. The thematic areas below are broad enough to encompass different disciplines and overarching focus areas of the OH concept.

The themes identified along with their designation code are presented in Table 3 below:

**Table 3: Different thematic areas within OH and the designations utilised**

<b>Theme Areas</b>	<b>Designation code</b>
Termed One Health (TOH):	A
Public Health (PH):	B
Involving animal, human and environmental health in a combination/ or together (IAHET):	C
Infectious disease with zoonotic implications (IDZ):	D
Infectious disease that has socio-economic effects (IDSE):	E
Food security (FSe):	F
Food safety (FSa):	G
Antimicrobial Resistance (AMR):	H
Climate change that involves public health response (CC):	I

The themes in Table 3 were collated to determine the quantum of OH-related research publications that had emanated from the FVS. It also allowed for it to be further categorised to identify focus areas through the unique designation code.

### **Timeframe for Review**

The period ranging from January 2010 to March 2020 was selected. All scientific publications produced within that period by the FVS were selected for review, to identify those publications that were OH-related. The University of Pretoria repository was identified as the database that would contain all publications that have been produced by the FVS. Utilising the University of Pretoria library repository (<https://repository.up.ac.za>), an initial filter for scientific publications from the FVS was applied. This was followed by a filter to search for publications during the period of January 2010 to March 2020.

## **Strategy to select OH-related publications**

All scientific publications were initially screened using the title of the scientific publication. If there was indication of the publication falling within the previously identified themes, a further evaluation of the paper's content was performed. The secondary screening was performed by identifying keywords and themes within the abstract. A publication that was identified to fall within a thematic area was given a primary designation. If a publication fell within two different thematic areas, it was assigned a secondary designation in addition to its primary designation. Publications were also evaluated according to the number of affiliated institutions involved in the publication.

All the identified publications were placed within an Excel database to allow for further evaluation of the results. The following information from the identified scientific publications was captured:

- Title
- Author/s
- Year of publication
- Primary designation
- Secondary designation
- URL.

## **Additional reviewers as a pilot study**

Since a reviewer can have bias, further enhancement of the systematic review of scientific publications for future studies was examined, by having the review conducted by a total of four independent reviewers. These additional reviews will allow for potential improvement of the evaluation methodology. All systematic reviews were conducted independently after being given a recorded tutorial on the requirements and methodology of performing the systematic review.

The four reviewers were veterinary students, either undergraduate or post-graduate students, with differing OH exposure levels. The author, a veterinarian

with prior exposure to OH and extensive history within OH organisation, undertook a MSc study and had no previous research experience. A post-graduate veterinary student from Utrecht University performed a similar systematic review of OH publications from Utrecht University and had previous exposure to research. Two FVS undergraduate veterinary students were in their final year of the degree and had performed a One Health module with no research experience.

- i. The results were evaluated to achieve three objectives:
  - i.a. To establish the number of OH-related research publications from the FVS on a year-on-year basis, their evolution and the number of affiliated institutions per publication over the previous 10 years.
  - i.b. To determine the thematic areas that the OH-related publications fell within; this was performed by evaluating each scientific research publication's designation code, as well as how many of the publications were given primary and secondary designation codes.
  - i.c. To compare which publications were considered to be OH-related, based on the subjective identification by individual reviewers.

## **B. Conceptual understanding and evaluation**

### **Interviews**

The interview strategy was based on utilising an email to make initial contact with all potential participants, inviting them to an online interview (Gray et al. 2020; Sappleton and Lourenço 2016). This was then followed up with telephonic calls to non-responders to engage them on potential interviews, which has a higher potential response rate (Siemiatycki 1979).

Online one-on-one interviews were conducted with nine members of staff at the FVS that were involved with OH-related activities. Interviewees were identified through two routes. All authors of identified OH scientific publications that still worked within the FVS were contacted individually, inviting them to an interview

to explore their work and publications further. The five heads of departments within the FVS were contacted asking them to disseminate open invitations to staff members within their department to participate in an interview if they believed that any aspect of their work fell within the OH concept as identified by the aforementioned themes determined in the literature review.

A OH activity was considered to be any outreach, project or research that had a tangible output, and that fell within the OH concept's previously identified themes that were currently being performed. Interviewees were requested to choose and discuss a OH activity they were involved with that they understood as falling within the OH concept.

All interviews were conducted via an online platform, "BlackBoard learn" and recorded.

Two matrices were explored through the interviews:

- Conceptual understanding and evaluation (Qualitative)
- Baseline Scoring (Quantitative).

Each person was interviewed on their own OH project. A OH project referred to specific work the interviewee was involved in, whose focus lay within the OH concept. It also had its own discernible funding, aims and reporting. Multiple OH projects, where a common theme, interest or collaboration occurred, was referred to as a OH initiative. A OH initiative did not necessarily need to be an agreed upon theme, interest, or collaboration between various OH projects, but rather were identified by the researcher where there was a common theme, interest or collaboration occurring. The work could be as a natural progression of a project, such as an overlay between projects, or could have been due to active collaboration occurring.

In certain instances, and for the purpose of this research, when a OH project shared no common theme or interest with other OH projects, it would form a OH initiative on its own, to allow for a full assessment as described below.

A semi-structured interview format, with open-ended questions, was utilised in interviews with members of staff. The relevant objectives were integrated, and the interviewer would guide the discussion utilising key words to gather all the relevant information (Weller et al. 2018).

This method of questioning enabled the interviewees to ‘give a voice’ and narrate a story of their project, in a manner which allowed for an in-depth understanding of the project at hand. When an interviewee was allowed to “give a voice”, it means that they controlled the pace and direction of the interview while the interviewer questioned the finer details to ensure that important required pieces of information were provided. It did not create a standardised framework for the interview flow and allowed only details the interviewee deemed important to be provided. It provided an opportunity for qualifications and justifications for choices taken during the project (Beckett and Clegg 2007), which resulted in an in-depth understanding of the project, and the ability for the interviewee to self-reflect on aspects of the project.

- ii. The interviews were designed to understand three areas within each OH project: the drivers for the initiative; where and what transdisciplinary work was taking place; and barriers to the OH activity.
  - ii.a. To create a clear understanding of the project, while identifying the drivers and the objectives of the project.
  - ii.b. To evaluate the transdisciplinary approach utilised by the project, required that the different spheres of OH (human, animal and environment), that were involved were identified. The background of the team members was also identified.
  - ii.c. To determine the barriers of the implementation of the OH concept and approach to projects within the FVS.

### **Project and Initiative Scoring**

A baseline scoring was performed on all OH activities. This scoring was done by the author in conjunction with the interviewees for each OH project after gathering information from the interviewees.

The scoring aimed to evaluate OH projects according to “One Health Operation”, and evaluate OH initiatives according to “Supporting Infrastructure”. Within “One Health Operation” it was divided into “Thinking”; “Planning”; and “Working” elements, while within “Supporting Infrastructure” it was further divided into “Sharing”; “Learning”; and “Systemic Organisation” elements (S. Rüegg et al. 2018a).

The original design was meant to critically understand a single OH initiative that spanned multiple disciplines within a single organisation and did not evaluate multiple initiatives within an organisation, or to evaluate an entire academic institution. In the original design a “Theory of Change” was required to fully evaluate an initiative. The development of a “Theory of Change” (ToC) requires that there should be an understanding of the desired long-term goals, which is developed through an active collaborative process from the start of a project. As many of the individual OH projects that created the OH initiatives did not have this, creating a “ToC was not possible.

The original design of the evaluating tool was modified to allow for ease of use and understanding by the interviewees. Elements and questions that were underpinned by the development of the ToC were not evaluated.

As elements and questions of the evaluation tool were removed, the final “OH-Index Ratio” that the tool was to generate, was not used. Rather the fundamental aspects that underpin the OH approach such as planning, working, sharing and systemic organisation were evaluated to understand the implementation of the OH concept by these OH projects and initiatives.

The scoring per section evaluated different elements needed to gather a comprehensive quantitative understanding of the section. Each element was scored between zero and one. A clear explanation of how each element was scored according to various levels was provided which ensured the correct understanding of how to utilise the tool. These explanations can be found in the original tool(S. Rüegg et al. 2018a). Elements under “One Health Operations” were evaluated as being more pertinent and easier to correctly score by a team

leader as the elements are more related to individual OH project implementation. While those under “Supporting Infrastructure” required an overview of the different identified OH initiatives to be correctly scored in combination with scores derived by the different OH projects.

For each OH project, the following two elements and three and five subsections, respectively, were evaluated for “One Health Operation”:

iii. “Planning”:

- *Common aims*
- *Stakeholder and actor engagement*
- *Self-assessment and plan revision*

iv. “Working”:

- *Broadness of the initiative*
- *Collaboration*
- *Transdisciplinary balance*
- *Culture and social balance*
- *Flexibility and adaptation*

For each OH initiative, two elements and two and one subsections respectively were evaluated for “Supporting infrastructure”:

v. “Sharing”:

- *General information/awareness sharing*
- *Institutional memory/resilience*

vi. “Systemic Organisation”:

- *Level of assistance across the leadership structure*



## RESULTS

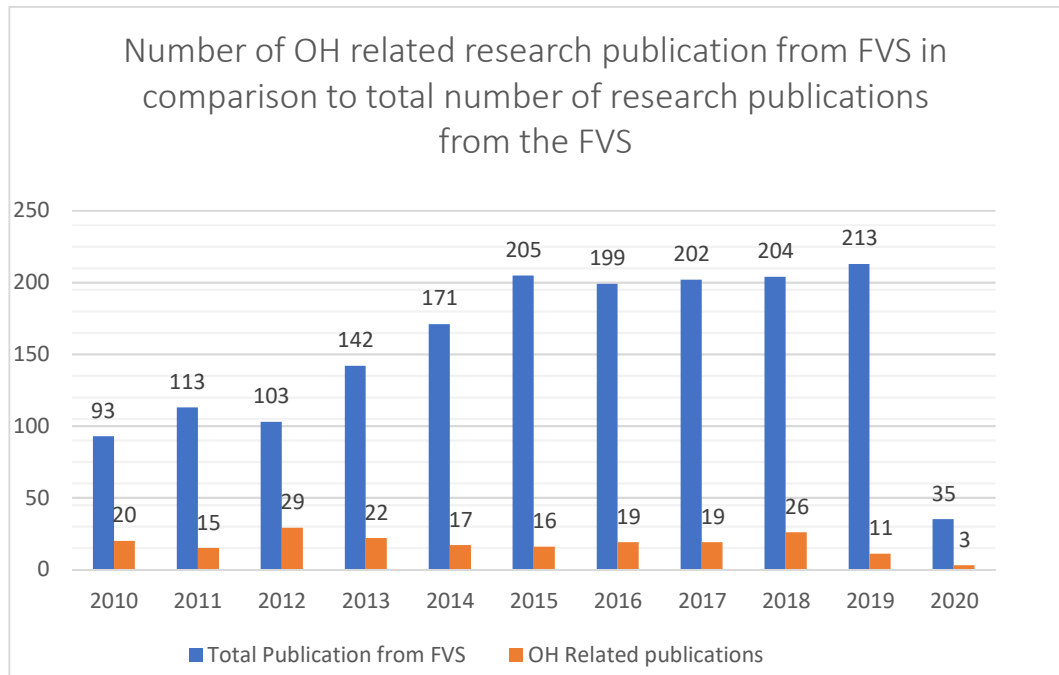
### A. Scientific Research Output

The following datasets are the results from the systematic review of scientific research publications from the FVS.

#### *i.a. Number of OH-related research publication*

The data utilised was collected from the systematic review by post-graduate researcher 1 (PG1).

A total of 197 scientific research publications that were OH-related were identified out of a total of 1680 research publications emerging from the FVS as depicted in Figure 2, which amounted to 12% of total publications being OH-related in the 11-year period reviewed. There has been a reduction in the proportion of OH papers as compared to the total number of publications from FVS. Over the period under review the total number of publications per year from the FVS has increased, while the absolute number of OH-related publications has remained constant.

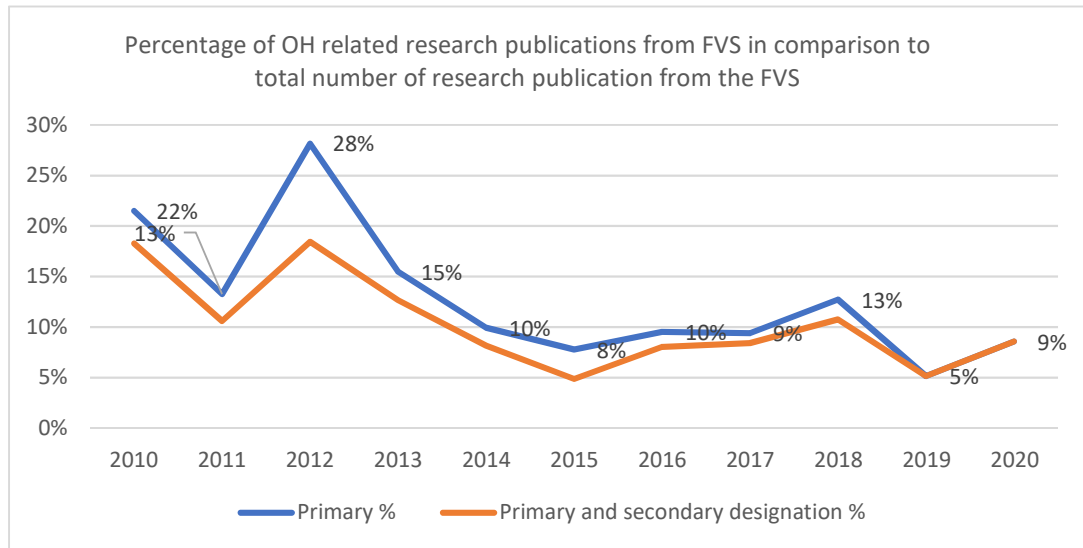


**Figure 2: Number of scientific publications from the FVS, and the number of OH-related scientific publications that have either a primary or both primary and secondary designation produced by the FVS for the period 2010-2020. The blue bars are the total number of publications from the FVS in a year, while the orange bar is the number of OH-related publications identified.**

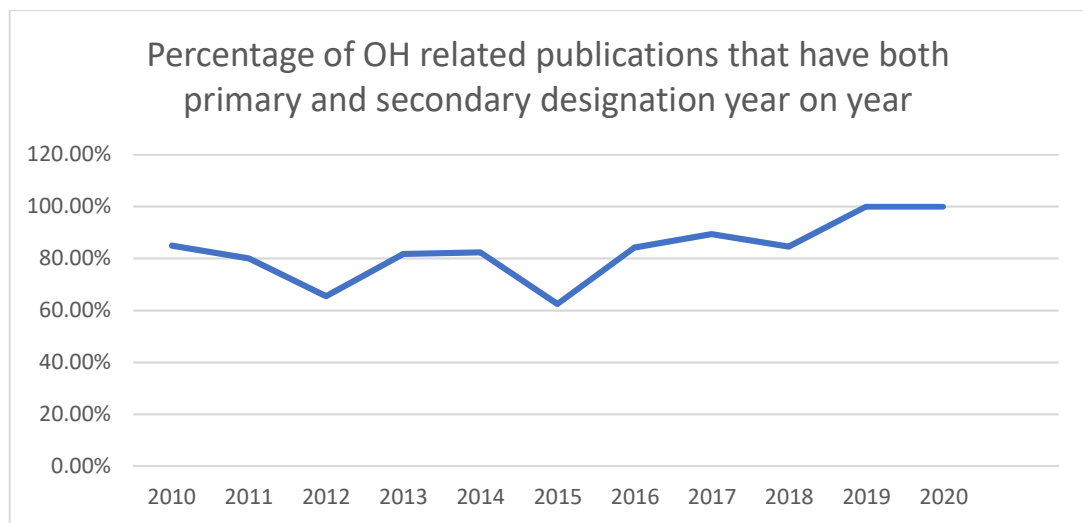
In 2012, 28% of publications were OH-related compared to 2018 when only 13% of publications were OH-related, as presented in Figure 4 below, although the absolute number of OH-related publications remained constant. In 2012, 29 publications were OH related representing 28% of total publications were OH-related compared to 2018 when only 26 (13%) of publications were OH-related, as presented in Figure 3 below, although the absolute number of OH-related publications remained constant. From 2012 there had been a steady decline in the proportion of OH-related publications in comparison to the total number of scientific publications from the FVS. From 2015 to 2018 there had been a rise in the absolute number of OH-related publications at the FVS, with a decrease occurring in 2019.

While 2012 produced the most publications that were OH-related, it produced the second-lowest number of publications that had both primary and secondary designations at 66%. From 2012 there has been a rise in

publications with both a primary and secondary designation, as depicted in Figure 4 below.



**Figure 3: Number of OH-related scientific publications, both primary and secondary designation, identified in comparison to the total number of scientific publications that have been produced by the FVS for the period 2010-2020 as a percentage.**



**Figure 4: Number of OH-related publications that have both a primary and secondary designation compared to the number of OH-related publication that have only a primary designation.**

A further review for the period 2017-2019 was performed. Each OH-related scientific publication identified in the years under review was evaluated to determine the number of institutions involved in the publication. Due to a lack of information on the database this review could not be done for the entire

review period from January 2010. This information is presented in Table 4 below.

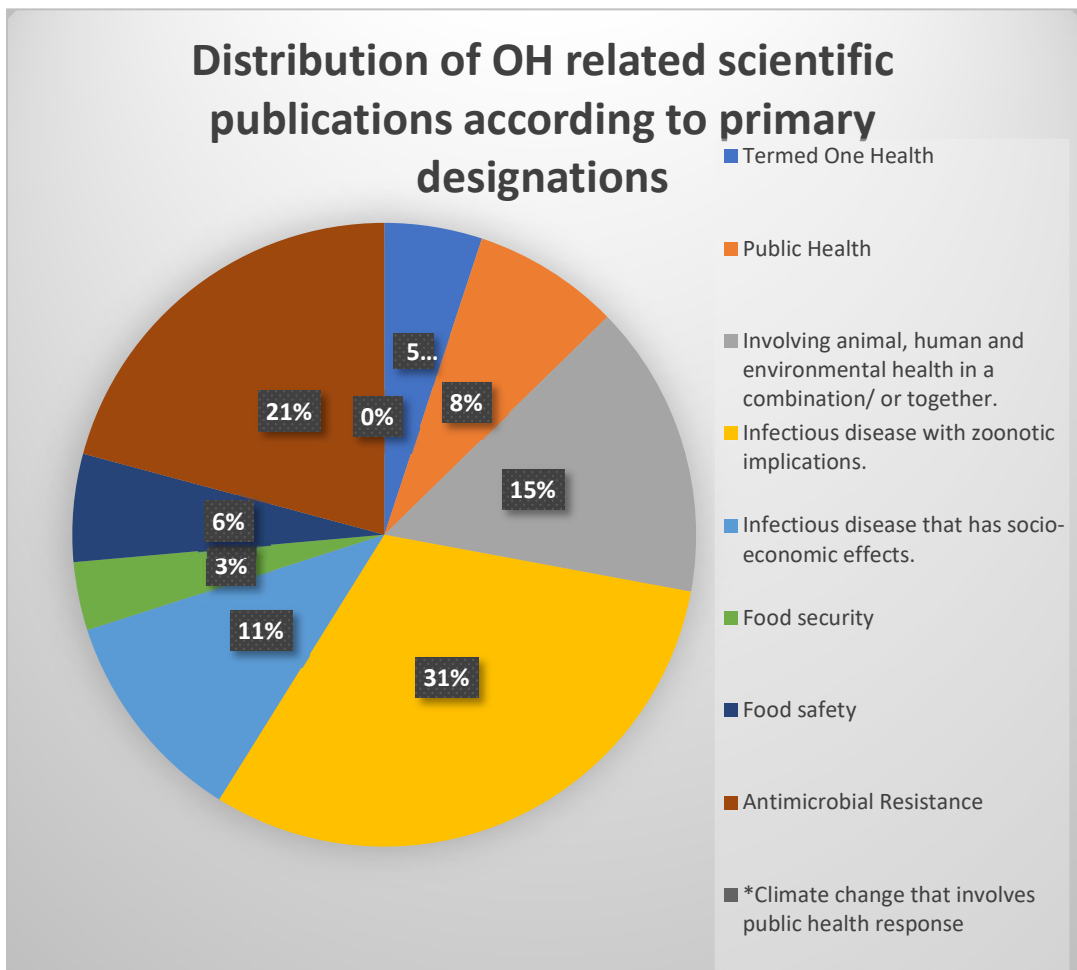
**Table 4: Number of OH-related scientific publications for the period 2017-2019 in comparison to the number of institutions involved in the research.**

No. of institutions	2017 (Number)	2017 (%)	2018 (Number)	2018 (%)	2019 (Number)	2019 (%)
1	4	21%	11	42%	2	18%
2	1	5%	1	4%	1	9%
3	5	26%	4	15%	2	18%
4	2	11%	3	12%	2	18%
4<	7	37%	7	27%	4	36%
Total	19		26		11	

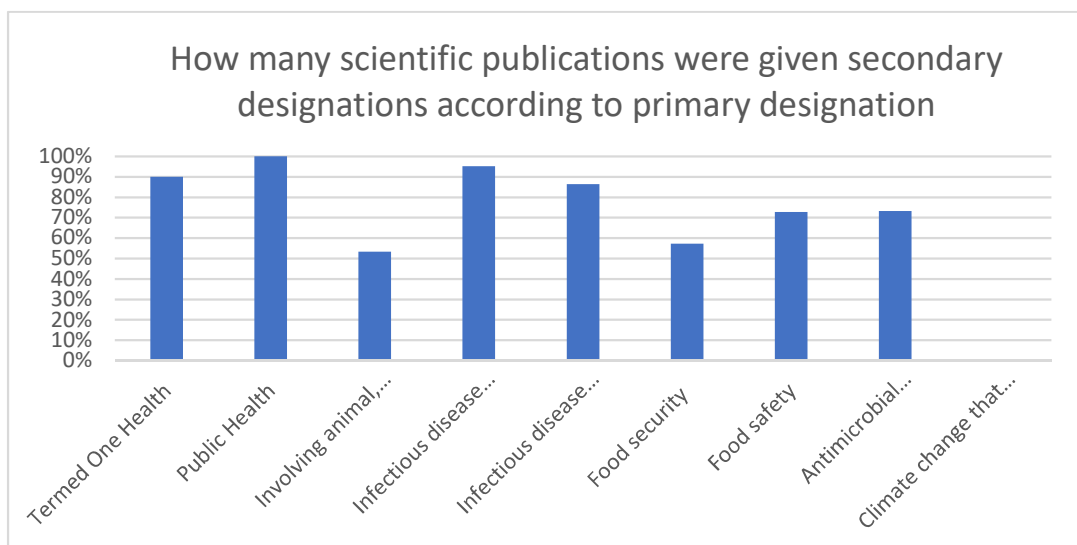
***i.b. Number of OH-related publications according to thematic areas***

The data utilised was collated from the systematic review performed by post-graduate researcher 1.

Of the 197 publications identified (Table 5), 61, or 31%, fell within the theme termed “infectious diseases with zoonotic implications”, with 95% of these having a secondary designation. The theme “anti-microbial resistance” was the theme with the second-highest number of publications at 41. However, only 73% had a secondary theme designation, while the theme classified as “Involving animal, human and environmental health in combination/or together” had 30 identified publications with only 53% having a secondary designation. The “Food security” theme had the lowest number of publications at only seven (7) with 57% having a secondary designation, as presented in Table 5, Figure 5 and Figure 6.

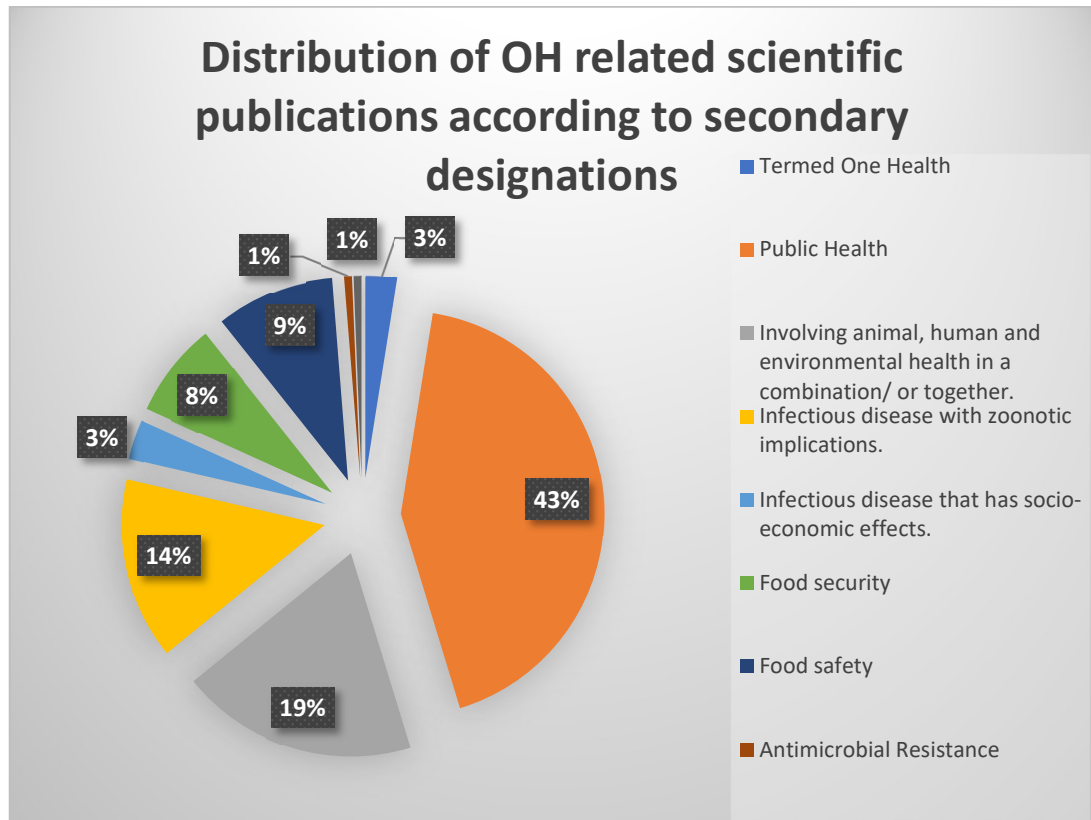


**Figure 5: Percentage distribution of OH-related research publications broken down according to different thematic areas according to only primary designation. “Climate change that involves public health response” had zero primary designations and is not visible on the graph.**



**Figure 6: Percentage of scientific publications that were given a secondary designation per thematic areas.**

Public health was the most identified secondary designation with 68 (43%) publications, as depicted in Figure 7 & Table 5 below.



**Figure 7: Number of OH-related research publications broken down according to different thematic areas according to only secondary designation, and thematic percentage in comparison with each other.**

Of the scientific publications that were given a primary designation of “infectious diseases with zoonotic implications.”, 60.65% had a secondary designation of “public health” while 39.03% of those given a primary designation of “Anti-microbial resistance” were given a secondary designation of “public health” as presented in Table 5 below.

**Table 5: Primary designation of OH-related scientific publications performed by PG1.**

PG 1											
Primary Designation code	Secondary Designation code										Total primary designation
	TOH	PH	IAHET	IDZ	IDSE	FSe	FSa	AMR	CC	No secondary designation	
TOH	*	1	3	5	0	0	0	0	0	1	10
PH	0	*	7	4	1	1	0	1	1	0	15
IAHET	1	7	*	7	0	1	0	0	0	14	30
IDZ	2	37	14	*	3	1	1	0	0	3	61
IDSE	0	3	2	4	*	9	1	0	0	3	22
FSe	0	1	1	0	0	*	2	0	0	3	7
FSa	1	3	0	3	1	0	*	0	0	3	11
AMR	0	16	3	0	0	0	11	*	0	11	41
CC	0	0	0	0	0	0	0	0	*	0	0
Total	4	68	30	23	5	12	15	1	1	38	197

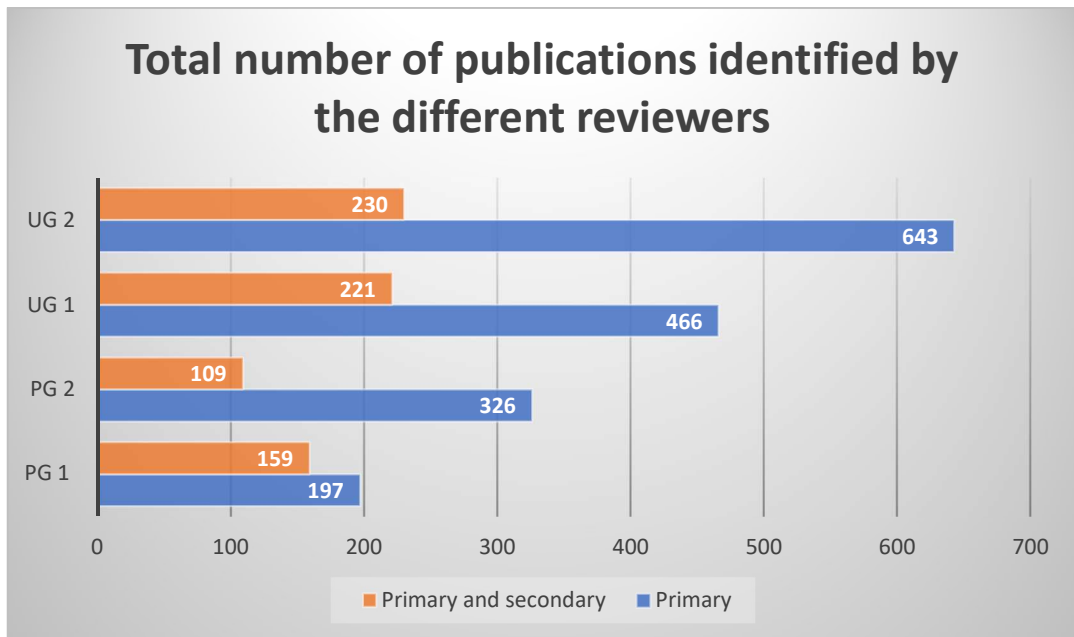
Tables 5 Legend: The abbreviations are as follows - “Termed One Health” (TOH), “Public health” (PH), “Involving animal, human and environmental health together/or in combination” (IAHET), “Infectious disease with zoonotic implications” (IDZ), “Infectious disease with socio-economic effect” (IDSE), “Food security” (FSe), “Food safety” (FSa), “Anti-microbial resistance” (AMR), “Climate Change” CC.

### ***i.c. Independent review of scientific publications***

A total of 326 scientific publications were identified as being OH-related by post-graduate researcher (PG2), of which 109 publications (33.4%) were given a secondary designation as depicted in Figure 8 below.

Undergraduate researcher 1 (UG1) identified a total of 466 scientific publications as being OH-related, of which 221 publications, or 47.4%, were given a secondary designation as depicted in Figure 8 below.

Undergraduate researcher 2 (UG2) identified a total of 643 scientific publications as being OH-related, of which 230 publications, or 35.8%, were given a secondary designation as depicted in Figure 8 below.



**Figure 8: Number of publications per designation identified by different reviewers over the time period evaluated.**

As described previously, individual reviews were undertaken to model the best methodology to reduce bias.

Out of 1680 scientific publications produced over the period under review, 824 (49.05%) unique OH-related scientific publications were identified by the independent reviewers. There was congruence amongst the publications between all four researchers in 116 publications (14.08%), between three of the four researchers in 133 publications (16.14%), and between two of the four researchers in 194 publications (23.54%). There were 381 publications (46.24%) identified as being OH-related by only one researcher.

The following data sets can be found in Appendix 5 II.

The most identified primary thematic area by PG2 was “Infectious Disease with zoonotic implication” but only 55 publications (26,31%) were given a secondary designation. “Food safety” was the third most identified theme amongst the publications, with 70% of “Food safety” publications given a secondary designation.



Of the 466 OH-related publications identified by UG1, 120 publications (25.75%) were identified as “Infectious disease with socio-economic effect” but 99 publications (82.5%) were not given a secondary designation. The second most identified theme identified by UG1 was “Infectious disease zoonotic impactions”, of which 73.4% were given a secondary designation.

UG2 identified 643 unique OH-related publications, of which 279 (43.39%) were given the primary designation of “Infectious disease with zoonotic implication”; of those, only 91 publications (32.62%) were given a secondary designation.

The most identified secondary designation by PG2 was “Infectious disease with zoonotic implication,” while for PG1, UG1 and UG2 it was “Public Health”. The designation “Public health” was the second most common secondary designation given by PG2.

## **B. Conceptual understanding and evaluation**

### **Interviews**

#### ***ii. Summary of results of interviews to identify the drivers, health spheres and barriers***

A total of ten interviews were conducted with members of staff at the FVS. One interviewee’s activity was deemed to be insufficient within the OH-related sphere to constitute a OH project. Staff members interviewed spanned different departments within the faculty, which were the Department of Veterinary Tropical Disease, the Department of Paraclinical Studies, the Department of Production Animal Studies, the Department of Companion Animal Studies and the Human Health Services.

Of the nine projects identified as being OH-related, one was identified through emails to the HOD of the departments. The other nine projects were identified

through personal communication with members of staff that had been identified on the basis of previous OH-related research.

From the nine identified OH projects, five individual and discernible OH initiatives were identified as listed in Table 8 below.

ii.a. Drivers of OH initiatives (OHi): Of the five initiatives identified, two of the initiatives were driven by an event of zoonotic disease detection in humans. One initiative was developed to educate and train the public through the creation of a strategic plan. The other two initiatives were all driven by the lack of knowledge and research within communication strategies of disease knowledge and animal health within local communities.

ii.b. Health spheres involved: Of the five OHi three of them had members from only two of the three health spheres considered important within the OH concept. OHi commonly lacked members from the environmental health sphere in their teams. The other two OHi were more inclusive and had members from all three spheres of health, although none of the five initiatives involved any undergraduate veterinary students.

Two of the five OHi interventions were directed at the human sector only. The OHi 1's interventions were directed at both the human and animal health spheres, while OHi 3 and OHi 4 had interventions directed at all three spheres of health.

Ultimately, three of the OHi aimed to educate a wider population regarding a OH issue and one aimed to fill a scientific gap at an academic and scientific level to help shape future policy, programmes and initiatives. The other, the last OHi, aimed to directly improve health through specific interventions, while educating the affected human population. None of the five initiatives was aimed at educating undergraduate students from the FVS.

ii.c. Barriers to OH initiatives: When considering barriers encountered by the OHi, institutional assistance was highlighted by all five of the OHi, specifically a lack of funding for OH-specific projects or research. There was also a notable lack of institutional assistance in increasing collaboration of OH inclined individuals and projects both within and outside the FVS. An important barrier that was indicated was that the performance evaluation structure at the FVS is not suited to encouraging trans-disciplinary working.

**Table 6: Summary of drivers, spheres of involvement and barriers of OH initiatives that are currently active at the FVS.**

<b><u>Descriptors of identified objectives of OH initiatives</u></b>		<b><u>One Health Initiative 1 (OHi 1)</u></b>	<b><u>One Health Initiative 2 (OHi 2)</u></b>	<b><u>One Health Initiative 3 (OHi 3)</u></b>	<b><u>One Health Initiative 4 (OHi 4)</u></b>	<b><u>One Health Initiative 5 (OHi 5)</u></b>
Drivers	What started the initiative?	Fill a scientific gap.	Lack of strategic plan.	Fill a scientific gap.	Detection of zoonotic disease.	Detection of zoonotic disease.
	What are the objectives of the initiative?	Knowledge creation to help shape future programmes, policy and interventions.	Educate, promote and train health care workers and population.	Knowledge creation to help shape future programmes, policy and interventions.	Decrease zoonotic disease transmission and improve health.	Decrease zoonotic disease transmission and improve knowledge regarding zoonotic disease
Spheres	What is the background of the members?	Animal Human	Animal Human Environment	Animal Human	Animal Human Environment	Animal Human
	What are the spheres of intervention?	Animal Human	Animal Human Environment	Human	Animal Human Environment	Human
Barriers	What are the major barriers faced for OH working?	Funding Lack of FVS OH plan	Specialised collaborative spaces	Funding Performance target	Funding Lack of FVS OH plan	Funding Specialised collaborative spaces
Duration of OH initiative		2013 to current	2014 to current	2009 to current	2005 to current	2009 to current

## Project and Initiative Scoring

When evaluating the different OH projects that were identified, there were two elements examined, “Planning” and “Working”. Scores ranged from 0 to 1.

### **iii. Scoring of “Planning” of OH projects One Health operations**

The first element examined for the OH projects was “Planning”, which consisted of three subsections that were evaluated, namely *common aims*, *stakeholder and actor engagement* and *self-assessment and plan revisions*. “Planning” evaluation subsections underpin a OH approach and contribute to a final OH outcome. When “Planning” is examined, it helps to provide a level of planning and resource allocation that occurred during the OH project.

The subsection *common aims* scored above 0.5 in eight of the nine projects, whilst five of the nine OH projects scored above 0.4 when evaluating *stakeholder and actor engagement*. The subsection that was the weakest was *self-assessment and plan revisions* with five of the nine projects scoring below 0.4, of which one was scored 0.1.

In examining the individual projects, the highest degree of planning was achieved in project P9. The project scored the highest on all three subsections involved in planning. The project had a common aim thoroughly discussed with the different stakeholders and had undertaken self-assessments and revisions of the plans. The project followed an iterative process of design self-assessment and a revision of the plan and not a linear approach of planning and then execution of the plans without self-reflection. Projects P6 and P7 also scored well with all three subsections scoring more than 0.6. Projects P3 and P8 although scoring 0.5 for *common aims* scored less than 0.2 for both *stakeholder engagement* and *self-assessments*. Project P2, although not doing well on the *common aim* (0.2) scored above 0.6 for the other two subsections, as presented in Table 9 below.

The majority of OH projects failed to engage appropriately with stakeholders and actors that were involved in the projects but did actively plan to have common aims to be achieved. The minority of projects allowed appropriate time for self-assessment of the projects that would allow for changes to the project.

(S. Rüegg et al. 2018a)

**Table 7: Scores of the different OH projects according to the modified planning scoring system (Rüegg et al. 2018a)**

Planning										
	P1	P2	P3	P4	P5	P6	P7	P8	P9	Average score for all projects
Overall OH planning score (median of all scores)	<b>0,40</b>	<b>0,60</b>	<b>0,15</b>	<b>0,30</b>	<b>0,40</b>	<b>0,60</b>	<b>0,70</b>	<b>0,40</b>	<b>0,85</b>	<b>0,49</b>
Common aims	0,50	0,20	0,50	0,40	0,40	0,80	0,70	0,50	0,85	0,54
Stakeholder and actor engagement	0,33	0,60	0,13	0,33	0,40	0,60	0,67	0,20	0,83	0,46
Self-assessment and plan revisions	0,40	0,60	0,20	0,30	0,30	0,60	0,60	0,10	0,85	0,44

#### ***iv. Scoring of “Working” of OH projects within One Health operations***

The second element of OH operation for each OH project evaluated was “Working”. It consisted of five subsections: *Broadness of the initiative*, *Collaborations*, *Transdisciplinary balance*, *Culture and social balance* and *Flexibility and adaptation*. The element “working” evaluates how the project is executed in a transdisciplinary and participatory manner, which leads to the OH project being able to modify to improve the OH in a project.

There were no OH projects that scored more than 0.5 in all the subsections. The subsection that scored poorly across all the projects was *Transdisciplinary balance* with six of the nine projects scoring below 0.3. and an average score of 0.42. The project with the highest average score for “Working” scored 0.3 for *Transdisciplinary balance*.

P6 scored the highest in *Transdisciplinary balance*, but poorly for the *Breadth of initiative*, compared to P1 that scored marginally lower in *Transdisciplinary balance* but achieved the highest score of 0.7 for the *Breadth of the initiative* as presented in Table 10 below.

Almost all the OH projects provided a high degree of flexibility within the project and were balanced appropriately across social and cultural lines. The majority of projects scored low in *Breadth of collaboration* and *Transdisciplinary balance*.

**Table 8: Scores of the different OH projects according to the modified working scoring system (Rüegg et al. 2018a)**

Working										
	P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	Average score for all projects
Overall OH working score (median of all scores):	0,55	0,60	0,50	0,60	0,40	0,50	0,50	0,60	0,90	0,57
Broadness of initiative	0,70	0,47	0,10	0,47	0,10	0,20	0,37	0,57	0,50	0,39
Collaboration	0,25	0,90	0,40	0,80	0,40	0,30	0,80	0,60	0,80	0,58
Transdisciplinary balance	0,70	0,30	0,20	0,80	0,35	0,70	0,15	0,30	0,30	0,42
Cultural and social balance	0,48	0,70	0,68	0,50	0,55	0,53	0,65	0,83	1,00	0,66
Flexibility and adaptation	0,83	0,63	0,95	0,68	0,75	0,70	0,45	0,73	0,83	0,73

When evaluating the different OH initiatives that were identified, there were two elements that were examined, “Sharing” and “Systemic organisation”.

**v. Scoring of “Sharing” of OH initiatives within Supporting Infrastructure**

Evaluation of OH initiatives required that the element of “Sharing” is evaluated, which consisted of two subsections *General information/awareness sharing* and *Institutional memory/resilience*. “Sharing” evaluates how information and knowledge is shared across the initiative, the institution, stakeholders and the public. An important aspect of OH is ensuring that the knowledge created is



disseminated as widely as possible and not kept within groups or silos of disciplines.

Overall, the different initiative scored well, with three of the initiatives scoring 0.5 or higher. General information/awareness sharing had an average of 0,47 but no initiative scored better than 0.6, which is of concern. In comparison, institutional memory/resilience scored well across the board, with an average of 0.58 as presented in Table 11 below.

The OH initiatives at the FVS show they are able to disseminate the information created well, but there is a wider audience that can be reached through utilisation of different dissemination tools.

**Table 9: Scores of the different OH projects according to the modified structure scoring system (Rüegg et al. 2018a)**

Sharing						
	OHi 1	OHi 2	OHi 3	OHi 4	Ohi 5	Average score for all initiative
Overall data and information sharing infrastructure score (median of scores)	<b>0,50</b>	<b>0,60</b>	<b>0,70</b>	<b>0,30</b>	<b>0,40</b>	<b>0,50</b>
General information/awareness sharing	0,5	0,6	0,5	0,3	0,4	0,47
Institutional memory/resilience	0,5	0,7	0,8	0,3	0,7	0,58

**vi. Scoring of “Systemic Organisation” of OH initiatives within Supporting Infrastructure**

The element “Systemic Organisation” evaluates the leadership and how well the team works together in an initiative. Overall, all the different initiatives scored well, except for OHi 1 which scored lower than 0,5 as presented in Table 12 below.

**Table 10: Scores of the different OH projects according to the modified systemic organisation scoring system (Rüegg et al. 2018a)**

Systemic Organisation						
	OHi 1	OHi 2	OHi 3	OHi 4	OHi 5	The average score for all initiative
Overall score for systemic organisation (median of all scores):	<b>0,35</b>	<b>0,7</b>	<b>0,65</b>	<b>0,6</b>	<b>0,5</b>	<b>0,56</b>

## DISCUSSION

### A. Scientific Research Output

Evaluation of the number of OH-related scientific research outputs year-on-year with primary designation only indicated that there was no growth in the number of OH-related publications from the FVS over the last ten years in comparison with the total number of publications produced. The number of the publications produced each year varied, with no correlation to the previous years. As indicated in Xie et al. 2017, in the previous 25 years prior to publication, while there was an increase of 14.6% per year of OH-related publications globally this was not the case at the FVS. Considering that globally there has been an increase in OH-related publications, the growth of OH-related publications produced within the FVS is below the global standard.

The majority, or 80.7% of OH-related publications, were identified as having both a primary and a secondary theme that fell within the OH concept. This amounts to 9% of the total research publications from the FVS as depicted in Figure 4 above.

When considering the number of publications identified as being OH-related from the year 2012, there was an increase in the publications that had a secondary designation as well. This indicated that researchers looking into fields related to OH were increasingly taking cognisance of aspects outside of their own thematic area and can point to an increase in awareness of OH and the importance of interconnectedness within OH research. Research publications that have only primary designation are more likely to be working in a narrow discipline that falls within the OH concept, but not necessarily utilising a OH approach to their work. Over the period examined, there has been an increase in the number of publications year-on-year that have a secondary designation which indicates that the OH-related

research is becoming more diverse and a better OH approach is being utilised, as presented in Figure 5 above. This correlates with the rise of awareness of the OH concept globally and specifically within the animal health community.

Of the 56 papers evaluated for the number of institutes involved in the scientific publications, 45% of them had four or more institutes involved in the work while only 30% of them only involved researchers from the FVS. Many of these OH-related publications were dissertations which had an impact on the evaluation. This high level of institutional cooperation indicates the ability for researchers to work outside of the FVS but might not necessarily translate into working outside of their professional backgrounds.

When analysing these results, it appears that the FVS has become more diverse in the research surrounding OH but there is still the same quantum of research being done. This could be due to those involved in OH research identifying more aspects related to their research but with only a limited number of people involved in themes that fall under the OH concept. The FVS has increased its research capacity but not expanded its capacity with regard to researchers that are OH-orientated.

OH-related scientific publications from the FVS were predominately produced by one department. This is a trend that is seen within the FVS, as the same department accounts for a large proportion of publications emanating from the FVS. This may create a false impression of the level of OH-related publications across the FVS being high, whereas the level is higher in certain departments and low in others.

Most of the research that is OH-related is focused on infectious diseases that either have a socio-economic impact or a zoonotic disease aspect to it, accounting for approximately 40% of all primary designations. Of the publications within these two thematic areas, the majority of publications were given a secondary designation of public health which shows a specific additional direction for most of the research. The majority of publications given a primary designation of anti-microbial resistance

were either given a secondary designation of public health or food safety. Although the publications overall had an increase in secondary designation, it shows that the focus is narrower than previously examined. The over-representation of two themes means that it is compensating for thematic areas that are underperforming and where a significant increase in terms of research publications is possible.

There was a severe lack of research publications that investigated aspects of environmental health and how they were involved with the health of humans and animals. Due to the limited current research on climate change and its impact on animal health, this is an area where there is large potential for growth. To achieve growth in this research area, the FVS should create active collaborations and research frameworks with faculties at the University of Pretoria that work within environmental health research. There was also a lack in the growth of publications titled “One Health” over the period examined, where 2014 had the most publications that mentioned “One Health” in the title.

The department that was over-represented in research output was the Department of Veterinary Tropical Diseases (DVTD). The DVTD comprises two research focused groups which focus on infectious diseases and their implications, which accounts for the high representation of the two abovementioned thematic areas. DVTD is one of two departments where the staff are all classified as non-clinical and therefore are more orientated to research. This indicates that to increase research outputs across the faculty, especially in OH thematic areas, there should be emphasis placed on recruiting of staff in other departments that are not required to perform clinical work.

A further evaluation tool that would advance the implementation of the OH concept and ensure that all departments within the FVS are contributing would be to evaluate OH-related publication output per department. This will allow for interventions to be specifically aimed at areas of underperformance.

The purpose of the additional review was as a pilot study to provide further data for methods to improve the accuracy and reduce bias in the systematic review of scientific publications.

Although reasonable measures were put in place such as a tutorial, there was a high variability in the OH-related scientific publications identified by the individual researchers. There are several reasons for the high degree of variability in the identification of OH-related scientific publications. Each researcher could perceive research output according to how they view OH and how the research fits into that perception. Alternatively, two researchers might identify a research publication to be OH-related but fall into different primary and/or secondary designations.

The number of OH-related publications identified by undergraduate reviewers was far higher than found by both post-graduate reviewers, while analysing the number of publications of all four reviewers that had a primary and secondary designation brought the variability of the numbers down considerably. The number of OH-related publications identified between the two post-graduate reviewers was considerably smaller. This is possibly due to the relative lack of a OH definition, where undergraduate students are not able to filter research that is not specifically OH-related. As discussed in the literature review, the different OH definitions could be viewed as an essential aspect of OH which showcases the wide spectrum of professions and understanding of the role the OH concept performs within their field. In addition, undergraduate students have had less exposure to both research and evaluation of research publications which negatively affects their ability.

This indicates that involvement of multiple reviewers with prior training in concepts of OH at an advanced level is advantageous in the evaluation of the OH-ness of an academic institution.

When evaluating all the scientific publications from the FVS, 824 unique OH-related publications (49.05%) were identified. This amount is more than four times the

amount identified by PG1, and more than two times the amount found by PG2. When looking at only publications where agreement was either between three out of four researchers or four out of four researchers, 249 publications were identified. This is within 1 standard deviation of the average.

If publications where agreement between at least two researchers was included, the total number of publications identified is 443. This is more than 1 standard deviation away from average, which lowers the confidence of the result.

A model that could be created to reduce bias would involve having four researchers with experience and exposure to OH and that come from similar professional backgrounds. This would allow for researchers to utilise their own understanding and definitions of OH to define a publication. All results can then be checked for agreement between the researchers. If the agreement between researchers when added together is within 1 standard deviation, then that will be the agreement level required for that evaluation.

Even if there is agreement between researchers that a scientific publication is OH-related, there could be disagreement between the designation. This disagreement, could be overcome by having a fifth researcher with OH experience and from the institute to independently evaluate and provide primary and secondary designations to the identified OH-related publications. This proposed method of having another independent researcher could lead to an improvement, but this method needs to be validated.

In summary, there is a lack of continuous growth trends within the FVS OH-related publications, but organic growth is improving the OH-related research emanating from the FVS. The research is becoming more diverse, and researchers are increasingly looking at aspects outside of their own discipline. There is a disproportional amount of focus within two thematic areas, namely infectious disease either with a zoonotic or socio-economic impact, which can be addressed

by improving other thematic areas of research through the appointment of staff with special emphasis on a OH orientation in non-clinical roles by an underperforming department. An area of potential growth for the FVS is within environment health research, collaborative research both outside the faculty and outside the professional background of animal health as well as a growing awareness of what constitutes OH.

## **B. Conceptual understanding and evaluation**

### **Interviews**

Out of the nine OH projects identified, five were research-driven while none of them was aimed at undergraduate veterinary students. This means that there is currently no practical OH education of undergraduates being undertaken at the FVS, which would help improve the knowledge and awareness of OH by veterinarians in future years and would lead to a direct increase of OH-related research publication and initiatives by the FVS. Due to the current structure of the FVS, there is both a limited opportunity for researchers to involve undergraduates within OH-orientated projects as well as a lack of funding for them to be involved.

Of the five initiatives identified, the aims of the projects were to fill scientific knowledge gaps, educate professionals within and outside of the animal health discipline and to improve the health of humans and animals. Of these five initiatives, only two actively collaborate with faculties and professionals outside of the FVS. The other three initiatives utilise skills, infrastructure and knowledge from outside the FVS but do not actively work in a collaborative manner. This could be due to a lack of interaction between disciplines in different spheres or lack of knowledge of research being undertaken in other spheres. Collaborators who are willing to engage in utilisation of the OH approach could also be a potential cause of the lack of active outside collaboration. This means that the potential opportunities for new OH-related initiatives in South Africa are wide-ranging and not limited to a theoretical level only.



The knowledge, expertise, and infrastructure within the FVS exist to improve the number of OH initiatives that currently exist. When evaluating the “performance evaluation” structure, supervisors only receive 0.5 units compared to 1 unit when they are a co-supervisor compared to being an only supervisor. This system of performance evaluation actively penalises supervisors for attempting to work across disciplines and ensure a trans-disciplinary approach to research. As such the barriers to OH at the FVS require an evaluation of current funding and performance. It was identified that the lack of dedicated OH funding and co-coordination are barriers experienced across all the OH projects.

Overall, the lack of support through funding and infrastructure from the FVS was apparent, as was the lack of intention to improve future OH awareness through involvement with practical interventions. A limitation on the ability for collaborative areas was seen as a major barrier. There was limited outreach from the different OH initiatives to professions outside of the faculty to provide diverse input at the commencement of initiatives to improve the overall success of the initiatives which is due to the current structure of the performance targets. The focus of many of the OH initiatives was on improving animal health and a by-product was that there would be an improvement in human health instead of attempting to improve animal, human and environmental health and knowledge together in a manner that limits impact on each component. This is likely due to activity leaders not actively working and collaborating outside of their spheres when planning OH activities, a lack of OH awareness and the benefits of a OH approach. Improving OH awareness and actively creating spaces for cross-pollination of ideas and communication between different spheres could contribute to improvements being realised.

## Project and Initiative Scoring

Modification of the original scoring to ensure accurate evaluation is allowed according to Rüegg et al. (2016), which was done in the scoring of the OH projects and initiatives at the FVS.

OH projects at the FVS regularly fail to properly engage with the relevant stakeholders and actors. This could lead to challenges of delayed implementation as well as a lack of community and stakeholder commitment to the project which could reduce the potential impact thereof. A standard protocol for OH project planning which focuses on external stakeholder engagement and allowance for self-assessment could contribute to an improvement in the outcome of a OH project.

All initiatives scored poorly on transdisciplinary balance, which indicates a systemic issue with how the teams for these initiatives are constituted. This could be due to the lack of a creative and open space where multiple disciplines gather to share ideas, projects and discuss issues. These types of spaces allow for teams to identify new members that come from different health spheres. The majority of projects scored low in *Breadth of collaboration* and *Transdisciplinary balance*, which indicates that the projects are dominated by people working within a single discipline. While some projects scored well for how broad the initiative was in terms of the work they were doing, many performed poorly which can also be attributed to the lack of cross-pollination and lack of institutional funding to expand the projects and initiatives outside of the FVS.

Overall, the poor scores for sharing across all the initiatives indicate that the institutional support for these OHi is lacking, and will result in the initiative not reaching its maximum potential impact. The FVS and the University of Pretoria could provide support through chairs, funding and the dissemination of regular newsletters that are aimed at different groups such as academics, the general public and students where OH initiatives can provide information. Due to time constraints many

OH initiatives do not have the capacity to produce the material nor the time to identify various and different audiences, and the FVS can assist in this.

### **Limitations of the study**

The COVID-19 pandemic meant that all interviews and scoring was performed online which limited the discussion and participation of researchers.

Due to the structure of the FVS publications database it is not possible to accurately determine the professional backgrounds of the different researchers. This means that it is not possible to correctly evaluate if researchers are working across disciplines.

Overall, the assessed OH projects and initiatives performed well in certain aspects; limited conclusions can be drawn from these scores as the scoring was not done exactly as per the model. This was due to limitations on time and participants not wanting to be interviewed. Rather these scores should be used to self-evaluate OH projects and initiatives and assist in finding areas of poor performance that can be targeted to be improved. These scores, if performed by the members of initiatives on a regular basis, can help them note any improvements in areas and how each initiative has progressed over time.

## CONCLUSION

The main focus of OH research publication within the FVS is disproportionately orientated towards infectious disease that has either a zoonotic disease or socio-economic impact. Research within the FVS is orientated towards primarily animal health that has human health implications, while there is limited research that evaluates the impact on environmental health. The quantum of OH-related research at the present time is not increasing, either as a percentage of total output or the number of publications. The research being produced that falls under the OH concept is happening as a by-product of other research and not due to an active plan by the FVS.

The majority of OH-related projects and initiatives are research-driven, with the objectives varying from filling scientific gaps, education of health professionals and improvement of animal health through human disease identification and treatment. There was a definite lack of awareness of OH and whether an initiative is considered to be OH-related or not. There was a limitation on institutional support for the creation of OH initiatives and the lack of a forum that allows for cross-pollination of ideas and skills both within and outside of the FVS.

Certain conclusions were drawn regarding important aspects of how to ensure that initiatives are more OH-orientated through proper planning before starting and that there is a lack of transdisciplinary balance across the institution's initiatives that need to be addressed.

To accurately evaluate OH-ness at an academic institution, it is important to evaluate multiple aspects within the institution as they provide various pieces of information. Starting with an evaluation of research publications allows for easier identification of OH initiatives within the institution and will allow for a complete evaluation of different initiatives due to the lack of knowledge surrounding OH and if initiatives are OH-

related or not. Multiple experienced researchers with different backgrounds that have been involved in OH should all perform a systematic review of all research publications from the institution. A further refinement, whereby only publications that have a primary and secondary designation will be recognised as being OH-related publications. All interviews should take place with the methodology utilised for this research, but with a greater emphasis placed on identifying challenges that OH projects encounter during the beginning of the project in order to identify further barriers. Finally, all quantitative evaluations should be done by the interviewee, and occur annually to indicate improvement or regression.

Throughout the research, it was apparent there was a lack of a complete, coherent and coordinated OH plan within the FVS. The major barriers noted include the lack of specialised funding, collaborative areas for knowledge sharing and cross-pollination of ideas and the current structure of performance evaluation. A comprehensive OH plan at the FVS will allow for the OH concept to flourish within FVS due to the numerous areas of potential growth in terms of research and initiatives. These areas include, but are not limited to, environmental health, cross-pollination of knowledge between various professions and disciplines. With an OH plan, the issues of awareness and understanding of OH within the current staff can be addressed, which would lead to a direct increase in OH-related work. An aspect that promotes trans-disciplinary working with institutions that provide a different professional background should be integrated into performance evaluation. This could be through the creation of high-level agreements between the FVS and institutions that are outside of the animal health field to facilitate different types of collaboration.

Furthermore, an OH plan could address the issue of OH teaching of undergraduate veterinary students, and lead to the improvement of teaching to undergraduates through practical examples and involvement with OH-related initiatives that would allow the FVS to become a leading OH institution at the international level. In addition, it will improve the basic knowledge and understanding of OH in the next

generation of veterinarians that leave the institution, which will allow for long term growth in the area of OH for the FVS.

Through this research, a best practise study design to evaluate OH-ness at the academic institution has been created that will add to the growing number of tools available to evaluate OH. It has also created an understanding of the current state of OH at the FVS, by identifying areas where improvement is possible and where FVS currently excels.

Overall, the level of OH-ness at the FVS is good considering that the current state and improvements seen over time were not due to a concerted effort from within the FVS. All improvements presently identified are due to researchers and OH activity leaders attempting to incorporate the OH concept within their pre-existing work. There are various areas for growth, such as institutional funding or creation of spaces for discussion regarding OH, that can lead the FVS becoming a global leader in OH.

## REFERENCES

- Anonymous 'One Health', (updated 2017-03-27) <<https://www.uu.nl/masters/en/one-health>>, accessed 05 May 2021.
- Anonymous 'MSc (Tropical Animal Health) | University of Pretoria', <<https://www.up.ac.za/msc-tropical-animal-health>>, accessed 05 May 2021.
- Anonymous 'One Health', <<https://www.ed.ac.uk/vet/studying/postgraduate/taught-programmes/one-health>>, accessed 05 May 2021.
- Association, American Veterinary Medical (2021), 'What is One Health?', <<https://www.avma.org/one-health-what-one-health>>, accessed 9 February.
- Atlas, Ronald M. (2013), 'One Health: Its Origins and Future', in John S. Mackenzie, et al. (eds.), *One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases: The Concept and Examples of a One Health Approach* (Berlin, Heidelberg: Springer Berlin Heidelberg), 1-13.
- Baum, Sarah E., et al. (2017), 'Evaluating one health: Are we demonstrating effectiveness?', *One Health*, 3, 5-10.
- Berrian, Amanda M, et al. (2016), 'One Health profile of a community at the wildlife-domestic animal interface, Mpumalanga, South Africa', *Preventive veterinary medicine*, 130, 119-28.
- Bevc, Christine A, H. Retrum, Jessica, and M. Varda, Danielle (2015), 'New perspectives on the “silo effect”: initial comparisons of network structures across public health collaboratives', *American journal of public health*, 105 (S2), S230-S35.
- Buttigieg, Sandra C., et al. (2018), 'Brucellosis Control in Malta and Serbia: A One Health Evaluation', *Frontiers in Veterinary Science*, 5 (147).
- Chirau, T, et al. (2018), 'Assessing evaluation education in African tertiary education institutions: Opportunities and reflections', *South African Journal of Higher Education*, 32 (4), 229-44.
- Commission, One Health (2021), 'What is One Health?', <[https://www.onehealthcommission.org/en/why\\_one\\_health/what\\_is\\_one\\_health/](https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/)>, accessed 9 February.
- Destoumieux-Garzón, Delphine, et al. (2018), 'The one health concept: 10 years old and a long road ahead', *Frontiers in veterinary science*, 5, 14.
- Diseases, Centre for Communicable (2021), 'One Health', <<https://www.cdc.gov/onehealth/index.html>>, accessed 9 February.
- Frank, Diane (2008), 'One world, one health, one medicine', *The Canadian veterinary journal*, 49 (11), 1063.
- Frankson, Rebekah, et al. (2016), 'One Health Core Competency Domains', *Frontiers in Public Health*, 4 (192).
- Gibbs, Samantha EJ and Gibbs, E Paul J (2012), 'The historical, present, and future role of veterinarians in One Health', *One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases*, 31-47.
- Gower, Charlotte M, Vince, Louise, and Webster, Joanne P (2017), 'Should we be treating animal schistosomiasis in Africa? The need for a One Health economic evaluation

- of schistosomiasis control in people and their livestock', *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 111 (6), 244-47.
- Gray, Lia M, et al. (2020), 'Expanding qualitative research interviewing strategies: Zoom video communications', *The Qualitative Report*, 25 (5), 1292-301.
- Haraldsson, Hörður V (2004), *Introduction to system thinking and causal loop diagrams* (Department of chemical engineering, Lund University).
- Hassell, James M, et al. (2017), 'Urbanization and disease emergence: dynamics at the wildlife–livestock–human interface', *Trends in ecology & evolution*, 32 (1), 55-67.
- Haxton, Eva, Šinigoj, Špela, and Rivière-Cinnamond, Ana (2015), 'The Network for Evaluation of One Health: evidence-based added value of One Health', *Infection ecology & epidemiology*, 5, 28164-64.
- Health, World Organisation for Animal (2021), 'One Health', <<https://www.oie.int/en/for-the-media/onehealth/>>, accessed 09 February.
- Hobohm, Carsten (2003), 'Characterization and ranking of biodiversity hotspots: centres of species richness and endemism', *Biodiversity & Conservation*, 12 (2), 279-87.
- Initiative, One Health (2021), 'One Health', <<https://onehealthinitiative.com/about/>>, accessed 9 February.
- Jones, Bryony A., et al. (2013), 'Zoonosis emergence linked to agricultural intensification and environmental change', *Proceedings of the National Academy of Sciences*, 110 (21), 8399-404.
- Jones, Kate E, et al. (2008), 'Global trends in emerging infectious diseases', *Nature*, 451 (7181), 990-93.
- Khan, Mishal S., et al. (2018), 'The growth and strategic functioning of One Health networks: a systematic analysis', *The Lancet Planetary Health*, 2 (6), e264-e73.
- King, LJ (2009), 'One world of veterinary medicine', *Revue scientifique et technique (International Office of Epizootics)*, 28 (2), 463-7, 69.
- Kriek, NPJ and Swan, GE (2009), 'Veterinary education in Africa: current and future perspectives: animal health management in the 21st century', *Onderstepoort Journal of Veterinary Research*, 76 (1), 105-14.
- Lammie, Samantha L and Hughes, James M (2016), 'Antimicrobial resistance, food safety, and one health: the need for convergence', *Annual review of food science and technology*, 7, 287-312.
- Mackenzie, John S and Jeggo, Martyn (2019), 'The One Health Approach—Why Is It So Important?', *Tropical Medicine and Infectious Disease*, 4 (2), 88.
- Monath, Thomas P, Kahn, Laura H, and Kaplan, Bruce (2010), 'One health perspective', *ILAR journal*, 51 (3), 193-98.
- O'shaughnessy, Patrick T (2008), 'Parachuting cats and crushed eggs the controversy over the use of DDT to control malaria', *American journal of public health*, 98 (11), 1940-48.
- Ogada, Darcy L, Keesing, Felicia, and Virani, Munir Z (2012), 'Dropping dead: causes and consequences of vulture population declines worldwide', *Annals of the New York Academy of Sciences*, 1249 (1), 57-71.
- Organisation, World Health (2021), 'One Health', <<https://www.who.int/news-room/q-a-detail/one-health>>, accessed 9 February.



- Paternoster, Giulia, et al. (2017), 'The Degree of One Health Implementation in the West Nile Virus Integrated Surveillance in Northern Italy, 2016', *Frontiers in Public Health*, 5 (236).
- Patz, Jonathan A. and Hahn, Micah B. (2013), 'Climate Change and Human Health: A One Health Approach', in John S. Mackenzie, et al. (eds.), *One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases: Food Safety and Security, and International and National Plans for Implementation of One Health Activities* (Berlin, Heidelberg: Springer Berlin Heidelberg), 141-71.
- Podsakoff, Philip M., MacKenzie, Scott B., and Podsakoff, Nathan P. (2016), 'Recommendations for Creating Better Concept Definitions in the Organizational, Behavioral, and Social Sciences', *Organizational Research Methods*, 19 (2), 159-203.
- Robinson, T. P., et al. (2016), 'Antibiotic resistance is the quintessential One Health issue', *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 110 (7), 377-80.
- Rubin, Carol S. (2013), 'Operationalizing One Health: Stone Mountain and beyond', *Current topics in microbiology and immunology*, 366, 173-83.
- Rüegg, Simon, et al. (2018a), 'A one health evaluation framework', *Integrated approaches to health : a handbook for the evaluation of One Health*, 39-85.
- Rüegg, Simon R., et al. (2018b), 'A Systems Approach to Evaluate One Health Initiatives', *Frontiers in Veterinary Science*, 5 (23).
- Rüegg, Simon R., et al. (2017), 'A Blueprint to Evaluate One Health', *Frontiers in Public Health*, 5 (20).
- Ryu, Sukhyun, et al. (2017), 'One health perspectives on emerging public health threats', *Journal of Preventive Medicine and Public Health*, 50 (6), 411.
- Sappleton, Natalie and Lourenço, Fernando (2016), 'Email subject lines and response rates to invitations to participate in a web survey and a face-to-face interview: the sound of silence', *International Journal of Social Research Methodology*, 19 (5), 611-22.
- Schrader, Kurt 'H.R.3771 - 116th Congress (2019-2020): Advancing Emergency Preparedness Through One Health Act of 2019', [legislation], (updated 08/09/2019) <<https://www.congress.gov/bill/116th-congress/house-bill/3771/>>, accessed.
- Schwabe, C. W. (1964), 'Veterinary Medicine and Human Health', (The Williams & Wilkins Company).
- Siemiatycki, Jack (1979), 'A comparison of mail, telephone, and home interview strategies for household health surveys', *American Journal of Public Health*, 69 (3), 238-45.
- Stroud, Cheryl, et al. (2016a), 'One Health training, research, and outreach in North America', *Infection ecology & epidemiology*, 6 (1), 33680.
- Stroud, Cheryl, et al. (2016b), 'A one health overview, facilitating advances in comparative medicine and translational research', *Clinical and translational medicine* (5: Springer), 1-7.
- Thanner, Sophie, Drissner, David, and Walsh, Fiona (2016), 'Antimicrobial resistance in agriculture', *MBio*, 7 (2), e02227-15.
- Vandersmissen, A and Welburn, SC (2014), 'Current initiatives in one health: consolidating the one health global network', *Rev Sci Tech*, 33 (2), 421-32.

- Wasimuddin, et al. (2020), 'Evaluation of primer pairs for microbiome profiling from soils to humans within the One Health framework', *Molecular Ecology Resources*, 20 (6), 1558-71.
- Weller, Susan C, et al. (2018), 'Open-ended interview questions and saturation', *PloS one*, 13 (6), e0198606.
- Woolhouse, M. E. J., et al. (2001), 'Risk factors for human disease emergence', *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 356 (1411), 983-89.
- Yates-Doerr, Emily (2015), 'The world in a box? Food security, edible insects, and “One World, One Health” collaboration', *Social Science & Medicine*, 129, 106-12.
- Zinsstag, Jakob, et al. (2011), 'From “one medicine” to “one health” and systemic approaches to health and well-being', *Preventive veterinary medicine*, 101 (3-4), 148-56.

## ANNEXURES

### Annexure 1: Recording

Student training video:

[https://drive.google.com/drive/folders/174RxaRFXZyNLralPK\\_XxzBmSodVc7WIX?usp=sharing](https://drive.google.com/drive/folders/174RxaRFXZyNLralPK_XxzBmSodVc7WIX?usp=sharing)

### Annexure 2: Questionnaire

1.	What is the selected initiative?	<i>Name and describe the initiative in few lines to outline the main features and characteristics</i>
2.	Why does the initiative exist?	<i>What are the reasons that determined the initiative? What does justify the existence of the initiative? What is the problem behind?</i>
3.	What are the aims of the initiative?	<i>What does the initiative materially do or make? How does the initiative contribute to a wider problem or a general context? In particular, what problem does the initiative want to solve in that context?</i>
4.	How the initiative is meant to solve the targeted problem?	<i>What are the specific actions that lead to the expected result? What processes are activated? How are those processes combined in view of the aim?</i>
5.	What barriers to the initiative were experienced?	
6.	What is the timeline of the initiative?	<i>Identify a starting and ending point, if applicable (e.g. a research project); or is it an iterative process, conditioned by result (e.g. a surveillance programme or a medical programme)? Is it continuous (e.g. a structured teaching programme)?</i>
7.	What geographical level does the initiative involve or target?	
8.	What are the other relevant dimensions involved in the initiative?	<i>Social sector, economy, life dimensions, organization, knowledge creation, teaching or training, dissemination</i>
9.	In which sectors of the OH does the initiative operate?	<i>Human health Animal health Environment</i>
10.	At what level does the initiative operate?	
11.	How does the initiative influence OH sectors and/or their relationships?	
12.	What kind of resources are in place to make the initiative work?	<i>Competences, material and immaterial infrastructure, funding, specific equipment, ...</i>

## **Annexure 3: Informed Consent**

### **Interview Consent Form**

**Research Project Title:** Evaluation for One Health-ness of the Faculty of Veterinary Science, University of Pretoria

**Research investigator:** Dr A Jeenah - +27 82 416 7325 – aqiljeenah@gmail.com

**Research Participants name:**

The interview will take approximately 1-1.5 hours. We don't anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research undertaken from a South African institutions require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Would you therefore read the information below and then sign this form to certify that you approve the following:

- the interview will be recorded and a transcript will be produced.
- you will be sent the transcript and given the opportunity to correct any factual errors.
- the transcript of the interview will be analysed by Dr A Jeenah as research investigator.
- access to the interview transcript will be limited to Dr A Jeenah and academic colleagues and researchers with whom he might collaborate as part of the research process .
- any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed.
- the actual recording will be kept for 5 years.
- any variation of the conditions above will only occur with your further explicit approval

All or part of the content of your interview may be used;

- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations.
- On other feedback events

- In an archive of the project as noted above

By signing this form I agree that;

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read the Information sheet;
4. I don't expect to receive any benefit or payment for my participation;
5. I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

Printed Name: \_\_\_\_\_

\_\_\_\_\_  
Participants Signature

Date \_\_\_\_\_

\_\_\_\_\_  
Researchers Signature

Date \_\_\_\_\_

If you do not agree to the above conditions, you will be excluded from the interview process of this study. It will be noted how many people refused to sign this form and the subsequent interview process.

## Annexure 4: Ethics Approval



Faculty of Veterinary Science

Research Ethics Committee

12 June 2020

CONDITIONALLY APPROVAL

<b>Ethics Reference No</b>	<b>REC047-20</b>
<b>Protocol Title</b>	<b>Evaluation for One Health-ness of the Faculty of Veterinary Science, University of Pretoria</b>
<b>Principal Investigator Supervisors</b>	<b>Dr Aqil Jeenah Prof AL Michel</b>

Dear Dr Aqil Jeenah,

We are pleased to inform you that your submission has been conditionally approved by the Faculty of Veterinary Sciences Research Ethics committee, subject to other relevant approvals.

Please note the following about your ethics approval:

1. Please use your reference number (REC047-20) on any documents or correspondence with the Research Ethics Committee regarding your research.
2. Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.
3. Please note that ethical approval is granted for the duration of the research as stipulated in the original application for post graduate studies (e.g. Honours studies: 1 year, Masters studies: two years, and PhD studies: three years) and should be extended when the approval period lapses.
4. The digital archiving of data is a requirement of the University of Pretoria. The data should be accessible in the event of an enquiry or further analysis of the data.

Ethics approval is subject to the following:

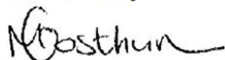
1. The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.
2. **Applications using Animals:** FVS ethics recommendation does not imply that AEC approval is granted. The application has been pre-screened and recommended for review by the AEC. Research may not proceed until AEC approval is granted.

NOTES:

1. Conditionally approved (pending obtaining other relevant approvals).
2. Supervisor should have the right to co-authorship (which is currently not indicated in the application).

We wish you the best with your research.

Yours sincerely



**PROF M. OOSTHUIZEN**  
Chairperson: Research Ethics Committee



## Faculty of Humanities

Fakulteit Geesteswetenskappe  
Lefapha la Bomotheo



21 July 2020

Dear Dr Aqil Jeenah

<b>Project Title:</b>	Evaluation for One Health-ness of the Faculty of Veterinary Science, University of Pretoria
<b>Researcher:</b>	Dr Aqil Jeenah
<b>Supervisor(s):</b>	Prof AL Michel
<b>Department:</b>	Veterinary Tropical Diseases
<b>Reference number:</b>	12059162 (REC047-20)
<b>Degree:</b>	Masters

I have pleasure in informing you that the above application was **approved** by the Research Ethics Committee on 21 July 2020. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely,



**Prof Innocent Pikirayi**  
**Deputy Dean: Postgraduate Studies and Research Ethics**  
**Faculty of Humanities**  
**UNIVERSITY OF PRETORIA**  
e-mail: PGHumanities@up.ac.za



Office of the Registrar

2020-09-07

Dr Aqil Jeenah  
Department of Veterinary Tropical Diseases  
Faculty of Veterinary Science  
University of Pretoria

Email: [aqiljeenah@gmail.com](mailto:aqiljeenah@gmail.com)  
Cc: [marinda.oosthuizen@up.ac.za](mailto:marinda.oosthuizen@up.ac.za)

Dear Dr Jeenah

#### APPROVAL OF RESEARCH STUDY

The UP Survey Coordinating Committee has granted approval for your Masters research study titled "Evaluation for One Health-ness of the Faculty of Veterinary Science, University of Pretoria".

The proposed research study has to strictly adhere to the associated study protocol, as well as the UP Survey Policy and the Research Ethics Committee of the Faculty of Veterinary Science and the Faculty of Humanities instructions.

A final electronic copy of the research outcomes must be submitted to the Survey Coordinating Committee as soon as possible after the completion of the study. Please liaise with the Market Research Office in the Department of Institutional Planning ([carlien.nell@up.ac.za](mailto:carlien.nell@up.ac.za)) to officially register the study and to finalise the survey procedures and the field work dates.

Kind regards



**Prof CMA Nicholson**  
**REGISTRAR**  
**CHAIRPERSON: SURVEY COORDINATING COMMITTEE**



## Annexure 5: Raw Data

### Annexure 5 I: Scientific research publication

Primary designation only												
Research Output complied by post-graduate												
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
PG 1 Reviewer	20	15	29	22	17	16	19	19	26	11	3	197
	10,15%	7,61%	14,72%	11,17%	8,63%	8,12%	9,64%	9,64%	13,20%	5,58%	1,52%	100,00%
PG 2 Reviewer	25	15	36	35	27	31	45	37	42	22	11	326
	8%	5%	11%	11%	8%	10%	14%	11%	13%	7%	3%	100%
Research Output complied by under-graduate												
UG 1 Reviewer	34	35	67	56	38	50	44	47	48	40	7	466
	7%	8%	14%	12%	8%	11%	9%	10%	10%	9%	2%	100%
UG 2 Reviewer	42	48	55	100	48	50	62	75	80	61	22	643
	7%	7%	9%	16%	7%	8%	10%	12%	12%	9%	3%	100%

Primary and secondary designation												
Research Output complied by post-graduate												
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
PG 1 Reviewer	17	12	19	18	14	10	16	17	22	11	3	159
	10,69%	7,55%	11,95%	11,32%	8,81%	6,29%	10,06%	10,69%	13,84%	6,92%	1,89%	100,00%
PG 2 Reviewer	19	9	9	11	12	8	15	10	10	6	0	109
	17%	8%	8%	10%	11%	7%	14%	9%	9%	6%	0%	100%
Research Output complied by under-graduate												
UG 1 Reviewer	26	15	31	29	16	16	25	24	21	15	3	221
	12%	7%	14%	13%	7%	7%	11%	11%	10%	7%	1%	100%
UG 2 Reviewer	26	23	23	21	18	10	19	27	33	25	5	230
	11%	10%	10%	9%	8%	4%	8%	12%	14%	11%	2%	100%

Research Output complied by post-graduate										
Primary										
	<u>Termed One Health</u>	<u>Public Health</u>	<u>Involving animal, human and environmental health in a combination/ or together.</u>	<u>Infectious disease with zoonotic implications.</u>	<u>Infectious disease that has socio-economic effects.</u>	<u>Food security</u>	<u>Food safety</u>	<u>Antimicrobial Resistance</u>	<u>Climate change that involves public health response</u>	<u>total</u>
PG 1 Reviewer	10	15	30	61	22	7	11	41	0	197
PG 2 Reviewer	12	12	17	209	7	1	23	39	1	321
Secondary										
PG 1 Reviewer	4	68	30	23	5	12	15	1	1	159
PG 2 Reviewer	0	29	29	34	1	2	14	1	0	110
No secondary designation										
PG 1 Reviewer	1	0	14	3	3	3	3	11	0	38
% Of total with secondary designation	90,00%	100,00%	53,33%	95,08%	86,36%	57,14%	72,73%	73,17%	N/A	80,71%
PG 2 Reviewer	5	6	5	154	4	0	7	30	0	211
% Of total with secondary designation	58,33%	50,00%	70,59%	26,32%	42,86%	100,00%	69,57%	23,08%	100,00%	34,27%

Research Output compiled by under-graduate										
Primary										
	<u>Termed One Health</u>	<u>Public Health</u>	<u>Involving animal, human and environmental health in a combination/ or together.</u>	<u>Infectious disease with zoonotic implications.</u>	<u>Infectious disease that has socio-economic effects.</u>	<u>Food security</u>	<u>Food safety</u>	<u>Antimicrobial Resistance</u>	<u>Climate change that involves public health response</u>	<u>total</u>
UG 1 Reviewer	12	57	56	94	120	11	33	79	4	466
UG 2 Reviewer	14	47	59	279	92	28	43	80	1	643
Secondary										
UG 1 Reviewer	5	57	57	33	33	5	21	10	0	221
UG 2 Reviewer	1	59	22	52	35	15	33	10	3	230
No secondary designation										
UG 1 Reviewer	0	22	35	25	99	6	6	50	2	245
% of total with secondary designation	100,00%	61,40%	37,50%	73,40%	17,50%	45,45%	81,82%	36,71%	50,00%	47,42%
UG 2 Reviewer	3	21	49	188	67	19	15	51	0	413
% of total with secondary designation	78,57%	55,32%	16,95%	32,62%	27,17%	32,14%	65,12%	36,25%	100,00%	35,77%

## Annexure 5 II: Combination of designation as provided by additional independent reviewers

Primary designation of OH-related scientific publications performed by PG2.

PG2											
Primary Designation code	Secondary Designation code										Total
	TOH	PH	IAHET	IDZ	IDSE	FSe	FSa	AMR	CC	No secondary designation	
TOH	*	0	1	6	0	0	0	0	0	5	12
PH	0	*	1	5	0	0	0	0	0	6	12
IAHET	0	0	*	12	0	0	0	0	0	5	17
IDZ	0	23	25	*	1	0	6	0	0	154	209
IDSE	0	0	0	2	*	1	0	0	0	4	7
FSe	0	0	0	0	0	*	1	0	0	0	1
FSa	0	6	0	8	0	1	*	1	0	7	23
AMR	0	0	2	0	0	0	7	*	0	30	39
CC	0	0	0	1	0	0	0	0	*	0	1
Total	0	29	29	34	1	2	14	1	0	211	321

Primary designation of OH-related scientific publications performed by UG1.

UG1											
Primary Designation code	Secondary Designation code										Total
	TOH	PH	IAHET	IDZ	IDSE	FSe	FSa	AMR	CC	No secondary designation	
TOH	*	3	2	6	1	0	0	0	0	0	12
PH	0	*	13	13	4	0	3	2	0	22	57
IAHET	1	12	*	3	3	0	1	1	0	35	56
IDZ	2	24	19	*	14	0	10	0	0	25	94
IDSE	1	1	9	5	*	2	2	1	0	99	120
FSe	0	0	0	1	3	*	1	0	0	6	11
FSa	0	14	1	1	4	2	*	5	0	6	33
AMR	1	3	12	4	4	1	4	*	0	50	79
CC	0	0	1	0	0	0	0	1	*	2	4
Total	5	57	57	33	33	5	21	10	0	245	466

Primary designation of OH-related scientific publications performed by UG2.

UG2											
Primary Designation code	Secondary Designation code										Total
	TOH	PH	IAHET	IDZ	IDSE	FSe	FSa	AMR	CC	No secondary designation	
TOH	*	1	1	9	0	0	0	0	0	3	14
PH	0	*	2	15	1	1	2	4	1	21	47
IAHET	0	5	*	1	2	2	0	0	0	49	59
IDZ	1	37	10	*	22	1	18	1	1	188	279
IDSE	0	4	1	7	*	8	3	1	1	67	92
FSe	0	0	1	0	6	*	1	1	0	19	28
FSa	0	9	2	10	3	1	*	3	0	15	43
AMR	0	3	4	10	1	2	9	*	0	51	80
CC	0	0	1	0	0	0	0	0	*	0	1
Total	1	59	22	52	35	15	33	10	3	413	643