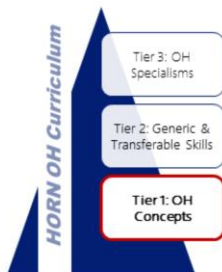




UK Research
and Innovation



22. Transdisciplinary Research

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This is an introductory lecture for the teaching modules of the One Health Regional Network, or HORN project. This lecture forms part of the tier 1 concepts curriculum program.

My name is Siobhan Mor and I am an epidemiologist in both public health and veterinary medicine background. I work at the Institution of Infection and Global Health at the University of Liverpool in the UK. I am based at the International Livestock Research Institute in Ethiopia where I am a visiting scientist.

The subject of this lecture is transdisciplinary research (TD).

1. Definition of One Health (revisited)



- “One Health is the **collaborative effort** of multiple health science professions, together with their related disciplines and institutions – working locally, nationally, and globally – to attain optimal health for people, domestic animals, wildlife, plants, and our environment” (One Health Commission)

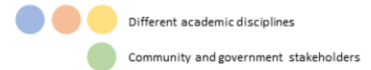
But precisely *how* can multiple disciplines collaborate to achieve this goal?



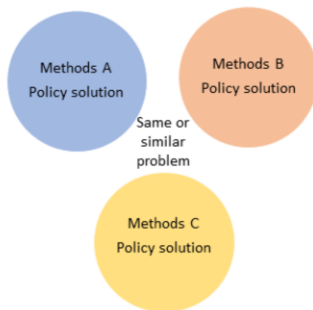
Let’s revisit the definition of One Health.

Earlier on in this program you learnt that One Health as been defined as “the **collaborative effort** of multiple health science professions, together with their related disciplines and institutions – working locally, nationally, and globally – to attain optimal health for people, domestic animals, wildlife, plants, and our environment”. The emphasis on this definition is collaborative effort, but precisely how can multiple disciplines collaborate to achieve this goal? This is the focus of this lecture.

2. Different ways of collaborating

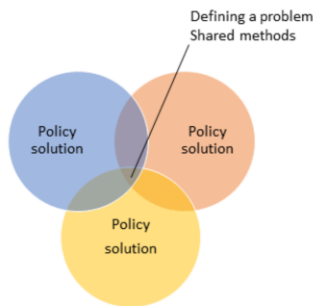


Multidisciplinary



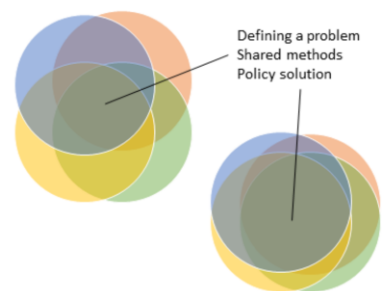
“Researchers from different fields work independently or sequentially, each from their own disciplinary perspectives” (Allen-Scott, 2015)

Interdisciplinary



“Researchers share more information and coordinate more closely with researchers from various fields, but their research is still guided by their own discipline-specific theories and frameworks” (Allen-Scott, 2015)

Transdisciplinary (TD)



“Researchers work jointly using **shared conceptual framework** drawing together disciplinary-specific theories, concepts, and approaches to address common problem” (Rosenstein, 1992) ± involvement of community and government **stakeholders**



Three terms that are often used to describe the nature of collaboration across several disciplines are multidisciplinary, interdisciplinary and transdisciplinary. All involve two or more disciplines, but they actually refer to different approaches to collaboration and the terms themselves are not interchangeable.

In **multidisciplinary** research, we have *multiple* different disciplines – represented here by blue, orange and yellow circles - working on the same or similar problem. Often the problem itself will be framed in a way that is consistent with a particular disciplinary paradigm. Each team member goes about their work by applying methods consistent with their disciplinary toolbox and reaches their own conclusions about the way forward – be it to propose further scientific research or a particular policy solution. In research, these findings would likely be published in separate papers in discipline-specific journals.

A simple example, might be a microbiologist, chemist and public health researcher working on a project that focusses on the problem of antimicrobial resistance. There are 3 specific objectives. The microbiologist focuses on the first objective which aims to understand the mechanisms of resistance of a particular bacteria. The chemist focussed on the second objective, which aims to identify new compounds targeting resistant organisms. Finally, the health researcher focuses on the third objective which aims at understanding prescribing habits of practitioners. In essence it is a divide and conquer approach to research.

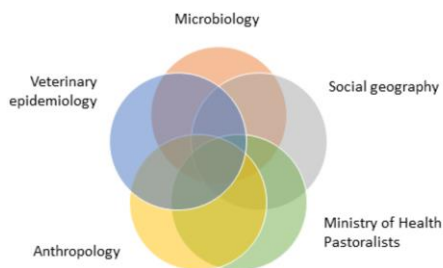
In **interdisciplinary** research, there is more *integration*. The problem itself might be identified and defined by team members from multiple disciplines, and the research will draw on methods and data from more than one discipline. The result is a more synthesized view of the problem and way forward, although research is still largely guided by discipline-specific theories and frameworks. Findings might be published in shared publications using language understood by all contributing disciplines, and the research itself might give rise to new sub-disciplines. So continuing the example of antimicrobial resistance, now the researchers are sharing more information. The microbiologist discovers a particular resistance mechanism, and the chemist then focusses on identifying compounds that overcome this particular mechanism.

In **transdisciplinary** research, the research moves beyond disciplinary boundaries and researchers work together under a shared conceptual framework to define the problem, develop methods and identify appropriate solutions. Called *transdisciplinary* because it *transcends* disciplinary boundaries. In addition, some definitions emphasize the role of community and government stakeholders in the process (represented by the addition of the green circle). In this case, the research is said to be participatory. Findings of TD research are usually published in shared publications using some new language that translates across traditional disciplines. Indeed, TD approaches may give rise to entirely new areas of study. Continuing the antimicrobial resistance example above...now the researchers are engaging with representatives from the pharmaceutical company and professional bodies to discuss what research is needed. They're sharing information with stakeholders and making collective decisions about how guidelines might be adapted based on the research findings.

3. TD research – example

Integrated health service delivery for pastoralists in Chad

- Trigger: Nomadic communities passing by human healthcare facilities
- Challenge: Improve healthcare access by pastoralists



Elements of the program:

- **Launch**
 - Partnership formed with different disciplines represented
 - Setting of overall aims and approaches
 - Exploratory study and site visit
- **Stakeholder involvement**
 - Setting of priorities and goals
 - Review of intermediary findings
 - Identification of pilot interventions
 - Policy formulation and ownership
- **Inter-/trans-disciplinary research, e.g.**
 - Evaluation of morbidity, risk factors, communities' priorities
 - Establishment of laboratory
 - Assessment of interventions
- **Testing interventions, e.g.**
 - Joint vaccination programs



Adapted from: Schelling *et al.*, 2008

To give an example of TD research in an One Health context, consider the issue of health service delivery for pastoralists in Chad. The trigger for this work came from the observation that nomadic communities often passed by healthcare facilities, without accessing services available there. Thus this project set about trying to address the challenge of improving healthcare access by these mobile populations.

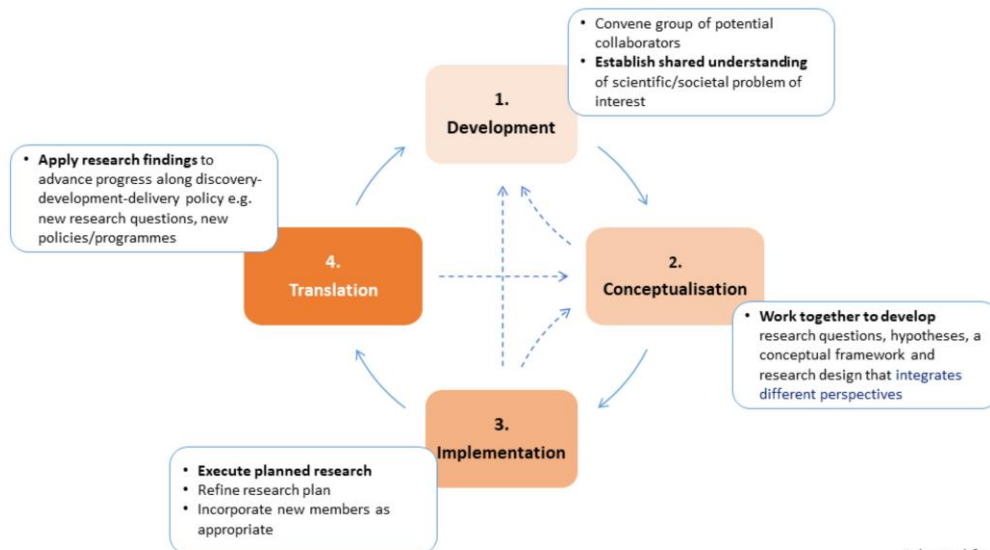
The researchers identified several elements to the program:

1. At the program **launch**, a partnership was formed with different disciplines represented, including microbiologists, veterinary epidemiologists, social geographers, anthropologists and stakeholders from the Ministry and pastoralists themselves. At this launch the overall aims and approaches were agreed, and following this an exploratory study and site visit was initiated to identify possible research directions.
2. The **stakeholders** were continuously involved throughout the program. They worked with the researchers to set the priorities and goals, review intermediary findings and identify potential interventions to pilot. Research evidence was provided to authorities as a way to support the decision- making process.
3. **Inter-disciplinary and transdisciplinary research** was conducted in specific areas – such as evaluating causes or morbidity, risk factors for disease and community

priorities. A laboratory was established to facilitate the research. Projects were complementary – with hypotheses and objectives guided by the recommendations of the first national workshop and carried out in common areas, but informed by specific disciplinary approaches and methods.

4. Finally the program involved **testing an intervention**, namely a joint public health and veterinary vaccination program. This was informed by the research that showed that most animals were vaccinated but no nomadic child was fully immunised – although the communities wanted access to vaccination for their children. Hence the research was conducted to assess the feasibility and success of such interventions. The findings were then passed back to stakeholders who were able to turn these into policies as well as continue a sustained program.

4. Four phases of TD research



Adapted from: Hall *et al.*, 2012

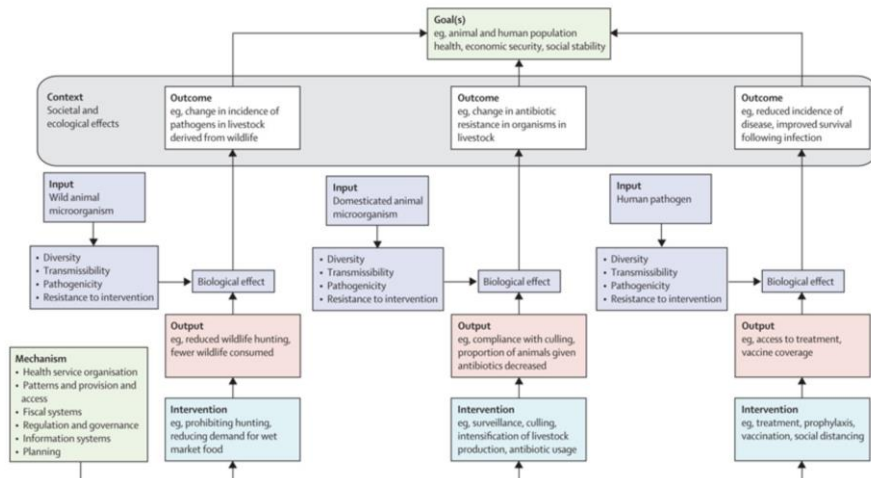
There are four recognised phases of TD research:

1. In the first phase, or **development phase**, researchers and stakeholders are brought together to develop a shared understanding of the problem. This phase is very important as it ensures everyone is on the same page about how to proceed with the project.
2. In the **conceptualisation phase**, the team works together to identify research questions and hypotheses and to develop a conceptual framework and research design that integrates different perspectives. We will discuss conceptual frameworks in more detail on the next slide.
3. Next up is the **implementation phase**. This is where the actual research gets done. In this phase it might be necessary to make refinements to the research plan or incorporate new members with a different skill set. But in general, the research proceeds under the guidance of the conceptual framework that was agreed in the earlier part of the project.
4. The final phase is the **translation phase** where research findings are applied with the aim of advancing progress along the discovery-development-delivery process. In the context of basic research, this might mean designing new studies to address new

hypotheses. For more applied research it might mean making changes to policies or guidelines, based on the findings of the research

It's important to note that the process is iterative and flexible meaning that we might skip phases or go back to an earlier phase, based on the findings of the work.

5. Conceptual framework for One Health research - example



Schematic representation of a framework for research to inform One Health policy on **emerging zoonoses**

From: Coker *et al.* 2011

I mentioned that shared conceptual frameworks are key to TD research. According to one definition, “a conceptual framework explains, either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships among them.” Importantly, a conceptual framework can help researchers see the links between their research and other projects as well as to the overall policy goal.

This example focuses on a particular One Health challenge, namely emerging zoonoses. Our ultimate **goal** is to improve animal and human health. But let’s suppose, as a researcher, we are focussed on antibiotic prescribing practices for livestock. In this example, microorganisms that occur in domestic animals are the **inputs** into the system. And since resistant organisms are dispersed and spread via the environment and other hosts, we can actually consider microorganisms in wild animal and humans as inputs into the system as well.

In our case, we are aiming to develop evidence-based guidelines on the use of antibiotics in livestock. Guidelines in this case are an **intervention**. Interventions are the means by which we intend to achieve the overall goal of improving animal and human health. Interventions produce **outputs** which are the measurable results from a particular intervention program. For example, our guidelines on the use of antibiotics in animals may result in fewer animals being given antibiotics. This ultimately leads to the

outcome of reduced incidence of resistant organisms in livestock.

Its important to note that all of this research is happening in a particular **context**. Context includes the political, legislative, cultural, economic environment, as well as the ecological circumstances. Research questions need to be framed accordingly, as what might work in one place may not work in another.

6. Challenges to effective TD research - environment



- Funding agencies
 - Siloed funding streams
- Academic institutions
 - Siloed organisational structures
 - Differences in resourcing by discipline
 - Territorialism



TD research can be highly rewarding, particularly when the research results in real policy changes. That being said, TD research can be challenging for a number of reasons.

- At the funding agency level, many organisations still default to disciplinary approaches to research. One agency might focus on human health, while another might focus on animal health and production. When tackling One Health issues, we often require funding agencies that are sympathetic to both sides, so obtaining funding can be difficult for TD research.
- Siloed organisational structures at our research institutions can also make it difficult to collaborate effectively with different disciplines – veterinarians might sit in an area that is entirely separated, geographically, from their medical counterparts, making it quite difficult to collaborate. In addition, there can be differences in resourcing by discipline. Traditionally, medicine has tended to receive more money than public health and veterinary medicine, and this can sometimes create territorialism and conflict related to access to resources.

7. Challenges to effective TD research - individual



- Different beliefs in what constitutes rigorous research methods
- Misinterpretation due to differences in terminology
- Feelings that expertise is not understood, acknowledged or valued
- Fear of appearing uninformed
- Reverting to independent research



There are a number of challenges to effective TD research that operate at the individual level.

- Different disciplines often have different beliefs about what constitutes rigorous research methods. A classic example of this are the difference between researchers who engage in qualitative and quantitative research.
- Different disciplines often use the same terms to mean the different things, so there can be misinterpretation due to differences in terminology. One example is “bio-security”, which means something very different to a veterinarian compared to someone who works in a laboratory safety in the context of bio-terrorism.
- Sometimes peoples feelings can be hurt because expertise is not understood, acknowledged or valued by teams when operating in a multidisciplinary environment.
- People can be fearful that they may appear uninformed. In fact, this is because they have a particular skill set, and others have different skill sets – we all add value.

Because of these challenges, researchers will revert to independent research. This can be particularly problematic if it happens halfway through a research project because it may mean objectives may not be reached.

8. Essential KSAs for effective TD One Health research



- Veterinary medicine
- Medicine
- Public health
- Conservation medicine
- Environmental science
- Social science
- etc.

Disciplinary KSAs

- Grant writing
- Research ethics
- Presentation skills
- Grant management, M&E
- Writing for policy
- Working with the media
- etc.

Generic research KSAs

- Communication (cross-disciplinary, cross-cultural)
- Negotiation
- Conflict resolution
- Knowledge translation
- Team building
- Management

Social KSAs



KSA = knowledge, skills and attitudes

As we start to wrap up this presentation, I wanted to talk about the essential knowledge, skills and attitudes for effective TD research, particularly in a One Health context.

We all come to this space with particular disciplinary knowledge, skills and attitudes. Whether that's veterinary medicine, medicine, public health and social science, we all act and believe in certain things as a result of our disciplinary training, and this is often the focus of research programs.

As part of the HORN project we're teaching valuable generic research skills - grant writing, research ethics, presentation skills - things that are cross-cutting so it doesn't matter what disciplinary background you come from.

Finally, and particularly for TD research, it's important that we all have particular knowledge, skills and attitudes. Communication is particularly important, and this relates to our ability and willingness to communicate with people who are different to us, be that because they come from a different discipline or a different culture. Negotiation and conflict resolution skills need to be developed because the potential for misinterpretation in TD research is higher. Knowledge translation skills in helping research to progress to that applied level are critical, as are team building and management skills when working in a TD environment.

9. Summary



- Multidisciplinary, interdisciplinary and transdisciplinary refer to different ways of collaborating and are **not** interchangeable
- Four phases of TD research: development, conceptualisation, implementation, translation
- Shared conceptual frameworks are key to TD research
- Effective TD research requires development of disciplinary, generic and social KSAs



In this lecture we talked about:

- Multidisciplinary, interdisciplinary and transdisciplinary as terms used to refer to different ways of collaborating. It is important to remember that these terms are **not** interchangeable.
- Four phases of TD research were described: development, conceptualisation, implementation, translation.
- We also talked about conceptual frameworks and their importance in developing a shared understanding of the project team.
- Finally, we talked about Effective TD research requires development of disciplinary, generic and social knowledge, skills and attitudes.

On the following slide you will find additional resources where you can read up further on the above topics.

Additional Resources



- Allen-Scott LK *et al.* (2015). Academic institutions and One Health: Building capacity for transdisciplinary research approaches to address complex health issues at the animal–human–ecosystem interface. *Acad Med* 90(7):866-871. doi: 10.1097/ACM.0000000000000639
- Coker R *et al.* (2011). Towards a conceptual framework to support one-health research for policy on emerging zoonoses. *Lancet Infect Dis* 11(4):326-331. doi: 10.1016/S1473-3099(10)70312-1
- Hall KL *et al.* (2012). A four-phase model of transdisciplinary team-based research: goals, team processes, and strategies. *Transl Behav Med* 2(4):415-430. doi: 10.1007/s13142-012-0167-y
- Min B *et al.* (2013). Transdisciplinary research for complex One Health issues: A scoping review of key concepts. *Prev Vet Med* 112(3-4):222-9. doi: 10.1016/j.prevetmed.2013.09.010
- Schelling E *et al.* (2008). Towards integrated and adapted health services for nomadic pastoralists and their animals: A North-South partnership. In: Hirsch Hadorn *et al.* (eds) *Handbook of Transdisciplinary Research*. Springer, Heidelberg, pp. 277–291. ISBN: 978-1-4020-6699-3