One Health Informatics and the stewardship of complex systems

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***Program Description*—This session explores how Complex Adaptive Systems provide a framework for analyzing important social, biological, and environmental systems in One Health. Anthropogenic disturbances, many of which are technological, pose a threat to key ecological and sociological processes. They lead us to consider questions such as: Is artificial intelligence a saviour or a demon? What are the political, ethical, and scientific implications for One Health? How might the Global Burden of Disease (human), the Global Burden of Animal Diseases (GBADs) and other Global Burdens constitute a broader "One Health Burdens of Disease" and provide an evidence-base for One Health decisions? It will be necessary to address different data challenges in the developed and developing worlds, many of which are ethical and political, not just technical. Panelists will discuss the GBADs approach to data sharing, including how FAIR-principled metadata can be used to create trustworthy data systems and how the Data Governance Handbook provides important guidance for communicating data sharing principles to data contributors and users. Each panelist will provide a 5-10 minute "primer" talk which will introduce and link the key themes. This will be followed by a moderated panel discussion with opportunities for the audience to pose questions.**

Keywords—Health, informatics, data collection, data governance, complex systems

The session began with Graham Taylor and what constitutes a complex system. A system is a set of three portions (elements, interconnections, and a function) that can change, adapt, mend injuries, and ensure the system's survival. According to Taylor, there are two methods to study systems: Classical science, which consists of mechanisms such as mathematical equations, and complexity science which consists of mechanisms such as simulation-based computation. Modern AI systems are better classified under complexity science due to their de-centralized nature. Using complex systems like One Health allows us to better understand other complex systems through gathering various types of animal, human, and environmental data.

This was further shown through Theresa Bernardo's presentation, which focused on how the One Health Informatics system creates its complex solutions (or system functions) through the gathering of various forms of data. She noted that "making balanced and informed One Health decisions will depend on having interoperable data through the various global burdens of disease". Such horizontal studies model data like causes of human death and animal [population] health in relation to one another. These forms of data factor into One Health deliberations such as whether humanity has breached the "nine planetary boundaries,"

which otherwise allow humans to operate safely on Earth. However, in using different types of data, issues can arise surrounding how said data is procured and utilized in the One Health approach.

This topic was continued by Deborah Stacey, who broke down how the process of providing data to the One Health Informatics system can create issues. Using a personal example involving Ethiopian livestock, Stacy showed how data of the same topic can be vastly different depending on the source, citing linguistic discrepancies and a lack of semantic interoperability which is a "problem with actually figuring out what people call things". For example, the same set of data can be divided into different categories depending on the organization, with one combined category for 'sheep and goats' versus another organization who divides these in two. Other contextual issues shaping data collection include civil wars or natural disasters, as well as data biases such as having fewer women represented in data sets.

Kassy Raymond then discussed a solution to these issues by data sharing principles for metadata called FAIRS, which stands for findable, accessible, interoperable, reusable, and secure. FAIRS allows for the consideration of interoperability, the comparison of different metadata standards, and can be used to ensure data-centric software are utilizing data in a more ethical way and promotes the view that "communication and data literacy [are] key for data users and contributors" alike.