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Commentary

An evolution in thinking to support the post 2020 global vaccine strategy: The application of complexity and implementation science

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1. Background: The successes and challenges of *the global vaccine action plan*

Immunization is one of the most successful and cost-effective health interventions known [1]. This success however, is dependent on effectively optimising access to and sustainably delivering and utilising vaccines. The Global Vaccine Action Plan (GVAP), endorsed by all 194 member states of the World Health Organisation in May 2012, is a framework to support the equitable access to vaccines through immunization programs [2]. Excellent progress has been made on some but not all GVAP goals and strategic objectives [3]. Between 2011 and 2017 an additional 20 million children were vaccinated and new vaccines were introduced in many countries. However, important trends prior to 2011 have not continued in a positive direction: In the past eight years coverage for the first measles–containing vaccines and the third dose of diphtheria, tetanus and pertussis-containing vaccine have remained at around 85% globally. As the 2018 GVAP Assessment Report noted progress *. . .still remains too slow for most goals to be reached by the end of the Decade of Vaccine in 2020* [4]. Furthermore, the gains to date are fragile with the incidence of measles increasing from 19 per million in 2016 to 25 per million in 2017 [5,6].

The 2017 and 2018 assessments of the GVAP recognised significant challenges in reaching targets related to vaccination uptake and systems performance, and called for the need to intensify efforts and address systemic weaknesses to enable equitable access and uptake [3,4]. Multiple challenges continue including economic constraints, conflict and natural disasters, displacement and migration, complacent immunization program management, programmatic issues potentially resulting in vaccine hesitancy and rises in vaccine shortages [2]. As the international community plans for a new 2020–2030 framework, new and innovative thinking is needed to better enable programs to achieve high and equitable immunization coverage.

In beginning the planning process for the coming decade, an informal World Health Organization (WHO) survey at global, region and country level identified important elements needed to drive progress [7]. Guiding principles included the need to move away from a specific vaccine preventable disease focus to a health systems and primary health care (PHC) perspective with more focus on community-led and bottom-up processes. Aligning with this is the need to re-affirm immunization within effective Universal Health Coverage (UHC) planning more broadly, for the target of the United Nations' Strategic Development Goal (SDG)3 and beyond.

2. The need and opportunities for new thinking

A global review of progress offers a number of anomalies. There are many examples of unexpected underperformance in immunization programs and, in contrast, examples of countries with multiple challenges who have achieved high sustained rates of immunization coverage [3]. "Near neighbour" paradoxes exist where countries with similar socioeconomic conditions or close geographic proximity have very different coverage rates, and in other cases pockets of under-performance are found within otherwise well performing systems. While considerable data is collected, there is often a lack of effective data interpretation and use, and a dearth of authentic narratives to explain and inform the differing findings. Despite the availability of many evaluation and intervention tools, implementation and evaluation are often insufficient to foster and sustain change. The recent evaluation of quality and use of immunisation coverage and surveillance data undertaken by the SAGE Working Group for example, has highlighted that, while there are a large number of guidance materials there are significant disconnects between resources, awareness and usage" [8]. As demonstrated from the current failure to achieve GVAP targets, [5,6] it should thus be recognised that traditional public health and linear approaches alone will not drive and sustain strong immunization uptake rates nor address chronic equity issues.

Looking towards the next 2020–2030 global immunization plan, both evolution and innovation are needed. To help catalyse and renew progress, there are opportunities to apply existing methods such as enhanced community engagement and 'bottom up' co-design of projects which have worked well in other areas

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of health care, such as in sexual health and health promotion [9,10], but which have been used rarely in immunization. Alongside effective community engagement in design, there is also a need for new 'whole systems' approaches, and utilising principles of both complexity and implementation science.

3. Innovations in systems thinking

Some aspects of systems science have already been adopted within immunization approaches by WHO and within individual countries [11]. WHO has supported previous work around vaccine hesitancy, creating the 3 'Cs' (Complacency, Convenience, Confidence) model which recognises the complexity of interactions between systems, providers and communities [12]. The development of the Tailoring Immunization Programmes (TIP) approach has offered countries a process to diagnose barriers and facilitators to vaccination in susceptible under-vaccinated populations, and design and evaluate targeted interventions. The most commonly cited strength of the TIP approach is the interdisciplinary approach which values community engagement and enables programs to listen and learn, to gain an understanding of community and individual perspectives [13]. Wider scale-up of the TIP approach is warranted at this critical turning point.

4. Complexity, implementation and resilience

Every system is perfectly designed to get the results it gets.
P. Bataladen & W E Deming

There is a substantial academic literature that is complementary to traditional public health approaches to inform change. This includes elements of systems' science, complex adaptive systems theory [14,15], implementation science [16,17] and the evolving science on resilience [18]. This literature is supported by research and evaluation methodologies such as participatory action research [19], and the use of narrative techniques including micronarrative stories that are uniquely relevant to members of a particular group [20,21]. From a practical standpoint, this requires the acknowledgement of complexity in initial problem formulation, prioritisation of approaches to management and consideration of innovative solutions drawn from a variety of sources.

From other industries, disciplines and areas within health there is a growing body of evidence about the use of complexity science in the analysis of problems with multiple variables [22]. A complexity approach recognises the need to explore organisational and systems change from multiple perspectives, to move thinking away from the traditional top-down linear approaches and recognise the often 'predictably unpredictable' consequences follow interventions. Complexity science values the application of flexible/adaptive responses to problems, and pays attention to the different local stories and micronarratives from different stakeholders and perspectives, in order to make sense of complex problems and offer novel solutions [20]. It also acknowledges the place of resilience using what was traditionally considered a policy/programme 'failure', as a learning opportunity and as a context within which a challenge can be used for incremental positive change.

Implementation Science, with its aim of promoting the systematic uptake of research findings and other evidence into routine practice also offers insights to enhance the performance of health sector delivery in areas such as immunization programs [17]. However, in many instances implementation science remains aligned with a linear approach to health services and in the area of immunization has not acknowledged the complexity inherent in program delivery and vaccine uptake.

5. A whole systems approach: Combining methods

There are currently multiple frameworks, approaches and terminologies in the area of health sector delivery change. There are no simple solutions for complex problems and adopting any single approach is likely to be overly simplistic for informing development of the post-2020 global immunization plan. However, we believe this is an opportunity to utilize the principles discussed above and to blend them with principles already contained in effective components of the current strategy i.e. a composite practical approach.

Combining elements of complexity and implementation science could guide progress in health systems problem solving [22]. There are currently few examples of composite approaches. Elements have been described in the implementation of rapid response systems from specialized teams attending to deteriorating hospital inpatients [23], and from a community perspective in the opportunities taken to develop and sustain primary mental health care ser-

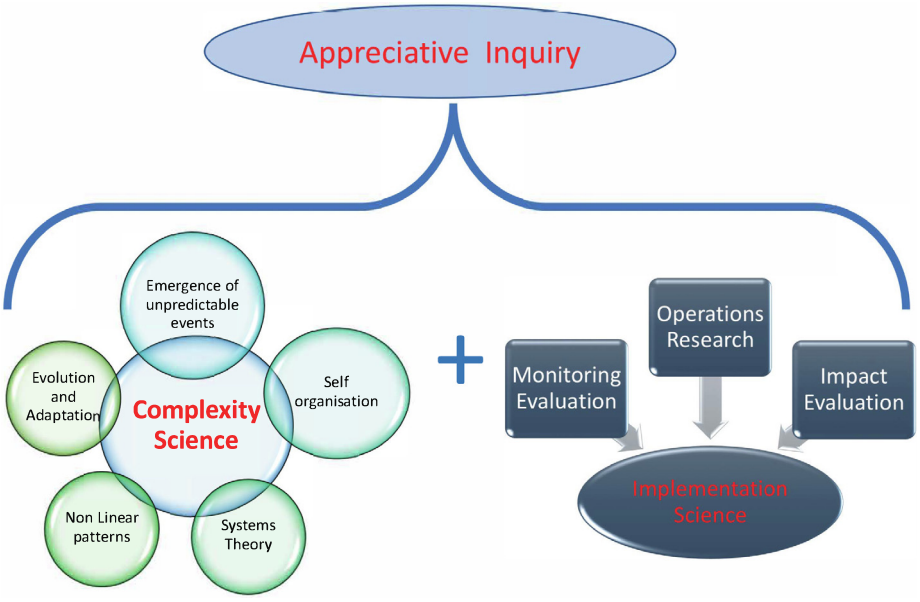

Fig. 1. General principles. Complexity and Implementation Science/Appreciative Inquiry (CIS-A).

vice delivery platforms [24] In these examples flexibility and success in implementation pathways were derived from an acknowledgement of the complex systems environment in which change was occurring.

We suggest that an additional important element for whole systems change, particularly at scale, needs to be a focus on the positive attributes inherent within existing systems. Accordingly, the 'appreciative inquiry' approach seeks to engage stakeholders in a process of self-determined change [25,26], and recognises the importance of strengths-based change; retaining and building on the facilitators or best elements of current practice. Further, appreciative inquiry is valuable in seeking to engage local stakeholders in self-determined change.

Systematically integrating these approaches into current immunization programs will encourage a shift to more self-reflective forms of governance, and create new types of processes that are flexible, adaptive, and locally owned. Decision-making within a complex adaptive systems framework should be seen as an ongoing iterative process, incorporating regular reassessment; a continual process of reflection, action, and further reflection. This also impacts evaluation – what is measured when, by whom, and why. These processes are applicable at any and all levels up and down a complex system like an immunization program. This model has applicability for all settings, local, regional, national and global, and within high-, middle- and low-income settings. This is especially important as often complex and emergent factors occur when immunization ini-

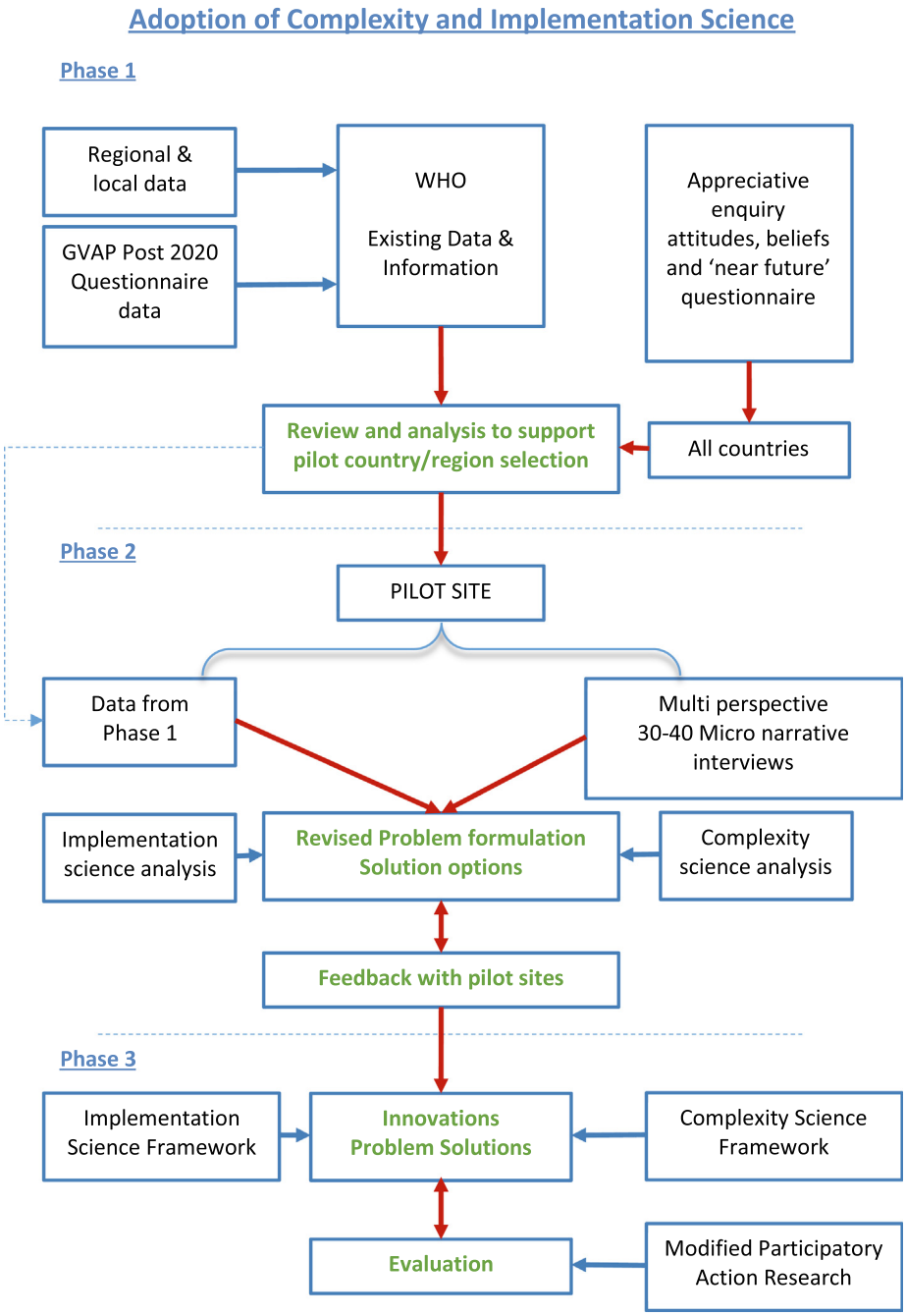

Fig. 2. Application to global vaccine action programme.

tiatives are spread and scaled up during implementation in those diverse settings [27].

Such whole systems thinking across multiple frameworks and methods can enhance the potential of low performing systems, and sustain performance and grow resilience in well performing systems in the face of changes in contexts [18]. These approaches can also have benefits beyond vaccine strategies by enhancing integration between immunisation programmes and Primary Health Care. While there is still active debate about the value of integration [28] we suggest that if sufficient account is taken of the complexity inherent in integration, then the strengths of well designed immunisation programmes may enhance health services in line with the WHO Universal Health Care programme.

A systems science approach has been successful in other health sectors in facilitating the application of evidence-based practice and supporting the translation of recommendations into more locally focussed examinations of problems [29].

6. Caveats and considerations

These are scientific approaches. They cannot be seen as rapid solutions to complex problems, and need to be integrated within current strategies and policies, not viewed as stand-alone methods.

Successful use of these approaches will require proactive and transparent engagement with stakeholders and participants so that incremental changes are valued as the achievement of modest ambitions that can be iteratively repeated and translated to other settings. Such reflective iterative approaches should be seen as part of routine business as usual within PHC and immunization programs at all levels. The outcomes and changes in program culture over the long term can be very impressive [11].

7. The way forward: A blended methods approach

Using the principles of complexity and implementation science, we propose a new blended methods approach to enhance change and improve the current functionality of programs to both support what is currently functioning well while creating opportunities for effective change. Fig. 1 outlines the general principles of our composite practical approach, while Fig. 2 provides the approach specifically framed for a practical immunisation programme supporting the global vaccine strategy.

Activity begins with an appreciative inquiry of existing data sources complementing collected local narratives. This is used to create an overall map of potential change, which with deeper or more targeted local data collection offers detailed multiple perspectives on future options. Analysis would use established complexity science tools such as sense making [30]. Then leading on to implementation using methodologies such as participatory action research adapted to account for the overall strategic direction inherent in the GVAP goals. Evaluation is core and involves an ongoing iterative process. Local stakeholder and community involvement from the outset – and throughout the process – is critical and will help build local ownership and accountability.

8. Conclusions: complexity, implementation, evolution and innovation

There has been tremendous progress in vaccine coverage and disease reduction in communities worldwide. However, over recent years amidst often turbulent social and political change, these gains have in many cases stalled or proven to be fragile. There is an urgency to apply innovation in supporting the plan for the next decade, more effectively embedding the principles within a UHC frame. Much attention has been paid to tools and aspects of systems, but little to the complexity inherent in trying to implement change at a systems level, nor the need to systematically engage communities. Apparent paradoxes and unnecessary failures have resulted.

Utilising the principles of complexity and implementation science, the immunization sector can move beyond traditional linear thinking with single program and toolbox solutions. Modern methodologies that draw on both complexity and implementation science can be applied that can effectively facilitate 'bottom up' solutions, at the same time retaining the best of current top down program infrastructure within each unique setting to drive positive incremental change. Gains can be made in the achievement of the 2010 GVAP goal that *all individuals and communities can enjoy lives free from vaccine preventable disease* with the application of complexity science and implementation science, using core principles of community engagement.

Declaration of Competing Interest

None.

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