Generating political commitment for ending malnutrition in all its forms: a system dynamics approach for strengthening nutrition actor networks

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Running title: Generating political commitment for nutrition.

Key words: nutrition, political commitment, policy, networks.

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Acknowledgements: This lead author was supported by funding from an Alfred Deakin Postdoctoral Fellowship, provided by Deakin University.

Conflicts of interest: The authors declare no conflicts.

Abstract

Generating political commitment for ending all forms of malnutrition represents a key challenge for the global nutrition community. Without commitment the policies, programmes and resources needed to improve nutrition are unlikely to be adopted, effectively implemented nor sustained. One essential driver of commitment is nutrition actor network (NANs) effectiveness, the web of individuals and organisations operating within a given country who share a common interest in improving nutrition and who act collectively to do so. To inform new thinking and action towards strengthening NAN effectiveness, we use a systems dynamics theoretical approach and literature review to build initial causal loop diagrams (CLDs) of political commitment and NAN effectiveness, and a qualitative group model building (GMB) method involving an expert workshop to strengthen model validity. First, a 'nutrition commitment system' CLD demonstrates how five inter-related forms of commitment – rhetorical, institutional, operational, embedded and system-wide – can dynamically reinforce or diminish one another over time. Second, we present CLDs demonstrating factors shaping NAN effectiveness organised into three categories: actor features, resources and capacities; framing strategies, evidence and norms; institutional, political and societal contexts. Together, these models generate hypotheses on how political commitment and NAN effectiveness could be strengthened in future, and provide potential starting points for country-specific conversations for doing so.

Introduction

Malnutrition *in all its forms* is the leading contributor to the global burden of disease, affecting one in three people worldwide and leaving no nation untouched[1]. The majority of low- and middle-income countries are now experiencing a double-burden of malnutrition – high concurrent rates of undernutrition (predominantly child stunting, adult underweight and/or micronutrient deficiencies) and overweight/obesity and diet-related non-communicable diseases (NCDs).[1, 2] Overweight, obesity and diet-related NCDs are increasing in every region globally, especially in middle-income countries undergoing rapid economic development and social change.[3, 4] The food system drivers of unhealthy diets – especially the production, intensive marketing and consumption of resource-intensive foods (e.g. animal-sourced and ultra-processed) – are also key drivers of diet-related inequities, ecosystems degradation and climate change[5-8]. Recognition of the need to address the common drivers of undernutrition, obesity and climate change are a core focus of the Lancet Commission on Obesity.[9]

Acknowledging the importance of nutrition to sustainable development, ending 'malnutrition in all its forms' has become a high-profile global ambition. The declaration of 2016-2025 as the United Nations Decade of Action on Nutrition and nutrition's positioning within the Sustainable Development Goals (Goal 2, Target 2.2 is ending all forms of malnutrition by 2030) demonstrate this. Evidence-based and effective solutions exist, including targeted nutrition-specific interventions and those in nutrition-

sensitive sectors (e.g. agriculture, social protection, trade and education)[10]. However, the *Global Nutrition Report* and other international monitoring efforts recognize that although some countries are making steady progress on attenuating some forms of malnutrition (especially child stunting and wasting, and a small number on child obesity), the large majority are off-track due to shortfalls in governance, policy and programming responses.[1, 11] In short, global progress on nutrition is insufficient to achieve global targets and accelerated action is urgently needed.

One potential reason for why some countries are succeeding, whereas others are showing limited or no progress on nutrition, is *political commitment* – i.e. the extent to which influential societal actors within those countries are willing to act and to keep on acting to attenuate the drivers and manifestations of malnutrition. The term 'societal actors' refers not only to political leaders but also government administrators, civil society groups, businesses, international organizations, researchers and on-the-ground implementation teams. The term 'political commitment' often appears in public health research and policy discourse, mostly in relation to calls to action or as an explanatory factor in the failure to achieve meaningful policy reforms and progress. A small number of studies and reports from authoritative organizations identify commitment as an essential ingredient for nutrition improvement across a diversity of country contexts and forms of malnutrition.[12-14] Without such commitment the policies, programmes and resources needed to improve nutrition and generate environmental co-benefits are unlikely to be adopted, effectively implemented, nor sustained. A growing body of empirical research describes why and how commitment for nutrition emerges in some countries and jurisdictions, whereas in others nutrition remains neglected or ignored.[e.g. 12, 15, 16, 17]

One essential driver of political commitment is the strength of *nutrition actor networks* (NANs), defined as the web of individuals and organizations operating within a given country or jurisdiction who share principled ideas, causal beliefs, and a common interest in tackling malnutrition, and who act collectively to do so.[18] At the global level, networks have 'proliferated' in recent years as distinct organizational forms to address a number of high-burden health issues (e.g. tobacco control, maternal mortality, tuberculosis).[19, 20] The Scaling Up Nutrition (SUN) Movement, the world's largest initiative for building commitment and scaling-up multi-sectoral implementation efforts, is driven by international as well as national nutrition networks in its 60 member countries. Nutrition policy scholars focused on national and sub-national contexts also acknowledge the centrality of networks in mobilizing political systems, institutions and resources, designing policies, building capacities and coordinating responses across levels and sectors, as well as actions on-the-ground.[18, 21] Despite this growing body of scholarship there is limited understanding of how NANs become established within countries, how they develop and evolve over time, and what ultimately drives their effectiveness at generating and sustaining political commitment among diverse actors.

In our previous study, we demonstrated that the drivers of political commitment for nutrition are interdependent, context-dependent and dynamic – i.e. they demonstrate systems features.[18] As understanding of the complexity of public health and nutrition has matured, systems thinking has surfaced as a promising approach for informing action including policy development, programme design, implementation and governance.[22-25] This emerging interest in systems responds to the growing awareness that actions to attenuate public health problems must engage with and respond to causal complexity. 'Soft-system' methodologies can also help inform policy and organizational decision-making, by enabling structured dialogue between actors and the development of consensus positions on causality and intervention.[26] A systems approach enables the consideration of non-linear relationships between variables, accumulations, feedback loops and emergence effects that linear approaches invariably miss.[27]

System dynamic modelling includes a tool called causal loop diagrams (CLDs), which visually depict the key feedback loops that drive a system's behavior.[27] In this paper, we use a systems approach to generate several CLDs as logic models for better understanding the complexity and dynamic nature of political commitment and NAN effectiveness. The first model, which we refer to as the 'nutrition commitment system', demonstrates five forms of commitment and several key reinforcing feedback loops (commitment cycles) that connect them. We then present several further CLDs that demonstrate the factors that shape NAN effectiveness as an essential driver of nutrition commitment systems. In doing so, we demonstrate a novel application of systems thinking for informing actions to strengthen NANs and generate political commitment for nutrition during the UN Decade of Action on Nutrition.

Method

We adopted a system dynamics theoretical approach to build initial models from the findings of a literature review, and a qualitative group model building (GMB) method involving a workshop with experts to strengthen the face validity of the models.[27, 28] We followed guidance on model building processes,[27] including specific guidance on the collection, analysis and reporting of qualitative data.[28, 29] The Deakin University Human Research Ethics Committee granted ethical approval for this study (protocol #HEAG-H 144_2017).

Research team and reflexivity

A core modelling team with expertise in public health nutrition, political science and policy (PB, KW, ML, AB, SA) defined the research aim and objectives, and developed the study protocol. An external reference group (KC, AL, HW, AD) with similar expertise was engaged to help further refine the model and explicate key variables. Protocols for developing the CLD models were developed using GMB scripts. These scripts describe essential components of the GMB exercise, steps needed to complete the script successfully, and help to define script outputs.[30]

Data collection and analysis

CLD models were developed using Vensim, a software package used routinely to build such models.[31] We collected data to inform the CLD models over two phases.

Phase one

To inform the development of the model on political commitment we drew on several complementary theories applied in nutrition policy research. These included Shiffman and Smith's work on political priority for health;[32] Heaver[13] and te Lintelo's on political commitment for hunger and nutrition;[33] Pelletier *et al.*'s on nutrition policy processes;[34, 35] and Fox, Reich and Balarajan's on the political economy of nutrition.[36, 37] These are elaborated on extensively elsewhere.[38] From these we identified five forms of commitment: rhetorical, institutional, operational, embedded and system-wide. We identified NAN effectiveness as an important determinant of nutrition commitment in much of this work, and considered these networks worthy of additional focus. To build the initial model on NAN effectiveness we further drew from Shiffman *et al's* framework and empirical studies on global health actor networks and their 'policy, knowledge creation and advocacy functions'.[19, 20]

To further develop and refine these models, we drew from the results of a review of empirical studies on the drivers of political commitment for nutrition conducted by four of the authors (PB, KW, HW, AD).[18] This involved keyword searches of scholarly databases and institutional websites for research articles and grey literature. In total, 75 studies were included, spanning all country contexts and forms of malnutrition. Studies were coded using Atlas.ti qualitative analysis software, using a coding framework derived from theoretical sources described in the previous paragraph and further added to and refined using constant comparative analysis.[39] As is typical of interpretive research, this was not a linear, stepwise process. Rather, it was iterative, involving reflection and refinement of key analytical categories through ongoing engagement with theory, the literature and workshop findings.[40]

Phase two

To build confidence in the CLD models, PB and AD delivered a 90-minute GMB workshop with 14 nutrition experts at the World Health Organization, Geneva, in October 2017. GMB is a systems thinking method that allows a group of people to develop a shared understanding of how a complex system operates. The workshop design was based on a script for reviewing pre-specified models (see also: https://en.wikibooks.org/wiki/Scriptapedia/Model_Review).[41] It began with a short presentation of the aims of the research, key definitions and concepts (what is commitment, who are NANs, what do they do, why they matter), and what factors can influence network formation, development and effectiveness. This was followed by an introduction to systems thinking, a presentation of the initial NAN model, and examples of causal loop diagrams. Working in small groups, participants were asked to critique models by considering the real-world validity of the presented factors and feedback loops.

Data collected in the workshop were used to refine the models. Participants provided written informed consent before participating.

Causal loop diagrams combined with reference modes, or the behaviour of a variable or variables of interest over time, are dynamic hypotheses of how the structure of a system of interest can explain behaviour of variables in the systems over time. For this paper, our first CLD was developed to hypothesise how political commitment to nutrition may grow exponentially over the time period of the UN Decade of Action on Nutrition. The second set of CLDs were developed to hypothesise how NANs could be strengthened exponentially over the same time period.

Results

What is political commitment for nutrition?

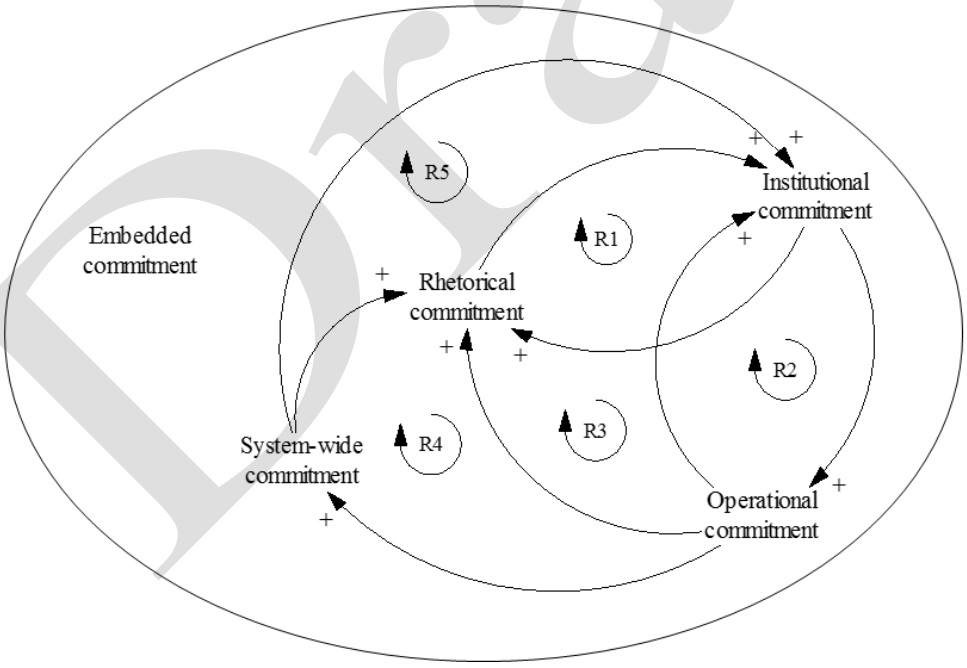
Several definitions of political commitment, and its synonyms political 'will', 'priority', or 'leadership' exist in the political economy of nutrition and global health literatures. Heaver's seminal publication on nutrition commitment-building defines it as "the will to act and keep on acting until the job is done" involving all relevant actors operating within a given political system.[13, pXIV] Te Lintelo, adapting Brinkeroff's definition, defines it as "the intent and sustained actions over time by societal actors to achieve the objective of reducing and eliminating the manifestations and causes of [malnutrition]".[33, p282] Shiffman and Smith define 'political priority' as the degree to which "…political leaders actively give attention to an issue, and back up that attention with the provision of financial, technical, and human resources…commensurate with the severity of the issue".[32, p1370] Pelletier develops the concept of 'system-wide' commitment, involving all actors within a given jurisdiction including not only elites, but all relevant actors including communities, households and individuals.[34]

Generating commitment for nutrition is more than generating attention to the issue and getting it onto the 'government agenda', although these are important. It further involves designing and establishing effective institutions and policies that incentivize multi-sector responses at multiple levels, mobilizing resources and building capacities for policy implementation, and sustaining these actions over time in the face of opposition and changing conditions.[13, 32-34] It refers to both the intention to act (intentionality or willingness) and action itself.[13] Credible and sustained commitment – from political leaders who champion policy initiatives and government officials who coordinate action, to civil society groups who advocate for attention and resources, and ultimately affected community groups and individual citizens – is crucial to driving nutrition policy responses in the long-term.[12, 13, 18]

Model of the 'nutrition commitment system'

In this section, we present a first model demonstrating the dynamic and inter-related forms of political commitment for nutrition. Five main forms of commitment are identifiable in the literature – rhetorical, institutional, operational, embedded and system-wide. Figure 1 presents a CLD of these forms and their inter-linkages. Table 1 provides concise descriptions and evidence for each form. Applying systems thinking, each form of commitment can be thought of as a variable that can increase or diminish over time. These are linked by feedback loops (arrows) whereby increases or decreases in one form of commitment can increase or diminish other forms dynamically.[27] These loops are labelled 'R' as reinforcing. For the purposes of this paper we call these feedback loops positive or negative commitment cycles, although others have referred to these as 'high-priority' and 'low-priority' cycles. Positive commitment cycles can be summarized concisely by the term: 'success breeds commitment breeds success' as actors at all levels will be more likely to reinforce their commitment when institutional and operational actions are successful. Conversely, negative commitment cycles can be summarized by the term: 'lack of impact breeds lack of commitment breeds lack of impact'.[13] We describe these forms and the commitment cycles that link them within this 'nutrition commitment system' in the following section.

Figure 1. A dynamic model of political commitment – the 'nutrition commitment system'



The first form, *rhetorical commitment*, refers to public or private statements of intent made by societal actors, recognizing malnutrition as a serious problem, and that concerted action is both needed and forthcoming. Such commitment can emerge at the highest-level, i.e. from among members of the executive (e.g. prime-minister, ministers), legislative (e.g. parliamentarians) and administrative (e.g.

heads of government agencies) branches of government, or from actors from outside of government with whom they may closely associate including international donors, civil society groups, philanthropists and business leaders.[13, 34, 36, 42] It may also emerge from the bottom-up, i.e. from grass-roots organizations, social movements and on-the-ground service providers operating at the local and community levels.[43]

Evidence of high-level rhetorical commitment can include emphasis on nutrition in public speeches, statements about nutrition in the media, awareness-raising campaigns, conferences and other nutrition-specific events (Table 1). It can also include governments becoming signatory to international policy initiatives, a number of which have emerged to generate, monitor and report on rhetorical commitments for nutrition and stimulate flows into institutional and operational forms within countries. These include for example, commitments made at the Nutrition for Growth (N4G) Summits (reported on by the Global Nutrition Report), and the encouragement of governments to make SMART (specific, measurable, achievable, relevant and time-bound) commitments within the framework of the UN Decade of Action on Nutrition. Evidence of bottom-up commitment can include, for example, the initiation of awareness-raising campaigns, civil society protests, community-level events and media engagement.

Public statements made voluntarily, explicitly and in high-visibility public fora may be more indicative of genuine commitment than those that are privately-made, coerced (e.g. in response to pressure from donors) or implied.[33] However, such commitment can be tenuous and short-lived, especially when actors can gain from 'symbolic gesturing' to appease the concerns of the public or various interest groups while anticipating low political costs of inaction (e.g. in the absence of sustained civil society pressure or media attention).[33, 34, 44] They may also perceive a limited capacity to act upon their commitments (i.e. they are willing to act but unable to because of weak institutional and operational capacity), or they may anticipate or face strong resistance from political opponents and key interest groups[33]. When high-level rhetorical commitment is genuine, malnutrition may reach a government's 'decision-agenda', the set of issues seriously considered for policy enactment,[42] followed by directives for legislative, bureaucratic and wider societal action.[13, 34, 45, 46] For organizations, social movements and other entities it can mean the mobilization of members and wider organizational networks.

Table 1. Forms of political commitment – descriptions and evidence of each form

Form	Description	Evidence of political commitment
[1] Rhetorical commitment	Statements of intent made by government officials (e.g. heads of state, parliamentarians, senior bureaucrats), influential actors outside of government (e.g. civil society and business leaders), or by community groups recognizing malnutrition as a serious problem, and that concerted action is both needed and forthcoming. When genuine (i.e. more than 'symbolic' or 'lip-service' only), such commitments may be converted into forms **[2 + 3]** through directives for government and societal action.	• Nutrition emphasised in speeches by political leaders • Governments sign-on to international nutrition initiatives • Awareness raising campaigns initiated • Nutrition receives sustained attention in print and online media • High degree of awareness within government • Community groups begin agitating and mobilizing members
[2] Institutional commitment	Conversion of **[1]** into substantive policy infrastructure including agencies and institutional frameworks for coordinating multi-sector/-level action, the adoption of policies, operational plans, laws and regulations commensurate with the severity of the problem. Coordinating agencies may be more likely to sustain institutional commitment and achieve operational impact when adequately empowered and resourced, and when engaged in advocacy for ongoing attention and resources.	• Multi-sector/-level consultative processes initiated to develop policy • Laws, policies, operational plans and regulations designed and adopted • Legislative empowerment of new coordinating agency / institutions • Coordinating agency located in central government (e.g. President's Office) • Coordinating agency is well resourced with capable staff • Multi-sector/-level monitoring and surveillance systems established
[3] Operational commitment	Conversion of **[1 + 2]** into on-the-ground actions, including the mobilization and disbursement of human, technical and financial resources, the effective coordination of all actors involved along national to sub-national implementation pathways, and motivated implementation teams. Operational success (i.e. achieving results) can, in turn, reinforce and sustain commitment forms **[1 + 2]**.	• Nutrition has a dedicated line item in government budgets • Budgetary allocation is proportional to rhetorical commitment and need • Budgetary allocation is full disbursed • Sub-national coordinating bodies and teams are well resourced • Laws and regulations are actively monitored and regularly enforced

[4] Embedded commitment	When commitment to address issues that indirectly impact on nutrition (e.g. economic development, social protection. hunger reduction, health systems strengthening) achieve positive nutrition outcomes without explicit nutrition commitment. Such commitments can create opportunities for reinforcing commitment forms **[1 + 2+ 3],** when nutrition actors are capable of sensitizing these nutrition-sensitive policy agendas.	• National development plans that drive equitable income growth • Social policies and programmes that provide basic income protection • Nutrition-sensitive food distribution established e.g. school feeding • Gender-based development initiatives established • Agricultural development initiatives, including diversification
[5] System-wide commitment	The achievement of commitment forms **[1 + 2+ 3 + 4]** involving all actors within a nutrition system including communities, families and individual citizens. When achieved, system-wide commitment may create a powerful reinforcing feedback-loop that sustains long-term policy and programming responses. However, efforts must be sustained and re-calibrated in response to emerging opposition and demands, changing on-the-ground conditions and implementation challenges.	• Sustained non-partisan commitment for nutrition across government elections, policy planning cycles and sectors • Policies, plans, laws and regulations are reviewed and strengthened over time in response to changing conditions and needs • Civil society groups and businesses sustain long-term actions on nutrition • Sustained awareness and action on nutrition in affected communities

Institutional commitment is the conversion of rhetorical commitment into substantive policy infrastructure. This includes the establishment of coordinating agencies and institutional frameworks with sufficient powers, capacities and resources for coordinating multi-sector and multi-level responses. It also includes the adoption of enabling legislation, policies and operational plans commensurate with need, and/or other mechanisms for incentivizing cooperation including shared and sector-specific goals, performance measures, and data systems for monitoring performance, policy feedback and calibration.[13, 36, 44] The commitment of mid-level public servants and managers responsible for policy development and coordinating responses further enables this process.[13, 44] Policies that have clearly stated, time-bound and measurable objectives, and with supporting data systems for monitoring progress, may be indicative of stronger commitment as these features enhance accountability. The adoption of laws and regulations that strongly infringe the freedoms of powerful interest groups (e.g. the food industry) may further indicate stronger commitment because they may be more likely to generate political opposition.[47]

Strong institutional commitment is likely to reinforce rhetorical commitment ($R1^+$) because well designed policies represent commitments to which political leaders and bureaucracies can be held accountable, thus representing a first of several high-commitment cycles.[34, 48] Furthermore, empowered institutions are more likely to effectively advocate for sustained attention and resources as well as institutionalize (i.e. entrench) pro-nutrition beliefs and practices within and outside of government.[32, 44, 48, 49] Conversely, weak institutional commitment may undermine sustained rhetorical commitment ($R1^-$), trapping nutrition in a first of several potential low-commitment cycles. This may be especially so when institutions and policies are established tokenistically (i.e. to give the appearance of acting without genuinely doing so), when coordinating institutions have insufficient powers, capacities and resources to operate effectively, or when they are overly-focused on technical work but not on advocacy for sustained attention and resources.[44, 48, 50]

Operational commitment is the conversion of rhetorical and institutional commitment into operational actions and on-the-ground results. This involves the sustained allocation of human, technical and financial resources at all levels but especially at sub-national levels, the effective coordination of all actors involved along national to sub-national implementation pathways, the monitoring and enforcement of laws and regulations, and the commitment of street-level managers responsible for on-the-ground implementation.[44-46] Strong operational commitment, when combined with credible indicators and data systems for monitoring progress, can increase the likelihood of visible policy success and in-turn reinforce the commitment of bureaucracies and mid-level managers ($R2^+$) and the rhetorical commitments of both political elites and community groups ($R3^+$).[13, 33, 34] The expansion and effective administration of nutrition budgetary allocations can further reinforce this commitment by incentivizing multi-sector/-level coordination, and by

creating ownership and entitlements among politicians, bureaucracies and citizens.[45, 48] Conversely, low operational commitment increases the likelihood of implementation failure, thereby undermining sustained institutional ($R1^-$) and rhetorical ($R2^-$) commitments, and potentially trapping nutrition in a second low-commitment cycle.[45]

Embedded commitment is when commitments to address issues indirectly related to nutrition inadvertently achieve positive nutrition outcomes (e.g. economic development, poverty reduction, social protection and hunger reduction initiatives), referred to as 'nutrition success without nutrition-specific commitment'.[48] When sustained, embedded commitment can create opportunities for nutrition policy-makers and advocates, when they are able to sensitise or position nutrition within broader policy agendas, thereby further catalysing nutrition commitment-building processes.[44, 45, 48] Longer-term societal changes can also present opportunities for commitment building (e.g. sustained economic growth can enable greater budgetary commitments for action on nutrition). So too can short-term focusing events (e.g. sustained attention in the media to nutrition or related issues, or changes in government that bring new opportunities for change).[18]

Systems-wide commitment is the achievement of all forms of commitment, involving all actors operating within a nutrition system including, ultimately, the commitment of communities, households and individual citizens.[13, 34] To be truly effective, commitment-building must be more than a one-off process – efforts must be sustained and re-calibrated in response to emerging opposition, changing conditions and implementation challenges until on-the-ground reductions in malnutrition are achieved.[13, 33, 34] Once achieved, systems-level commitment may generate powerful reinforcing feedback loops ($R4^+$ and $R5^+$) that institutionalize effective nutrition policy responses and that sustain reductions in malnutrition over time as success breeds commitment breeds success.

Nutrition actor networks as commitment system drivers

In the remainder of this paper we focus on the central role of NANs as a core driver of commitment systems. The formation, longevity and effectiveness of NANs consistently features in the political economy of nutrition literature as an important commitment driver.[44, 46, 51-53] Such networks vary widely in structure (formal vs. informal), maturity (nascent vs highly evolved) and membership composition across different country contexts and forms of malnutrition. They often comprise a variety of member types spanning multiple sectors and levels including political leaders, parliamentarians, public servants, academics and other researchers, journalists, civil society organizations, and business representatives. In low and middle-income country contexts, they may also involve international organizations, global multi-stakeholder initiatives and international NGOs.[18] This diversity in potential membership may create several challenges

for collective action due to differences in member interests, worldviews, organizational cultures and ways of working.[54, 55] Thus, NANs may comprise various sub-sets of actors who may (or may not) work together as a cohesive whole.

Mobilized civil society groups – including *inter alia* international and national non-governmental organizations (NGOs), faith-based organizations, professional associations, women's organizations, indigenous groups, consumer organizations, and social movements – are often key drivers of NAN formation and action.[44, 45, 48, 51, 52, 56, 57] These groups often vary in their expertise, available resources, advocacy strategies, and functional roles within NANs. Global actors, typically international organizations (e.g. WHO, UNICEF, World Bank), donor agencies (e.g. USAID, DFID, JICA, CIDA) and global initiatives (e.g. SUN, GAIN, MNI), were also often seen as important drivers of NANs.[48, 58-63] Several global initiatives (e.g. SUN) have been explicitly designed to "foster country ownership and broad stakeholder engagement in policy development and implementation",[34, 64] and have been seen as important in galvanizing the formation of multi-sector nutrition networks.[61] In some low-income country contexts, policy and programming may be almost entirely donor-driven with initial research and pilot projects taken to scale in collaboration with government partners.[58, 64, 65]

A dynamic model of nutrition actor network effectiveness

The political economy of nutrition literature demonstrates that NAN members individually and collectively engage in a range of activities that drive commitment systems.[18] These include *inter alia* awareness-raising and advocacy, framing nutrition problems and solutions (norm promotion), technical activities (e.g. generating data and evidence), coordinating multi-sector and multi-level policy development, implementation and evaluation activities, nutrition financing, service delivery, building capacities and mobilizing resources.[46, 56, 57, 66-74] Drawing on the work of Shiffman & Smith (2007) on global health networks, NAN 'effectiveness' may be evaluated in relation to three criteria.[20] First, are outputs – the immediate products resulting from network activities e.g. research and advocacy publications, media appearances, conferences and meetings, inputs into policy processes and so on. Second, are policy consequences – the achievement of the various forms of commitment described earlier. Third, is impact, in terms of achieving measurable improvements in population nutrition. Although evaluating network effectiveness in terms of outputs is straightforward, attributing policy consequences and impacts to NANs is more challenging given the range of contextual factors (socio-economic, political and epidemiological) that can also contribute.[20]

Drawing on Shiffman et al's framework, and findings from the political economy of nutrition literature and workshop, we identified multiple factors that drive NAN effectiveness at the country-level. These were

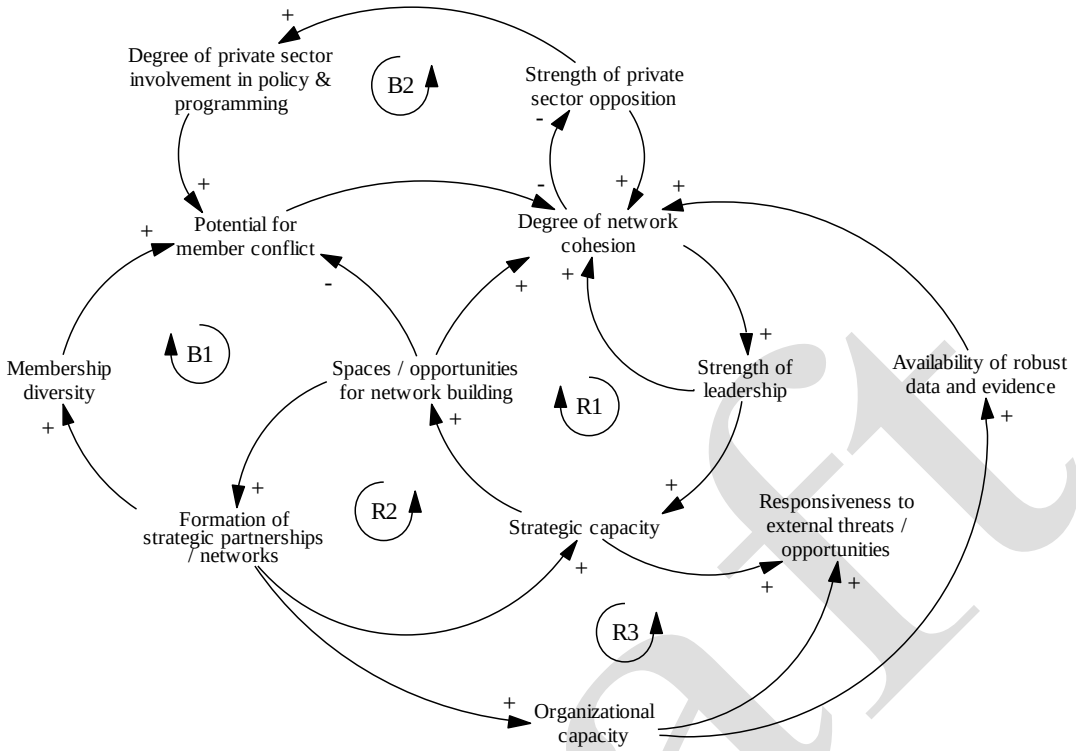
organized into three categories – network actor features, resources and capacities; framing strategies, evidence and norms; and institutional, political and societal contexts. The following sections describe factors within each of these categories and their interactions with accompanying CLDs, which we use to generate hypotheses on key feedback loops that may inform thinking for strengthening NAN effectiveness. Consistent with systems thinking, these factors will function in inter-dependent, dynamic and context-dependent ways, and at different levels of abstraction – from micro (e.g. the actions of individual leaders), meso (e.g. the activities of networks as a whole) to macro (e.g. norms in society-at-large). Applying these concepts in practice (i.e. to inform strategic actions for commitment-building) will likely require non-linear 'systems thinking' – identified as one important attribute of nutrition leaders.[68]

Network actor features, resources and capacities

Many of the factors that drive (or impede) effectiveness are internal to NANs, including member and network features, as well as the resources and capacities they have available to drive commitment systems. The internal nature of these factors lends itself to the endogenous perspective in system dynamics, where factors within a system's boundary are the focus for understanding system behavior.[75] A CLD of these factors is presented in Figure 1 and described below.

NANs are consistently reported as more effective at driving commitment systems when members speak and act cohesively.[46, 51, 52, 76-78] Members that are aligned around a common problem definition, causal interpretation, and set of proposed solutions (internal frame alignment) may be more likely to overcome ideological differences, appease powerful 'veto players', counter opposition, and be perceived as a legitimate and authoritative source of expertise.[34, 44, 46, 52, 55] However, achieving this cohesion in practice is reported as a significant challenge in many studies.[17, 44, 45, 54, 57, 61, 79, 80] Member conflict within NANs appears to stem less often from technical disagreements, and more from divergent interests, organizational mandates and professional cultures. It has arisen from multiple topics of disagreement, but especially from divergent beliefs regarding the role of the private sector in nutrition policy and programming.[37, 44, 51, 54, 56, 68, 81] Hence, greater private sector involvement may increase the potential for member conflict and fragmentation. In contrast, workshop participants noted that NANs may become more unified in the face of a common adversary (e.g. infant formula or ultra-processed food companies), a finding that is consistent with Shiffman *et al*'s findings (e.g. as in the case of global tobacco control). In general, many NANs have experienced strong opposition from food industry groups, as highly organized and financially resourced opponents hindering obesity prevention efforts in middle- and high-income countries.[81-90]

Figure 2. Causal-loop diagram of network actor features, resources and capacities



Another consistent finding in the literature is that NANs are more likely to be cohesive in the presence of leaders capable of managing complex relationships, conflicts and competing interests among members,[34, 44-46, 48, 52, 76, 91] while increased cohesion can in-turn reinforce the strength of leadership.[68] Nutrition leaders enhance the strategic capacities (i.e. 'soft-power' skills) of NANs, and are thereby more capable of building internal cohesion and managing external commitment-building activities across multiple-sectors and levels.[25, 60, 67, 69, 72, 74, 92-95] This resonates with the findings of a recent four-country Sub-Saharan Africa study that 'boundary-spanning actors' intentionally engaged in boundary-spanning actions (e.g. brokering, conflict resolution, coordinating, convening, diplomacy, framing, networking, negotiating) are a feasible and acceptable approach to fostering policy action within complex multi-sectoral and multi-agency nutrition governance contexts.[25] Strategic capacities includes the creation of spaces and opportunities (e.g. formalized governing bodies, conferences, workshops, informal networking events) for members to share information, build consensus and manage conflicts. This in-turn may help to facilitate the formation of strategic multi-sector partnerships and inter-personal networks with decision-makers,[21, 46, 55, 62, 96-98] and enhance the responsiveness of NANs to emerging threats and opportunities. This includes their responsiveness to longer-term changes in societal conditions (e.g. epidemiological transitions) as well as shorter-term focusing events (e.g. government elections, famine, economic crisis) that create opportunities and challenges for commitment building.[44, 51, 56, 99]

Consistent with Shiffman *et al*'s framework, an expansion in the number and diversity of members may enhance the strategic expertise and organizational capacities and resources available to NANs, although it may also increase the potential for conflict and fragmentation.[37, 55, 80, 83] Greater capacities may in-turn support the production of robust data and evidence, thereby supporting actions to develop a unifying discourse and hence greater cohesion.[45, 54, 100] The expansion of donor or government nutrition budgetary commitments, adequate funding, and effective financing have enabled many NAN activities.[45, 48, 56, 101] In contrast, inadequate financing, or the failure to effectively utilize or administer financial resources, is a major challenge for NANs.[45, 61, 65, 67, 95, 102-104] Inadequate nutrition budgets have undermined their human, technical and administrative capacities. Major reported challenges have included a lack of training providers, trained nutrition professionals and administrators, as well as high staff turn-over.[45, 61, 65, 67, 93, 103, 105-107] Another is weak technical capacities, especially regarding the collection, management and analysis of multi-sectoral/-level data.[45, 59, 64, 65, 108, 109]

From these results, we hypothesise five examples of feedback loops that may be important for enhancing NAN effectiveness. A first reinforcing feedback loop can be observed (R1) whereby strong leaders enhance the strategic capacity of NANs, which can create spaces and opportunities for network building, enhance network cohesion, and in-turn reinforce the strength of leaders. Second (R2), enhanced strategic capacity may in-turn foster the formation of strategic partnerships and networks, that then fosters more strategic capacity as NANs are increasingly able to leverage a greater diversity of member expertise. A third (R3), is when the formation of strategic partnerships and networks can help foster greater organizational capacities, the availability of robust data and evidence, which can in-turn support the development of a shared discourse and greater network cohesion. Two balancing feedback loops are evident. A first (B1), is that the formation of new partnerships and network expansion may increase member diversity, but also increase the potential for conflict and fragmentation, and thereby weaken network cohesion, and by extension, the other factors in R1. A second (B2), is that strong private sector opposition may expand the role of the private sector in nutrition policy and programming, which may increase the potential for conflict and network fragmentation, but also galvanise NANs in response to a common opponent.

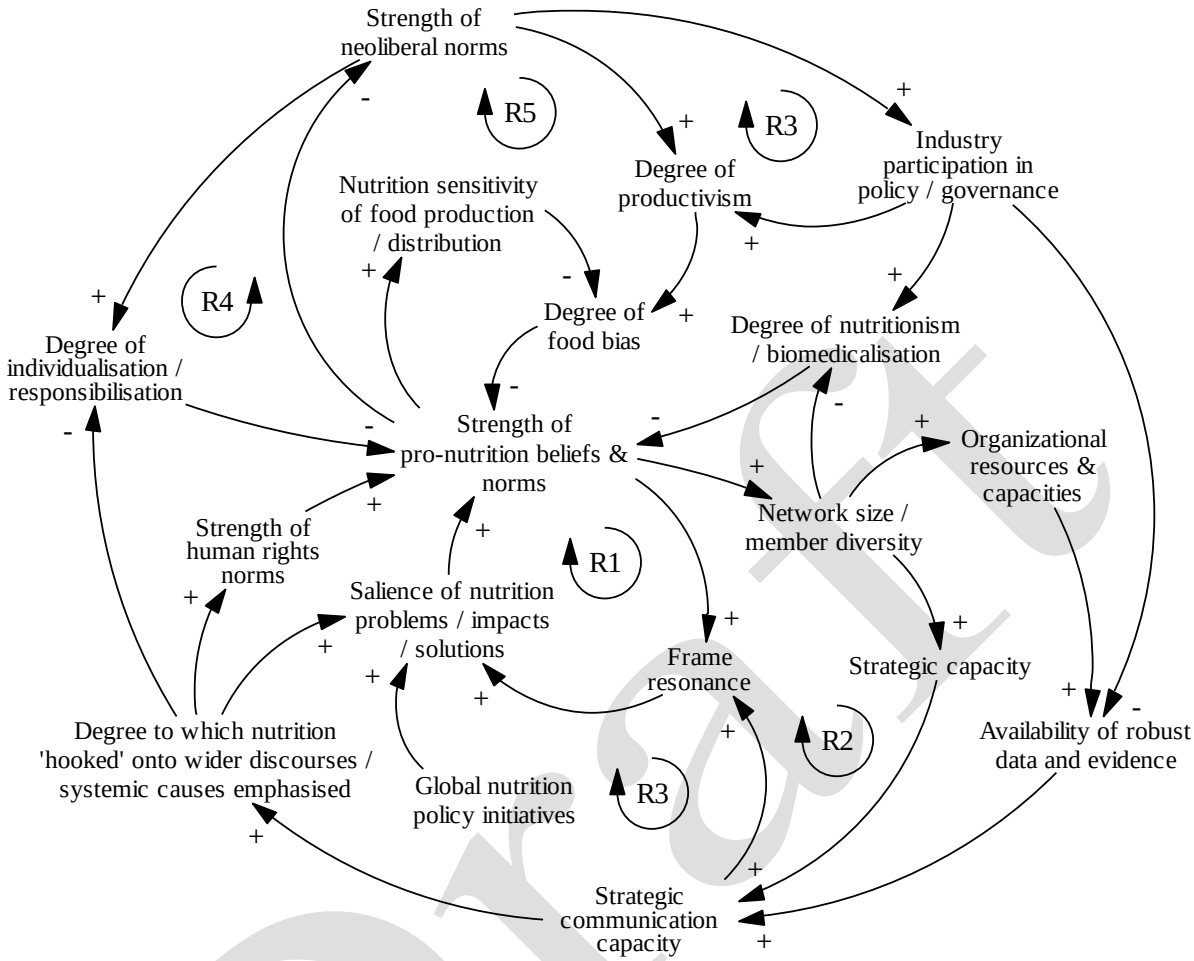
Framing strategies, evidence and norms

Figure 3 presents a CLD of relevant factors in the category of framing strategies, evidence and norms. Consistent with Shiffman et al's framework and the literature, the effectiveness of NANs in generating attention and commitment is enhanced when members are capable of interpreting and portraying (i.e. framing) nutrition problems in ways that resonate with the underlying worldviews and beliefs of external audiences, and especially with those of political decision-makers.[57, 85, 97] By effectively framing nutrition problems and solutions, NAN members increase their societal salience and enable pro-nutrition norms (also

called ‘norm-promotion’) that may in-turn enhance the resonance of frames over time, as well as the organizational capacities and resources of NANs as pro-nutrition policies and funding becomes available.

Several frames have been notable in achieving this ‘frame resonance’ including an emphasis on the human right to food and health,[37, 45, 56, 60] an ‘economic rationale’ for action,[58, 64, 88] and a focus on harms to children.[49, 56, 85, 88] For example, in England, a focus on children was seen as critical in generating political buy-in from a range of sectors and over-coming political opponents to a national obesity strategy.[49] Expanding and de-individualizing the perceived ‘responsibility’ for nutrition problems also appears to be important. For example, the increasing use of an ‘obesogenic environment’ frame has helped to emphasize the ‘causes of the causes’ of the obesity and thus with a wider diversity of actors beyond the individual (or parents, in the case of child obesity), including the responsibility of the food industry and government.[49, 88, 110] Food industry groups have often conflicted with nutrition advocates around the diametric frames of ‘individual responsibility’ versus ‘obesogenic environments’, industry freedoms versus consumer’s rights, and the use of ‘soft’ versus ‘hard’ approaches to intervention.[51, 81, 84, 88, 110, 111]

Figure 3. Causal-loop diagram of framing strategies, evidence and norms



'Hooking' nutrition onto high priority non-nutrition issues has also been a successful strategy for generating embedded commitment.[44, 45, 48, 96, 112, 113] For example, this includes the positioning of nutrition within broader poverty reduction and national development agendas,[48, 96, 112] within financial and tax policy reforms (as in the case of sugar-sweetened beverage taxes),[114, 115] and by appealing directly to the interests of non-nutrition actors. For example, in Brazil, nutrition goals were adopted into a national school feeding program when access to 'fresh basic foods' resonated with local farmers and food supplier interest groups.[112] Global-level policies and commitments may also generate attention and compel governments to initiate policy responses.[45, 58, 59, 62, 92, 116] Achieving frame resonance appears to be not only a function of alignment and content, but also of the strategic communication capacities of NANs. This includes the capacity to contextualize and tailor messages to different target audiences,[44, 45, 83, 97] advocate for realistic changes aligned with decision-maker priorities,[37, 48, 55, 78, 85, 96, 97, 112, 117] utilise high-level champions,[44, 52, 56, 62, 76, 96] and speak with a consistent and unified voice.[44, 45, 62] Robust data systems (i.e. comprehensive food and nutrition monitoring and surveillance systems) and evidence enhance strategic communication

capacities by enabling the identification of nutrition problems (i.e. to demonstrate severity, trends and distributions), the identification of causal linkages between nutrition determinants and outcomes,[48, 62, 78, 118] by enabling accountability mechanisms (e.g. the watchdog role of civil society),[37, 56, 119] and advocacy for sustained commitment by making it possible to 'demonstrate success'.[44, 96, 100, 120] In a five-country study, for example, data demonstrating a high undernutrition burden and/or limited progress in addressing those burdens was the only consistent factor (out of 12) driving pro-nutrition policy change within countries.[34]

Consistent with theories on expert and advocacy networks, NAN members are typically both technical as well as principled actors. For example, NANs have mobilized around strong human rights norms in several Latin America countries and in India.[44, 56, 73]. However, they have also faced major normative challenges when their objectives and actions have conflicted with entrenched belief systems and practices within policy-making institutions, political systems and/or in society-at-large.[34, 55, 88, 97, 110, 111, 121] A neoliberal ideology is reported in the literature as a significant barrier to advancing food regulations targeting obesity prevention. This includes the mobilization of bias in favor of 'behavioral-lifestyle' approaches to nutrition that individualize responsibility for obesity,[51, 82, 87, 88, 110, 111] and the view that government should have only a minimal role in regulating free enterprise.[82, 88, 110, 117, 122, 123] For example, lifestyle-behavioral and private-sector led approaches to obesity prevention have become highly entrenched in Australia and the UK, having persisted irrespective of the government's political orientation.[88, 110, 111] Furthermore, neoliberal norms have also manifested within government deregulation agendas and regulatory vetting procedures (i.e. regulatory impact assessments to assess costs of new food regulations to business) in high-income countries.[86, 122]

Two diametric paradigms – nutritionism and food bias – have also hindered responses to undernutrition by narrowing and skewing perceptions about the scale and scope of nutrition problems, and preventing the development of balanced approaches addressing broader determinants (e.g. women's empowerment, care of mothers and children, health services and unhealthy environments),[107] Nutritionism is an overly-reductionist nutrient-centric understanding of nutrition,[45, 48, 107] also conceptualized as a clinical, curative or biomedical interpretation as distinct from a 'public health' or 'integrated' one.[100, 107] In some instances, it was reinforced when the placement of nutrition within ministries of health resulted in an over-emphasis on curative interventions,[45, 64, 100] when network members were fixated on single issues and ideologically resistant to alternatives,[56, 107] and by a generally overly-technocratic approach to nutrition policy.[44] Nutritionism may also stem from the co-option of nutrition science by 'Big Food' companies who have adopted 'functionalization, fortification and reformulation' strategies for marketing ultra-processed food and beverage products in response to growing public health concerns.[124] Industry groups have also used a strategy of skewing and undermining scientific evidence.[84, 88, 90, 125]

Food bias is described as "the conflation of malnutrition with lack of food".[44] It has been found to orientate policy responses towards food production, distribution and access without consideration of the nutritional quality of foods nor of the non-food related determinants of malnutrition (e.g. unhealthy environments, access to care).[33, 34, 44, 48, 56, 58, 64, 109, 119] A number of factors were found to reinforce food bias. This includes events (e.g. drought, conflict, economic crises) that stimulate food distribution responses but not longer-term 'development nutrition',[45, 64, 68] when food distribution or pricing was an entrenched electoral issue (i.e. food and not nutrition-related initiatives bring in more votes) or when food distribution schemes were strongly institutionalized and resistant to change.[44, 56, 63, 107, 126] The agri-food paradigm of 'productivism' also appears to reinforce food bias. For example, when food systems are orientated towards the production of only a few commodities (e.g. maize in Zambia, rice in Bangladesh) that create powerful electoral constituencies resisting change,[45, 64, 126] or towards agricultural commercialization and cash-cropping at the expense of agricultural diversification for enhanced nutrition.[64, 127]

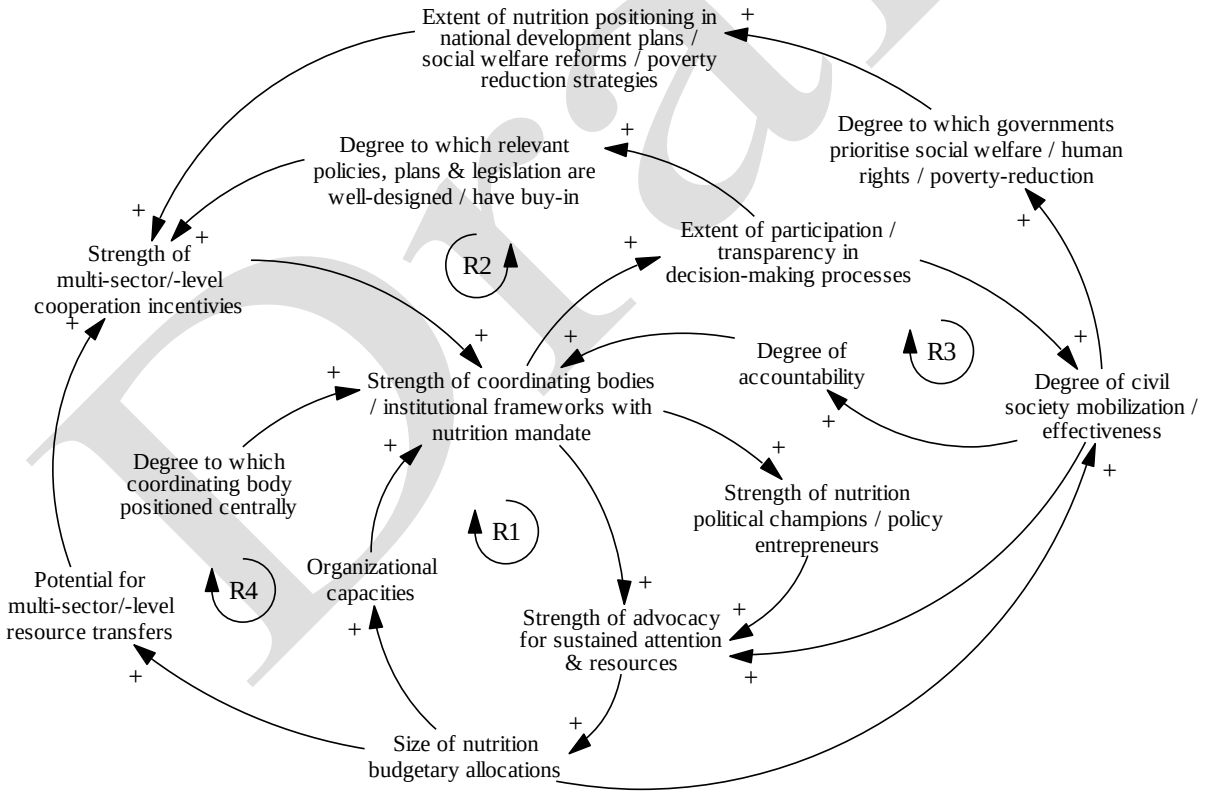
From these results, we hypothesise examples of several key feedback loops. First (R1), effective framing enhances the societal salience of nutrition problems, impacts and solutions hence promoting pro-nutrition norms, which may in-turn enhance the resonance of ongoing framing efforts. Second (R2), as a result of this virtuous cycle, pro-nutrition norms can enable network expansion, the mobilization of organizational and strategic capacities, and enhanced strategic communications, which can in-turn enhance the resonance of frames, further strengthening pro-nutrition norms. Third (R3), this further enables pro-nutrition norms when NANs become capable of hooking nutrition onto wider discourses and emphasizing systemic causes, further enabling the salience of nutrition, the promotion of human rights norms and reduced individualization. However, the three major ideological barriers NANs encounter – neoliberalism, food-bias, and nutritionism – may create competing reinforcing loops that can weaken pro-nutrition norms. Stronger neoliberal norms can individualise nutrition / reduce the perceived responsibility of governments and industry (R4), enhance the degree of productivism and hence food bias (R5), and further expand the role of the private sector in nutrition policy, thereby promoting nutritionism (R6).

Institutional, political and societal contexts

Figure 4 presents a CLD of factors in this category. A major challenge facing NANs is institutionalizing national nutrition responses, including effectively coordinating actions and commitment-building activities within and across multiple policy sectors (horizontal dimension) and levels (vertical dimension). Sectors have typically included health and agriculture,[64, 100, 106, 112, 128] but also education, economic development, finance, gender, industry, labour, social protection, water and sanitation among others.[44, 45, 61, 98, 112, 113, 129, 130] The complex institutional arrangements involved and the limited 'institutional ownership' for nutrition resulting from such arrangements were commonly reported challenges.[34, 44, 45, 56, 61, 64, 68, 97, 130, 131] NANs are

therefore likely to be more effective when government coordination bodies and institutional systems mandated to address nutrition provide effective platforms for multi-sector/-level action and norm-promotion e.g. consensus-building, coordinating policy development, implementation and monitoring activities, mobilizing human, technical and financial resources, and sustained advocacy for attention and resources.[45, 46, 48, 55, 56, 62, 100, 112, 130, 131] Coordinating bodies have been typically located within supra-sectoral government agencies (e.g. office of the prime minister) or line agencies (e.g. ministries of health, agriculture), but also formalised coalitions of non-governmental actors acting independently or in unison with government, and less formal taskforces operating within a wider multi-sector low-income country development context.[48, 56, 62, 100] The role and effectiveness of civil society within and outside of NANs was enhanced when coordinating and governance bodies had transparent and inclusive decision-making processes.[45, 48, 77]

Figure 4. Causal-loop diagram of institutional, political and societal contexts



In some cases coordination bodies have been embedded within broader institutional frameworks with delineated multi-sector/-level roles and responsibilities.[44, 48, 62, 77, 112] For example, Brazil's National Council on Food and Nutrition Security (CONSEA) was positioned at the center of a National System of Food

Security and Nutrition involving 17 ministries and agencies, as well as sub-national bodies.[48, 77, 112] Coordinating bodies appear to be more effective when positioned within centralized government agencies (e.g. office of the prime minister) with sufficient authority, capacities, resources and leadership.[37, 44, 48, 60, 61, 109] Also when strong incentives have existed for coordinated multi-sector/-level action including well designed polices, operational plans and enabling legislation, shared and sector-specific goals, performance measures and performance or results-based budgeting (i.e. multi-sector/-level resource transfers).[48, 49, 61, 62, 64] Coordinating bodies were potentially less effective when having limited capacities and resources (often when responsibility was located within politically weaker line ministries e.g. ministries of health, agriculture, gender),[45, 48, 56, 62-64, 109, 126] when overly-focused on technical work but not on advocacy for sustained attention and resources,[44, 48, 50] and when NANs have possessed limited capacities for managing conflicts during policy processes.[34, 44, 54, 99] For example, in Bolivia, despite the early successes of the Zero Malnutrition initiative at coordinating actions and mobilizing financial resources, a failure to advocate for sustained political attention and administrative commitment led to its demise.[44]

Another major challenge facing NANs is converting institutional commitments into on-the ground actions and results through national to sub-national implementation pathways i.e. the degree to which nutrition policies are effectively coordinated, implemented and monitored across levels (i.e. national, regional, municipal, community). This relates especially to the cooperation incentives (e.g. legal frameworks, resource transfers, and political motives) of sub-national governments and non-government actors to adopt, progress and benefit from policies established by central governments.[45, 46, 106, 127] However, this 'vertical coordination' presents a significant challenge given the many potential 'veto points' for actors to impede policy responses at different levels of national to sub-national implementation pathways.[45, 106, 127] A key enabling factor appears to be generating buy-in through engagement of sub-national actors responsible for implementation in centralised policy development.[45, 58, 61, 64, 107] Another, is the presence of existing sub-national food and nutrition bodies with adequate organizational capacities for coordinating sub-national policy and programming actions.[45, 46, 48, 58] These bodies, along with national data sharing systems enable NAN responsiveness, allowing for the calibration of central policies in response to feedback on changing implementation challenges, on-the-ground conditions and local-level needs.[45, 119, 127]

From these results we can hypothesise several key reinforcing feedback loops. First (R1), coordinating bodies that are more capable of advocating for sustained attention and resources can mobilize greater financial resources for nutrition and in-turn enhance their organizational capacities, thus providing NANs with stronger platforms for multi-sector/-level action. Second (R2), that when coordinating and governance bodies have inclusive and transparent decision-making processes they are more likely to design effective policies and generate buy-in, and strengthen multi-sector/-level cooperation incentives. Third (R3),

inclusive and transparent decision-making processes also enable civil society groups to influence and access decision-makers, thereby enhancing their effectiveness at mobilizing financial resources for nutrition and holding decision-makers and coordinating bodies to account. Finally (R4), the expansion of financial resources for nutrition and in-turn the potential for multi-sector/-level resource transfers can create powerful cooperation incentives, thereby strengthening coordination bodies and institutional frameworks.

Conclusion

Fostering political commitment for nutrition represents a key challenge during the Sustainable Development Goal era and UN Decade of Action on Nutrition. Without such commitment, the policies, programmes and resources needed to improve nutrition and achieve global targets are unlikely to be adopted, effectively implemented, nor sustained. In this paper we adopted a systems approach and have taken two steps to inform commitment-building actions. First, acknowledging the dynamic nature and complexity of political systems, we present a 'nutrition commitment system' model. This demonstrates that the five forms of commitment – rhetorical, institutional, operational, embedded and system-wide – are inter-related and can reinforce or diminish one another dynamically through positive and negative reinforcing feedback loops. Hence, this model provides a new representation and set of hypotheses on how political commitment for nutrition may grow (or diminish) dynamically. We then presented three causal loop diagrams demonstrating potential drivers of NAN effectiveness across three categories of variables – network actor features, resources and capacities; framing strategies, evidence and norms; and institutional, political and societal contexts. Together these demonstrate the complex and dynamic ways in which NANs might evolve and become (in)effective over time. By identifying key reinforcing feedback loops (i.e. 'virtuous cycles') we proposed several hypotheses for how NANs might be strengthened to more effectively drive commitment systems.

It is important to note that these CLDs are not absolute nor complete representations of these systems. Rather, they are interpretations made by the investigator team through engagement with key theoretical and empirical literature, as well as inputs from nutrition experts. As with any interpretive research, the results should be treated with caution and taken as a starting point for further investigation. However, this first attempt to explicate models of these systems may inform new thinking and action for strengthening NANs and generating political commitment. The true value of this approach in future may be to apply systems thinking and methods towards strengthening within-country NANs. For example, undertaking group model building exercises with network members (e.g. through national and sub-national workshops) could enable structured and evidence-informed conversations on how to go about strengthening NANs, and help to generate member cohesion. Such an approach would ensure that network-strengthening strategies are tailored to national and sub-national contexts and build on existing network strengths and needs. Doing so

may inform new strategies for building more effective NANs, generating political commitment for nutrition and encouraging non-linear 'systems thinking' within the nutrition field more broadly.

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Table and figure legends