SUSTAINING EFFECTIVE EDUCATIONAL INITIATIVES
Annotated Bibliography

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Papers relating to sustainability of initiatives in Complex Adaptive Systems

Bartelink, N.H.M., van Assema, P., Jansen, M.W.J., Savelberg, H.H.C.M., Willeboordse, M., & Kremers, S.P.J. (2018) The Healthy Primary School of the Future: a contextual action-research approach. *International Journal of Environmental Research and Public Health*, 15:2243.

Butler, H., Bowes, G., Drew, S., Glover, S., Godfrey, C., Patton, G., Trafford, L., & Bond, L. (2010) Harnessing complexity: taking advantage of context and relationships in dissemination of school-based interventions. *Health Promotion Practice*, 11(2): 259-267.

Murphy, S., Littlecott, H., Hewitt, G., MacDonald, S., Roberts, J., Bishop, J., Roberts, C., Thurston, R., Bishop, A., Moore, L., & Moore, G. (2018). A Transdisciplinary Complex Adaptive Systems (T-CAS) Approach to

developing a national school-based culture of prevention for health improvement: the School Health Research Network (SHRN) in Wales. *Prevention Science*, 8.

Rosas, S.R. (2017). Systems thinking and complexity: considerations for health promoting schools. *Health Promotion International*, 32:301-311.

Shelton, R.C., Cooper, B.R., & Wiltsey Stirman, S. (2018) The sustainability of evidence-based interventions and practices in public health and health care. *Annual Review of Public Health*, 39:55-76.

Anderson, P. (1999). Complexity theory and organization science. *Organization Science,* 10(3): 216-232. doi:1047-7039/99/1003/0216.

Paper reviewed: 5.5.19

Type of paper: Literature review, definition of complex adaptive systems (CAS) and CAS modelling

Setting/Programmes evaluated: Organisations in general

Our summary:

- Complex adaptive systems (CAS) characterized by four key elements:
    - Agents with schemata
    - Self-organizing networks sustained by importing energy
    - Coevolution to the edge of chaos
    - System evolution based on recombination
- Three dimensions of complexity:
    - Vertical complexity (eg: number of levels in an organizational hierarchy)
    - Horizontal complexity (eg: number of job titles or departments across the organization)
    - Spatial complexity (eg: number of geographical locations)
- Hard to predict complex systems because they are non-linear and difficult to compress into a parsimonious description
- Intervening to change one or two parameters may result in drastic change of behaviour of the whole system, and the whole can be very different from the sum of parts
- Components interact with one another via a web of feedback loops
- Six important insights concerning CAS:
    - It is dynamic and does not reach a fixed point of equilibrium
    - Processes are random and chaotic, revolving around identifiable attractors in a deterministic way that seldom return to the same state
    - Behaviour of CAS is sensitive to small differences in initial conditions, so that two entities with very similar initial states can follow radically divergent paths over time
    - CAS resist simple reductionist analyses because descriptions at multiple scales are necessary to identify emergent properties
    - Complex patterns arise from interaction of agents that follow relatively simple rules; they are emergent in the sense that new properties appear at each level in a hierarchy
    - CAS exhibit self-organizing behaviour →starting in a random state, they usually evolve towards order instead of disorder
- CAS are nested hierarchies that contain other CASs
- CAS models complement causal models as they build on the foundation of causal models to explain observed regularities as the product of structured, evolving interactions between agents →good CAS

model should not only explain established findings but successfully predict new aggregate regularities and aggregate-level causal relationships

- Steps to build a CAS model:
    - Build a model based on theoretical assumptions that incorporates empirical data:
        - Who are the agents? How many organizations compete in this space, and what are their salient demographic characteristics?
        - What are the agents' schemata? Eg: What innovations they pursue and how each agent reacts to the efforts of other agents, what are the "rules"
        - How are the agents connected? How do these connections change over time?
        - What payoff functions do these agents pay attention to? What tradeoffs are they willing to make among different types of payoffs?
        - How do the actions of one agent affect the payoffs of others? What is the payoff structure of the evolutionary game they appear to be playing?
    - Demonstrate that the model can simulate the trajectory of innovation in the population observed to date
    - Make novel predictions based on the model that move beyond theory
    - Make predictions about what outcomes would be observed if key elements of the model change
    - Build several competing models that are consistent with observed data but lead to different predictions→ discard models that predictions do not hold and synthesize new models from their most successful elements

Authors' recommendations:

The melding of complexity science with organizational theory and the increasing availability of new techniques for modelling nonlinear behaviour open opportunities for researchers to build good CAS models.

Andreou, T., McIntosh, K., Ross, S. and Kahn, J. (2015). Critical Incidents in Sustaining School-wide Positive Behavioral Interventions and Supports. *The Journal of Special Education, 49*(3), 157-167.

Paper reviewed: 24.5.18
Type of paper: Original data: interviews regarding critical factors in sustainability
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- 17 participants from 3 elementary schools and district office
- Used *Critical Incident Technique* to identify clusters of barriers and facilitators
- Although retrospective, this technique allows for corroboration of individual reports
- Yielded 13 categories (with percentage of respondents nominating each category)
    - Continuous teaching (88%)
        - Visible across lessons, assemblies, incidents, presentations – consistent culture, common language
    - Programme team effectiveness (88%)
        - Regular meetings, broad representation, high profile
        - Mechanisms for tracking progress and for reporting back
    - Positive reinforcement (82%)
        - For use of programme behaviours (this programme has a formal system of acknowledgement tickets for prosocial behaviour)
        - Also, improved outcomes reinforces staff implementation
    - Conflict of personal beliefs/mistaken beliefs (82%)
        - Eg don't think it's their role; disagree with philosophy; misunderstand programme elements/objectives
    - Staff ownership (76%)
        - Programme is staff driven and owned rather than a top-down mandate
        - Teacher buy-in and high level of involvement in planning and implementation
        - Involvement of people in the trenches who are dealing with the issues and can share successes from experience
    - School administrator involvement (76%)
        - Actively involved in supporting, using language/modelling key concepts, giving presentations, setting school priorities
        - Drawbacks of an unsupportive principal particularly highlighted
        - May need to plan for programme sustainability through admin turnover and enhancing principal support
    - Adaptation (71%)
        - Maintaining core elements while adapting for efficiency/effectiveness/local fit/local changes
        - Re-evaluating, and also refreshing ways of doing things to maintain enthusiasm amongst students and staff
    - Community of practice (65%)
        - Networking and connection to peers for support and concrete new ideas
    - Use of data (65%)
        - Patterns of implementation, and student outcomes + highlight connection
        - Communication and accountability
        - Celebrate successes, identify next steps
        - Become self-sufficient in directing own priorities and resources
    - Involving new personnel (65%)
        - Rotation of staff to committee refreshes ideas and energy

        - Teachers new to school - recruiting to committee, pair with programme veterans, change job descriptions/hiring criteria to require experience/support for the programme
    - Access to external expertise (59%)
        - Vision can become too narrow or stagnant; help evaluate or troubleshoot; help create connections with district leaders and other schools
    - Maintaining priority (53%)
        - Visible and written high profile; part of curriculum
        - Also at a district level
    - Staff turnover (47%)
        - Diminishes capacity, consistency and commitment if training/involvement not planned
- Frequent comment that events are synergistic
    - Eg data collection and positive reinforcement = self-sustaining loop

Authors' recommendations for practitioners:

- Good descriptions of salient features supporting sustainability, as above

Authors' recommendations for researchers:

- These elements reported by sustaining schools in elementary settings – do they generalise?
- Can they be tested (?prospectively) in bigger and more diverse samples?
- Adaptation may become increasingly important as a variable for future research

Askell-Williams, H. (2017). Perspectives from teachers and school leaders about long-term sustainability: A challenge for mental health promotion initiatives in educational settings. In Carmel Cefai & Paul Cooper, ed. Mental Health Promotion in Schools: Cross Cultural Narratives and Perspectives. Rotterdam, Netherlands: Sense Publications., pp. 141-156. https://doi.org/10.1007/978-94-6351-053-0_9

Book chapter reviewed: 13 March 2018
Type: Original data
Setting/Programmes evaluated: Schools

Our summary:

- **Definition:** Sustainability, "generally includes embedding, diffusion and routinisation within initial contexts, and also, in some accounts, upscaling to wider contexts (e.g., from one school to a whole school district)" p. 142.
- Sustainability research typically investigates long term follow-up of the participants (ongoing behaviour change or improved outcomes), but may not refer to long-term follow-up of the program itself, such as whether it is embedded, adapted, refined, up-scaled, and so on.
- Various phases of implementation each require phase-specific questions about processes as well as outcomes. The tendency of program evaluators to ask these types of questions only at the end of the trial period of a program can mean that it is too late to redress issues and oversights that might be leading to the long-term demise of the program.
- Table 1: Framework for monitoring and feedback during the trials of educational initiatives (p. 145) provides specific questions to be addressed during each phase of implementation (not just when the initial implementation phase has passed)
- Educational initiatives are situated within complex systems, situated within communities with diverse cultural and social determinants. This provides a different set of circumstances to programs that have been piloted in relatively controlled, highly resourced situations, and are then broadly rolled-out to settings with fewer resources and limited controls over implementation processes. Thus the conceptual background to this chapter is informed by the ecological systems model proposed by Bronfenbrenner.

Research question:

- What are the perspectives and experiences of teachers about current processes of implementation that do, and do not, support the long-term sustainability of effective educational initiatives for promoting young people's wellbeing and positive mental health?

Procedure:

Focussed interviews with 17 teachers and school leaders in 8 promary and 4 secondary schools. Interview data coded to emerging themes.

Results: Four main themes emerged:

- A local champion is not enough
- Leadership support is essential
- Staff professional education must be continuous
- Evaluation and review must proceed throughout the life of the program

Author copy available from: http://hdl.handle.net/2328/37287

Atun, R., de Jongh, T., Secci, F., Ohiri, K. & Adeyi O. (2010). Integration of targeted health interventions into health systems: a conceptual framework for analysis. *Health Policy and Planning, 25*, 104-111. doi:10.1093/heapol/czp055.

Paper reviewed: 8.4.19
Type of paper: Development of a conceptual framework on integrating health innovations into health systems
Setting/Programmes evaluated: Public health

Our summary:

- Definition of 'integration'
    - No commonly accepted definition of 'integration'
    - Authors defined 'integration' as the extent, pattern and rate of adoption and eventual assimilation of health interventions into each critical functions of a health system which include governance, financing, planning, service delivery, monitoring and evaluation, and demand generation
    - 'Intervention' viewed as an innovation or a scaling up

- The proposed conceptual framework includes the health system characteristics, the context, the intervention system, the adoption system and the problem.
    - Characteristic of the problem influence the rate at which an intervention is integrated into the health system; eg: urgency and scale of the problem
    - Complexity of the intervention determines standardization, replicability and scalability whereas intervention complexity is determined by the number and nature of technologies used to address the problem
    - Adoption system refers to the key actors and institutions in the health system; includes perceptions of risks and benefits
    - Adoption process non-linear and involves changes in regulatory, organizational, financial, clinical and relational aspects involving multiple stakeholders

- The framework can be used as a diagnostic (past and current events) or formative (future events) tool
    - Diagnostic: detailed mapping of health interventions (purpose, extent and nature of integration)
- Limitations of the proposed framework:
    - Not tested and use at the country level requires refinement over time
    - Describes what a fully integrated health system looks like but agnostic whether a particular system should be fully integrated; decision left to policy makers

Authors' recommendations:

The authors proposed the potential applications of the conceptual framework in:

- Undertaking literature and program reviews
- Case studies to explore how novel health interventions and health systems interact
- Programme planning at the national and sub-national levels

Bartelink, N.H.M., van Assema, P., Jansen, M.W., Savelberg, H.H.C.M., Willeboordse, M., & Kremers, S.P.J. (2018). The Healthy Primary School of the Future: a contextual action-oriented research approach. *International Journal of Environmental Research and Public Health*, 15:2243. doi: 10.3390/ijerph15102243

Paper reviewed: 31.10.2019
Type of paper: Protocol paper
Setting: Dutch primary schools
Program: The Healthy Primary School of the Future (HPSF)
Study design: Prospective, quasi-experimental

Our summary:

- Schools play an important role in promoting children's health behaviours but school health promotion in the Netherlands was marked by relatively low priority and lack of coordination and fragmentation
- The supply-driven approach due to the fragmentation of school health promotion led to the overabundance of initiatives being offered to schools that do not match their needs
- The complexity of the school system, the contextual differences between schools, fragmentation of school health promotion and the worrying increase in unhealthy behaviours led to the development of the HPSF: a Dutch initiative that aims to sustainably integrate health and well-being within the school system
- HPSF builds upon the principles of the health-promoting school framework (HPS) and includes focus on changes in school policy and the schools' physical and social environment using bottom-up involvement of pupils, parents, teachers and staff
- Co-creation processes within schools are challenging to study in a scientifically sound manner because traditionally, many action researchers have followed the linear cycle of needs assessment, development, implementation, monitoring, and evaluation which makes it difficult to identity where changes are interacting with each other and with other contextual aspects of the school, hence Contextual Action-Oriented Research Approach (CARA) was developed
- CARA not only aims to evaluate the implementation, but also to support the process of change in the schools, with specific focus on contextual differences
- CARA is an adaptation of action research principles whereby the traditional linear steps are let go as they suggest a logical, causal process
- CARA centres on 4 questions:
    - What is the pre-existing context of each school?
    - How does the process of change in each school evolve and which factors affect this process?
    - How can research contribute to the process of change?
    - Do children's health and health behaviours improve as a result of the health promotion changes?
- Four schools, each with 200-300 children (aged 4-12 years) with 15-30 teachers per school and four comparable control schools in the same region were selected for this study
- Two top-down approaches are prepared and led by external staff provided by childcare organisations:
    - Providing a free healthy lunch each day
    - A full hour of structured physical activity each day
- Conditions for inclusion in the HPSF project:
    - Schools to decide autonomously whether to participate in this project
    - Parents and teachers to be involved in the 1-year decision and development process to adapt the above two changes to their school contexts
    - Schools to start implementation if they had the teachers' support and at least 80% parental support
    - One teacher in each school to be appointed as a HPSF school coordinator
    - Creation of a project team that include schools, Movare school board, the university, child care organisations, catering services, sports and leisure organisations, and provincial authorities

    - A framework of possible behavioural goals guides all methods and these goals were defined by the research team during the preparation year, by applying insights from the Precede-Proceed model about ways to define clear behavioural goals
    - Behavioural goals also work as inspiration for the schools to define their needs and preferences to focus on specific aspects relevant to their schools
- What is the pre-existing context for each school?
    - Use of mixed method to gather rich data that can be rapidly translated to real-time feedback for the schools
        - Semi-structured interviews with school coordinator and health promoter in each school. Behavioural goals are used in these interviews.
        - Barrier questionnaire based on the Measurement Instrument for Determinants of Innovations (MIDI)
        - Practices questionnaire
        - Health and behavioural measures: children wear an accelerometer for a whole week to assess their PA levels; have their weight, heights, waist and hip circumferences measured during PE classes; questionnaire for children's dietary and PA behaviours
- How does the process of change in each school evolve and which factors affect this process?
    - Process of change not a linear process → small changes can produce large effects at so-called 'tipping point' which is hard to predict. Therefore, innovators and external experts need to be receptive to what emerges and expect the unexpected
    - Adaptation drives change: what emerges in a school is interpreted as a function of on-going adaptations that may continually lead to new needs, interests, and opportunities in the school → this leads to greater ownership and commitment if it involves a process of mutual adaptation
    - Bottom up approach is required for teachers, children and parents to lead the process of change and goes hand in hand with the top-down approach to involve external experts for specific health promotion knowledge, skills and experiences →important to find balance between these two approaches
    - To facilitate on-going process of change, processes and their consequences are continuously being monitored
        - Annual interviews with the school coordinator and health promoter
        - A researcher participates, takes notes of all meetings and randomly talks to staff and children to hear about their experiences and perceptions of HPSF (once every 3 months)
        - Twice a year, all teachers and external staff are required to complete the Barrier Questionnaire
        - Teachers and parents to complete the Practices Questionnaire once a year
- How can research contribute to the process of change?
    - Evaluation is no longer merely an external observation but become of the strategies to embed HPSF in schools
    - Regular feedback required → written summaries from interviews, overviews of perceived barriers for teachers and external staff, easily understandable animated videos of key results of the health and behavioural measures, contextual suggestions for improvement, suggestions for possible behavioural goals and selection of relevant previously developed evidence-based additional changes for the schools leading to the development of a 'fruit basket model'
    - Fruit basket model consists of a continuously expanding overview of available evidence-based additional changes that schools can introduce; eg: gardening activities, energisers in lessons, creating a PA friendly schoolyard etc.
    - Questions re. researchers' contributions are included in the interviews to evaluate the extent to which the contributions are experiences as supportive and/or desirable
- Do children's health and behaviours improve as a result of the health promotion changes?
    - Effect study using quasi-experimental design:
        - Data on children's health and behaviours collected annually at all four HPSF schools and four control schools (approximately 1700 children, 900 parents and almost 80

employees) but need to consider context when evaluating differences, hence use of moderator analyses to examine interactions stratified by moderator
    - Quantitative data collected from four intervention schools to examine difference over time
    - Qualitative data collected from intervention schools to provide additional insight on the process of change

Authors' recommendations:

- Fully assessing and understanding all aspects of each context, process of change and implementation of change is impossible due to limitations of time, resources and participant burden
- Data collection instruments need to fit the context and able to get meaningful data
- CARA is not only an evaluation of process of change in schools but also an effect study to investigate the evidence for behavioural and health effects of these changes among children
- CARA requires time-consuming research as a thorough insight into the school context is necessary
- CARA is a possible solution to the challenge of supporting and evaluating change in school-based initiatives and generates knowledge and experiences on how to deal with health promotion in complex systems

Related papers:

Willeboordse, M., Jansen, M., van den Heijkant, S., Simons, S., Winkens, B., de Groot, R., Bartelink, N., Kremers, S.P., van Assema, P., Savelberg, H.H., et al (2016). The Health Primary School of the Future: study protocol of a quasi-experimental study. *BMC Public Health*, 16:639. doi: 10.1186/s12889-016-3301-9

Bartelink, N., van Assema, P., Jansen, M., Savelberg, H., & Kremers, S. (2019) The moderating role of the school context on the effects of the Healthy Primary School of the Future. *International Journal of Environmental Research and Public Health*, 16, 2433. doi: https://www.mdpi.com/1660-4601/16/13/2432

Bartelink. N.H.M., van Assema, P., Jansen, M.W.J., Savelberg, H.H.C.M., Moore, G.F., Hawkins, J., & Kremers, S.P.J. (2019) Process evaluation of the Healthy Primary School of the Future: the key learning points. *BMC Public Health*, 19:698. doi: https://doi.org/10.1186/s12889-019-6947-2

Butler, H., Bowes, G., Drew, S., Glover, S., Godfrey, C., Patton, G., Trafford, L., & Bond, L. (2010). Harnessing Complexity: taking advantage of context and relationships in dissemination of school-based interventions, *Health Promotion Practice*, 11(2): 259-267. doi: 10.1177/1524839907313723

Paper reviewed: 31.10.2019
Type of paper: Original data: observations from The Gatehouse Project
Setting: Australian schools
Program: The Gatehouse Project

Our summary:

- Schools are being increasingly being asked to use evidence-based strategies to promote health and well-being but dissemination of health promotion research in schools is challenging and has shown a low effect on educational practitioners and policy makers
- Tension between researchers and practitioners: contamination of trial versus practical solutions to challenging health and social problems
- Schools are multifaceted organisations that sit within constantly shifting broader contexts, hence there is a need to adapt models of intervention for complex systems such as schools
- The Gatehouse Project was a school-based cluster randomised controlled intervention designed to promote health and emotional well-being in 26 Victorian secondary schools from 1997 to 2001
- A key element of the Gatehouse Project was the facilitator or critical friend, a member of the research team with an education background, who assisted school action teams to apply principles and processes of the Gatehouse Project, review current practice, make use of local data and develop strategies appropriate for each school's context
- The Gatehouse Project was originally developed within a traditional model of prevention research and dissemination: develop intervention, trial, evaluate and disseminate findings but there is a need to move beyond conventional dissemination strategies to focus on active partnerships between developers and users of school-based intervention research
- At the start, the team had to make choices about whether and how to respond to requests from education and health sectors for information ad professional training and there was considerable interest in this approach due to growing awareness of school sites for prevention of important health problems. In the mid-to late 1990s, government commissioned taskforces recommended prevention and early intervention work in schools →mandated activities. Such interests laid the groundwork for the project
- Lessons learned from the Gatehouse Project:
    - The use of traditional dissemination tools such as publications, conference presentations, web site etc were not sufficient to change practice and culture and sustain these changes over time → hence an ecological perspective from the first stages of planning is needed
    - The development of dissemination strategies was co-constructed; built on a two-way exchange between the Project team and the school practitioners
    - More meaningful and durable engagement with the intervention's key elements was likely to occur through reflective teaching learning and through systems change, rather than delivery of training kits or isolated professional development sessions
    - Building partnerships between researchers and practitioners, in particular the critical friend of facilitator, school action teams, the use of local data, and school having active roles in framing research questions and shaping interventions are key elements for success
    - Dissemination is not linear process of applying theory to practice or finding more efficient ways to transfer more accessible information, products or techniques from researchers to practitioners and policy-makers. Dissemination involves identifying and addressing complex range of challenges within a web of relationships
    - Development of an ecological model as a representation of participants and context and the interactions between them; not a causal model but as an adjunct to the common linear

model of program development and dissemination because there is some important thinking that need to be done before nature and direction of the dissemination are determined
    - Dissemination and diffusion will be influenced by the key elements of the context and it is better to be aware of these in advance rather than simply account for their help or hindrance after the fact in process evaluation

Authors' recommendations:

- Start planning early: dissemination need to be considered during all stages of development of school-based interventions from earliest stages of research study design and funding proposal, through implementation trials and beyond.
- Consider a range of strategies for a range of participants and partners
- Understand school change and teacher learning processes
- Consider what all the participants bring to the work
- Pay attention to relationships and processes as well as content
- Understand and monitor the broader context

Calhoun, A., Mainor, A., Moreland-Russell, S., Maier, R. C., Brossart, L., & Luke, D. A. (2014). Using the Program Sustainability Assessment Tool to Assess and Plan for Sustainability. *Preventing Chronic Disease, 11*, E11. doi:10.5888/pcd11.130185

Paper reviewed: 8.6.18
Type of paper: Detailed description of how to use the PSAT, and a case illustration
Setting/Programmes evaluated: Public health

Our summary:

- Updated Framework for sustainability (modified from Schell et al., 2013)
    - **Environmental support** *supportive internal/external climate for program*
    - **Funding stability** *establishing a consistent financial base for program*
    - **Partnerships** *cultivating connections between program and stakeholders*
    - **Organisational Capacity** *internal support/resources to effectively manage program*
    - **Program Evaluation** *assessing program to inform planning and document results*
    - **Program Adaptation** *actions to adapt program to ensure its ongoing effectiveness*
    - **Communications** *strategic communications with stakeholders/public about program*
    - **Strategic planning** *using processes that guide program's directions, goals, strategies*
- Describe detailed three step process to plan for sustainability, with a case study example
    - **Prepare and assess program** (define program, identify participants, complete PSAT)
    - **Develop action plan** (assemble team, review program mission and purpose, review PSAT results, which program elements need to be maintained/eliminated/adapted, prioritise areas to improve sustainability capacity, action plan with specific steps
    - **Take action** (implement plan, reassess sustainability capacity annually)
- Some good pointers, e.g.
    - Clearly define the program you wish to assess especially if a loose coalition of activities/external stakeholders involved
    - Get a range of perspectives by wide use of tool: eg may be relevant to include external stakeholders, leaders (buy in is essential here), frontline staff, budget officers
    - Recommend fill in PSAT separately and anonymously
    - Can do the PSAT online with up to 12 participants and get a free report generated
    - Have a clear agenda; take time to revisit program's mission/long-term objectives. What will program look like in 3-5 years? Identify goals. This will help engage staff and map effort needed to maintain program/benefits over time
    - As well as noting domains for priority, considering program goals/PSAT scores, determine which elements of program should be continued and which dropped. Some good discussion questions here regarding whether the program is providing valued service, meeting needs, which are core elements – "Do not assume that all program components should be continued exactly as is into the…future"
    - As you build plan, try to foresee barriers and strategies to counter these
    - Feedback with periodic data regarding each action step and brainstorm solutions to challenges.

Authors' recommendations for practitioners:

- As above, this paper provides some good practical guidelines about utilising the PSAT information
- There will be individual setting nuances that the PSAT can't capture; encourage broader discussion across its domains than the five items

Chambers, D.A., Glasgow, R.E., & Stange K.C. (2013). The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change. *Implementation Science, 8*, 117. http://www.implementationscience.com/8/1/117.

Paper reviewed: 8.4.19
Type of paper: Development of a conceptual framework and sustainability definitions
Setting/Programmes evaluated: Public health

Our summary:

- Definitions:
    - Sustainability: the extent an evidence-based intervention can deliver its intended benefits over an extended period of time after external support from the donor agency is terminated
    - 'Voltage drop': phenomenon in which interventions are expected to yield lower benefits as the move form efficacy to effectiveness and into real world use
    - 'Program drift': phenomenon whereby deviation from manualized protocols in real world delivery is expected to yield decreasing benefit for patients

- Interventions developed with the idea that they are optimally constructed, manualized and tested in a single form, and deviation from the manual lowers the intervention's benefits
    - Over reliance on quality assurance hampers sustainability and improvement, customization and optimization of interventions to the detriment of population health
    - Maximal benefit of intervention can only be realized through continual development, evaluation and refinement in diverse populations and systems

- Important to examine fit between practice setting and the intervention to make changes necessary to improve the integration of intervention into on-going care processes; hence examining organizational characteristics is an essential component of sustainability

- Include sustainability planning early in intervention planning (eg: long-term financing, training of workforce, supervision, organizational support etc)

- The proposed framework (The Dynamic Sustainability Framework, DSF):
    - Three major elements: The Intervention, The Practice Setting and the Ecological System
    - Considers change over time (dynamic); change ripples across multiple levels
    - Intervention: components of intervention, target population, patient-centred outcomes, delivery platform (eg: face to face, web-based, mobile health app etc)
    - The practice setting: resources, information systems, organized culture, climate, structure, processes
    - Ecological system: other practice settings, legislative and regulatory, market characteristics, population characteristics

- Sustainability depends on the measured, negotiated and reciprocal fit of intervention within practice setting and the practice setting within larger ecological system → needs to be consistently tracked
- Ongoing quality improvement is the aim, not quality assurance

- The authors emphasised that:
  - An intervention should not be optimized prior to implementation, or even prior to sustainability phase
  - Interventions can be continually improved, boosting sustainment in practice and to enable continual learning
  - Ongoing feedback on interventions should use practical relevant measures of progress and relevance
  - Voltage drop is not inevitable
  - Programs are more likely to be maintained when there is a strong 'fit' between the program and the implementation setting
  - Organizational learning should be a core value of implementation setting
  - Ongoing stakeholder involvement leads to better sustainability

- Implications to research, policy and practice:
  - The need for continue assessment in practice leads to pooling of data across larger set of sites
  - Promotes use of multiple planning methods, eg: simulation, pilot testing, experimentation
  - Development and refinement is a continual process; potential evolution towards 'crowd sourcing' where instead of a small team of researchers developing a priori 'optimal' static product, a larger community continuously upgrades dynamic products
  - Benefits of modifying and refining interventions not evident for many years; require infrastructure to support pooling of practice-based evidence

- Limitations:
  - The DSF is a basic framework that can be expanded to include more levels of systems
  - Need to be refined and improved over time

Authors' recommendations:

- The authors encourage a culture of learning healthcare to promote sustainability of interventions and to reconfigure the research-practice-policy interface in which the best possible evidence is gathered and used in real time to inform policy, improve practice and to answer the highest priority research questions

Cooper, B. R., Bumbarger, B., & Moore, J. . (2015). Sustaining evidence-based prevention programs: correlates in a large-scale dissemination initative. *Prevention Science, 16*, 145-157.

Paper reviewed: 29.3.18
Type of paper: Original data (survey)
Setting/Programmes evaluated:
Evidence-based youth delinquency and substance abuse programmes (prevention and treatment)
Classroom, community, and clinic settings

Our summary:

- Aimed to investigate rates of sustainment, influencing factors, and differences by programme type
- Survey of 77 programmes ≥ 2 years post end of seed grant funding
    - 31% classroom based
    - 27% community mentoring
    - 20% family-focused prevention
    - 22% family treatment
- *Annual Survey of Evidence-based programs (ASEP)*
    - Sample questions appear in Table 1 (p149)
- 69% sustained functioning ≥ 2 years (no difference across setting type)
- However, only 42% of these operating at same or higher level, but differs per type
    - 75% family treatment programmes; 44% family prevention; 31% classroom; 25% community mentoring
    - Ie complete sustainment still a substantial challenge
- Significant correlates of sustainability (with moderate to large effect sizes) were
    - Organisational support/readiness
        - Greater coalition functioning (eg prioritising programme, seeking funding; not just connection but high functioning)
        - Greater outreach to community stakeholders (ranging from school board to community groups, eg presenting outcome data)
    - Programme fit
        - Participant engagement
        - Administrator support
        - Participant request for programme change (ie lack of fit)
    - Implementer characteristics
        - Communication with trainer
        - Knowledge of logic model
    - Sustainability planning
        - Financial (majority of organisations reported using other non-grant sources eg agency/school budget line beyond initial seed funding)
        - Alignment (strategies for integrating with existing organisations)
- By programme type
    - Classroom based
        - Outreach to community stakeholders, communication with trainers, adequate staffing and participant recruitment
    - Community/mentoring
        - Communication with trainers, connection to well-functioning coalition*, financial and alignment sustainability planning
    - Family focused prevention

        - connection to well-functioning coalition*, knowledge of logic model, participant recruitment (no programme without participants in this setting)
    - Family treatment programmes
        - Communication with trainers, community outreach and alignment sustainability planning

*unlike classroom and family treatment programmes, these settings must create their own infrastructure

Authors' recommendations for practitioners:

- Consider above factors especially those that are setting specific

Authors' recommendations for researchers:

- Identify mediational pathway through which correlates are associated with sustainability, eg is impact of communication with trainers due to greater motivation or higher quality implementation
- Examine how sustainability planning is related to obtaining specific types of funding; are specific funding sources more/less likely to predict sustainability

Francis, L., Dunt, D., & Cadilhac, D. A. (2016). How is the sustainability of chronic disease health programmes empirically measured in hospital and related healthcare services?—a scoping review. *BMJ Open, 6*(5). doi:10.1136/bmjopen-2015-010944

Paper reviewed: 30.4.18
Type of paper: Review of sustainability measures
Setting/Programmes evaluated: Chronic disease health programmes in primary care, hospitals, mental health centres, community health settings

Our summary:

- Sustainability is multidimensional construct; indicators of success fall into categories:
    - Shediak-Rizkallah and Bone (1998):
        - Maintenance of health benefits
        - Maintenance of core activities of programme
        - Continued capacity of community to deliver programme (training, access)
    - Scheirer and colleagues (2008, 2011) add
        - Programme diffusion (spread to new locations)
        - Maintenance of new practices, policies and procedures
        - Maintenance of attention to issues addressed by the programme
- Among the definitions of sustainability identified in this review– maintenance of program activities most common
- Timing of data collection varied according to definition of sustainability and outcome indicators eg., institutionalisation measured at a single time point vs adherence to guidelines measured monthly over 12-month period vs broad scale system change measured on several occasions up to 3-7 years.
- Commencement of sustainability measures varied from baseline to immediately post intervention to when withdrawal of funding occurred. Just over half the studies viewed sustainability as beginning from implementation
- Achieving sustainability dependent on inter-relationships between various organisational and social contexts – supporting broad scale approach to evaluation.
- Use of mixed methods over multiple time points may serve as best method
    - Mixed methods capture more holistic information
    - Longitudinal testing may delineate between residual improvements from implementation to sustained persistence of improvement
- Standardised measures required for future meta-analytic syntheses, including those which
    - encapsulate how programs adapt to changing contexts and health needs
    - capture spread into new areas or difficulties in new environments

Authors' recommendations for practitioners:

- More research into measurement and methodology needed to provide clearer guidelines for programme planning and evaluation
- Use mixed methods of evaluation over multiple time points recommended, especially for broad scale system change

Authors' recommendations for researchers:

- Current lack of standardisation of measurement precludes meta-analytic syntheses
- More research into measurement and methodology needed to provide clearer guidelines for programme planning and evaluation
- Use mixed methods of evaluation over multiple time points recommended, especially for broad scale system change

Goodman, R., McLeroy, K., Steckler, A., & Hoyle, R. (1993). Development of Level of Institutionalization Scales for Health Promotion Programs. *Health Education Quarterly, 20*(2), 161-178. doi:10.1177/109019819302000208

Paper reviewed: 10.5.18
Type of paper: Development and testing of a sustainability measure
Setting/Programmes evaluated: Health promotion programmes in schools and communities

Our summary:

- Measure is **Level of Institutionalization Scale for Health Promotion Programs (LoIn)**
- **Based on a theoretical framework (8 factors)**
    - Four Subsystems (building on the work of Katz and Kahn (1978)
        - Production (throughput; written plans, procedures, schedules, evaluation)
        - Maintenance (personnel; permanent staff assignation; admin level advocate; other staff involved)
        - Supportive (environmental; relationships, stable funding and housing)
        - Managerial (coordination of all other systems; at a level that matches standards applied to other aspects of organisation; adjustments to environment)
    - Two Degrees of embeddedness for each subsystem (building on the work of Yin (1979)
        - Routines (activities become routine)
        - Niche Saturation (expands to optimal limits within each subsystem)
- **Empirically tested**
    - Data collected from 453 administrators in 141 organisations (USA) including schools, local health departments and health agencies
    - Confirmatory Factor Analysis supported 8-factor model (TLI = .90). Cronbach's alpha levels ranged .44 - .86 but item-total correlations acceptable (>.28)
    - Construct validity:
        - Routinisation factors more highly correlated with programme longevity (in years)
        - Niche Saturation factors more highly correlated with manager perception of programme permanence
    - Institutionalisation usually occurs sequentially through production, managerial, maintenance and then support subsystems

Authors' recommendations for practitioners:

- LoIn can be used as a diagnostic tool
- Can just measure relevant subsystems
- Embody the concepts of this scale in grant writing and planning of programmes

Authors' recommendations for researchers:

- Can be used as a research instrument
- Also a need for tools to measure
    - institutionalisation across multiple organisations and levels of analysis
    - capacity development of individuals and communities
    - prospective research

Gottfreson, D., Cook, T., Gardner, F., Gorman-Smith, D., Howe, G., Sandler, I., & Zafft, K. (2015). Standards of Evidence for Efficacy, Effectiveness, and Scale-up Research in Prevention Science: Next Generation. *Prevention Science, 16*(7), 893–926. doi:10.1007/s11121-015-0555-x

Date Reviewed: 22/03/18
Type of paper: Review and recommendations
Setting/Programmes evaluated: General - Health and Education

Our summary:

Definitions:

- Intervention - programs, policies, and practices aimed at improving health and well-being or at reducing disease and related problems. (p. 2)
- An evidence-based intervention (EBI) is an intervention that has been tested in research meeting the efficacy standards described below and that has been demonstrated in this research to achieve statistically and practically meaningful improvements in health and wellness or reductions in disease or related problems. (p. 2)
- Review of standards of evidence for prevention research. A forward-looking intent with standards set high to encourage growth in the field and to provide the basis for sound decision-making about which interventions should be promoted.
- The emphasis in Prevention Science has shifted more toward understanding how EBIs can be implemented on a broader scale to produce larger impacts on entire populations – successful broader dissemination is an element of sustainability (scaling up).
- Progression of interventions is not linear: research on factors that are likely to influence the success of scale-up efforts should be collaborative (researchers/practitioners) and incorporated throughout each phase of the development and testing of EBIs.
- Detailed Tables and extended descriptors for: Standards of Efficacy (Table 1); Standards for Effectiveness (Table 2); Standards for Scaling up (Table 3).
- Table 3 is pertinent to issues of sustainability, including successfully meeting effectiveness criteria; implementation in the context of organisational development; costing information, tracking and analysis; materials availability; training availability; technical assistance availability; fidelity monitoring; implementation data collection; planning & monitoring client recruitment; evaluation of outcomes. (p. 8).
- With respect to Scaling Up, recommended that activities be undertaken throughout the planning, development, and evaluation of an intervention to increase its dissemination and implementation potential.
- Four phases of translational functions (Spoth et al., 2013) for:
    - Preadoption phase: addressing intervention, consumer, provider, and organizational characteristics with scale-up feasibility assessments or dissemination/marketing plans.
    - Adoption phase: attending to adoption decision-making factors and processes.
    - Implementation phase: integrating quality implementation procedures and processes into service systems or settings.
    - Sustainability phase: institutionalizing or maintaining over the long term and expanding reach.

Authors' recommendations for researchers:

- Desirable Standard: It is desirable in effectiveness trials to investigate the context, systems, and other factors that influence intervention adoption, quality implementation, and sustainability of the EBI. (p. 23).
- New research to further clarify important organizational factors that can later be incorporated into a refined set of standards to guide organizations and communities in developing capacity to adopt, implement, and sustain effective interventions. (p. 24).

Gruen, R., Elliott, J., Nolan, M., Lawton, P., Parkhill, A., McLaren, C., & Lavis, J. (2008). Sustainability science: an integrated approach for health-programme planning. *The Lancet, 372*(9649), 1579-1589.

Paper reviewed: 13 March, 2018
Type: Systematic Review (Sustainability) of conceptual frameworks and empirical studies; Proposal of model
Setting/programmes evaluated: Health

Our summary:

- **Wide range of sustainability factors and targets for intervention identified from review**; many fit categories proposed by Shediac-Rizkallah and Bone:
    - Aspects of programme design and implementation (goal, duration, governance, financial, training, involvement of local stakeholders)
    - Attributes of the organisational setting (congruency with mission, leadership/champion, integration with existing programmes, institutional effectiveness)
    - Factors in the broad environment (nature/stability of SE and political environment, community participation, market forces, relevant laws)
- **Authors propose a model** of health programme sustainability (Figure p. 1584)
    - Model **emphasises the interdependent and dynamic nature of the sustainability process** (not emphasised in previous models), analogous to an ecosystem
    - Three components: Health, Programme, Drivers (latter includes funders, managers, policy makers, community leaders; can be positive or negative)
    - Three bidirectional relationships
        - Health-programme relationship –identify need, design programme, measure programme quality and effect, modify as needs evolve and effectiveness apparent
        - Programme-driver relationship - the less obvious direction is beneficiaries shaping the perspectives of drivers through demonstration of results
        - Health-driver relationship – ideally a deficiency in health status prompts resource flow; problem definition and prioritisation by drivers can be subjective
    - If components of system are not in equilibrium, impacts sustainability
      e.g., effective health programme vulnerable if neglects stakeholder connection; programme pandering to stakeholders at expense of effectiveness will run out of support
- **Authors propose a checklist to plan for Sustainability** (page 1585, Panel 3)
    - Are the components of the system well defined; are the interactions between components understood/documented?
    - Encourages "planners to undertake specific activities that engage with the range of stakeholders, strengthening connections and promoting mutual benefits"

Limitations:

Model yet to be tested, may not generalise beyond health settings

Authors' recommendations for practitioners:

Checklist for planning for sustainability (page 1585, Panel 3) to consider all elements and relationships of the model

Authors' recommendations for researchers:

Can demonstrate sustainability by measuring continuation of programmes or health benefits, but exploration of complex interactions between model components is needed to understand determinants of sustainability

Han, S. S., & Weiss, B. (2005). Sustainability of Teacher Implementation of School-Based Mental Health Programs. *Journal of Abnormal Child Psychology, 33*(6), 665-679. doi:10.1007/s10802-005-7646-2

Paper reviewed: 29.3.18
Type of paper: Review and Proposal of sustainability model
Setting/Programmes evaluated: Schools, specifically classroom teacher factors

Our summary:

- Implementation by school personnel makes mental health programmes fiscally sustainable, also allows for reinforcement and frequent opportunity to practice new skills
- Policy and local infrastructure support also important factors
- Adaptation to local conditions often happens after initial training resources are withdrawn
- Review of literature reveals
    - School and teacher-specific factors – pre-implementation – influence initial motivation
        - Support by school principal (prioritise, encourage, monitor implementation)
        - Self-efficacy beliefs (more open to new ideas and willing to experiment)
        - Professional burnout (likely to lower motivation)
        - Acceptability of program
            - Severity of target problem
            - Type of intervention (e.g., positive vs punitive)
            - Amount of time required to implement (favour time efficient, but more allowance for complexity if target problem severe)
            - Familiarity with intervention principles
            - Compatibility with own beliefs
            - Anticipated effectiveness
    - Programme specific factors
        - Teacher training
        - Performance feedback (in-classroom, sufficient duration)
- Authors then propose four higher order factors for sustainable teacher implemented classroom mental health programmes
    - Acceptability to teachers
        - Meet student needs and own teaching styles
    - Effectiveness
        - Select evidence-based programme
        - Sufficient training, including in-classroom feedback and knowledge of core principles, to achieve fidelity
        - Observe positive change in target issue attributable to programme (may need to be scaffolded as part of feedback)
    - Feasibility to implement on ongoing basis with minimal (but sufficient) resources
        - Planned from start of programme before external resources withdrawn
        - Integrated into school infrastructure
        - Teacher training of sufficient intensity necessary investment – establish self-reinforcing mechanisms for continued high quality implementation
    - Flexibility and adaptability
        - Within programme design
        - Teachers must understand programme well enough to modify it without sacrificing core principles and techniques
- Authors present this as a process model (Figure 1 page 674) but does not add much to text
- Sustainability process occurs during three phases
    - Preimplementation (admin support, teacher efficacy beliefs, perceptions of programme's compatibility, acceptability and anticipated benefits)

- Supported Implementation (increase teacher knowledge and skills, how to adapt, notice impact) including in-classroom consultation (direct observation, feedback, modelling)
- Sustainability phase (requires intrinsic teacher motivation and ability to modify and evaluate effect of adaptations; heavily dependent on success experienced during supported implementation phase)

Authors' recommendations for practitioners:

- Consider factors above starting in preimplementation phase

Authors' recommendations for researchers:

- Funded research beyond implementation phase
- Given high cost of consultation, need to evaluate impact on sustainability compared to basic training
- Examine mediators of implementation eg teacher skills, motivation, attributions

Hawe, P., Shiell, A., & Riley T. (2009). Theorising interventions as events in systems. *American Journal of Community Psychology,* 43:267-276. doi:10.1007/s10464-009-9229-9.

Paper reviewed: 1.5.19
Type of paper: Literature review
Setting/Programmes evaluated: Public Health

Our summary:

- Quality and well-designed health interventions failed to deliver significant effect, leading to the acceptance of 'weak prevention' as the norm
- Multi-component/level interventions based on ecological models are sometimes confused as "complex interventions" when they do not address the issue of systems change nor were they context specific
- Drawing from sustainability literature on the concept of institutionalisation/ routinisation/ embeddedness of an intervention within each system requires interventions to be context specific (eg; extensiveness of the program across organization and intensiveness of its integration into routine practice)
- Important to recognize that systems are not only complex but constantly adapting/evolving, hence dynamic and are characterized by:
    - The social networks that connect people and the settings
    - Their constituent activity settings (eg: clubs, festivals, classrooms, assemblies etc)
    - Time
- Four specific enquiries are required for systems thinking:
    - How intervention couples with the context (diffusion, internalization, routinization)
    - How intervention changes relationships (roles, status, use of technologies/resources, interactions)
    - How interventions changes distribution and transformation of resources
    - How activities in the system were displaced because of the intervention
- Four implications from systems thinking:
    - Change in how program fidelity is viewed and measured →it's not about standardization and replicability but how the function of the intervention is standardised despite changes to its form
    - Change in how we define and measure "capacity building" from looking at spread and uptake of the program to a dynamic perspective, in which success is measured by looking at enablement or improvement of the structural position of people and organizations
    - Change in how we allocate and manage resources to strategic investments of energy and resources towards building positive feedback loops while counteracting negative feedback loops towards achieving the desired outcomes
    - Change in how we measure intervention effects and health outcomes or desired outcome of interest as changes are non-linear → need to allow longer time frames for follow up, use of observations and analysis of the pre-intervention context and a shift away from program evaluation to context evaluation

Authors' recommendations:

Interventions should be viewed as system events and a successful intervention will change the future trajectory of the system's dynamics which leads to positive outcomes while a failed intervention will wither away due to the system's self-organizing nature. Whether systems thinking leads to more effective and sustained interventions needs to be tested but the aim is to produce improved equitable health outcomes that are maintained.

Recommended further reading:

Hawe, P. (2015) Lessons from Complex Interventions to Improve Health. *Annual Review of Public Health,* 36:307-323. doi: 10.1146/annurev-publhealth-031912-114421.

Johnson, K., Collins, D., & Wandersman, A. (2013). Sustaining Innovations In Community Prevention Systems: A Data-Informed Sustainability Strategy. *Journal of Community Psychology, 41*(3), 322-340.

Paper reviewed: 26.4.18
Type of paper: Testing of a sustainability process model
Setting/Programmes evaluated: Community prevention programmes

Our summary:

- This article build on the related 2004 paper by Johnson and colleagues (also in this annotated bibliography; refers again to a four step model of sustainability from preconditions to strategies, mediators and outcomes (Fig 1, page 326)
- Preconditions for sustainability
    - Stakeholder capacity (awareness of/commitment to community prevention efforts)
    - Infrastructure capacity (linkages/positive relations between organisations/stakeholders, champions/ownership of innovation, admin support, adequate/stable funding, trained/committed staff, technology/data resources, policies and procedures, expertise for integration into routine operations;
    - Innovation fit, quality and effectiveness
    - Sustainability strategy designed from startup
        - Toolkit developed based on theory, evaluation and electronic tools (52 tasks to be undertaken over 8 monthly meetings with a workgroup of 4-6)
- Summary of steps involved in sustainability strategy (Table 1, p 327):
    - Assess stakeholder, system and innovation attributes linked to sustainability
    - Select measurable outcomes at various stages (capacity building, routinisation, perceived benefit; fidelity/dosage delivered of intervention AND capacity building)
    - Select promising sustainability factors to achieve these goals
    - What resources are needed? (funding, human, technical, linkage)
    - Develop sustainability plan (What needs to change? What actions must be implemented? How will this be done?)
    - Implement
    - Compare outcomes pre and post
    - Revise steps and repeat as needed
- Testing this in practice revealed that
    - going through training in the sustainability process provided benefits generalizable across different innovations
    - Process modified from 8 to 4 meetings, over 12 not 8 months; group tasks completion need not be limited to F2F meetings; one day of F2F training in the process (hard to get all stakeholders together for two) needs to be supplemented by more than the three scheduled follow-up consultations
    - Sustainability should be accountable – ie a requirement of and supported by funder

Authors' recommendations for practitioners:

- Full Sustainability toolkit is not open access; contact author Dr David Collins at Pacific Institute for Research and Evaluation Collins@pire.org

Authors' recommendations for researchers:

- Approach outlined adds to methods to evaluate process and outcomes of sustainability

Related papers

- Johnson et al (2004) Building capacity and sustainable prevention innovations: a sustainability planning model. *Evaluation and Program Planning, 27*, 135-149.

Johnson, K., Hays, C., Center, H. and Daley, C. . (2004). Building capacity and sustainable prevention innovations: a sustainability planning model. *Evaluation and Program Planning, 27*, 135-149.

Paper reviewed: 5.4.18

Type of paper: Systematic review combined with "think tanks" resulting in planning model for sustainability of prevention innovations

Setting/Programmes evaluated:
Substance abuse prevention (literature review was more broadly across prevention)

Our summary:

- Sustainability vs institutionalisation:
  - e.g., 'meeting the continual needs of stakeholders' vs. 'integration into business as usual'
- Institutionalisation has three phases (Goodman; Yin)
  - Passage (occurs only once, eg measurable objectives into strategic plan
  - Cycle (eg including in yearly budget)
  - Niche saturation (integrated into all subsystems of an organisation)
- Both literatures consistent in terms of temporal ordered series of steps
  - Review found 16 stage models that continue beyond implementation
  - Sustainability typically at end of change process, argue should begin much earlier
- Building on Shediac-Rizkallah & Bone, authors define sustainability as
  'the process of ensuring an adaptive prevention system and a sustainable innovation that can be integrated into ongoing operations to benefit diverse stakeholders.'
  - Sustainability is ongoing and cyclical
  - System must be adaptable
    - Capacity is a *determinant* as opposed to Shediac-Rizkallah & Bone's *outcome*
  - Innovation to be sustained may be a new programme or a new infrastructure element that supports it (e.g., evaluation system, policy, training)
  - Innovation is fully integrated into normal operations, passing through Goodman, Yin's stages to niche saturation
  - Innovation is of proven benefit prior to and after implementation in the target system
- Figure 1 (p 138) presents a conceptual view of planning model through four elements
  - sustainability factors
    - 10 factors; two categories (infrastructure capacity, attributes of innovation)
  - sustainability actions
    - 5 stages: assessment, planning, implementation, evaluation, modification/reassessment; cyclical
    - more detail on this element in Figure 2 (p145)
  - immediate outcomes ("sustainability readiness": adequate infrastructure & innovation)
  - distal outcomes that define sustainability (integration into normal operations, benefits to stakeholders – these two factors reciprocally influence each other)
- Tables 1 & 2 (pp 141-142) present objectives, actions and indicators of success for sustainability factors and actions; this section is lean but "tools are being developed for each of these steps" (p146); accompanying text is rich (for each factor, synthesises findings and evidence from literature review)
- Reference made to a tool for scoring sustainability readiness has been developed – ranks each of the 10 sustainability factors. A more comprehensive "Sustainability Tool Kit" is under development. *We have emailed the authors to see access to these tools (5.4.18)*

Authors' recommendations for researchers:

- At time of article, planning models sparse; combining results of systematic review and think tank of professionals essential to model construction
- While a sustainability model is important, tools are needed to help in the sustainability process. An example has been provided, but much work to be done
- Model needs experimental testing within substance abuse prevention and more broadly

Authors' recommendations for practitioners:

- An example of a tool to help assess sustainability readiness across 10 factors has been developed; but more work to be done with additional tools

Related papers

- Johnson, K., Collins, D., & Wandersman, A. (2013). Sustaining Innovations In Community Prevention Systems: A Data-Informed Sustainability Strategy. *Journal of Community Psychology, 41*(3), 322-340.

Keshavarz, N., Nutbeam, D., Rowling, L. & Khavarpour, F. (2010). Schools as social complex adaptive systems: a new way to understand the challenges of introducing the health promoting schools concept. *Social Science & Medicine,* 70: 1467-1474. doi:10.1016/j.socscimed.2010.01.034.

Paper reviewed: 20.4.19
Type of paper: Original data (qualitative study; interviews)
Setting/Programmes evaluated: Schools; Health Promoting Schools' (HPS) project

Our summary:

- Implementation of HPS lags far behind WHO vision as successful implementation and sustaining the positive benefits of HPS projects has proven challenging in evolving, complex school systems
- Understanding schools as systems offers scope for improvement in the introduction and management of multi-component/level interventions in schools
- Lack of consensus on definition of CAS means reliance on definition based on context
- CAS in social systems have linked and interdependent characteristics that do not respond in the same way to the same stimulus at different times and circumstances
- CAS comprises of a population of diverse rules-based agents, located in multi-level and interconnected systems in a network.
- System is characterized by the behaviour of individual agents. Agents are numerous, dynamic, autonomous, highly interactive, learning and adaptive. Agents act based on knowledge, experience, feedback, values and formal system rules → leads to novel change/adaptations over time that is unpredictable
- CAS are open systems with fuzzy boundaries, distributed control and highly context dependent →leads to complexity at system level
- Characteristics of CAS: nested systems, adaptation/change is continuous, have distributed control, exhibit emergence and unpredictable
- Study method: semi-structured interviews of 26 staff from public primary schools that had implemented HPS project in Sydney; 18 school management plans and annual reports collected
- Characteristics of schools as CAS:
    - Component & Structure: Schools located in a network structure including bigger systems such as State education system and parallel systems such as families
    - Diversity in and between schools
    - School interactions: amongst agents in school and with externals
    - Flow of information
    - Feedback loops
    - Rules in schools: includes ethos
    - Credit and blame attribution: mechanisms for attributing credit or blame strongly favoured improvement in the core educational business of literacy and numeracy
    - Learning, change and adaptation
    - Emergent nature of school behaviour

Authors' recommendations:

Paradigm shift required in practice of public health intervention in schools with consideration of schools as CAS.

Kittelman, A., Bromley, K. W., Mercer, S. H., & McIntosh, K. (2018). Validation of a Measure of Sustainability of School-Wide Behavior Interventions and Supports. *Remedial and Special Education, 0*(0), 0741932517753821. doi:10.1177/0741932517753821

Paper reviewed: 21.5.18
Type of paper: Psychometric validation of sustainability measure (SUBSIST)
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Evaluation of stability and convergent validity of SUBSIST *(School-Wide Universal Behavior Support Sustainability Index: School Teams)*
- >450 schools across three phases of implementation (planning/first year, 2-4 years, ≥5 years)
- Stability of the measure's four factors across three annual waves of data collection – highly stable
- Correlates modestly with external validity measures
    - Generation of school discipline reports with Team use of data factor
    - Training levels with Capacity building factor
    - Modest correlation as expected, due to SUBSIST factors measuring a broader construct

Authors' recommendations for practitioners:

- Stability of SUBSIST suggests limited need to reassess unless substantial change in school/external context

Authors' recommendations for researchers:

- Future research should investigate whether SUBSIST is sensitive to predicting abandonment of implementation

Lennox, L., Doyle, C., Reed, J. E., & Bell, D. (2017). What makes a sustainability tool valuable, practical and useful in real-world healthcare practice? A mixed-methods study on the development of the Long Term Success Tool in Northwest London. *BMJ Open, 7*(9), e014417. doi:10.1136/bmjopen-2016-014417

Paper reviewed: 25.6.18
Type of paper: Development of sustainability measure (Long Term Success Tool; LTST)
Setting/Programmes evaluated: Healthcare

Our summary:

- Long Term Success Tool (LTST) developed through mixed methods: scoping review followed by group discussions/interviews with stakeholders regarding perceived relevance of identified factors, and piloting of tool with feedback on usability/interpretability
- Authors concede that a systematic review would have strengthened initial step (has now been undertaken, see Lennox 2018; awaiting confirmation from authors if tool has been modified since)
- Authors' definition of sustainability:
    - *A dynamic process where staff and others involved have the capacity and capability to monitor and modify activities and interventions in relation to the health benefits they wish to achieve and in response to threats and opportunities that emerge over time*
- LTST designed to address practitioner concerns with NHS sustainability guide (clarity of language, length, suitability for continuous use in routine care)
- LTST consists of 12 factors
    - People
        - Commitment to the improvement
        - Involvement
        - Skills & Capabilities
        - Leadership
        - Team functioning
    - Practice
        - Resources in place
        - Progress monitored for feedback and learning
        - Evidence of benefits
        - Robust and adaptable processes
    - Setting
        - Alignment with organisational culture and priorities
        - Support for improvement
        - Alignment with external political and financial environment
- Can be completed in 10-15 minutes; designed to be used every 3 months
- Scoring
    - Factors are scored on a five-point Likert scale (as well as no opinion/don't know)
    - Excel scoring sheet that can be downloaded with paper aggregates outputs (from up to 20 staff) into graphs, and highlights risks and differences in opinions
    - LTST also allows recording of concerns or suggested actions for group discussion
- Paper version available as an appendix to the paper; also open access via http://www.qihub.scot.nhs.uk/media/1090174/6eauc%20%20improvement%20team%20network%20-%2005.12.16%20-%20long%20term%20success%20tool%20-%20clahrc.pdf
    - However, also need accompanying reflection/interpretation questions from the paper itself, as well as the handy excel scoring spreadsheet to collate and interpret group answers

Authors' recommendations for practitioners:

- Investigate impact of tool on sustaining improvement in own setting

Authors' recommendations for researchers:

- Investigate impact of tool on sustaining improvement in across diverse settings

Lennox, L., Maher, L., & Reed, J. (2018). Navigating the sustainability landscape: a systematic review of sustainability approaches in healthcare. *Implementation Science, 13*(27), 1-17.

Paper reviewed: 25.6.18
Type of paper: Systematic review
Setting/Programmes evaluated: Healthcare

Our summary:

- **Definitions** of sustainability
  - Often viewed as an "outcome" (benefits, activities, workforce capacity sustained)
  - However, this linear approach does not take into account the learning, adaptation and continuous development of the "process" of sustainability
  - Therefore the authors used the following definition:

  "The continuation and maintenance of a desirable feature of an initiative and its associated outcomes as well as the process taken to adapt and develop in response to emerging needs of the system"
- 4 most common **theoretical perspectives** on sustainability emerged
  - Diffusion of innovations *(S is final stage of initiative life cycle)*
  - Complex systems theory *(S nonlinear process – change, adaptation, uncertainty expected; initiatives introduced to complex adaptive systems that change in response to interactions with environment and individuals)*
  - Ecological theory *(S is ongoing/dynamic process throughout implementation)*
  - General/open systems theory *(organisation needs to adapt to its environment in order to achieve lasting change; need to find right fit between initiatives, contexts, expectations)*
- Sustainability factors
  - 40 factors emerged, across six themes* (Initiative design/delivery, Negotiating initiative processes, People involved, Resources, Organisational setting, External environment) **More detail across all factors/themes is presented at the end of our summary. A complete description can also be found at the link below to the (open access) article, just prior to reference list: see 'Additional File 2"* https://implementationscience.biomedcentral.com/articles/10.1186/s13012-017-0707-4
  - No two approaches included same combination of factors
  - Six factors present in 75% of approaches
    - General resources (e.g., funding, infrastructure, staff, time)
    - Demonstrating effectiveness (e.g., benefits, perceived benefits)
    - Monitoring progress over time (e.g., data, regular feedback)
    - Stakeholder participation
    - Integration with existing programs and policies
    - Training and capacity building
  - Diverse views within these constructs, but value in having an overarching framework rather than continually recreating setting-specific approaches
  - Common and different key factors depending on whether organisation focus (e.g., readiness and capacity, belief in initiative, shared vision) or intervention focus (e.g., integration with existing programs, training/capacity building, intervention adaptation, funding)
  - These factors are deemed important to assess but it is unknown whether they are valid – need to be applied and assessed in practice

Authors' recommendations for practitioners:

- Assess these factors in practice (impact)

Authors' recommendations for researchers:

- Assess these factors in practice (impact) and across diverse settings

Sustainability Factors: 40 factors across 6 themes (our summary)

1. **External Environment**
   - **Strategically raising awareness with stakeholders** to garner support
   - **Socioeconomic and political considerations**/awareness of impact (eg on funding)
   - **Spread** within or to other organisations
   - **Urgency of initiative** – based on scale/severity of issues it addresses
2. **Negotiating Initiative Processes**
   - **Roles and responsibilities** – clearly outlined, spread beyond one individual
   - **Belief in the initiative** – value, effectiveness
   - **Complexity** of understanding/delivering initiative
   - **Defined, shared vision**
   - **Incentives** – from programme benefits to specific incentives to motivate
   - **Job requirements** – included in job descriptions, within skill sets
   - **Workload** – staff have time within daily schedule, fair division of labour
3. **Resources**
   - **General/unspecified**
   - **Funding** – for implementation, embedding and sustainment
   - **Infrastructure** – workspaces, materials, access to information
   - **Resources_Staff** – drivers, sufficient staff, accommodate turnover
   - **Resources_Time** – in daily schedules of staff
4. **Initiative design and delivery**
   - **Demonstrating effectiveness** – Measuring, feedback and learning
   - **Evidence base**
   - **Expertise** – adequate knowledge/experience to carry out initiative
   - **Improvement methods** - eg PDSA cycles
   - **Monitoring progress over time** – standardised systems
   - **Project duration** – Resources vs project length including sustainability assessment
   - **Project type** – design, type (eg preventive, curative)
   - **The problem** – disease burden and social narrative/acceptance of problem
   - **Training and capacity building** – initial and ongoing for new staff
5. **Organisational Setting**
   - **Integration** with existing programs and policies
   - **Intervention adaptability** to local context and challenges
   - **Opposition** – resistance due to other priorities/competing interests
   - **Organisational readiness and capacity** – preparedness, existing experience, building capacity, support provision
   - **Organisational values and culture** – compatibility, visible support and prioritisation, communication surrounding initiative, workplace climate and cohesion
   - **Support available** – reminders, education boosters, management support/supervision, peer support, technical and data support
6. **People involved**
   - **Leadership and champions –** advocate, communicate, support
   - **Ownership –** amongst stakeholders
   - **Power –** used to advocate/support initiative
   - **Relationships, collaborations, networks** – ability to build
   - **Satisfaction** – stakeholders/staff from participation
   - **Stakeholder participation –** involvement of those impacted by issues
   - **Community participation –** to direct and shape, valued partners
   - **Patient involvement –** perspective, empowerment
   - **Staff involvement**- include at all stages from planning; value input and feedback

Lewis, C., Fischer, S., Weiner, B., Stanick, C., Kim, M., & Martinez, R. (2015). Outcomes for implementation science: an enhanced systematic review of instruments using evidence-based rating criteria. *Implementation Science, 10*, 155.

Paper reviewed: 23.4.18
Type of paper: Review and Rating of instruments assessing implementation outcomes
Setting/Programmes evaluated: Mental/behavioural health settings

Our summary:

- As a new field, implementation science is beset with oversupply of single use/adapted instruments with uncertain psychometric properties
- Proctor (2009, 2011) proposed 7 implementation outcomes (sep from service/client outcomes)
    - Appropriateness, Acceptability, Feasibility, Adoption, Penetration, Cost, Fidelity, Sustainability
- Instruments in this review were classified across these eight constructs, and then rated against evidence based criteria: Internal consistency, structural validity (eg, factor analysis), predictive validity, norms, responsiveness (sensitivity to change), usability (length)
    - Most instruments assessed acceptability and adoption constructs
- Only one instrument met min evidence across 6 psychometric criteria (Level of Institutionalization Scales for Health Promotion Programs, Goodman 1993)
- 8 specifically assessed sustainability, of which SUBSIST (McIntosh, 2011) had highest overall rating, with excellent rating (4) for reliability, structural validity and norms; good rating (3) for usability; emerging rating (1) for predictive validity. No sustainability measure yielded responsiveness information

Authors' recommendations for practitioners:

- Potentially relevant sustainability instruments of education initiatives that rated at least 12/24 and peer reviewed (from Supplementary File 3):
    - Adoption (implementation, but impacts on sustainability)
        - Adoption of the Principles of Effectiveness Survey score 12 (in paper Pankratz et al., 2002 for bibliography review in this document)
        - Rogers Adoption Questionnaire score 12 (in paper Steckler et al., 1992 for bibliography review in this document)
    - Penetration
        - Level of Institutionalization Scales for Health Promotion Programs, score 19.5 (open access, see resources on this website)
    - Sustainability
        - SUBSIST, score 16 (open access; see resources on this website)
        - Next best = Program sustainability assessment tool (score 8; internal consistency 3, structural validity 2, usability 3) Luke et al 2014, for bibliography review)

Authors' recommendations for researchers:

- Few instruments that address sustainability
- Instruments in general need systematic approach to development including psychometric validation beyond internal consistency in large samples
- Rather than focus solely on new instrument development, undertake psychometric testing on promising existing instruments – and make these available for this purpose
- Many instruments not published
    - Encourage searching beyond traditional databases, eg using social networks, websites and electronic newsletters via Google scholar – although this yielded many single use, lower quality measures and this search is difficult to replicate
    - Encourage uploading on SIRC repository (*note, the current paper is a summary of the content available on this webpage under construction that requires annual membership of $US175 to access: https://societyforimplementationresearchcollaboration.org/sirc-instrument-project/*

- or Grid-enabled measures project *(see related paper, Rabin 2012; and website https://www.gem-beta.org/public/MeasureList.aspx?cat=2; search for sustainability revealed one project specific measure for tobacco education programmes COMMIT questionnaire (Thomson et al 2000; will be reviewed in this annotated bibliography)*

Lorthios-Guilledroit, A., Richard, L., & Filiatrault J. (2018). Factors associated with the implementation of community-based peer-led health promotion programs: a scoping review. *Evaluation and Program Planning,* 68:19-33. https://doi.org/10.1016/j.evalprogplan.2018.01.008.

Paper reviewed: 20.4.19
Type of paper: Scoping review
Setting/Programmes evaluated: Public health

Our summary:

- Most framework identifying factors influencing implementation of health innovations adopted an ecological perspective and organized factors into hierarchical levels
- Databases searched: MEDLINE, Embase, CINAHL, ERIC and PsycINFO using keywords "implementation", "process evaluation", "health promotion/prevention", "peers" and their synonyms → 55 papers met criteria
- Factors likely to impact on implementation of peer-led health promotion programs:
    - Individual: socio-demographics, social environment, health profile, beliefs & attitudes
    - Peer leaders: sociodemographic, health profile, social environment, belief & attitudes, skills & experience, social identity
    - Stakeholders: beliefs & attitudes
    - Relationships: Peer-participant relationships. Peer-stakeholder relationships, peer-peer relationships
    - Program: content and format quality, standards and expectations, compatibility, adaptability, accessibility, support system
    - Organizational: structural characteristics, general organizational factors, implementation climate, readiness for implementation
    - External: geographic area, socio-political, partnerships with other organizations, demonstration projects involving an evaluation component, larger external conditions (eg: weather)
- Proposed framework consisted of 3 dimensions:
    - Factors likely to affect implementation
        - Consists of the identified factors from scoping review
    - Mechanistic functions
        - Through CAS interpretation: consists of interactions, self-organization and adaptation
    - Implementation outcomes
        - Reach, fidelity, adaptation, responsiveness
- Weaknesses:
    - Lack of implementation outcome measures in studies limited generalizability of findings and increased risk of misinterpretation

Authors' recommendations:

Future research should consider longitudinal designs to monitor implementation factors and outcomes over time. Need to test the framework to generate evidence from practice.

Luke, D. A., Calhoun, A., Robichaux, C. B., Elliott, M. B., & Moreland-Russell, S. (2014). The Program Sustainability Assessment Tool: A New Instrument for Public Health Programs. *Preventing Chronic Disease, 11*, E12. doi:10.5888/pcd11.130184

Paper reviewed: 7.6.18
Type of paper: Development and validation of sustainability measure
Setting/Programmes evaluated: Public health

Our summary:

- Based on authors' sustainability framework (see Schell et al., 2013) developed and tested a new measure: the Program Sustainability Assessment Tool (PSAT)
- Tested across a range of public health programmes (N = 252) at state (63%) and community level
- Conducted CFA
    - Final version contains 40 items across 8 domains
        - Strategic planning (how program direction, goals, strategies defined)
        - Organisational capacity (resources to manage program)
        - Program adaptation
        - Program evaluation
        - Communication (strategic dissemination of activities/outcomes with stakeholders, decision makers, public
        - Funding stability
        - Political support
        - Partnerships (program/community)
    - Compared to original framework, *Public Health Impacts* domain did not survive CFA (measures outcome rather than capacity; removal also renders scale suitable across other settings)
    - Model fit is acceptable (RMSEA .07; CFI .89; SRMR .06)
- Internal consistency good (subscales α = .79 - .92)
- Model invariance testing:
    - No difference across type of public health program (eg tobacco vs diabetes)
    - Small difference between community and state programs – same factor structure, but small differences in magnitude of factor loadings across domains and items. Overall PSAT scores lower for state vs community programs
- Construct validity
    - Perception of sustainability (single item) correlated with PSAT overall score (.68) and domain scores; highest relationships bolded
        - **Strategic planning (.63)**
        - Organisational capacity (.58)
        - Program adaptation (.32)
        - Program evaluation (.45)
        - Communication (.55)
        - **Funding stability (.67)**
        - Environmental support (.48)
        - Partnerships (.44)

Authors' recommendations for practitioners:

- Tool is freely available: https://sustaintool.org/wp-content/uploads/2016/12/Sustainability-ToolV2_w-scoring_12.11.13.pdf

Authors' recommendations for researchers:

- Determine generalisability beyond public health

- More extensive validation with sustainability outcomes

Related papers

Calhoun, A., Mainor, A., Moreland-Russell, S., Maier, R. C., Brossart, L., & Luke, D. A. (2014). Using the Program Sustainability Assessment Tool to Assess and Plan for Sustainability. *Preventing Chronic Disease, 11*, E11. doi:10.5888/pcd11.130185

Schell, S. F., Luke, D. A., Schooley, M. W., Elliott, M. B., Herbers, S. H., Mueller, N. B., & Bunger, A. C. (2013). Public health program capacity for sustainability: a new framework. *Implementation Science, 8*(1), 15. doi:10.1186/1748-5908-8-15

Maher, L., Gustafson, D., & Evans, A. (2010). *NHS Sustainability Model and Guide*. NHS Institute for Innovation and Improvement Retrieved from http://webarchive.nationalarchives.gov.uk/20160805122935/http://www.nhsiq.nhs.uk/media/2757778/nhs_sustainability_model_-_february_2010_1_.pdf**.**

Paper reviewed: 31.5.18
Type of paper: Model & measurement tool for sustainability
Setting/Programmes evaluated: Healthcare

Our summary:
Sustainability model
10 factors across 3 domains

- Process
  - Benefits beyond helping patients
    - *does it also reduce duplication, system run more smoothly, reduce load on staff*
  - Credibility of the benefits
  - Adaptability of improved process
    - *not referring to adaptation of actual process, but whether it can survive organisational change, spread within the organisation, or survive staff turnover*
  - Effectiveness of the system to monitor progress
    - *in place, feeding back, beyond initial implementation phase*
- Staff
  - Staff involvement and training
  - Staff behaviours towards sustaining change
  - Senior leadership engagement and support
    - *including trust, respect, involvement, promotion of initiative*
  - Clinical leadership engagement and support
- Organisation
  - Infrastructure
    - *Staff fully trained, resources, built into job PDs and policies/procedures*
  - Fit with organisation's strategic aims and culture

Measure
- Choose from four levels of achievement for each factor (gives detailed description for each level)
- Scoring system allocate points for each factor, and plots against highest possible score for each factor
- Allows organisation to identify where biggest gaps are between actual and ideal to identify areas to prioritise and target

Authors' recommendations for practitioners:
Recommend use with CD containing practical tips to improve factors; no longer available
Authors' recommendations for researchers: N/A

Mancini, J. A., & Marek, L. I. (2004). Sustaining Community-Based Programs for Families: Conceptualization and Measurement. *Family Relations, 53*(4), 339-347. doi:10.1111/j.0197-6664.2004.00040.x

Paper reviewed: 24.5.18
Type of paper: Proposal of sustainability model; Development and validation of a measure
Setting/Programmes evaluated: Community-based programmes for families (military setting)

Our summary:

- Definition:
  - Capacity to continuously respond to community issues
  - Provide continuous benefits, regardless of particular activities or format
- Propose a *Model of Community-based Programme Sustainability* based on mixed qualitative and quantitative research (Mancini & Marek, 1998; Betts et al., 2001) and an unpublished survey (2003)
- Three sequential tiers (Fig 1 p 339)
  - Sustainability elements
    - Leadership competence
    - Effective collaboration (shared vision, build broad support base)
    - Understanding the community (context, values, participation)
    - Demonstrating programme results (measure intervention results and modifications)
    - Strategic funding (intentional planning, diversity in sourcs)
    - Staff involvement and integration (broad base, community involvement, training)
    - Program responsivity (ability to adapt to meet changes in community needs)
  - Middle Range (intermediate) programme results (closely related to sustainability)
    - Meeting participant needs (original goals), confidence in programme survival (perception of permanence), planning for sustainability
  - Ultimate result (sustainability)
    - Clarify what is meant – number of years in existence (institutionalisation) not necessarily related to programme functioning at full capacity
    - Authors define whether participant benefit is being sustained, as key
- Data from professionals (N = 243) running community initiatives, majority were at-risk family programmes in military setting
- Results support 6-factor model (*Understanding the community* items did not load clearly onto a factor); Internal consistency of retained factors α=.67 - .88; Weak support for construct validity ($r \leq .2$) where 6 factors (in first stage of model) relate to intermediate results (second stage of model) with latter measured by single item questions. Here, 3 factors most consistently related to intermediate results: leadership competence, strategic funding and staff involvement

Authors' recommendations for practitioners:

- Recommend continuing to use full 53 item PSI until tested in larger, more homogenous sample
- Results can help teams develop a concrete sustainability plan with priorities, personnel, timeline and KPIs; sustainability plan should be an entry-level activity, with PSI used to continue to monitor support factors

Authors' recommendations for researchers:

- Test full 53 item measure in larger, more homogenous sample
- Consider expanding 3 choice response scale to 5 or 7 to increase variance
- Investigate interplay between factors – in this model, positioned as equal and simultaneous

- Sustainability may look different across programmes and in time– models and measures should be flexible to accommodate this

Document Information:
This article summary was prepared by the Sustainability of Effective Educational Initiatives Research Project team located at Flinders University, Adelaide, Australia, supported by an Australian Research Council Discovery Project Grant, DP170100237.

Website: http://flinders.edu.au/seei
Facebook: https://www.facebook.com/pg/Sustainability-of-Educational-Initiatives-Research-Project-Flinders-Uni-2050847068265716/posts/?ref=page_internal

Mason, M. (2009). Making educational development and change sustainable: insights from complexity theory. *International Journal of Educational Development,* 29:117-124. doi: 10.1016/j.ijedudev.2008.09.005.

Paper reviewed: 5.5.19
Type of paper: Literature review
Setting/Programmes evaluated: Sustainability of change and development in education

Our summary:

- Consideration of enabling environments invites discussion of the perspectives of complexity theory on effecting sustainable change
- Complexity theory offers a dynamic and system-wise perspective on how sustainable change, characterized by emergent properties and behaviours in the system emerges from interaction of a myriad of agents
- Implications of CAS approach:
    - Question the idea of one-off, crash course programmes
    - Widen the emphasis and conceptualisation to ensure boys and girls complete primary schooling and eliminate gender disparity in primary and secondary education
    - Question the notion that we can assess whether the world is 'on track' by looking at the handful of indicators
- Complexity is a science of emergence and concerns itself with environments, organizations or systems with very large numbers of constituent elements or agents connected to and interacting with each other in many different ways
- Relationships/connections among agents is a central concern of complexity theory
- A certain critical level of diversity and mass need to be achieved for a system to achieve sustainable autocatalytic state for it to maintain its own momentum in a particular direction → context specific
- Important to examine the trivial as it may well be part of the complexity of the system
- It is in the dynamic interactions and adaptive orientation of a system that new phenomena, new properties and behaviours emerge, that new patterns are developed, and old ones change
- Power is defined as the phenomenon that enjoys dominant inertial momentum over other competing phenomena →sustain and increase dominance via snowball effect
- Complexity theory can be used to understand and explain but not to predict outcomes
- CAS are self-organizing, emergent and consist of inter-dependent networks and nested relationships
- Change and sustainable development in education are not so much about a consequence of effecting change but a case of generating momentum in a new direction by attention, to as many factors as possible
- To sustain educational development, focus should not be on the efficacy of an isolated factor but on the interactions of structural factors and human agents
- CAS is concerned with wholes, the notion of embeddedness which is implied the nesting of a particular phenomena within broader networks and structures
- CAS moves beyond the concerns on cost-effective delivery to the examination of what is effective in the sustainable change of a failing education system → involves multiple factors, some beyond the

control of the state (eg: globalisation) and associated with schools' leaders, teachers, the students with their parents, the curriculum, the school's organization with the local community etc

- Despite CAS' inability to predict the direction or nature of change, by implementing at each constituent level changes whose outcomes we can predict with confidence, hence influencing change in the appropriate direction
- New conceptual approaches to study complex systems include multi-scale hierarchical organization, emergent patterning, agent-based modelling, dynamical attractors and repellors, information flows and constraints, system-environment interaction, developmental trajectories, selectional ratchets, fitness landscapes, interaction across time scales and varieties of self-organization → tools for qualitative reasoning about complex sociological systems and for quantitative modelling and simulation

Authors' recommendations:

- There are no independent interventions; proposed changes need to be supported by related interventions across levels
- We must change our thinking about research in education away from the input-output causal models to modelling the specific, local linkages that actually interconnect actors, practices and events across multiple levels of organization; away from single and simplistic interventions to coordinated changes throughout the system and to its constraining and enabling contexts and resources

McIntosh, K., Horner, R. H., & Sugai, G. (2009). Sustainability of Systems-Level Evidence-Based Practices in Schools: Current Knowledge and Future Directions. In W. Sailor, G. Dunlap, G. Sugai, & R. Horner (Eds.), *Handbook of Positive Behavior Support* (pp. 327-352). Boston, MA:Springer. https://link.springer.com/content/pdf/10.1007/978-0-387-09632-2.pdf#page=338

Paper reviewed: 13 March 2018
Type of paper: Theoretical; Literature review; Case study of School-Wide Positive Behaviour Support
Setting/Programmes evaluated: Schools

Our summary:

- **Definition**: "Sustainability may be defined as durable, long-term implementation of a practice at a level of fidelity that continues to produce valued outcomes (Han & Weiss, 2005). In practical, school-level terms, sustainability is the creation of a social norm, the point at which a practice ceases to be a project or initiative and becomes institutionalized (p. 328)
- **Theoretical distinction:** between sustainability and maintenance: "What distinguishes sustainability from maintenance are the continual re-examination and *changes* in regular adult behavior that continue a practice." (. 328)
- **Importance of sustainability**: "First identifying an important, valued outcome and then identifying a practice that can produce the outcome may lead to more sustainability than identifying a practice and then determining how it can be sustained. (p. 329)
- **Barriers**:
    - **Changes in context** – changes in in the nature of problems; introduction of competing initiatives
    - **Changes in capacity**; personnel (administrators, researchers), systems, resources; funding
    - **Changes in consequences**; poor fidelity; changing values.
- **Conceptual model** of sustainability (p. 333)
    - based upon observable behavior, reinforcement, maintenance, competing schedules of reinforcement, and generalization.
    - First, school personnel identify valued outcomes as targets for the change process. Second, practices that may produce those outcomes are identified and adopted. Third, school personnel implement the critical features of the practices with fidelity.

Authors' recommendations for practitioners:

- **Effectiveness** of program
- **Efficiency** of program
- Priority identification with careful planning and specific actions to increase the priority of a practice, including advocacy, policy, and blending with new initiatives, sharing successful outcomes, convincing funders and policy-makers, incorporation into value/mission statements
- C**ontinuous regeneration** including monitoring, adaptation, re-adaptation, evolution, application to new areas, responsiveness to change, connection to a community of practice
- **Generalisation**, expansion, upscaling dissemination
- **Capacity building,** structured and systemic at people, and position levels
- **Continuous measurement,** regularly scheduled**,** of outcomes and fidelity of implementation
- **Accountability**
- **Data-based** diagnosis, problem solving and decision making.

Recommendations from Case study – SW-PBS

Implementation Is Coordinated by a Leadership Team

- Social Behavior Is Defined as a High Priority
- Specific Practices Are Effective and Efficient
- Collection and Use of Data for Decision Making (includes measurement instruments Team Implementation Checklist and School-wide Evaluation Tool)
- Capacity Building and Continuous Regeneration

Authors' recommendations for researchers:

- Conceptual thinking about sustainability exceeds empirical demonstrations require clear information about the variables that affect sustained use of effective practices.
- The absence of a research foundation addressing sustainability is a major barrier to large scale dissemination of effective educational reform.
- Traditional funding cycles of 3 and 5 years allow the study of practice implementation but will not allow a functional test of sustainability, which can only be measured *after* controlled implementation (p. 345)
- Constraints of Educational systems on RCT designs
    - Requires varied research designs, quasi-ecperimental to experimental.
    - Requires multi-level statistical methods (nested data)
    - Requires repeated measures, direct and indirect data sources and large-scale assessments, collaborative research, similarities to other large social change disciplines
    - Requires clear standards of research
- "The value, trustworthiness, and meaningfulness and role of basic and applied research will need to be discussed, especially as research efforts move toward replication, effectiveness, and adaptation." (p.346)

Clearly defined conceptual models including principles of sustainability

- Investment in Measures
- Innovative Designs
- Integration of Research Methods
- Analysis Procedures

Related Papers:

Kent Mcintosh, S. H. Mercer, A. E. Hume, J. L. Frank., M. G. Turri, S. Mathews. (2013). Factors Related to Sustained Implementation of Schoolwide Positive Behavior Support. *Exceptional children, 79(3), 293-311.*

Kent McIntosh, Leslie D. MacKay, Amanda E. Hume, Jennifer Doolittle, Claudia G. Vincent, Robert H. Horner, and Ruth A. Ervin. (2011). Development and Initial Validation of a Measure to Assess Factors Related to Sustainability of School-Wide Positive Behavior Support. *Journal of Positive Behavior Interventions*, 13(4) 208–218. https://dx.doi.org/10.1177/1098300710385348.

McIntosh, K., MacKay, L., Hume, A., Doolittle, J., Vincent, C., Horner, R., & Ervin, R. (2011). Development and Initial Validation of a Measure to Assess Factors Related to Sustainability of School-Wide Positive Behavior Support. *Journal of Positive Behavior Interventions, 13*(4), 208-218. https://dx.doi.org/10.1177/1098300710385348

Paper reviewed: 13 March 2018
Type of paper: Qualitative and quantitative evaluation of a measurement instrument
Setting/Programmes evaluated: Schools

Our summary:

- Use of school-wide data predicts initial implementation.
- Five factors critical to sustainability: school culture, building administrator support, time efficiency, capacity building, and stakeholder involvement.
- Conceptual model - long-term student outcomes (i.e., improved social competence and academic achievement, reduced problem behavior) are mediated by fidelity of implementation. Sustained fidelity of implementation is affected by priority, effectiveness, efficiency, and continuous regeneration.
- Authors sought to create a measure to test elements of these themes on a large, international scale.
    - The measure is administered online as a web-based survey and is intended to be completed at the school level, by school team members or personnel familiar with the school in question.
    - The measure is composed of 50 items, or statements about the SWPBS systems, such as,
        - *"A vast majority of school personnel (80% or more) support SWPBS" and*
        - *"There is regular measurement of fidelity of implementation (e.g., Team Checklist, SET, Benchmarks of Quality),"*
        - *"There are high levels of turnover of school personnel who served as key leaders ('champions') of SWPBS."*
    - Items are organized into 8 broad subscales, including priority, building leadership, external leadership, effectiveness, efficiency, use of data, capacity building, and potential barriers, plus a set of open-ended and demographic questions.
    - Respondents are asked four questions per item. Two questions assess the extent to which each item is true for the school (a) during the 1st year of implementation and (b) at the time of administration. Two questions assess perceived importance of the item for (a) initial implementation and (b) sustainability. Responses are on a Likert-type scale.
    - The scale generates individual item scores as well as total scores for initial implementation, sustainability, and perceived importance derived through an extensive literature review and discussion among the authors based on their experience with sustainability, measurement, and a previous sustainability study.
- 41 stakeholders were invited to serve on an expert panel to evaluate the content validity of the measure and its items.
    - Inter-expert reliability = .97 (following modification): Content validity index .95.
- Pilot study; 25 participants; 21 completed the survey twice.
    - Reliability: Alpha coefficients ranged from .77 to .94, indicating strong internal consistency. The test–retest reliability was .96 for both team leaders and coaches. Between team leaders and coaches, an average interrater reliability of .95 was found.
    - *Concurrent validity:* overall $r = .68$, $p < .05$

Authors' recommendations for practitioners:
The authors have adapted the measure into a self-assessment tool for use by school personnel.

Authors' recommendations for researchers:
The measure presents an opportunity to test hypotheses on a large scale. Results may lead to information on overall factors affecting sustainability and regional variations based on different external support provided at the district or provincial/state level

Related papers: McIntosh, K., Horner, R. H., & Sugai, G. (2009)

McIntosh, K., Mercer, S., Hume, A., Frank, J., Turri, M., Mathews, S., . (2013). Factors Related to Sustained Implementation of Schoolwide Positive Behaviour Support. *Exceptional Children, 79*(3), 293-311. Paper reviewed: 13 March 2018

Paper reviewed: 13 March 2018
Type of paper: Original research
Setting/Programmes evaluated: Schools (mostly elementary)

Our summary:

- The purpose of this study was to identify factors associated with sustainability of school- based interventions and the relative contributions of those factors to predicting sustained implementation of the Schoolwide Positive Behavior Support (SWPBS) initative.
- **Definition**: Sustainability is: "a practice's potential for durable implementation, with high fidelity, when considering features of the practice, its implementation, and the context of implementation" and, the process of maintaining fidelity through these inevitable changesso that the practicecontinues to beeffective in thelong term. (p. 294).
- Contextual factors enhance or impede sustainability:
    - Priority: staff commitment; administrative support; integration into new and existing efforts; ongoing resources
    - Actual and perceived effectiveness: valued outcomes; quality of the practice and quality of implementation – visible changes in students – improved student behavior, implementer skill and knowledge, teams
    - Efficiency: worthwhile, realistic
    - Continuous regeneration: collection and use of data, capacity building
- Participants: 217 schools across 14 U.S. states, facilitators, administrators, team members, coaches
- Measures: School-wide Universal Behavior Support Sustainability Index: School Teams (SUBSIST; McIntosh, Doolittle, Vincent, Horner, & Ervin, 2009), (predictor), and Research-validated measures of SWPBS fidelity of implementation (outcome).
- Scale verification: Exploratory factor analysis of SUBSIST revealed 2 school-level factors, School Priority and Team Use of Data, and 2 district-level factors, District Priority and Capacity Building.
- Results: SEM in MPlus (complex). WLSMV estimator. The zero order correlations indicated that each factor was positively correlated with sustained implementation. Two factors, Team Use of Data and Capacity Building were significant independent predictors of sustained implementation. School team functioning, especially the use of data for decision making, had the strongest association with sustained implementation.

Authors' recommendations for practitioners:

Results indicate that the most directly influential role in sustainability is not the administrator but the school team; running regular efficient meetings; effective use of data for decision making; capacity building; connections to a community of practice. The SUBSIST is freely available in a checklist and action planning tool format (contact the first author)

Authors' recommendations for researchers:

The concept of 'team functioning' has been relatively neglected in the literature. Replication. Broader samples.

McIntosh, K., Kim, J., Mercer, S., Stickland-Cohen, M.K. and Horner, R. . (2015). Variables Associated with Enhanced Sustainability of School-Wide Positive Behavioural Interventions and Supports. *Assesment for Effective Intervention, 40*(3), 184-191

Paper reviewed: 21.5.18
Type of paper: Evaluation of school demographics and specific school actions on sustainability,
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Defines difference between sustained implementation (outcome) and sustainability (presence of variables that predict sustained implementation)
- Study investigated whether and frequency of school actions were associated with sustainability as measured by SUBSIST, where four validated factors predict this outcome (Cross sectional)
- N = 860 schools with 0-5 years of implementation of programme
- School demographics were grade level, urbanicity, percentage of non-white students, percentage receiving free lunch, years implementing positive behaviour intervention
- School actions were frequency of team meetings, sharing data with whole school staff and hours of intervention coaching received
- Results:
    - Demographics: Years implementing and grade levels were predictive of school level factors on SUBSIST; other demographics (location, SES factors) were not
        - Challenging contexts eg low SES may increase motivation to adopt and sustain programmes like positive behaviour support.
        - More challenging in high schools - ?harder to cultivate/maintain staff support
    - School actions: strongly associated with sustainability factors on SUBSIST especially frequency of data sharing with the whole school staff

Authors' recommendations for practitioners:

Frequency of data sharing with whole school staff appears to be a key consideration

Authors' recommendations for researchers:

These cross sectional results require longitudinal testing, and on sustainability itself as an outcome (as opposed to SUBSIST measure of predictors)
Do these results generalise to other programmes?

McIntosh, K., Mercer, S. H., Nese, R. N. T., Strickland-Cohen, M. K., & Hoselton, R. (2016). Predictors of Sustained Implementation of School-Wide Positive Behavioral Interventions and Supports. *Journal of Positive Behavior Interventions, 18*(4), 209-218. doi:10.1177/1098300715599737b

Paper reviewed: 17.5.18
Type of paper: Longitudinal study: predictive power of school characteristics and speed of implementation on sustainability
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Analysis of extant data from 3,011 schools implementing positive behaviour intervention (SWPBIS); schools were tracked at Year One (roughly analogous with *implementation*), Three (*institutionalisation*), and Five (*ongoing evolution/sustainability*)
- Outcome (sustainability) measured 28-item Schoolwide Evaluation Tool (external evaluation of whether > 80% implementation of critical programme features)
- Tested predictive power of school demographics (SES, ethnicity, grade levels), external support (coaching/training of school staff; evaluation plan, long-term funding plan) and speed of achieving full implementation
    - Grade level strongest predictor
        - middle, high schools reduced sustainability at Years 3 & 5
        - Implementation time frame may be longer for high schools (Bohanon et al 2006 suggest need 5-8 years compared to 3-5). However, this creates in itself a longer period of "fragility"
    - Low SES predicted reduced sustainability at Year 3
    - Less complete implementation in Year 1 predicted reduced sustainability in Years 3 & 5
    - **However, school level predictors only explained a small amount of variance in sustainability**
- Tested whether greater differences between schools, districts or states in sustainability
    - Largest differences at state level
    - Surprising, given emphasis of previous research on school-level factors
    - District coaching and capacity building may be key

Authors' recommendations for practitioners:

- Consider external support factors

Authors' recommendations for researchers:

- Identify most effective supports at district and state levels for sustainability

Mercer, S., McIntosh, K., Strickland-Cohen, M., & Horner, R. (2014). Measurement Invariance of an Instrument Assessing Sustainability of School-Based Universal Behavior Practices. *School Psychology Quarterly, 29*(2), 125-137.

Paper reviewed: 17.5.18
Type of paper: Validation of structure of school sustainability measure
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Cross validated factor structure of SUBSIST school sustainability measure (McIntosh, Doolittle, Vincent & Horner, 2009) in large independent sample (N = 860 school respondents)
- Tested measurement invariance across stage of implementation, student ethnicity and socioeconomic status
- Provides support for previous 4-factor structure (McIntosh et al., 2013) consisting of two school level (priority, team use of data) and two district level factors (priority, capacity building)
- Strong measurement invariance across ethnicity, SES
- Strong measurement invariance for stage of implementation except for one item relating to programme being considered typical school operation: logical considering progression across stages.

Authors' recommendations for researchers:
Predictive strength pf SUBSIST still needs to be assessed, examining any changes across stage of implementation

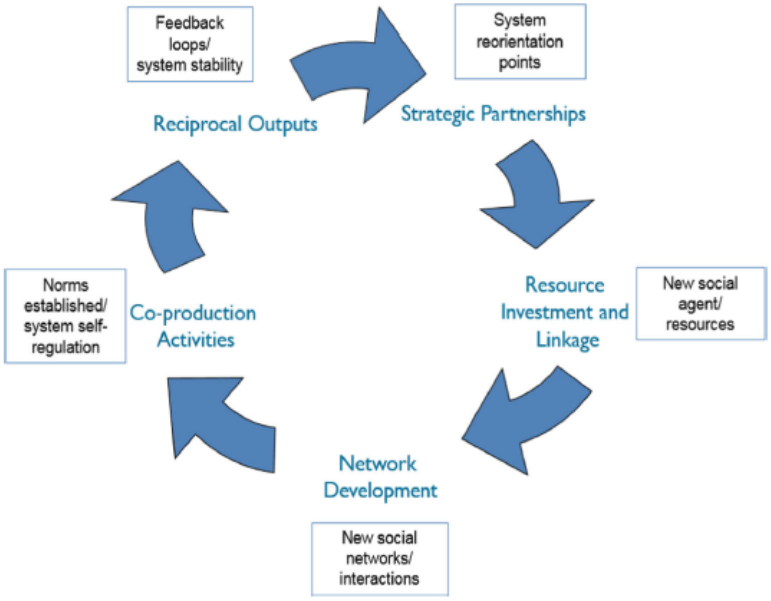
Murphy, S., Littlecott, H., Hewitt, G., MacDonald, S., Roberts, J., Bishop, J., Roberts, C., Thurston, R., Bishop, A., Moore, L., Moore, G. (2018) A Transdisciplinary Complex Adaptive Systems (T-CAS) Approach to developing a national school-based culture of prevention for health improvement: the School Health Research Network (SRHN) in Wales. *Prevention Science*, 8. doi: 10.1007/s11121-018-0969-3

Paper reviewed: 31.10.2019
Type of paper: Original data – development of the T-CAS framework
Program/Organisation: School Health Research Network (SHRN) in Wales

Our summary:

- The array of demands schools face means their willingness to devote time to student health and wellbeing is variable, compounded by the notion of zero-sum game between promoting academic attainment and promoting health
- The widespread failures of school health researchers to consider impacts of health interventions on schools' core educational business has led to this assumption going largely unchallenged and likely contributed to intervention failure
- There has been a failure to integrate academic, policy, practice and public communities to co-produce school health improvement research and build in processes to understand intervention congruence with existing systems and structures, and hence their sustainability
- Transdisciplinary approaches emphasise innovation in order to generate and translate scientific evidence that can be practically applies to address societal problems. Such innovation requires sustained collaboration between academic disciplines, practitioners, policy-makers and the public
- Transdisciplinary action research (TAR) cycles are process for cultivating and sustaining such collaborations in order to achieve shared goals by linking 3 types of collaboration:
    - Transdisciplinary scientific collaboration
    - Collaborations among researchers and community practitioners
    - Inter-sectoral partnerships for designing and implementing public policies
- Schools as complex adaptive systems (CAS):
    - CAS conceptualises the interrelationships between parts or components of a system and their relationship with the system as a whole
    - Have dynamic network of diverse agents, constantly acting and reacting to other agents' behaviour
    - System functioning emerges from these interactions, in turn influencing individuals' behaviour in a context-dependent and inconsistent manner
    - CAS has propensity towards self-organisation, with order emerging through collective actions of agents within the system, rather than central planning
    - Where a relatively stable 'attractor state' is disrupted by internal or external changes, agents work to return the system to a new form of order
    - The functioning of CAS is largely sustained by feedback loops, with feedback on the impacts of a way of working acting as inputs for subsequent actions; these may be positive-reinforcing, leading to continuation of a way of working, or negative balancing, leading to discontinuation

- SHRN uses a TAR network cycle approach, implemented within a CAS perspective and has successfully:
    - Established new cross-sector stakeholder partnerships at multiple levels
    - Embedded network activity within national and local policy frameworks
    - Built a national data infrastructure with biennial collection of student and school-level health and wellbeing data
    - Established a programme of school engagement activities to secure membership of 212 secondary schools in Wales
    - Co-produced scientific evidence and established a new data-led planning system
    - Developed research capacity to generate evidence and support professional practice
    - Secured resources from multiple stakeholders for long term sustainability
- Five stages of SHRN's continuous T-CAS network cycle represents a disruption to the functioning of the school health system in Wales:



- T-CAS highlights the importance for establishing transdisciplinary partnerships to identify and develop opportunities for system re-orientation
- Investment in and the linking of resources develops the capacity for key social agents to take advantage of disruption points in the re-orientated system and engagement activities develop the network to facilitate new social interactions and opportunities for transdisciplinary activities
- A focus on transdisciplinary action research to co-produce interventions, generate research evidence and inform policy and practice plays a key role in developing normative processes that act to self-regulate the emerging system and promote the network cycle
- SRHN recruited every secondary school and engaged over 60% of the pupil population in Wales is an indication that SHRN has been embedded in a new system structure and successfully implemented within 3 diffusion cycles by securing sustainability funding from health and education
- SRHN has begun to re-orient the system to one of evidence generation (56 research papers co-produced) and opportunities for data-led practice at multiple levels

Authors' recommendations:

- Reorientating a national education system is challenging and requires numerous cycles to achieve
- It is not possible to approach system change with a priori indicators of success
- Key activities and processes to be examined in future empirical evaluation:
    - Systems events, which provide opportunities for strategic collaboration and system reorientation
    - Identifying and understanding active ingredients of the network that have been instrumental in triggering changes in the CAS
    - Transferability of the T-CAS approach to support co-production with stakeholders

Related paper(s):

Hewitt, G., Roberts, J., Fletcher, A., Moore, G., & Murphy, S. (2018) Improving young people's health and wellbeing through a school health research network: reflections on school-reseacher engagement at the national level. *Research for All*, 2:16-33. doi: 10.18546/RFA.02.1.03

Nese, R., McIntosh, K., Nese, J., Hoselton, R., Bloom, J., Johnson, N., . . . Ghemraoui, A. (2016). Predicting Abandonment of School-wide Positive Behavioral Interventions and Supports. *Behavioral Disorders, 42*(1), 261-270. doi:10.17988/bd-15-95.1

Paper reviewed: 21.5.18
Type of paper: Investigation of factors leading to abandonment of an evidence-based programme
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Summarise their research team's finding to date, which focused on sustained fidelity of implementation. Important factors:
    - District and State support to build capacity
    - Elementary schools > high schools
    - SES – mixed findings eg see McIntosh 2015; 2016
    - Early fidelity (?see rapid change early on which reinforces behaviours)
- This study focused on abandonment as measured by externally assessed fidelity data, and school demographics (grade level; school locale; % receiving free lunch)
- Results:
    - Low rates of abandonment (7% of 915 schools); of these, most occurred in first 3 years of implementation
        - Surprisingly low rates, but states had in place strong centralised training, local coaching and coordination of data collection, using an efficient, flexible, EBP
        - Shows that scaleable and durable implementation is possible
    - School locale only significant predictor, with city schools 13 times more likely than rural schools to abandon
        - ?higher turnover at district and school level needs countering by increased training/coalition building

Authors' recommendations for practitioners:

Strong state-level training networks important; challenges for schools in large cities

Authors' recommendations for researchers:

Sample where strong, active networks present precludes generalisability, and also analysis of which state level factors most important
Use of extant data precluded analysis of finer grained variables, eg staff buy in that may be key predictors of abandonment
Qualitative interviews with staff who abandon EBPs instructive

Persaud, D. (2014). Enhancing Learning, Innovation, Adaptation, and Sustainability in Health Care Organizations: The ELIAS Performance Management Framework. *The Health Care Manager*, 33(3):183-204. doi: 0.1097/HCM.0000000000000014.

Paper reviewed: 15.4.19
Type of paper: Literature review and development of a conceptual framework
Setting/Programmes evaluated: Public health

Our summary:

- Health care organizations are complex adaptive systems (CAS) because of their complicated design and varied stakeholders
- Two forms of complexity in health care:
    - Combinatorial complexity
        - Seeking solutions from large permutation of possibilities
    - Dynamic complexity
        - Feedback loops that either reinforce or counteract activities
- Although CAS are unpredictable, sustainability is enhanced by having formal networks that manage knowledge acquisition and encourage informal social networking that utilize reflection and sense making towards organizational learning and knowledge generation
- Organizational learning is an important driver of innovation and adaptation in organizations
- From a CAS' perspective, a sustainable health organization is defined as one that efficiently achieves its strategic goals while providing effective, equitable, evidence-informed, high quality health services in a manner that allows for continuous adaptation to the environment and co-evolution with it
- ELIAS (Enhancing Learning, Innovation, Adaptation and Sustainability) framework was developed to provide quality sustainable health care that is responsive to population needs through creation of innovative evidence-based practices (EBPs)
- ELIAS utilizes data already collected for accountability with added benefit of reflecting on the data to learn, innovate, adapt and enhance sustainability
- The cyclical aspect of ELIAS framework begins with performance measurement; learning occurs as a result of using the feedback from measurement and reflection on the information
- Four stages for implementation incorporated into ELIAS: - awareness (determining gap), identification (developing solutions), implementation (action) and institutionalization
- Characteristics of sustainable innovations: - relative advantage, compatibility, complexity, trialability and observability
- The strength of the ELIAS framework is the use of performance data already gathered by health care organization for accountability and strategic assessment to drive organizational learning, innovation, adaptation and sustainability, hence it is cost effective

Authors' recommendations:

- The ELIAS framework provides a template for testing institutionalized routines and EBPs, therefore, moves beyond EBP to Practice-Based evidence while closes gap between research and practice
- It is a tool that can be used by managers to assess, develop and implement EBPs within health organizations with added benefit of enhancing sustainability

Pinkelman, S. E., Mcintosh, K., Rasplica, C. K., Berg, T., & Strickland-Cohen, M. K. (2015). Perceived Enablers and Barriers Related to Sustainability of School-Wide Positive Behavioral Interventions and Supports. *Behavioral Disorders, 40*(3), 171-183. doi:10.17988/0198-7429-40.3.171

Paper reviewed: 17.5.18
Type of paper: Qualitative assessment of enablers and barriers to sustainability
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- Assessment undertaken in 860 schools preparing to or in early stages of implementation (compared to McIntosh et al., 2013 where 217 schools had been implementing for average of 5 years)
- 68% elementary, 20% middle and 12% high schools (twice as many high schools as McIntosh 2013)
- Two open ended questions: *"What is the most important factor sustaining the positive behaviour intervention (SWPBIS)?"*, and *"What is the most significant barrier to sustaining SWPBIS?"* (compared to using 39 items of SUBSIST in McIntosh 2013)
- 13 themes identified (in order of frequency)
    - Facilitators:
        - **Key:** Staff buy-in, school administrator support, consistency across school, training
        - **Additional:** team driving it, effectiveness of programme evident, philosophical fit, collection and sharing of data, fidelity, resources (time and money equally)
    - Barriers
        - **Key:** Staff buy-in, time, money
        - **Additional:** consistency, integration with existing initiatives, training, fidelity, student buy-in, philosophical fit, school administrator support)
- Although staff buy in higher on the list than previous McIntosh studies, this may be a greater preoccupation in initial stages of implementation

Authors' recommendations for practitioners:

- Key factors identified above worthy of emphasis, especially during initial phases

Authors' recommendations for researchers:

- Experimentally/prospectively evaluate these factors
- Staff buy-in: test whether activities to improve this impact on sustainability
- Training – differentially test different elements suggested by earlier research (e.g., didactic presentation of theory, modelling, practice, performance feedback, coaching, follow-up support)

Rosas, S.R. (2017) Systems thinking and complexity: considerations for health promoting schools. *Health Promotion International*, 32:301-311. doi: 10.1093/heapro/dav109

Paper reviewed: 31.10.2019
Type of paper: Opinion text
Setting/Population: Schools

Our summary:

- Health Promoting Schools (HPS) approach is a comprehensive and integrated philosophy to improve student and staff health and wellbeing that often targets many levels simultaneously and conceived as a whole greater than the sum of individual parts, but the settings in which HPS are embedded present formidable challenges, hence it is crucial to understand the nature of systems, their behaviour and complexity and ways to manage inevitable change
- Characteristics of a complex adaptive system (CAS):
    - Possess inter-dependent features
    - Permeable boundaries
    - Consist of agents with freedom to act in unpredictable ways and their actions are inter-connected and affects each other
    - Agents react to changes following a set of internalised rules, often expressed as instincts, constructs and mental models
    - Produces tension and anxiety as by-products that do not necessarily need to be resolved in order for the system to function
    - System stress produces continuous state of disequilibrium, triggering change
    - Emergent behaviour leads to inherent unpredictability and system functioning can only be anticipated through constant observation
    - Too much variation lead to chaotic state while limited variation is counter-productive to innovation and progress
    - Continuous adaptation is the only truly predictable action in CAS
- Schools health and CAS:
    - Health is determined through a web of dynamic interactions and self-organising systems across biochemical, cellular, physiological, psychological and social domains
    - HPS assumes that improved outcomes is a function of changes in the immediate context, but there is little to no evidence of linear relationship between changes in contextual factors and students outcomes
    - HPS initiatives operationalised under the whole-school approach, include many interconnected components that are coordinated to improve health outcomes and these context-level interventions purposefully change system-wide patterns by changing underlying system dynamics, structures and conditions
    - Context widely differ, therefore there is need to understand system diversity and complexity found across contexts for sustainable and effective school health promotion
    - Four areas of systems considerations for health promotion:
        - Systems knowledge
        - Networks
        - Modelling
        - Organisation
- CAS utilise combination of explicit and tacit knowledge:
    - Explicit knowledge: precise and formally articulated, eg: health policies, programs, curricula
    - Tacit knowledge: covert, ambiguous and resides within individuals, eg: internalised know-how of an experienced school health coordinator
- For HPS, establishing a robust infrastructure with concern for the audience, motivations and mechanisms for knowledge management and transfer is critical for implementation and sustainability

Table 1: Systems thinking activities by initiative stage

Systems areas	School health promotion stage		
	Development	Improvement	Sustainability
Knowledge	• Determine the types of information and resources most important to the system and who controls access • Identify practices not in place but needed to fully support the goals and philosophies of change	• Examine current feedback mechanisms that support or impede system change goals • Identify additional feedback mechanisms that need to be added to facilitate systems change • Identify daily routines that get in the way of change being fully enacted	• Determine the extent system members have the skills and knowledge for the system to adapt • Identify knowledge needed to support, or in its absence hinder relationship development and sharing
Modeling	• Identify the current assumptions that support or impede systems • Explicate multiple causal pathways leading to change • Identify potential unintended consequences that might surface due to systems change	• Examine the 'theories in use' that stakeholders use to explain why the targeted problem exists • Explore the values guiding current programs, policies and practices • Identify the current assumptions that explain why things are done as they are	• Develop mechanisms to share and disseminate agreed-upon theory of change among all system stakeholders • Ensure that the theories underpinning the problem and the solution are congruent and reasonable
Organization	• Design new decision-making structures needed to support the goals of the initiative • Identify what else within the system that needs to be altered to support this new decision-making structure	• Examine existing relationships and decision-making structures that support/promote the systems change effort • Explore how the systems change effort promotes and challenges the existing decision-making structures	• Anticipate the authority needed and types of decisions most critical to future functioning of the system • Anticipate the structural flexibility needed to manage future complexity
Networks	• Identify the social 'movers and shakers' of the system and how they are connected • Identify the ways these key individuals support the systems change effort	• Examine how deep and apparent structures (e.g. policies, attitudes, relationships) currently interact with each other • Identify the shortest and longest connective paths in moving from one part of the network to the other	• Anticipate how the interdependencies of network members may be leveraged strategically to promote sustainability of the desired change • Identify parts of the network that require strengthening of collaborative ties

- Systems knowledge:
  - Complex adaptive systems continually produce new information resulting from the tension between stability and change
  - When the use of new information leads to improvement along some measure of success, adaptation occurs.
  - Adaptation requires the selection, recombination and application of information produced from the exchanges among system members
  - This system knowledge is a fluid mix of experience, practiceroutines, information and insight which provides a mental framework for incorporating information-rich experiences. Insufficient or disrupted information flow compromises and prevents the system from adapting to internal and external stimuli
- Systems networks:
  - CAS interventions require a network of stakeholders from multiple sectors working across several levels
  - Network analysis can be used to answer specific relational questions about schools, units and individuals

    - Networks form the backbone of a system harnessing the collective power of diverse individuals and groups
    - Attention to the network of relationships within a school health promotion initiative is key to maximizing system capacity to recognize complex problems, plan systemically to meet needs, and mobilize, leverage and obtain scarce resources
- Incorporating multiple system perspectives legitimised planning and implementation processes
- Schools and communities are capable of identifying local needs, determining fit and describing how innovations should be adopted
- Systems modelling:
    - Methods used to model actions and their intended and unintended outcomes can support examination of system dynamics and should be used
    - Improve ability to more realistically view complexity as a dynamic array of recursive cause and effect relationships
    - Visually modelling anticipated changes aid in identifying assumptions, limits and mechanisms of adaptation
    - Modelling seeks to refine the needs, expectations and future outcomes of the system through a continual process of envisioning, clarifying, evaluating and learning
    - Evaluations that aim to isolate, reduce and find attribution of effects to specific components in HPS are counter-productive and against the philosophical underpinnings of CAS
    - When system conditions and dynamics are not considered, important aspects that affect the operationalisation of a system change can be obscured
    - Example approaches that show promise: collaborative model building process that harness group problem-solving capabilities and formal system-dynamic techniques; system dynamics simulations → predictive models to guide planning and implementation (eg; scenario planning)
- Systems organising:
    - How systems organize to address complexity has important implications for sustaining interorganizational partnerships, practice networks, system leadership and strategic communications
    - Successful implementation of comprehensive school-wide initiatives requires attention to the capacity of the organization to address issues of consensus, collaboration and process management
    - Systems organizing reflects a shift from traditional management approaches to that of a learning organization approach. For members functioning in a learning organization making mistakes, taking risks, acquiring and sharing new knowledge is viewed as advantageous
    - System viability depends on integration and management of exchanges with the environment
    - As health promoting schools seek to engineer change within the school environment, attention should be focused on establishing the conditions in which change can emerge

Author's recommendations:

- Applying systems thinking illuminate how obstacles found in HPS approach where complicated and complex aspects can be navigated
- Given the complexity in modern school environments, it is advantageous that any re-conceptualisation of HPS concept should include systems thinking and complexity characteristics
- Short-term pressures for immediate success, abstract and technical terminology, and the need for consistent long-term monitoring can limit the uptake of systems thinking
- Initiating successful systems change requires shift from a traditional reduce and resolve approach to one that incorporates a dynamic, emergent, creative and intuitive view of the world as systems that co-evolve, self-organise and adapt

Sarriot, E.G., Winch, P.J., Ryan, L.J., Bowie, J., Kouletio, M., Swedberg E., LeBan, K., Edison, J., Welch, R., & Pacque, M.C. (2004). A methodological approach and framework for sustainability assessment in NGO-implemented primary health care programs. *International Journal of Health Planning and Management*, 19:23-41. doi: 10.1002/hpm.744.

Paper reviewed: 15.4.19
Type of paper: Development of a conceptual framework
Setting/Programmes evaluated: Public health

Our summary:

- Sustainability requires a systematic and systemic consideration of human, social and organizational processes beyond purely biomedical perspective
- Sustainability happens when local stakeholders take ownership, meaning envisioning their future without a project and act as such
- Sustainability a development process, complex and non-linear
- The Child Survival Sustainability Assessment (CSSA) framework was developed to understand the complex and non-linearity of NGO programs; does not guarantee predictability but to better understand conditions and linkages between systems and actors
- The CSSA is organized around 3 interrelated dimensions:
    - health and services
        - Health Outcomes: measured using proxies such as immunization coverage, child growth, healthy household behaviours, improved health knowledge
        - Health and Social Services: quality, cost, accessibility, equity, appropriateness, coverage
    - capacity and viability of local organizations
        - Organizational capacity: range of functions that are necessary for the life of the organization, its administration, and ability to perform
        - Organizational Viability: financial viability, essential types of support and relationships, connectedness; rational profile of organizational dependency, or interdependency – which the organization depends on to fulfil its mission
    - capacity of the community in its social ecological context
        - Community Competence/Capacity: cultural acceptance of change, social cohesion, collective efficacy
        - Ecological, Human, Economic, Political and Policy environment: national and regional policies, economic and political environment, environmental/ecological conditions, human development situation (often out of project scope but represent important transitional stages of development which NGOs must not ignore)
- Sustainability in NGO context: development of conditions to enable individuals, communities and local organizations to express their potential, improve functionality, develop mutual relationships of support and accountability and decrease dependency on insecure resources, in order for local stakeholders to negotiate their respective roles in the pursuit of health and development, beyond project intervention
- Six stages for sustainability assessment:

    - Define the system to be assessed, its vision and goals
    - Identify the relevant elements/general objectives for the local system
    - Choose indicators and performance criteria measuring progress on the determined elements
    - Measure and map the status on the indicators combining the appropriate evaluation tools
    - Combine the indicators and build indices as needed
    - Review results and propose programmatic intervention (including specific objectives) or policies
- Strengths:
    - Beyond the traditional linear problem-solving approach; a learning process
    - Helps inform local adaptive processes
    - Monitoring of selected capacity building indicators help organizations to be mutually accountable to each other
    - CSSA provides a commonality of language to increase learning through collective process
- Weaknesses:
    - Difficulty in measuring complex processes such as leadership, community participation, capacity and social cohesion →requires large amount of qualitative appreciation
    - Translation of qualitative information into reliable and valid indicators require clarifying processes of data collection and analysis

Authors' recommendations:

- Include self-evaluation for effective decision making to achieve a lasting and positive change at community level
- NGOs can play a part as development professionals in providing technical monitoring and evaluation knowledge while respecting community and local stakeholders' ownership in the process

Scheirer, M. (2005). Is sustainability possible? A review and commentary on empirical studies of program sustainability. *American Journal of Evaluation, 26*(3), 320-347.

Paper reviewed: 26.3.18
Type of paper: Systematic review of empirical studies within US and Canada
Setting/Programmes evaluated: Health

Our summary:

- Pluye (2004) proposes that implementation and sustainability are not sequential stages but occur in parallel concomitantly
- Discusses Yin's (1979, 1981) routinisation framework derived from technical innovations in local government (Table 1. P326); 12 processes; includes change from soft to hard funding
- Critiques Goodman et al.'s (1993) Level of Institutionalisation scale; e.g., 8-factor structure not fully supported by data
- **Reviewed 19 empirical studies with sustainability outcomes** relating to programme not health benefits, did not do meta-analysis due to lack of adequate statistical reporting (eg narrative only, or correlations rather than multiple regression).
- **Examined extent of sustainability achieved; factors contributing; methodology used**
- Coding of studies **guided by Shediac-Rizkallah and Bone's (1998) framework**; authors note that recent frameworks have also been suggested by Hays et al (2004; substance abuse prevention) and Mancini & Marek (2004; family support programmes)
- Author notes **methodological weaknesses** (definition, methodology, basis for conclusions; lack of detail on some potential influences) - interpret results below as suggestive:
    - 14/17 relevant studies reported that **≥ 60% of sites studied showed at least partial sustainability**. Some form of sustainability is frequently possible – but not guaranteed, frequent challenges cited
    - **Consistent empirical support for five factors**; author notes that these are likely to interact
        - Program can be modified over time
        - Champion present
        - Good fit with organisation's mission and procedures
        - Benefits readily perceived (not necessarily formally evaluated)
        - Stakeholders in other organisations provide support (including securing funding)
    - Few studies differentiated between the three types of sustainability measures proposed by Shediac-Rizkallah & Bone
        - Outcomes, programme continuation, community support (?capacity)
        - Programme continuation most studied; often single question of one respondent
        - In some cases, where outcome also measured, intensity of programme reach had reduced (outcomes not sustained) – important to include
- Authors note that this review limited to health – desirable for similar reviews in education, criminal justice, social services to see if similar factors influence
- Operational definitions of sustainability largely missing – at what level of intensity/proportion of original activity is a programme considered sustained?

Authors' recommendations for practitioners:

- Local level
    - Choose programmes with a strong link to organisation's mission and culture
    - When modifying, engage in this thoughtfully without destroying core components
    - Identify and support programme champion
    - Publicise benefits for stakeholders as well as its fit with major objectives of potential external funders
    - Consider routinisation into core operations of institution using Yin's list of factors contributing to success of this as a checklist (Table 1, p 326)_
- External funding agencies
    - Fund in agencies with capacity, or allow time and resources to build this

- Build local ownership
- Be aware of local modification
- Encourage planning for sustainability early
- Support funding for studies of sustainability even after initial programme funding ends

Authors' recommendations for researchers:

- Be explicit about operational definitions and methodology
- Standardise for accumulation and comparison of findings
  - Build on previous work, eg conceptual framework of Shediac-Rizkallah and Bone (1998), Yin (1979, 1981) and extensions of this by Goodman and colleagues
  - Don't limit future research to the five influential factors of this review – not all potential influences conceptualised, tested, rigorously evaluated
- Use multiple respondents and sources to reduce bias
- Plan to feed back evaluation findings earlier in funding cycle

Scheirer, M., & Dearing, J. (2011). An Agenda for Research on the Sustainability of Public Health Programs. *Framing Health Matters, 101*(11), 2059-2067.

Paper reviewed: 30.4.18
Type of paper: Framework to guide standardised research on sustainability; model proposed
Setting/Programmes evaluated: Public health programmes that were externally funded

Our summary:

- Despite increasing interest in sustainability research, still not a widely used set of research questions, operational definitions or research paradigm that can provide generalisable findings and recommendations
- Many studies develop their own definitions, variables, methods, and analysis – reinvent wheel within own specific domains; need a coherent roadmap across diverse programme areas – share what has been done before that might apply
- Define sustainability as continued use of program components/activities for the continued achievement of desirable programme/population outcomes
- Likelihood heightened when alignment between problem recognition (external stakeholders), programme itself, and internal objectives and capacities
    - Multilevel system, therefore can required several layers of data collection to capture multiple components
- Sustainability is a process (eg initial decision making, funding, organisational support; it can vary over time involving adaptation and recursive learning) and also an outcome
- Efficacy research and sustainability research may not be linear but may proceed in parallel
- Dependent variables
    - Move away from dichotomy – did program continue or not?
    - Six types
        - Continued clinical benefits/volume of services
        - Which components of original intervention continued, and how much adaptation can occur before an intervention is no longer considered sustained?
            - Ideally core/customizable components ID'd by developer
            - Issues of dosage/intensity and modification
        - Maintenance of community partnerships after funded period
            - Important for longer term work on focus issue even if specific program does not sustain
        - Maintain new policies, procedures post implementation
            - Again, may be independent of whether program continues
        - Sustaining attention to the issue/problem in the community
        - Program diffusion to other sites
            - Research needed into what activities lead other organisations to notice, adopt and sustain
- Independent variables
    - Key predictors of sustainable outcomes; goes beyond an exclusive emphasis on funding
    - Not a uniform set of factors identified across diverse contexts, however an overall framework of influences originating from Shediak-Rizkallah and Bone (1998) is emerging:
        - Characteristics of intervention(adaptability, inexpensive/scalable through volunteers, evidence based)
        - Organisational factors (good fit with mission and operations; internal champion, existing capacity and leadership (and including staff turnover and ongoing commitment), belief in benefits of programme from key staff/clients, funding – see below, accommodating changes within the organisation in response to program implementation)

        - Community factors (non monetary partnerships, funding – either incorporated into agency's ongoing budget, or external; systems approach that acknowledges political and economic climate)
- Authors present this as a conceptual framework with hypothesised relationships (Figure 1, page 2063), taking place in a social, policy and financial environment. This might require an ecological/nested systems approach under certain circumstances.
- How much effect does one influence have compared to another, and how do they interrelate? Important area for research
- Types of data collection
    - self-reports by project managers about continued status of project; can go beyond simply asking whether programme was maintained after cessation of funding (in past, often primary method of data collection)
    - routine data collection at individual level
    - trainer observer fidelity rating
    - interviewing multiple informants about intervention and organisation processes, partnerships
    - multimethod data to assess same outcomes will help with any self-report bias
- Funding often limited for follow-up (sustainability) research – setting up a data extraction system from e-health records/archival sources one option
- Unresolved question is timing: recommend no sooner than 12 months after funding source ends. Where clinical data system has been set up, should be used indefinitely to assess continued beneficial outcomes
- Research on health-related outcomes typically RCTs; for most sustainability studies, a non-experimental approach is preferable – to examine and understand the relationships and processes that relate the dependent and independent variables
- Research question must be clearly delineated and research design congruent
- Research designs include
    - Multivariate regression analysis if large enough numbers of organisations
    - In depth case studies, where possible longitudinal (during/after funding)
    - System change approaches (what are the drivers in the system in which the intervention is embedded? Collection of external policy data as well as actions undertaken within organisation)
    - Policy oriented research (Trace the effects of changes in funding policy on local attempts to sustain related programmes)

Authors' recommendations for practitioners:

- Make the case to funders for the important role sustainability plays in life cycle of interventions – perhaps this is the key outcome
- Actions taken early in a program's life cycle can heighten the likelihood of sustainability

Authors' recommendations for researchers:

- Stronger research needed concerning which strategies work best for which types of outcomes and interventions
- Develop standardised "readiness to sustain" criteria – perhaps leading to web-based decision making tools developed and validated across topical fields.
    - Examples of long-sustained programs might be one source of the measures that could anchor such tools
    - Could include iterative tailored feedback for program redesign, plus readiness rankings of communities as programme hosts
- Why bother with what is effective if it is also fleeting?

Shediac-Rizkallah, M., Bone, L. (1998). Planning for the sustainability of community-based health programs: conceptual frameworks and future directions for research, practice and policy. *Health Education Research, 13*(1), 87-108.

Paper reviewed: 26.3.18
Type of paper: Review and Theory of sustainability (including framework)
Setting/Programmes evaluated: Community health programmes

Our summary:

- Programme efficacy = traditional emphasis, sustainability latent concern (if at all)
- Some instances where innovations should *not* endure eg more efficacious programme; health need changes or disappears
- This paper
    - Synthesises diverse literature with multiple perspectives on sustainability
    - Examines indicators that can be used to monitor sustainability
    - Reviews known processes that lead to sustainability
- Three categories in the literature when defining sustainability (see endpoint of fig 1 page 99)
    - **Maintain health benefits** (note, may be slow to see change emerge eg prevention; may need to continue initiatives to "inoculate" future generations)
    - **Continue programme activities within an organisation** (institutionalisation; see also work by Goodman & Steckler, 1989a)
    - **Capacity building** of community (sustained change more likely to occur with involvement, ownership, competence)
- Authors' definition: includes concept of a living entity with the power to respond and change
- **Measuring sustainability**
    - Depends on category
        - Health benefits – track disease levels, health related behaviours
        - Institutionalisation – eg level of institutionalisation scale (Goodman et al 1989-1993)
        - Capacity building – eg Community ownership scale at different stages in programme implementation (Flynn 1995); Community competence questionnaires (Goeppinger & Baglioni, 1985; Eng & Parker, 1994)
- **Influences on sustainability**
    - Authors note that this is not an exhaustive or quantitative summary but a starting point
    - planning along these guidelines must begin early in the programme
    - Three groupings (see fig 1 p99; Table II p 99)
        - Project design and implementation factors
            - Goals shared with community, programme driven by community needs, effectiveness, grant/funding period, source of funds/affordability, preventive/treatment, training
        - Factors within the organisational setting
            - Strength of institution, adaptability and compatibility of programme, programme champion/leadership
        - Factors in the broader community environment
            - Socioeconomic/political climate; community participation

Authors' recommendations for practitioners:

- Focus on the thee groups of proposed influences, some of which are more amenable to control by programme staff than others
- Consider collaborative approaches in the community
- Use early results and process to enhance visibility of programme and commitment of staff/leadership

Authors' recommendations for researchers:

- Future research must specify objectives/emphasis for particular context (eg health benefits, programme continuation, capacity building) and select appropriate measures in specified timeframes
- Aforementioned measurement instruments need further testing and validation before they can be broadly applied in different settings; instruments should tap different levels: personal, organisational, community

Authors' recommendations also made for policy

- While programme funding remains driven by funders' own timeframes, budget cycles and political pressures, sustainability is negatively impacted
- Needs of communities must be considered; need enough resources to yield initial success and build local capacity; allocating resources to cover the maintenance/recurrent costs of existing programmes with proven track record rather than biasing spending to new programs (Steckler and Goodman, 1989; Lafond, 1995)

Schell, S. F., Luke, D. A., Schooley, M. W., Elliott, M. B., Herbers, S. H., Mueller, N. B., & Bunger, A. C. (2013). Public health program capacity for sustainability: a new framework. *Implementation Science, 8*(1), 15. doi:10.1186/1748-5908-8-15

Paper reviewed: 6.6.18
Type of paper: Framework for sustainability
Setting/Programmes evaluated:
Public Health (70% were prevention programs; most were community based)

Our summary:

- Definition
  - Sustainability outcomes (ability to maintain programming and effects over time)
  - **Here, referring more to Sustainability capacity** (broader, moves beyond the program itself to include organisational and systems characteristics). If capacity high, may be better prepared when facing threats
- Framework generated by combination of Literature Review and concept mapping (expert informed framework)
- Concept mapping sample broad across participants (scientists, funders, practitioners) and public health areas
- Designed to potentially be applicable to other types of programmes eg clinical, public, social service, and to be applicable to smaller (community level) and larger (state/national level) programs
- Nine domains
  - Internal
    - Strategic planning (how program direction, goals, strategies defined)
    - Organisational capacity (resources to manage program)
    - Program adaptation
    - Program evaluation
    - Communication (strategic dissemination of activities/outcomes with stakeholders, decision makers, public
  - External
    - Funding stability
    - Political support
    - Partnerships (program/community)
    - Public Health Impact

Authors' recommendations for practitioners:

- Framework will form basis for measurement tool (see Luke et al. 2014; Calhoun et al., 2014)

Authors' recommendations for researchers:

- Important to validate framework domains – link to outcomes
- Determine generalisability beyond public health

Related papers

Luke, D. A., Calhoun, A., Robichaux, C. B., Elliott, M. B., & Moreland-Russell, S. (2014). The Program Sustainability Assessment Tool: A New Instrument for Public Health Programs. *Preventing Chronic Disease, 11*, E12. doi:10.5888/pcd11.130184

Calhoun, A., Mainor, A., Moreland-Russell, S., Maier, R. C., Brossart, L., & Luke, D. A. (2014). Using the Program Sustainability Assessment Tool to Assess and Plan for Sustainability. *Preventing Chronic Disease, 11*, E11. doi:10.5888/pcd11.130185

Shelton, R.C., Cooper, B.R., & Wiltsey Stirman, S. (2018). The sustainability of evidence-based interventions and practices in public health and health care. *Annual Review of Public Health*, 39:55-76. doi: https://doi.org/10.1146/annurev-publhealth-040617-014731

Paper reviewed: 31.102019
Type of paper: Literature review
Setting/programmes evaluated: Public health interventions

Our summary:

- Sustainability is an understudied area – "one of the most significant translation research problems of our time"
- Fundamental challenges to achieving and studying sustainability:
    - The nature of evidence that comes form systematic review of controlled trials conducted in well-resources settings, unrepresentative populations, making the conditions of implementation also unrepresentative
    - Evolvement of sustainability conceptualisation from static process of compliance to dynamic and adaptive process of change
    - Methodological issues hampered development of literature in sustainability studies because much of them has been naturalistic, descriptive, exploratory, retrospective and often influenced by short-term budgets and funding cycles. Many were not guided by conceptual frameworks with clear operational definitions or used rigorous outcome measures of sustainability
- Definitions of sustainability:
    - 65% did not define sustainability and were developed anew by study's authors
    - Sustainability the most common term used
    - Other terms used: routinisation, institutionalisation, sustainment, durability, maintenance, long-term follow-up/implementation, as well as terms related to discontinuing programs (eg: discontinuation, de-adoption)

- Sustainability can be conceptualised as an outcome or process
    - Traditionally conceptualised at outcome: - measured during final stage of intervention
    - Some researchers focused on sustainability as a set of processes that occur in earlier stages of project life cycle and emphasised the importance of planning for sustainability
    - Sustainability is not the only endpoint to consider in implementation process because eligible population changes and needs change → evolution or replacement of intervention might be warranted
- Sustainability conceptualised as a dynamic process of change:
    - Focus on institutionalisation or routinisation impede organisations or communities from adopting more effective practices when new evidence emerges
    - Sustainability should be conceptualised as a dynamic construct that allows for adaptation and capacity building
    - Example framework: Dynamic Sustainability Framework (DSF) by Chambers and colleagues
- Many conceptual frameworks have been developed focusing on intervention characteristics, contextual influences and qualitatively identifying stakeholders' perspectives on sustainability, but none were empirically tested; hence the priority ow is to test these conceptual frameworks
- Adaptation is common and necessary because of the dynamic contexts in which interventions are implemented but the benefits of adaptation are inconclusive, leading to the continuing debate about fidelity versus adaptability
- Measuring sustainability as an outcome is challenging due to the absence of a gold standard and the wide variability in program components

- There are many gaps in our understanding of factors that influence sustainability, the inter-relationships among these factors, which is more critical over others, what combination works best etc.
- Emerging factors associated with sustainability:

Table 1 Emerging factors associated with sustainability across multiple settings and contexts

	Community	School	Clinical/social service	Global	Whole systems	Coalitions
Outer context						
Policy and legislation	X		X			
Sociopolitical context	X		X	X	X	
Funding environment	X	X	X	X	X	X
Leadership			X		X	X
Values, priorities, needs			X	X	X	
Community ownership				X		
Inner context						
Funding/resources	X	X	X	X		
Leadership/support	X	X	X			
Climate/culture			X			
Staffing/turnover	X	X	X		X	
Structural characteristics		X			X	
Capacity	X			X		
Champion	X		X		X	
Policies (alignment)		X			X	
Mission				X		
Intervention characteristics						
Adaptability	X		X	X	X	
Fit with population and context	X	X	X		X	
Benefits/need	X		X	X		X
Burden/complexity	X					
Trialability						X
Cost				X		
Processes						
Partnership/engagement	X		X	X		X
Training/support/supervision	X	X	X			
Fidelity		X	X			
Adaptation			X			
Planning	X					X
Team/board functioning						X
Program evaluation/data	X	X	X		X	X
Communication	X		X			
Technical assistance				X		
Capacity building	X			X		
Implementer and population characteristics						
Provider/implementer characteristics	X		X	X		
Implementation skills/expertise	X			X		X
Implementer attitudes	X					
Implementer motivation	X					
Population characteristics				X		

Author's recommendations for researchers:

- Sustainability is critical to address and is increasingly conceptualised as a dynamic construct that allows for adaptation in response to new or changing populations
- More research is needed to identify and evaluate planned strategies to support the sustainability of evidence-based interventions in real-world settings

Related paper:

Wiltsey Stirman, S., Kimberly, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science, 7*(1), 17. doi:10.1186/1748-5908-7-17

Sigayeva, A., & Coker, R.J. (2017). Communicable disease control programmes and health systems: an analytical approach to sustainability. *Health Policy and Planning, 30*, 368-385. doi:10.1093/heapol/czu005.

Paper reviewed: 8.4.19
Type of paper: Systematic review of conceptual frameworks, definitions, analytical approaches and empirical studies in health
Setting/Programmes evaluated: Public health

Our summary:

- Definition of 'sustainability'
    - No agreement on its operational definition
    - Integral to the sustainability concept is the focus on future needs, where equity, effectiveness and efficiency are central concerns
    - System's sustainability understood as system's resilience
        - Resilience viewed as adaptive capacity, self-organisation, learning and possibilities of multiple equilibriums (complex adaptive system perspective)
        - Persisting through continuous development in the face of change and to innovate and transform into new and desirable configurations; non-linear

- Definition of sustainability of health:
    - Interventions
        - Multidimensional concept
            - Continuing benefits to stakeholders over time (improvements in health, continued control over a health problem)
            - Institutionalization of interventions within organizational settings
            - Maintaining capacity of implementing entity
    - Organizations
        - Organization's longevity or viability
        - Maintenance of organization's capacity, goals and philosophy
            - Sustaining ideas, cultures, beliefs or principles underlying innovation or organizational goals
        - Bring benefits to users of services or meeting population needs and demands
            - Alignment, connectivity, adaptability and responsiveness to change
    - Systems
        - Traditionally focused on financial sustainability
        - Attaining health system's goals (improve health of population, protection against financial risks, responsiveness to needs, consumer's satisfaction)

        - Economic perspective: maximizing attainment of health system's goals in view of constraints of revenue and expenditure

- Authors identified 29 frameworks for analysis of sustainability in health systems:
    - Most frameworks are deterministic with sustainability viewed as end goal
    - Theoretical underpinnings of frameworks:
        - Diffusion of innovations theory
        - Theories of organizational change
        - Organizational learning theory
        - Normalization process model
        - Ecological systems theory
        - New institutional theory
        - Open systems
        - Health systems framework

- Authors identified 5 main attributes of a sustainable health programme:
    - Leadership (capability to govern, lead and manage)
    - Capacity (structures and processes, financing, human resources, medicines and technology, physical infrastructure, monitoring and evaluation
    - Interactions (capability to build internal and external relationships)
    - Flexibility/adaptability (ability to adapt, renew or be flexible)
    - Performance (ability to bring about results or attain goals)

- The proposed conceptual and analytical approach:
    - Consists of health systems as CAS; disease control programmes a components of health systems; institution and individual roles as actors
    - Health systems and diseases control programmes embedded within broader contexts (economical, political, social etc)
    - Health system and disease control programmes comprise a set of critical interacting functions that include governance, financing, planning, service delivery and evaluation
    - Include key roles of actors and relations among them in establishing, changing and sustaining health programmes

- Limitations of the proposed framework:
    - Not tested and need refinement through empirical studies
    - Does not address informal interactions between actors

Authors' recommendations:

Authors proposes that the 5 identified characteristics of leadership, capacity, adaptability/flexibility, interactions and performance may explain potential for sustainability and recommends the above proposed conceptual approach.

Turri, M., Mercer, S., McIntosh, K., Nese, R., Strickland-Cohen, M.K. and Hoselton, R. . (2016). Examining Barriers to Sustained Implementation of School-Wide Prevention Practices. *Assesment for Effective Intervention, 42*(1), 6-17.

Paper reviewed: 21.5.18
Type of paper: Development and validation of a brief measure of perception of barriers to sustainability
Setting/Programmes evaluated: Schools (School-wide positive behaviour intervention)

Our summary:

- 5-item measure of perceptions of barriers to sustainability derived from longer SUBSIST measure
- Assesses Fit with staff values; competing school/district initiatives; level of turnover of administrators, champions and general school personnel
- EFA supports unidimensional scale
- Scale operates differently for initial implementation and full operation phases compared to sustainability phase (>5 years)
    - Structural model shows partial invariance: Item 2 (competing initiatives) shows lower factor loading during initial and full operation phases compared to sustainability stage
    - Norms indicate that schools in sustainability stage report lower mean scores (fewer perceived barriers)
    - Inverse relation between perceptions of barriers and fidelity of implementation during initial and full operation phases but not sustainability stage
    - Demographic variables (grade level, school size, SES, school location) operated differently across phase.
        - As predictors of fidelity of implementation (a proxy for sustainability), demographics collectively explained progressively more variance in fidelity from initial implementation (10.7%) through full operation (22%) to sustainability (22.6%). Again, higher grade level associated with less programme fidelity across phases; size of school and % of minority students related to lower fidelity in full operation phase only; urban school locale associated with lower fidelity in sustainability phase only
        - As predictors of perceived barriers to implementation, low SES predicted more perceived barriers in initial implementation and full operation; higher grade level predicted more perceived barriers in sustainability phase

Authors' recommendations for practitioners:
Use of this brief measure can give heads up to allow proaction
Eg if too many competing initiatives, identify which lack evidence, which are not feasible to maintain, which can be braided with other initiatives addressing common goal
Importance of measuring barriers across phases as they operate differently (and also changes to resources, context and priority can occur at any point)
Where non-malleable barriers exist (eg., high turnover) consider importance of proactively offsetting (eg., training plan for new staff that runs frequently)
Authors' recommendations for researchers:
Further differentatiate barriers from facilitators (can be polar opposites) and determine relative importance
Strategies for sustainability may need to differ by stage eg effective external coaching

Wiltsey Stirman, S., Kimberly, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science, 7*(1), 17. doi:10.1186/1748-5908-7-17

Paper reviewed: 8 March, 2018
Type of paper: Systematic Review (Sustainability)
Setting/Programmes evaluated:

- 125 studies: 33% medical interventions/healthcare programmes; 34% public health/health promotion; 27% mental/behavioural health interventions; 7% educational interventions
- Research questions: definitions, models, methods and measures used to investigate sustainability; factors impacting sustainability; level of sustainment

Our summary:

- High proportion of studies did not present a **working definition or model of sustainability**. Most cited definition was Scheirer (2005) based on framework from Shediac-Rizkallah & Bone (1998) which report multiple aspects of sustainability: continued benefits, activities and capacity.
- **Type of research methodology:** 94% naturalistic rather than experimental; most retrospective. Few studies employed rigorous methods of evaluation. Studies with qualitative designs were more likely to identify processes and interactions between factors.
- Comprehensive discussion on existing measures of sustainability and fidelity (p12); suggesting **two promising multi-level measures** based on sound theory (Mancini & Marek, 2004; Maher & Gustafson, 2007) that warrant more research on their validity and generalisability across programmes.
- **Influences on sustainability** identified by this review could be coded into four categories (key points follow below), similar to those proposed by Shediac-Rizkallah & Bone (1998) and Scheirer (2005), and common across each of the health-related domains that were examined in more detail (education, at only 7% of studies, was excluded here):

1.

1. Innovation characteristics (e.g., effectiveness, fit, modification/fidelity)
2. Context (e.g., local culture, structure, policies and leadership)
3. Capacity (e.g., champions, funding, workforce/resources, external support)
4. Processes and Interactions (e.g., planning, engagement/relationship building, evaluation/feedback, integration of policies, training, navigating competing demands)

- **Partial sustainability** (continuation of some but not all elements) most common finding across domains, but not possible to determine impact on recipient outcomes. Minimal information reported on reasons for, or nature of, **adaptations** made.

Authors' recommendations for practitioners:

Given the variability in methodology and measures in the literature reviewed, it is difficult to make judgements on sustainability influencing factors at this nascent stage

Authors' recommendations for researchers:

The authors present a very comprehensive section here to tighten research moving forward (p10-13). Recommendations include: (i) choosing definitions, models and outcomes appropriate to the specific project (i.e., bottom line may differ: health outcomes vs sustainment of programme itself; fidelity of treatment protocol vs responsiveness to local conditions may be more important). (2) evaluation of models (3) development of assessment measures beyond fidelity (4) Studying fidelity and adaptation.