Health Research Board

Implementation frameworks for use by health workforce planners

Evidence review

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Published by:
Health Research Board, Dublin
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Acknowledgements

The authors would like to thank Gabrielle Jacob at the Department of Health for requesting this review. We are also grateful to our peer reviewers, Eszter Kovacs, Paolo Michelutti, Lisa M Pfadenhauer and Joanna Moullin, for their helpful comments.

Executive summary

Purpose of evidence review

This report presents the findings of a review of evidence on health workforce (HWF) planning and implementation frameworks undertaken by the Evidence Centre in the Health Research Board (HRB). The *Department of Health Statement of Strategy 2016 – 2019* sets out, as one of its deliverables, the development and implementation of a national integrated strategic framework for HWF planning. This will involve the establishment of a cross-sectoral governance and operational framework to guide HWF planning for Ireland. Once the recommended framework is developed, it is expected that workforce planning in the health services will be carried out as part of a collaborative multidisciplinary approach, informed by policy, strategy and the agreed models of care, and in collaboration with key cross-sectoral departments/agencies. It is envisaged that this evidence review will help inform the high-level implementation plan to be included in the Department of Health Cross-Sectoral Steering Group report and associated sector-specific action plans where required.

Research questions

The specific research questions were as follows:
Question 1a. Describe examples of implementation frameworks that have adopted a programmatic approach to support the successful implementation of a horizontal cross-sectoral policy initiative.
Question 1b. Do the described frameworks outline potential barriers and/or enablers for successful implementation, including suggested approaches to overcoming identified barriers?

Question 2a. Describe examples of frameworks for implementing health workforce planning systems and their core components.
Question 2b. Is there evidence of potential barriers and/or enablers to successful implementation of workforce planning systems with suggested approaches used to overcome them?

For Question 1a, the implementation framework should be led by a public sector entity (preferably within the health sector) rather than a private or commercial entity, and it should involve intersectoral or cross-sectoral collaboration, e.g. it should involve health and other ministries and/or not-for-profit or for-profit organizations. It was clear from our initial scoping that these were two very distinct questions requiring separate searches and syntheses. We have therefore summarized each question separately.

Question 1

Methods

The methods employed for questions 1a and 1b began with the undertaking of an initial scoping exercise to understand the scope of published literature pertaining to implementation frameworks. The scoping review established that implementation science is an emerging field and that there was no published literature to suggest that an implementation framework had been used to prospectively support any HWF systems. Therefore, examples from other areas would be required in order to answer this question. We undertook a systematic search of the MEDLINE and CINAHL bibliographic databases, using a combination of controlled vocabulary terms and free-text terms. We

also undertook a hand search of the specialist implementation journal *Implementation Science*; this online journal was first published in 2006 and we screened each paper that has been published since its inception. We supplemented this with forward and backward citation tracking. In particular, we undertook forward citation tracking by using the index papers describing the Consolidated Framework for Implementation Research (CFIR), the PRECEDE-PROCEED framework, the Theoretical Domains Framework, the Promoting Action on Research Implementation in Health Services (PARIHS) framework, and the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework.

Inherent in Question 1 was that, if it was to be considered successful, an implementation process should have been implemented and evaluated. As our scoping review indicated that there may be a dearth of relevant literature, we loosened the inclusion criteria to also include studies that had been implemented but not evaluated, and studies that described, in detail, a proposed implementation process.

Findings

For ease of presentation, we combined qwuestions 1a and 1b. We identified six papers that met our criteria:

- One paper described the implementation of a cross-sectoral intervention prospectively using a framework, and had undertaken an evaluation.
- Three papers described the implementation process, but were not evaluated.
- Two papers were protocols describing a proposed implementation process.

The included papers differed considerably in terms of the extent of implementation, the evaluation, and the type of intervention being implemented. Therefore, we did not undertake any data synthesis. Instead, we described the intervention in each paper as an individual case study.

Case study 1: The **Live 5-2-1-0 initiative** works with stakeholders to share (through social marketing) and support the evidence-based Live 5-2-1-0 message: at least 5 vegetables and fruits, less than 2 hours of screen time, at least 1 hour of physical activity, and zero sugary drinks, per day. To implement this intervention, the RE-FRAME framework was used; this is an adaptation of the Knowledge to Action (KTA) and RE-AIM frameworks. While the adapted RE-FRAME framework was appropriate to the Live 5-2-1-0 initiative, it is debatable whether the RE-FRAME framework would be useful for implementing a large multisectoral intervention such as a national HWF planning system. In comparison to a national HWF planning system, the Live 5-2-1-0 initiative had a low level of complexity. While elements such as translating research evidence into action and evaluation may play some role in implementing a HWF planning system, the framework does not consider multiple levels or context, both of which need to be considered when implementing such a system.

Case study 2: The **Immediate Postpartum Long-Acting Reversible Contraception (LARC) Learning Community** aims to promote immediate LARC use across the United States, and the CFIR was used to aid implementation. The CFIR contains 39 constructs across five domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and process of implementation. It was considered a suitable framework for this intervention, as it is an example of an evidence-based strategy requiring adaptation for different contexts (i.e. inner and outer settings), while the role of individuals in influencing implementation is also acknowledged. The LARC

intervention was multilevel, complex and multisectoral, and the CFIR enabled the identification of relevant enablers and barriers and emphasized the importance of context. The CFIR may be an appropriate framework for implementing a multilevel and multisectoral intervention and its use could be considered when implementing a national HWF planning system in Ireland. However, it should be noted that no evaluation was undertaken.

Case study 3: Rehabilitation Living Lab in the Mall aims to transform a shopping complex in Montreal into an inclusive environment optimizing the participation and social inclusion of all people. The PRECEDE-PROCEED framework was used: this guides planners through a process, starting with desired outcomes; it then works backwards to identify strategies for achieving the objectives and outcomes, and it requires the active participation of its intended audience. It was selected because it relies on the participation of the target population and can be used to iteratively integrate the planning and evaluation stages. This framework is data driven and in the PRECEDE phase a number of assessments were undertaken to determine if the proposed intervention was feasible with available resources and was compatible with mall administrative policies. PRECEDE-PROCEED is a widely used framework, particularly in planning health programmes, and it appears to be particularly useful for the planning and evaluations stages of implementation. However, it does not take into account the multilevel aspect of an intervention, and context is not considered; consequently, it may not be the most appropriate framework to select when implementing a national HWF planning system.

Case study 4: Child Pedestrian Injury Prevention Project is a three-year intervention trial aimed at reducing pedestrian injuries in schoolchildren aged 5–9 years. The programme includes variable applications of school-based student, parent, teacher, and community education, as well as environmental interventions. The PRECEDE-PROCEED framework was used to implement this intervention, as it forces the planner to thoroughly assess the factors associated with the problem that is the focus of concern. Using the framework ensured that a critical assessment was undertaken of all the relevant epidemiological, behavioural, and environmental information. For the same reasons outlined in Case study 3, the PRECEDE-PROCEED framework may not be the most suitable framework for implementing a HWF planning system.

Case study 5: Housing First model (HFM) is a complex health intervention designed to serve the chronically homeless. This project seeks to develop and test a scientifically grounded strategy for HFM by modifying a limited HFM implementation strategy known as the Housing First Technical Assistance and Training Program, which lasts between six months and two years. The authors propose the use of frameworks by Chaudoir *et al.* and Proctor *et al.* to implement this intervention. Chaudoir *et al*. describe 62 multilevel (structural-, organizational-, patient-, provider-, and innovation-level) constructs that are hypothesized to cause or predict implementation outcomes, and Proctor *et al.* identify three types of outcomes: implementation, service, and client outcomes. Compared to other frameworks, there is little guidance on how to use these frameworks and they do not appear to have been widely used. In terms of complexity, the HFM is probably the most similar to a national HWF planning system. However, no results regarding its implementation have been published.

Case study 6: SafeCare is a behavioural and psychosocial evidence-based practice developed to prevent child neglect. It is proposed to use the EPIS framework to implement SafeCare in California,

paying particular attention to the issue of adaptation. The EPIS framework has four phases: exploration, preparation, implementation and sustainment. It works along two planes: the outer plane addresses external factors, such as government policies, funding mandates, and the organization's relationships to outside organizations; and the inner plane addresses elements in the organization's operations, climate, and culture, such as staffing and internal policies. The EPIS framework was designed to be applied to public sector settings. It considers the role of context and it addresses factors at a number of different levels. It may be worth considering the use of this framework when implementing a multilevel, multisectoral intervention; however, it should be noted that this framework has only been applied in limited settings. This is a protocol and no results are available to determine if implementation of this SafeCare initiative was successful.

A number of enablers were consistently identified in the four case studies that were implemented. These enablers were:

- Conduct educational meetings
- Use advisory boards and workgroups
- Involve patients/consumers to enhance uptake and adherence
- Obtain and use patient/consumer and family feedback
- Identify and prepare champions
- Prepare patients/consumers to be active participants
- Facilitation
- Conduct local needs assessment.

Discussion

The existing literature indicates that implementation science is an emerging area and this is corroborated by the evidence review. One aim of the review was to identify horizontal cross-sectoral initiatives that had been prospectively implemented using an implementation framework. Just four relevant examples were found, with only one of these having been evaluated, and two protocols were described. There was considerable heterogeneity between the interventions in relation to their complexity and range of cross-sectoral partners. The frameworks used to implement each intervention varied. Three of the interventions used well-known existing frameworks (CFIR and PRECEDE-PROCEED) without adaption, and two of the interventions combined two existing frameworks: one combined the KTA and RE-AIM frameworks and the other combined frameworks by Chaudoir *et al.* and Proctor *et al.* The remaining intervention used the EPIS framework, which was designed by that study's authors for use in public sector settings.

There is no systematic basis for determining which framework is best suited to underpin implementation research. This makes selecting an implementation framework difficult. In spite of the large number of implementation frameworks that have been developed, it appears that frameworks are seldom used to prospectively implement any type of interventions. If there is no one suitable framework to prospectively help implement a national HWF planning system, another option may be to use more than one framework. Multiple frameworks may be used in instances where a single framework cannot comprehensively address study needs. There are numerous examples in the literature of two frameworks being used to implement an intervention.
A number of enablers to implementation were consistently identified in the four interventions that were implemented. These enablers included the use of an advisory board or workgroup to help

oversee the implementation process, and identifying and preparing champions who are committed to the process. The involvement of patients or end users during the implementation process was also considered important. Regardless of which framework is selected to implement a national HWF planning system, it may be worthwhile considering these enablers in the implementation plan.

Implementation of complex, cross-sectoral interventions is challenging, due in part to stakeholders' diversity in respect to their readiness, capacity and willingness to put in place the system, environmental, and policy changes involved. Coupled with the fact that implementation frameworks are rarely used as a basis for developing new interventions, it is probably not surprising that this part of the review yielded so little relevant information.

Question 2

Methods

Our scoping review indicated that most of the relevant material for Question 2 was located in the grey literature. Firstly, we undertook a search of the agencies associated with HWF planning, which we identified through a general desk search, namely Google searching and emergent searching via information available on each country's Department or Ministry of Health website. This was supplemented with literature from a general Google search. We particularly focused on English-speaking Organisation for Economic Co-operation and Development (OECD) or European Union (EU) countries. We also undertook a systematic search of the MEDLINE and CINAHL bibliographic databases, using a combination of controlled vocabulary terms and free-text terms.

Findings

We selected five different frameworks for inclusion that met our criteria:

- Two are generic frameworks devised by an international body – the World Health Organization (WHO) Human Resources for Health (HRH) Action Framework and the European Union (EU) Joint Action on Health Workforce Planning and Forecasting framework
- Two are national-level frameworks (England and Canada)
- One is a provincial-level framework (Alberta).

The five frameworks presented in this review were all developed since 2005 and, with the exception of the Alberta framework, were developed for use at a national level. The frameworks designed by England and Alberta were designed for their own specific health systems, while the remaining three are generic HWF planning frameworks that have been developed for any country to adapt and use in its own health system. All frameworks have been used to implement HWF planning systems. However, none have been independently evaluated.

1. The **EU** framework was developed as part of the EU Joint Action on Health Workforce Planning and Forecasting from 2014–2016, which aimed to improve HWF planning and forecasting capacity in the EU. The framework was developed by experts from 28 EU countries and beyond, who studied HWF systems from seven countries with good practices in relation to HWF planning. The framework has five main elements: goals, data, forecasting model, organization and link to policy. Both process and data elements are included. Other important considerations highlighted in the framework include stakeholder involvement,

political commitment, legislation, current situation analysis, and monitoring and evaluation. As part of the EU Joint Action, the 'Toolkit on Health Workforce Planning' was designed to support national-level health workforce planning with explicit tools that enable improvements.

2. The **WHO** framework was developed in 2005 by representatives of multilateral and bilateral agencies, non-governmental organizations (NGOs), and academics; it was sponsored by the WHO and the United States Agency for International Development (USAID). The framework consists of six action fields (HR management systems, leadership, partnership, finance, education, and policy) and an action cycle illustrating the steps to take to apply the framework (situational analysis, planning, implementation, and monitoring and evaluation). The Global Strategy on Human Resources for Health: Workforce 2030, which was published in 2016 set out policy options for countries to improve their HWF planning; following on from this, the WHO Regional Office for Europe has developed a framework for action and in late 2017 it presented its draft toolkit, which has been developed to help countries with their HWF planning.
3. The **English** framework was developed in 2013 by the Centre for Workforce Intelligence (CfWI) on behalf of the Department of Health and Social Care in England. It comprises five main elements: focal question, horizon scanning, scenario generation, workforce modelling, and policy analysis.
4. The **Canadian** framework was based on the framework designed by O'Brien-Pallas *et al*., who are researchers at the WHO Collaborating Centre on Health Workforce Planning and Research based in Canada. The framework starts with population health needs; HWF planning works with the current supply of providers, which is maintained by new providers, flow of services, financial resources and models of service delivery. This is influenced by deployment and utilization of resources. The framework takes account of the fact that HWF planning occurs within the context of many social, political, geographical, technological, and economic factors.
5. The **Alberta** framework was originally developed in 2003 and revised in 2005. It was developed by Alberta Health and Wellness after a consultative process with multi-partner involvement. The framework has four phases: set organizational strategic direction; conduct workforce analysis; implement human resources plan; and monitor, evaluate and revise.

A number of enablers to successful HWF planning were consistently identified across the frameworks. These included high-level involvement and collaboration of multiple stakeholders; multisectoral cooperation; availability of high-quality, up-to-date data; clear goals; clear roles and responsibilities; and adequate resources. The importance of monitoring and evaluating the implementation process was also cited.

Discussion

HWF planning is a challenging process that requires input from diverse stakeholders; a HWF planning framework can assist governments and planners to develop and implement strategies to achieve an effective and sustainable health workforce. The EU, WHO and Canadian frameworks all have guidance resources available to assist planners who wish to use their frameworks. The EU Joint Action framework has the most comprehensive accompanying resources; the EU Joint Action team developed a comprehensive toolkit, which is a collection of protocols, guidelines, checklists, check sheets, fact sheets and rating scales designed to help countries to adapt standardized HWF planning

processes and develop a plan for implementation. The toolkit can help planners understand the current state and existing weaknesses of their existing system and direct attention to possible points of improvement, which may be of use to the Department of Health when implementing a national HWF system.

Regardless of which framework is selected, based on the experience gained from the use of the five frameworks described in this review, it will be necessary to have high-level involvement and collaboration of multiple stakeholders; multisectoral cooperation; availability of high-quality, up-to-date data; clear roles and responsibilities; adequate resources; and a monitoring plan. It should also be noted when selecting a framework that no robust independent evaluations appear to have been undertaken on any of the five frameworks described here.

Conclusion

The information identified in this review indicates that there are no robust examples of evaluated cross-sectoral interventions that were implemented by prospectively using a framework, and a key challenge remains as how to select from the numerous frameworks described in the literature. The selected framework(s) will have to account for the multiple levels that a national HWF planning system will cut across, it will need to consider context, and it will have to be cognisant of the fact that implementing a HWF planning system will not necessarily be a linear process.

While a generic implementation framework may underpin the overall implementation of a HWF planning system in Ireland, a specific HWF planning framework would provide particular assistance in implementing and identifying the necessary steps required to implement a HWF planning system. Given that Ireland is a member of the EU, it may be worth reviewing the framework developed by the EU Joint Action in more detail. As it was designed specifically for European countries, it takes into account the specific realities or context associated with Europe that may not be applicable in non-European countries when it comes to HWF planning. In late 2017, a joint tender was supported by the Health programme of the European Union – Support for the health workforce planning and forecasting expert network – which aims to build on the results of the Joint Action work. It specifically aims to establish an expert network on HWF planning and forecasting, to structure and exchange knowledge in HWF and to provide tailor-made, country-specific support to some countries on the national implementation of HWF planning. From an Irish perspective, this may be an opportunity to gain additional knowledge and insight in relation to HWF planning.

A national HWF planning system may be described as a complex, cross-sectoral intervention and its implementation will be a challenging process, requiring input from diverse stakeholders. There are few published examples of similar-type interventions that have been implemented using a framework and that have been evaluated. This makes selecting an appropriate framework more difficult. In both parts of this review, it appears that little evaluation of either implementation or HWF-specific frameworks has taken place. The lack of robust evaluation should be considered when selecting either type of framework.

1 Purpose of evidence review

This report presents the findings of a review of evidence on health workforce (HWF) planning and implementation frameworks undertaken by the Evidence Centre in the Health Research Board (HRB). The evidence review was requested by the Department of Health (DoH) in Ireland. A HRB evidence review can be described as a comprehensive report of the existing evidence on a specific topic that is collected and synthesized using a systematic approach, and typically takes six months to complete. Evidence reviews are undertaken as part of a knowledge brokering service offered to policy-makers in the DoH by the Research Services Unit in the DoH in collaboration with the HRB Evidence Centre. The questions were set by DoH policy-makers through an iterative process with the DoH Research Services Unit and the HRB Evidence Centre.

The health sector in Ireland is experiencing challenges in the recruitment and retention of health workers, including doctors and nurses. The Irish health service has one of the highest proportions of foreign-trained doctors and nurses in Organisation for Economic Development and Co-operation (OECD) member countries while experiencing significant outflows of domestically trained doctors and nurses. While targeted efforts are underway to address current recruitment and retention issues, the capacity of the health sector – and of the wider public system, including the education sector – to analyse and meet emerging HWF challenges is limited. In this context, and in line with the *Department of Health Statement of Strategy 2016 – 2019*,[1] the DoH has developed the National Strategic Framework for Health and Social Care Workforce Planning. The objective is to align the new HWF planning system both vertically and horizontally in order to support effective information flows about the current workforce and current and future needs, and to identify, agree and implement appropriate short-, medium- and long-term human resource and policy solutions (either within the health sector or cross-sectorally with other partners), recognizing that such strategies and solutions must be designed and considered within the overall architecture of public sector human resource management while having due regard to national agreements and existing structures.

The aim of this evidence review was to identify horizontal, cross-sectoral initiatives that had been prospectively implemented using an implementation framework, and to describe HWF planning frameworks. It is envisaged that this review will help inform the high-level implementation plan, to be included in the DoH Cross-Sectoral Steering Group report, and associated sector-specific action plans where required.

1.1 Research questions

The specific research questions were as follows:
Question 1

a. Describe examples of implementation frameworks that have adopted a programmatic approach to support the successful implementation of a horizontal cross-sectoral policy initiative.
b. Do the described frameworks outline potential barriers and/or enablers for successful implementation, including suggested approaches to overcoming identified barriers?

For Question 1, we sought to identify generic frameworks that had been used to prospectively implement a cross-sectoral intervention. It was not necessary for the intervention to pertain to workforce planning; however, the intervention should:

- Be led by a public sector entity (preferably the health sector) rather than a private or commercial entity
- Be a complex intervention that required a system perspective and involved intersectoral or cross-sectoral collaboration, e.g. involve health and other ministries and/or not-for-profit or for-profit organizations.
- Have been implemented and evaluated.

Question 2

a. Describe examples of frameworks for implementing health workforce planning systems and their core components.
b. Is there evidence of potential barriers and/or enablers to successful implementation of workforce planning systems with suggested approaches used to overcome them?

For Question 2 we were looking at specific frameworks that had a particular focus on one single intervention, i.e. HWF planning.

It was clear from our initial scoping that these were two very distinct questions which would require separate searches and syntheses and there would be little or no overlap in the literature for both questions. We have divided this report into two main parts, which present a separate response for each question.

2 Question 1: Key concepts and background

Implementing evidence-based practices can be complex and challenging. Many efforts to implement interventions do not reach their full potential due to a variety of challenges inherent in the implementation process.[2] Implementation science has been defined as the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices to reduce the gap between what has been shown in research to be effective and what is actually practised.[3] The field of implementation science is evolving and it is growing in importance among funders, researchers, and practitioners as a means to incorporate research evidence into policy and practice.[4, 5] Implementation science has produced an increasing body of theories, models and frameworks which can be used for designing, assessing and evaluating interventions and implementation efforts, both on the primary and secondary research level; however, it has been noted that few published intervention evaluations provide formal documentation describing the content and delivery of an intervention and are seldom reported by researchers or practitioners in enough detail to replicate them.[6] Implementation frameworks are rarely used as a basis for developing new interventions or for determining why some interventions fail while others succeed.[7] Conducting implementation research without a theoretical framework can hinder the ability to generalize and build on findings across studies and contexts. One reason for this may be that implementation frameworks do not meet the needs of those implementing interventions.[7] However, in recent years there has been steady improvement in the number and quality of studies that investigate and shed light on implementation.[4] There is no standardized language for describing and assessing implementation, although in recent years attempts have been made to develop definitions

in relation to implementation and its core concepts.[4] In the following paragraphs, we present a common understanding of implementation concepts and terms extracted from a review of the literature.

2.1 Implementation

A recent review identified six definitions of 'implementation' in the literature.[8] The author subsequently described implementation as '*an actively planned and deliberately initiated effort, with the intention to bring a given intervention into policy and practice within a particular setting.'* It is '*undertaken by agents who either actively promote the use of the intervention or adopt the newly appraised practices. Usually, a structured implementation process consisting of specific implementation strategies is used and underpinned by an implementation theory'*. In his seminal work *Diffusion of Innovations*, Rogers defines an innovation as '*an idea, practice, or object that is perceived as new by an individual or another unit of adoption'*, while diffusion is the process through which an innovation is communicated through certain channels over time among the members of a social system.[9] Meyers, Durlak and Wandersmanhave identified implementation as one of five crucial stages in the wide-scale diffusion of innovations:

1. Dissemination (conveying information about the existence of an innovation to potentially interested parties),
2. Adoption (an explicit decision by a local unit or organisation to try the innovation),
3. Implementation (executing the innovation effectively when it is put in place),
4. Evaluation (assessing how well the innovation achieved its intended goals), and
5. Institutionalisation (the unit incorporates the innovation into its continuing practices).[4]

The implementation process is an active, multistage, iterative and dynamic process that does not usually occur in a linear fashion. At specific points, correction or refinements may be undertaken to aid implementation.[4]

2.2 Cross-sectoral or multisectoral interventions

In the literature, the terms 'cross-sectoral', 'multisectoral' and 'intersectoral' are used interchangeably. Implementation of multilevel, multisectoral interventions is challenging; different factors interact not only within but also across sectors to influence implementation effectiveness and subsequent intervention outcomes. Multisectoral interventions require significant buy-in and coordination of activities from diverse stakeholders, each of whom may vary in their readiness, capacity and willingness to put in place the system, environmental, and policy changes involved.[10] It can be difficult to engage diverse stakeholder groups in ways that minimize policy resistance, maximize desired intervention outcomes, and promote the subsequent sustainment and scaling-up of effective approaches. However, in part because so few multilevel, multisectoral interventions have been developed that prospectively employed a framework, little is currently known about strategies for overcoming these challenges and effectively implementing these interventions.[11]

2.3 Implementation frameworks

An implementation framework may be defined as a graphical or narrative representation consisting of various descriptive categories (e.g. concepts, constructs or variables) and the relations between them that are presumed to explain the phenomenon of implementation.[12] They provide an overview of ideas and practices that shape the complex implementation process and can help researchers and practitioners use the ideas of others who have implemented similar projects. Some frameworks are able to provide practical guidance by describing specific steps to include in the planning and/or execution of implementation efforts, as well as mistakes that should be avoided.[4, 12, 13] An implementation framework may be particularly useful when implementing a complex intervention. The process of implementation can be divided into three phases (e.g. pre-implementation, implementation, and maintenance). Implementation does not always move linearly through such phases and, generally, frameworks recognize that implementation is a multidimensional phenomenon with multiple interacting influences.[2] Birken *et al.*[14] have identified a number of ways in which implementation frameworks may differ from one another. First, they may serve different purposes: to describe/guide the implementation process as a whole (e.g. the Knowledge to Action KTA) framework), to identify determinants of implementation (e.g. the Consolidated Framework for Implementation Research (CFIR)), or to evaluate implementation (e.g. the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework). Implementation frameworks may focus on different conceptual levels; some focus on a single level (e.g. organizational, individual) while others may cut across multiple levels (e.g. the Context and Implementation of Complex Interventions (CICI) framework covers macro, micro and meso levels). They may also differ in their degree of operationalizability, with some including definitions, tools and suggested methodological approaches to facilitate use and promote consistent application. For example, the CFIR and RE-AIM frameworks have dedicated websites (www.cfirguide.org and www.re-aim.org) that provide detailed guidance on how to use the frameworks. Reviews have found that frameworks were developed in different ways;[4, 15] some frameworks have been developed by synthesizing results from empirical studies of barriers and enablers for implementation success; others have relied on existing determinant frameworks and relevant theories in various disciplines; while still other frameworks were mainly developed by brainstorming or consensus processes. Of note, some authors did not specify the methods used to develop their framework and so could not be allocated to a group.[13, 16]

A key challenge for those implementing an intervention is how to select from the growing number of frameworks. In many cases, a single framework can be used to address study needs; in some cases, however, it may be appropriate to use multiple frameworks. Furthermore, within the available frameworks, there is considerable heterogeneity.[17] In addition, most frameworks are also adapted or modified in practice.[15] A recent survey of 223 implementation scientists sought to determine which frameworks implementation scientists use, how they use them, and the criteria used to select them.[18] They reported using more than 100 different frameworks primarily to: identify key constructs that may serve as barriers and facilitators; inform data collection; guide implementation planning; and enhance conceptual clarity. The most commonly listed frameworks that were used included the CFIR (21%), the RE-AIM framework (14%), the Diffusion of Innovations framework (9%), the Theoretical Domains Framework (5%), and the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework (5%). The criteria used by respondents to select a framework included analytical level (58%), logical consistency/plausibility (56%), empirical support (53%), and description

of a change process (54%). However, it should be noted that the years in which the frameworks in this study were developed vary, which may impact the level of each framework's usage to date.

Numerous implementation frameworks have been developed; we identified four reviews of frameworks published between 2012 and 2015.[4, 12, 13, 15] Given that the most recent review was published in 2015, it is possible that further frameworks have been described since then. Undertaking a systematic search of the literature to identify all published frameworks was beyond the scope of this introductory chapter and therefore the list presented here is not exhaustive. The four reviews employed different search strategies and identified 97 unique frameworks, with just 28 being identified more than once. While some frameworks are generic and designed for use across a number of settings, others were designed for very specific settings and disciplines, e.g. substance abuse programmes, school-based prevention programmes and injury prevention programmes. The list of frameworks is provided in Appendix 1.

Given the large number of implementation frameworks, classifying frameworks may facilitate appropriate selection and application of relevant approaches when implementing an intervention or policy. In his narrative review of selected frameworks, Nilsen proposed a taxonomy to differentiate between categories of theories, models and frameworks in order to facilitate the appropriate selection and application of these theoretical approaches:[13]

- Process models
- Determinant frameworks
- Classic theories
- Implementation theories
- Evaluation frameworks.

This taxonomy distinguishes between three overarching aims: describing the process of translating research into practice (process models); understanding and/or explaining what influences implementation outcomes (determinant frameworks, classic theories, implementation theories); and approaches facilitating the evaluation of an implementation effort (evaluation frameworks) (Table 1).

Table 1 Five categories of theories, models and frameworks used in implementation science[13]

Category	Description	Examples
Process models	Specify steps in the process of translating research into practice, including the implementation and use of research. The aim of process models is to describe the process of translating research into practice. An action model is a type of process model that provides practical guidance in the planning and execution of implementation endeavours and/or implementation strategies to facilitate implementation.	• KTA Framework • CIHR Model of Knowledge Translation • Stetler Model • Iowa Model • Ottawa Model • Quality Implementation Framework
Determinant frameworks	Specify determinants which act as barriers and enablers that influence implementation outcomes. The overarching aim is to understand and/or explain influences on implementation outcomes, e.g. predicting outcomes or interpreting outcomes	• PARIHS framework • CFIR • Conceptual Model by Greenhalgh *et al.* • Active Implementation

Category	Description	Examples
	retrospectively. The determinant frameworks do not address how change takes place or any causal mechanisms. Many frameworks are multilevel, identifying determinants at different levels, from the individual user or adopter to the organization and beyond. These integrative frameworks recognize that implementation is a multidimensional phenomenon, with multiple interacting influences.	Frameworks • Ecological Framework by Durlak and DuPre • Theoretical Domains Framework • Framework by Grol *et al.*
Classic theories	Theories that originate from fields external to implementation science, e.g. psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation.	• Theory of Diffusion • Various social cognitive and social network or organizational theories
Implementation theories	Theories that have been developed by implementation researchers (from scratch or by adapting existing theories and concepts) to provide understanding and/or explanation of aspects of implementation.	• Implementation Climate • Absorptive Capacity • Organizational Readiness • COM-B system • Normalization Process Theory
Evaluation frameworks	Specify aspects of implementation that could be evaluated to determine implementation success.	• RE-AIM framework • PRECEDE-PROCEED framework • Framework by Proctor *et al.*

Determinant frameworks

Nilsen states that the determinant frameworks account for five types of determinants: characteristics of the implementation object, characteristics of the users/adopters, characteristics of the end users, characteristics of the context, and characteristics of the strategy or other means of facilitating implementation. Frameworks describe 'implementation objects' in terms of research, interventions, guidelines, innovations and evidence (i.e. research-based knowledge in a broad sense). In this literature review we are just presenting examples of innovations and interventions (Table 2), as they are most relevant to the type of intervention the DoH wishes to implement. Determinant frameworks take a systems approach to implementation; they point to multiple levels of influence and acknowledge that there are relationships within and across the different levels. Context is also an integral part of determinant frameworks.

Table 2 Implementation determinants and outcomes in four determinant frameworks

	Characteristics of the implementation object	Characteristics of the users/adopters	Characteristics of the end users	Characteristics of the context	Characteristics of the strategy or other means of facilitating implementation	Outcomes
PARIHS[19]	Characteristics of the evidence	Characteristics of the clinical experience (addressed as an aspect of the evidence element)	Characteristics of the patient experience (addressed as an aspect of the evidence element)	Characteristics of the context (comprising culture, leadership and evaluation)	Characteristics of the facilitation, i.e. the process of enabling or making easier the implementation	Successful implementation of research
Conceptual Model by Greenhalgh *et al.*[20]	Innovation attributes	Aspects of adopters (e.g. psychological antecedents and nature of the adoption decision) and assimilation by organizations	Not addressed	Features of the inner context (organizational antecedents and organizational readiness for innovation) and outer context (e.g. informal interorganizational networks and political directives)	Influences (e.g. opinion leaders, champions and network structure) lying on a continuum from diffusion to dissemination	Successful diffusion, dissemination and implementation of innovations
Ecological Framework by Durlak and DuPre[21]	Characteristics of the innovation	Provider characteristics	Not addressed	Community-level factors (comprising general organizational features, specific organizational practices and processes, and specific staffing considerations)	Features of the prevention support system (comprising training and technical assistance)	Successful implementation of innovations
CFIR[22]	Intervention characteristics	Characteristics of individuals	Patient needs and resources (addressed as an aspect of the outer setting)	Characteristics of the inner setting (e.g. structural characteristics, networks and communications, culture) and outer setting (e.g. cosmopolitanism, external policies and incentives)	Effectiveness of process by which implementation is accomplished (comprising planning, engaging, executing, reflecting and evaluating)	Successful implementation of interventions

2.4 Context

Implementation and context are linked, with the effectiveness of an intervention critically influenced by its context.[23] However, limited information on implementation and contextual factors is reported in primary implementation studies.[23] There are numerous definitions of context. For example, May *et al.* describe it as *'the physical, organisational, institutional, and legislative structures that enable and constrain, and resource and realize, people and procedures'*[24] whereas Damschroder *et al.* describe it more broadly as '*the given, broad environment within which an intervention/technology is implemented'*.[22] Most frameworks are primarily concerned with implementation, with context playing a minor role. Implementation and context are rarely assessed in an integrated way,[23] although selected frameworks have attempted to do so (e.g. the PARIHS[19] and CFIR[22] frameworks). Reviews of these frameworks suggest that their strengths lie in their attention to the interplay of contextual factors.[23] In early 2017, the CICI framework was developed. It provides guidance for assessing setting, context and implementation of complex interventions in a comprehensive manner and for integrating the views of different disciplines (economics, ethics, sociology, law). The CICI framework highlights this breadth and depth of the influence of context from a societal perspective and shows that context can act at one or several different levels (micro, meso and macro), thereby adding flexibility to the assessment of a complex intervention.[23] Depending on the nature of the intervention, the interactions between intervention, implementation and context can occur at a macro (e.g. across a whole health system or country), meso (e.g. organizational level), or micro level (e.g. individual level).

3 Question 1: Methods

This evidence review took place within a six-month time frame. To address the time constraints, the authors initially undertook a scoping exercise to understand the extent of published materials pertaining to implementation frameworks and workforce planning. The scoping exercise was also necessary to refine the search terminology that would be used to conduct the search proper.

3.1 Search strategy

Our search strategy was led by an information specialist (LF). From our scoping review it was apparent that implementation science is an emerging field. For our scoping review we undertook a brief keyword search in MEDLINE using the keywords 'health workforce planning', 'human resources for health' and 'implementation framework', and we repeated this search on Google Scholar. We also searched the journal *Implementation Science* using the terms 'health workforce planning' and 'human resources for health'. In our scoping review we were not able to identify any published literature to suggest that an implementation framework had been used to prospectively support any HWF systems; therefore, examples from other areas would be required in order to answer this question. We undertook a systematic search of the MEDLINE and CINAHL bibliographic databases, using a combination of controlled vocabulary terms and free-text terms. The lack of agreement regarding terminology in implementation science has previously been highlighted[15] and we found this to be the case in relation to the controlled vocabulary of the databases we used. We therefore primarily searched MEDLINE and CINAHL using keywords. As the area of implementation science is relatively new, we decided to restrict the search to studies published from 2006 onwards. This coincided with the first publication of the journal *Implementation Science*. We also undertook a hand search of the specialist implementation

journal *Implementation Science*; this online journal was first published in 2006, and we screened each paper that has been published since its inception (until July 2017). As the database search and hand searching yielded very little relevant material, we supplemented this with forward and backward citation tracking. We undertook forward citation tracking by using the index papers describing the CFIR,[22] the PRECEDE-PROCEED framework,[25] the Theoretical Domains Framework,[26] the PARIHS framework,[19] and the RE-AIM framework.[27] Due to time constraints, we just selected these frameworks, as it appeared from our search findings that these were the frameworks that were most commonly used when implementing interventions. Forward citation tracking was undertaken using Google Scholar. We undertook backward citation tracking of the papers we included in our analysis and systematic reviews that looked at the use of the CFIR,[28] PARIHS[19] and RE-AIM[29] frameworks, as well as the combined use of the CFIR and the Theoretical Domains Framework.[14] Further detail on the search strategy is set out in Appendix 2.

3.2 Inclusion/exclusion criteria

Implicit in Question 1 was that, if an implementation process was to be deemed successful, it must have been actually implemented and evaluated. As our scoping review indicated that there may be very few relevant papers to be found, we loosened the inclusion criteria before we undertook any screening to also include those studies that had been implemented but not evaluated, and to include studies that described a proposed implementation process in detail. Our other inclusion/exclusion criteria included:

- The cross-sectoral (also referred to as multisectoral and intersectoral) criterion required that the intervention must involve at least two sectors, with at least one being a health sector. It was agreed with the DoH that it did not matter what type of sector this was; eligible examples included ministries, public sector health bodies, and private or not-for-profit entities. Studies could also be included if all cross-sectoral partners were under the umbrella of health.
- We defined an implementation framework as '*a graphical or narrative representation of the key factors, concepts, or variables to explain the phenomenon of implementation',* which is the definition used by Moullin *et al.*[12] in their systematic review of implementation frameworks. In relation to the implementation framework, this included either named implementation frameworks or unnamed frameworks developed by the authors for implementing the intervention under study in the paper.
- Only studies that described the implementation of an intervention were included; theoretical studies were excluded.
- All relevant studies were included regardless of study design.
- We were only concerned with retrieving results written in the English language as we did not have either the facility or the resources for translation services.

3.3 Screening

Our initial database searches of MEDLINE and CINAHL yielded 4,749 records. Following the removal of duplicates, all remaining records were imported into EPPI-Reviewer for screening by title and abstract. Screening was undertaken separately by two reviewers (DM and LF). Following on from this, 3,205 records were excluded. Therefore, 103 papers went forward for full-text screening. These were also screened separately by two reviewers (DM and LF), with any discrepancies resolved by discussion or with recourse to the third reviewer (JL). Six papers described the implementation of an intervention by prospectively using a framework and these were included in the review (Figure 1). The remaining

papers were excluded for a number of reasons: the intervention being implemented was not cross-sectoral, the framework was not applied prospectively, there was no indication that a named framework was actually used to implement the intervention, or no intervention was described or implemented. Six papers were included in our analysis:

- One paper described a cross-sectoral intervention which was implemented using a framework that was applied prospectively, and was evaluated.
- Three papers described cross-sectoral interventions which were implemented using a framework that was applied prospectively, but were not evaluated.
- Two papers were protocols describing a proposed implementation process for a cross-sectoral intervention using a framework, but were not implemented or evaluated.

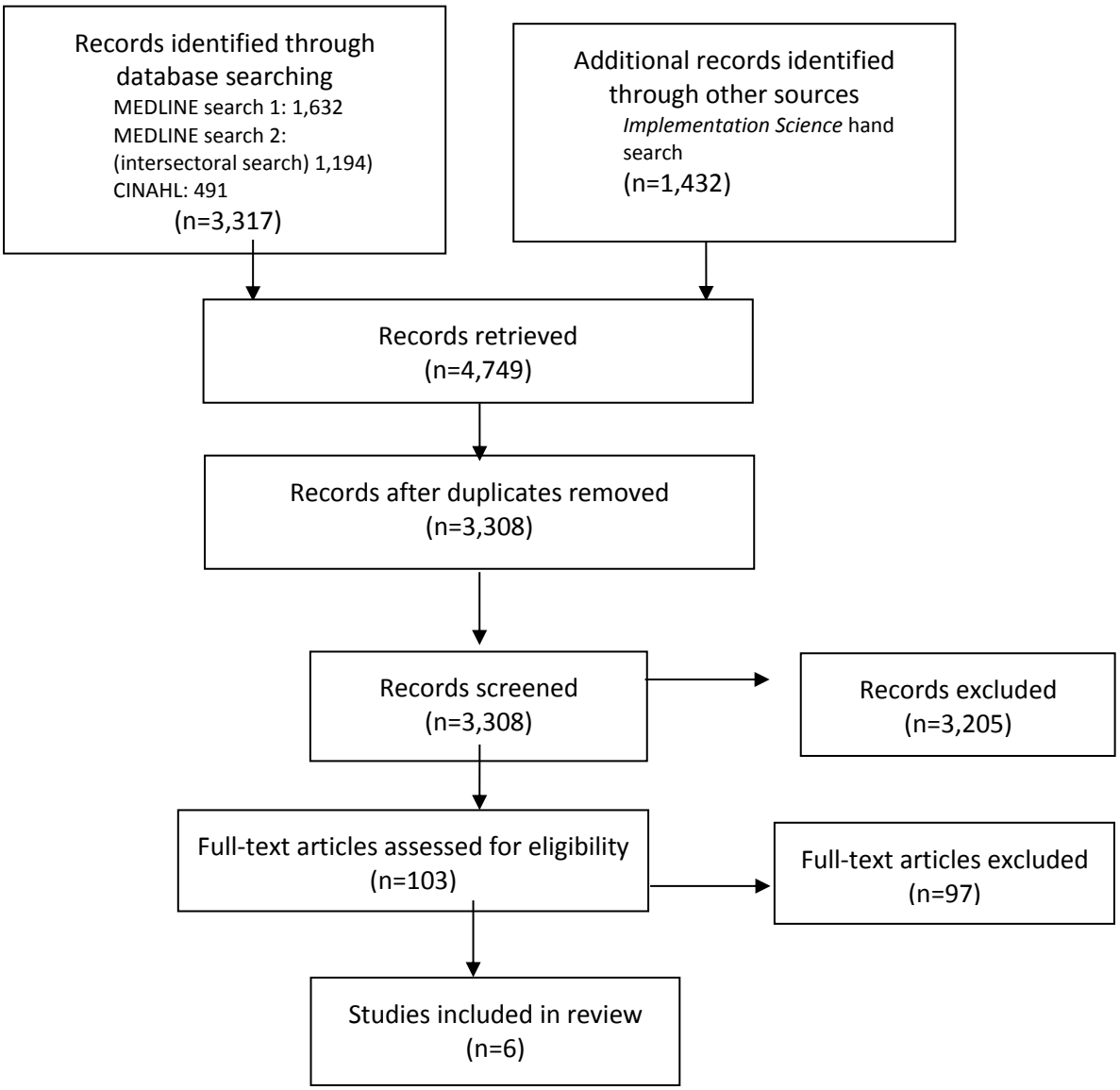

Figure 1 PRISMA flow diagram for Question 1

3.4 Critical appraisal

As part of our protocol for undertaking evidence reviews, we undertake a critical appraisal of included studies. However, given that our search revealed just one paper that described a cross-sectoral intervention that had been implemented using a framework, and five other examples that either had not been fully implemented or evaluated, we could not undertake critical appraisal. In this review we present each of the six included papers as individual case studies. While critical appraisal tools exist for epidemiological case studies, they generally are for use in clinical settings and it would not be appropriate to appraise implementation studies using case study appraisal tools.

3.5 Data extraction and analysis

Our search yielded six relevant papers. The papers differed considerably in terms of the extent of implementation, evaluation, and type of intervention being implemented. We undertook a narrative synthesis of the six studies, using a data extraction table. We were unable to undertake any further data synthesis. Instead, we have presented a summary table of each included paper and we also present each paper as an individual case study using the same headings.

3.6 Limitations of Question 1

Implementation science is an emerging area and this is reflected in our review. We undertook an extensive search of the literature, using different search strategies, yet only found six papers that could be included in this review, with just one paper meeting all criteria. Although our search was extensive, due to time restraints we had to limit our search to studies that were published in the English language. We were also limited in the number of frameworks we could search via forward citation searching; we identified 97 implementation frameworks and undertook forward citation tracking on the five frameworks we encountered most frequently in the literature. In addition, we were unable to critically appraise the included studies.

4 Question 1: Results

We have combined results for questions 1a and 1b. In relation to Question 1b, the frameworks identified do not typically outline barriers/enablers for successful implementation. Instead, some frameworks facilitate the identification of barriers/enablers through their constructs, e.g. CFIR, whereas others facilitate this through the assessment part of the framework, e.g. PRECEDE-PROCEED. For each of the included papers we have listed the enablers identified by the authors and we have applied labels to these using the list of implementation strategy terms published by the Expert Recommendations for Implementing Change (ERIC) study;[30] this study systematically compiled 73 implementation strategies using a wide range of stakeholders with expertise in implementation science and clinical practice.

Six papers were included in our analysis:

- One paper described a cross-sectoral intervention which was implemented using a framework that was applied prospectively, and was evaluated.
- Three papers described cross-sectoral interventions which were implemented using a framework that was applied prospectively, but were not evaluated.
- Two papers were protocols describing a proposed implementation process for a cross-sectoral intervention using a framework, but were not implemented or evaluated.

Just one paper met all our inclusion criteria. The intervention in each paper is described as an individual case study; a summary is presented in this section, and a more detailed description of each intervention and the framework(s) used is provided in Appendix 3. Table 3 provides a brief overview of the six papers. With the exception of the 1997 paper by Howat *et al.*, the included papers were published very recently and relate to either the USA or Canada. There was considerable heterogeneity between the interventions in relation to their complexity and range of cross-sectoral partners. The Live 5-2-1-0 initiative involved sharing the evidence-based Live 5-2-1-0 message and required little high-level cross-sectoral cooperation. In comparison, the Housing First model is a complex programme requiring considerable interaction between multiple individuals, organizations and systems in order for the model to be successful. The frameworks used to implement each intervention varied. Three of the interventions used well-known existing frameworks (CFIR and PRECEDE-PROCEED) without adaption; two of the interventions combined two existing frameworks: one combined the KTA and RE-AIM frameworks and the other combined frameworks by Chaudoir *et al.* and Proctor *et al.* The remaining intervention used the EPIS framework, which was designed by that study's authors for use in public sector settings.

Table 3 Overview of included studies

Author, year	Country	Intervention objective	Cross-sectoral partners	Framework used	Has the intervention been implemented?	Has the intervention been evaluated?
Amed *et al.*,[31] 2016	Canada	The Live 5-2-1-0 initiative works with stakeholders to share (through social marketing) and support (through systems-level change; programmatic, environmental, and policy level) the evidence-based Live 5-2-1-0 message: at least 5 vegetables and fruits, less than 2 hours of screen time, at least 1 hour of physical activity, and zero sugary drinks per day.	Division of Family Practice (health), The City – Parks and Recreation, the school district, local media, local government (mayor and council members), Child and Youth Committee (a non-governmental organization)	An adaptation of RE-AIM[27] and the KTA[32] frameworks, which was named RE-FRAME	Yes	Yes – mixed methods used
Rankin *et al.*,[33] 2016	USA	To study the complexities of rolling out policies that promote immediate postpartum long-acting reversible contraception use.	State health officials, payers, maternal and child health organizations, state health department staff	Consolidated Framework for Implementation Research (CFIR)[22]	Yes	No, and none appears to be planned
Ahmed *et al.*,[34] 2017	Canada	Rehabilitation Living Lab in the Mall aims to transform a shopping complex in Montreal into an inclusive environment optimizing the participation and social inclusion of all people.	Research groups across disciplines (biomedical, clinical, psychosocial, design) and stakeholder groups (merchants, community organizations, researchers, people with a disability)	PRECEDE-PROCEED[35]	Yes	Evaluation is ongoing but not published.

Author, year	Country	Intervention objective	Cross-sectoral partners	Framework used	Has the intervention been implemented?	Has the intervention been evaluated?
Howat *et al.*,[36] 1997	Australia	The Child Pedestrian Injury Prevention Project is a three-year intervention trial aimed at reducing pedestrian injuries in schoolchildren aged 5–9 years. The programme includes variable applications of school-based student, parent, teacher, and community education, as well as environmental interventions.	The primary target groups were 5–9-year-old children, their teachers, and parents. The secondary target groups were school administrators, city officials, legislators, police, road safety advisory committees, and other residents.	PRECEDE-PROCEED[35]	Yes	Paper states evaluation undertaken, but no results are available.
Watson *et al.*,[37] 2014	USA	The Housing First model (HFM) is a complex health intervention designed to serve the chronically homeless. This project seeks to develop and test a scientifically grounded strategy for HFM by modifying a limited HFM implementation strategy known as the Housing First Technical Assistance and Training Program, which lasts between six months and two years.	Housing First requires interaction among multiple individuals (e.g. providers, case managers, landlords), organizations (e.g. government funders, non-profit service providers, property management), and systems (e.g. housing, medical, mental health, substance abuse) in order for the model to be successful.	A combination of two frameworks: the first proposed by Proctor *et al.*[38] and the second by Chaudoir *et al.*[17]	No	No, but a mixed-methods evaluation is proposed.
Aarons *et al.*,[39] 2012	USA	To examine the feasibility and acceptability of an implementation approach, the Dynamic Adaptation Process, in relation to SafeCare, a behavioural and psychosocial evidence-based practice developed to prevent child neglect.	Federal and state governments and community-based organizations, non-governmental organizations (NGOs), other community stakeholders, academic researchers, and funding agencies.	Exploration, preparation, implementation and sustainment (EPIS) framework[2]	No	No, but a mixed-methods evaluation is proposed.

4.1 Summary of each case study

Case study 1: Live 5-2-1-0 initiative

The Live 5-2-1-0 initiative works with stakeholders to share the Live 5-2-1-0 message, which is at least 5 vegetables and fruits, less than 2 hours of screen time, at least 1 hour of physical activity, and zero sugary drinks per day. To implement this intervention, the RE-FRAME framework was used. This framework is an adaptation of the KTA and RE-AIM frameworks. The KTA framework was designed to bridge the gap between knowledge and practice. It is divided into two concepts: knowledge creation and knowledge action. The RE-AIM framework was designed to evaluate public health interventions across five dimensions: Reach, Effectiveness, Adoption, Implementation, Maintenance. The newly developed RE-FRAME framework was selected, as it repositions evaluation from a focus on outcomes to understanding the reach of complex community initiatives and the processes that support them. It also includes the concept of adaptation, which is critical when scaling up an initiative like Live 5-2-1-0. A mixed-methods approach was used to evaluate the framework's effectiveness in supporting the development and maintenance of multisectoral partnerships and the transfer and exchange of knowledge leading to community-wide action that shares and supports Live 5-2-1-0.

While the adapted RE-FRAME framework was appropriate to Live 5-2-1-0, it is debatable whether RE-FRAME, or indeed KTA or RE-AIM, would be useful for implementing a large multisectoral intervention such as a national HWF planning system. In comparison to a national HWF planning system, the Live 5-2-1-0 initiative had a low level of complexity. While elements such as translating research evidence into action and evaluation may play some role in implementing a HWF planning system, neither framework really considers multiple levels or context, both of which need to be considered when implementing such a system.

Case study 2: Implementing policies that promote immediate postpartum long-acting reversible contraception (LARC) use

The Immediate Postpartum LARC Learning Community aims to promote immediate LARC use across states in the United States, and the CFIR was used to aid implementation. The CFIR contains 39 constructs across 5 domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and process of implementation. It provides a practical guide for systematically assessing potential barriers and facilitators in preparation for implementing an innovation. The CFIR is not a prescriptive framework, meaning that it does not prescribe specific steps to take to implement a new innovation. Instead, it provides a broad taxonomy of factors that influence implementation. The CFIR was considered a suitable framework for this intervention, as it is an example of an evidence-based strategy requiring adaptation for different contexts (i.e. inner and outer settings), while the role of individuals in influencing implementation is also acknowledged. It also describes the non-linear process of implementation, which has been observed in states that had already implemented LARC policies.

The LARC intervention was multilevel, complex and multisectoral, and the CFIR was considered an appropriate framework, as it enabled the authors to identify relevant enablers and barriers and it emphasized the importance of context. Based on this example, the CFIR appears to be an appropriate framework for implementing a multilevel and multisectoral intervention, and its use could be considered when implementing a national HWF planning system in Ireland. However, it

should be noted that no evaluation was undertaken; although the authors recommended the use of this framework, this is not based on a thorough evaluation of the implementation process.

Case study 3: Rehabilitation Living Lab in the Mall

Rehabilitation Living Lab in the Mall (RehabMaLL) is a project that aims to transform a shopping complex into an inclusive environment, optimizing the participation and social inclusion of all people. The PRECEDE-PROCEED framework was used; this is designed to help health programme planners, policy-makers and other evaluators to analyse situations and design health programmes efficiently. It guides planners through a process starting with desired outcomes and then works backwards to identify strategies for achieving the objectives and outcomes, and it requires the active participation of its intended audience. This framework was selected for the RehabMaLL intervention, as it relies on the participation of the target population and can be used to iteratively integrate planning and evaluation stages. This framework is data driven and in the PRECEDE phase a number of assessments were undertaken – social and epidemiological assessment; behavioural and environmental assessment; identification of predisposing, enabling and reinforcing factors; and an assessment to determine if the proposed intervention was feasible with available resources and was compatible with mall administrative policies. The planning phases allowed a thorough identification of the target population's need and prioritization of issues to address. The authors state that an evaluation is ongoing, but as this has not yet been published it is not possible to determine how successful the implementation process was.

PRECEDE-PROCEED is a widely used framework, particularly in planning health programmes, and application tools are available online for purchase. It appears to be particularly useful for the planning and evaluation stages of implementation. However, it does not take into account the multilevel aspect of an intervention and context is not considered; consequently, it may not be the most appropriate framework to select when implementing a national HWF planning system.

Case study 4: Child Pedestrian Injury Prevention Project

The Child Pedestrian Injury Prevention Project is a three-year intervention trial that aims to reduce injury to child pedestrians. The programme included variable applications of school-based student, parent, teacher, and community education, as well as environmental interventions. The PRECEDE-PROCEED framework was used to implement this intervention, as it forces the planner to thoroughly assess the factors associated with the problem that is the focus of concern. Using this framework ensured that a critical assessment was undertaken of all the relevant epidemiological, behavioural, and environmental information. For the same reasons outlined in the RehabMaLL case study above, the PRECEDE-PROCEED framework may not be the most suitable framework for implementing a HWF planning system.

Case study 5: Housing First model

The Housing First model (HFM) is an evidence-based practice designed to serve chronically homeless individuals. As it has expanded nationally, HFM has proven difficult to implement for a number of reasons, including a lack of replication guidelines, contextual barriers (e.g. funding requirements, structure of available housing, pervasiveness of education in treatment-first practices among staff), and because the complexity of housing interventions requires significant coordination between multiple levels and systems in order for the model to be successful. The authors propose the use of

frameworks by Chaudoir *et al.* and Proctor *et al.* to implement this intervention. Chaudoir *et al*. describe 62 multilevel (structural-, organizational-, patient-, provider-, and innovation-level) constructs that are hypothesized to cause or predict implementation outcomes, and Proctor *et al.* identify three distinct but interrelated types of outcomes: implementation, service, and client outcomes. In terms of complexity, this intervention is probably the most similar to a national HWF planning system and as such it would be very useful to have the outcomes of this implementation process. There is a comprehensive mixed-methods evaluation planned, but no results had been published by September 2017.

Compared to other named frameworks, there is little guidance on how to use the adapted framework or either of the two original frameworks described above. In addition, the two frameworks do not appear to have been widely used to aid the implementation of interventions and the adapted framework is an original framework. Given the complexity of the HFM, it will be very interesting to analyse the results of the implementation process and the evaluation in order to determine the usefulness of the adapted framework. Until these results are available, it is difficult to recommend the use of the adapted framework.

Case study 6: SafeCare

SafeCare is a behavioural and psychosocial evidence-based practice developed to prevent child neglect. The authors propose using the EPIS framework to implement SafeCare in California, paying particular attention to the issue of adaptation. The EPIS framework was originally designed by this study's main author for use in public sector services serving children and families. The EPIS framework has four phases: exploration, preparation, implementation and sustainment. It works along two planes: an outer context and an inner context plane. The outer plane addresses external factors, such as federal or local government policies, funding mandates, and the organization's relationships to outside organizations. The inner plane addresses elements within the organization's operations, climate, and culture, such as staffing and internal policies.

The EPIS framework was designed by the study's authors to be applied to public sector settings. It considers the role of context and it addresses factors at a number of different levels. It may be worth considering the use of this framework when implementing a multilevel, multisectoral intervention; however, it should be noted that this framework has only been applied in limited settings. Similar to the HFM example, this is a protocol and no results are available to determine if implementation was successful.

4.2 Enablers of implementation

A list of enablers for each intervention is provided with each case study in Appendix 3. A number of enablers were consistently identified in the four case studies that were implemented. These enablers were:

- Conduct educational meetings
- Use advisory boards and workgroups
- Involve patients/consumers to enhance uptake and adherence
- Obtain and use patient/consumer and family feedback
- Identify and prepare champions
- Prepare patients/consumers to be active participants

- Facilitation
- Conduct local needs assessment.

5 Question 1: Discussion

The existing literature indicates that implementation science is an emerging area and this is corroborated by this evidence review. One aim of the review was to identify horizontal cross-sectoral initiatives that had been prospectively implemented using an implementation framework. Just four relevant examples were found, with only one of these having been evaluated, and two protocols were described but not implemented. Three of the examples used well-known frameworks as described – one used the CFIR and two used the PRECEDE-PROCEED framework. Two examples combined existing frameworks – KTA and RE-AIM were combined, as were the frameworks described by Chaudoir *et al.* and Proctor *et al.* One framework – EPIS – was designed by the study's main author. With the exception of the frameworks by Chaudoir *et al.* and Proctor *et al.*, each framework has a dedicated website with guidelines to help with its use, although the PRECEDE-PROCEED guidelines are only available for purchase. As there are so few published examples of implemented, cross-sectoral interventions to take guidance from, the availability of application tools in relation to a given framework may influence its selection when implementing an intervention.

It is recognized that few theories or frameworks have been tested in robust research in healthcare settings and there is no systematic basis for determining which framework predicts behaviour change or which is best suited to underpin implementation research.[40] This makes selecting an implementation framework difficult. In spite of the large number of implementation frameworks that have been developed (at least 97), it appears that frameworks are seldom used to prospectively implement any type of intervention. This is borne out by the existing research. A systematic review identified 26 studies (published up to January 2015) that used the CFIR; just two of these studies used the CFIR prior to implementation and they did not meet the inclusion criteria for this evidence review, as they were not cross-sectoral. A critical synthesis of the use of the PARIHS framework published in 2009 identified 33 papers describing the use of the framework in implementation studies.[10] None of the studies used the PARIHS framework prospectively to design implementation strategies; however, it should be noted that this review only included studies published prior to March 2009.

If there is no one suitable framework to prospectively help implement a national HWF planning system, another option may be to use more than one framework. Multiple frameworks may be used in instances where a single framework cannot comprehensively address study needs. It may sometimes be useful to use multiple frameworks when there are multiple study purposes (e.g. to identify determinants and inform evaluation) or conceptual levels (i.e. multilevel studies).[14] A recent systematic review identified 12 completed studies and protocols that had used both the CFIR and the Theoretical Domains Framework.[14]

One could also consider that there may be suitable frameworks for implementing a cross-sectoral intervention that have not been identified in this review. One pertinent example is the CICI framework, which was first described in 2017. It was developed with complex interventions in mind, and comprises the three dimensions of context, implementation and setting. As it has been

published so recently, its use in implementing an intervention has not yet been published, although it does provide a worked example where it was applied to a complex intervention: the Air Pollution Act, 1987 (Marketing, Sale and Distribution of Fuels) Regulations, 1990. There may also be other suitable frameworks, but undertaking a review of all existing frameworks for their potential usefulness in implementing a HWF planning system was beyond the scope of this review.

The examples presented here identified a number of enablers or success factors that were deemed important for implementing the interventions. Some of the enablers were consistently identified in the four interventions that were implemented. These enablers included the use of an advisory board or workgroup to help oversee the implementation process, and identifying and preparing champions who are committed to the process. The involvement of patients or end users during the implementation process is also considered important; it is useful to invite them to be active participants and to obtain their views and feedback. Educational meetings outlining the benefits of the intervention being implemented are also recommended. Regardless of which framework is selected to implement a national HWF planning system, it may be worthwhile considering these enablers in the implementation plan.

It is also recognized in the literature that implementation of complex, cross-sectoral interventions is challenging, due in part to stakeholders' diversity in respect to their readiness, capacity, and willingness to put in place the system, environmental, and policy changes involved. Coupled with the fact that implementation frameworks are rarely used as a basis for developing new interventions, it is probably not surprising that this review yielded so little relevant information. This review indicates that there are no robust examples of evaluated cross-sectoral interventions that were implemented by prospectively using a framework, and a key challenge remains as to how to select from the numerous frameworks described in the literature. The selected framework(s) will have to account for the multiple levels that a national HWF planning system will cut across, it will need to consider context, and it will have to be cognisant of the fact that implementing a HWF planning system will not necessarily be a linear process.

6 Question 2

The following sections present our methods and findings in relation to Question 2, which sought to describe examples of HWF frameworks that had been used to implement HWF planning systems and to identify if there are barriers or enablers to successful implementation of HWF planning systems.

The delivery of healthcare services highly depends on possessing an appropriate number of skilled health personnel. Effective HWF planning can simply be described as ensuring that the right number and type of health human resources are available to deliver the right services to the right people at the right time.[41] Estimating whether human resources for health will be sufficient to meet the health needs of the population is one of the main purposes of health workforce planning. These estimates are based on both the current stocks of health workers and on the projections of future supply and demand of human resources for health.[42] HWF planning involves multiple stakeholders: education and health sectors; industrial and professional organizations from the professions directly involved and from those who work with those professions; consumers; management and education; and health sector funders. HWF planning is particularly challenging and complex for a number of reasons. The complexity of HWF planning lies mainly in the number of variables which affect the health labour market. Factors such as economic outlook, population growth, health, and ageing create uncertainties that affect the ability to make accurate projections and pose particular challenges in many countries. There are also long lead times associated with training health professionals; taking into account that it can take 3–4 years to train a nurse and 10–12 years for a specialized physician,[43] the minimal time projection should be 12–18 years.[44] The longer the projection time, the greater the likelihood that there will be errors associated with forecasting. This has an important consequence: what might be best evidence and best judgement at a given time might be dramatically wrong at some time in the future as a result of unforeseen changes in the fiscal, policy or clinical environments (the global financial crisis impact being an example).[45]

7 Question 2: Methods

7.1 Search strategy

We initially undertook a scoping review to understand the extent of published materials pertaining to health workforce planning. The scoping exercise was also necessary to refine the search terminology that would be used to conduct the search proper. It was clear from the scoping review that most of the relevant material for this question was located in the grey literature. We employed a stepwise searching process. Firstly, we undertook a search of the agencies listed in Table 4. These agencies were identified through Google searching and emergent searching via information available on each country's Department or Ministry of Health website. We supplemented this with literature from a general Google search; we used the search term 'health workforce planning framework' in a general Google search and then undertook the search again specifically with the same search term and each selected country's name. The countries we selected were Australia, Canada, New Zealand, the UK (England, Wales, Scotland), and the United States, as these are all English-speaking OECD countries.

Table 4 List of websites searched and search terms used to undertake website search

Country	Website title	Website address	Search terms used to undertake website search
International	OECD	www.oecd-ilibrary.org and www.oecd.org	'health workforce planning'
International	EU Joint Action on Health Workforce Planning and Forecasting	http://healthworkforce.eu	All publications checked for relevance
International	World Health Organization (global site) – health workforce section	www.who.int/topics/health_workforce/en/	All publications checked for relevance
International	HRH Global Resource Center	www.hrhresourcecenter.org	'workforce planning framework'
Australia	Department of Health (health workforce section)	www.health.gov.au/internet/main/publishing.nsf/Content/publications-Health%20workforce	All health workforce publications checked for relevance
Australia	Health Workforce Australia (archived since August 2014)	http://pandora.nla.gov.au/pan/133228/20150419-0017/www.hwa.gov.au/index.html	All publications checked for relevance
Canada	Canadian Health Human Resources Network	www.hhr-rhs.ca	'workforce planning'
Canada	Health Canada	www.canada.ca/en/health-canada.html	'workforce planning framework'
New Zealand	Health Workforce New Zealand	http://www.health.govt.nz/our-work/health-workforce	All publications checked for relevance
New Zealand	New Zealand Ministry of Health	www.health.govt.nz	'health workforce'
UK	The King's Fund	www.kingsfund.org.uk	'health workforce planning'
UK (England)	CfWI (archived since 2016)	http://webarchive.nationalarchives.gov.uk/20161007101116/http://www.cfwi.org.uk/	All publications checked for relevance
UK (England)	Department of Health and Social Care	https://www.gov.uk/government/organisations/department-of-health-and-social-care	'workforce framework'
UK (Scotland)	NHS Scotland	www.scot.nhs.uk	'health workforce planning'
UK (Scotland)	2020 Workforce Vision – NHS Scotland	www.workforcevision.scot.nhs.uk	All publications checked for relevance
UK (Wales)	NHS Wales	http://gov.wales/topics/health/nhswales/?lang=en	'health workforce planning'
UK (Wales)	Data Unit Wales	www.dataunitwales.gov.uk/home	'health workforce'
UK (Wales)	Workforce, Education and Development Services	http://www.nwssp.wales.nhs.uk/weds	All health workforce resources checked for relevance
United	Human Resources and	www.hrsa.gov	'workforce planning

Country	Website title	Website address	Search terms used to undertake website search
States	Services Administration		framework'
United States	Health Workforce Technical Assistance Center	www.healthworkforceta.org	All publications checked for relevance
United States	Center for Health Workforce Studies	www.chwsny.org	All publications checked for relevance

Finally, we undertook a systematic database search of MEDLINE and CINAHL, using a combination of controlled vocabulary terms (MeSH) and free-text terms. We restricted this search to papers written in the English language. This search is described in further detail in Appendix 2.

7.2 Inclusion/exclusion criteria

We applied the following inclusion criteria to the retrieved results:

- We only included frameworks that relate to the whole HWF planning process. We excluded models or frameworks that were designed for use during the forecasting/data analysis stage of HWF planning only and did not include the broader process of implementing a HWF planning system. These types of models were described in depth in a previous HRB evidence review that was completed in 2016.[46]
- Retrieved results were assessed as suitable if they were journal articles, reports, papers, websites, etc. that described a framework for implementing a HWF planning system.
- We used the same definition for 'framework' as that used in Question 1 by Moullin *et al.*,[12] which describes a framework as '*a graphical or narrative representation consisting of various descriptive categories, e.g. concepts, constructs or variables, and the relations between them that are presumed to explain the phenomenon of implementation*'.
- We only included examples of HWF planning frameworks that were used or designed for use in OECD or EU countries, as it is recognized that for developing countries there may be issues in relation to HWF planning that are not relevant to OECD/EU countries.[44]
- The HWF frameworks must be applied at either a national or state/provinvial level.
- Included frameworks had to pertain to the whole health system; we excluded frameworks that just dealt with a part of the health system, e.g. frameworks dedicated to just public health or mental health, as the DoH wishes to implement a HWF planning system that will include the Irish health service at a national level.
- We only included HWF frameworks that had adequate information regarding their components and application.
- We only included results that were in the English language.

7.3 Screening

Our initial database searches yielded 504 records. These records were checked for duplicates and then imported into EPPI-Reviewer for screening by title and abstract. Screening was undertaken separately by two reviewers (DM and LF). Following on from this, 474 records were excluded. Therefore, 30 papers went forward for full-text screening. While a number of the retrieved articles provided some useful background reading on HWF planning and we have included definitions cited in two papers, only one of the screened papers described a HWF framework and is included in the review (Figure 2). Our website and Google search identified 47 documents that were then screened

to determine whether they met our inclusion criteria. We included 21 of the 47 screened documents in the review. Following this screening process, we decided to just include the five frameworks that provided the most comprehensive descriptions. We selected five different frameworks for inclusion that met our criteria:

- Two are generic frameworks devised by an international body – the World Health Organization (WHO) Human Resources for Health (HRH) Action Framework and the European Union (EU) Joint Action on European Health Workforce Planning and forecasting framework
- Two are national-level frameworks (England and Canada)
- One is a provincial-level framework (Alberta).

We selected these frameworks for inclusion, as they fulfilled our definition of 'framework' and there was adequate information available. They were also the frameworks with the most comprehensive descriptions. This list is not exhaustive; we are aware that other frameworks exist. However, we are satisfied that their inclusion would not provide any extra insights to this review.

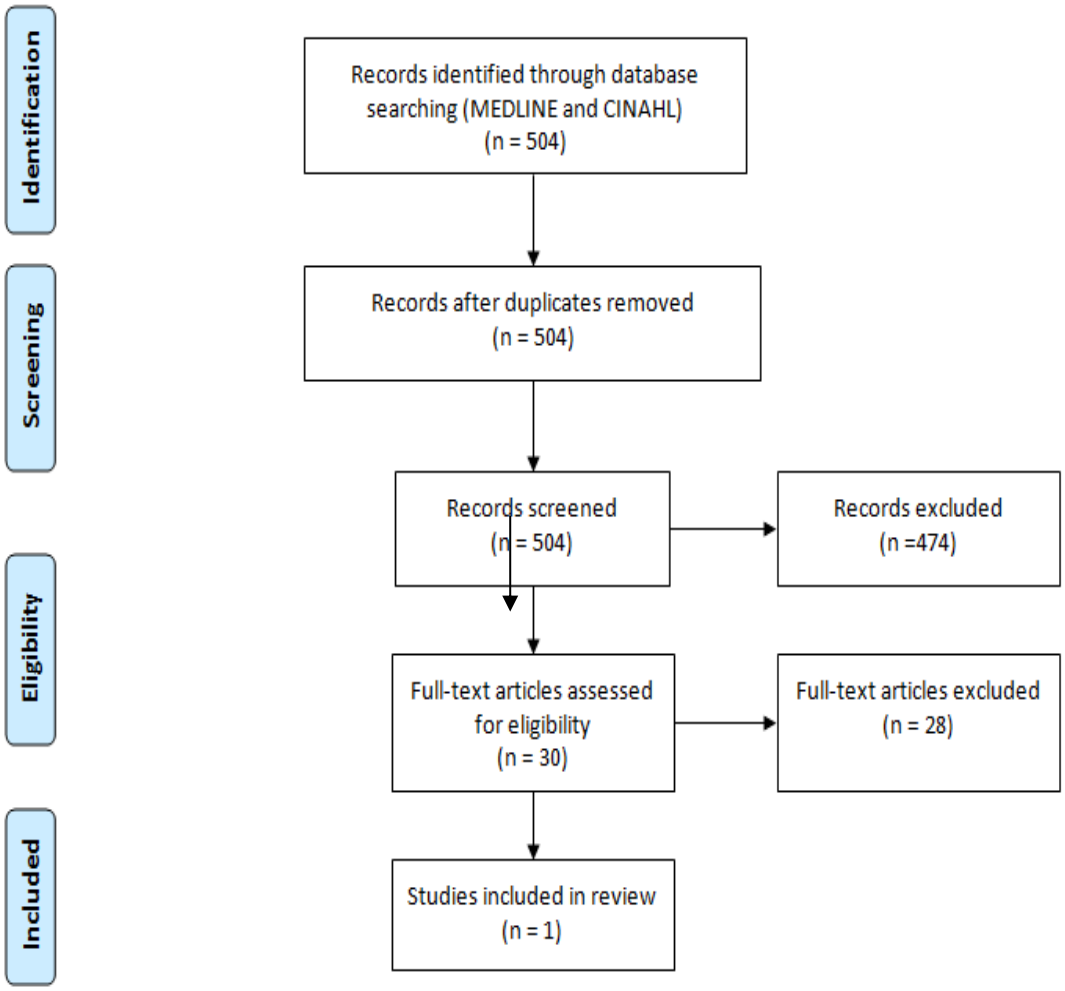

Figure 2 PRISMA flow diagram for Question 2

7.4 Quality appraisal

We did not undertake quality appraisal on Question 2, as the retrieved materials were not research studies.

7.5 Data extraction and analysis

We undertook a narrative synthesis of the selected HWF frameworks. We have presented a summary table (Table 5), which includes a brief synopsis of each framework, and we then present a more detailed description of each of the five frameworks. For each framework, we describe who developed the framework, its main components, what guidance is available, its application to date, and the enablers or critical success factors that support its implementation.

7.6 Limitations of Question 2

We were unable to critically appraise the materials, as they were not research studies; rather, they were descriptions of actions and experience. We limited our search to English-speaking countries and as a result we may have missed relevant HWF frameworks that have been applied in non-English-speaking countries.

8 Question 2: Results

For ease of presentation we have combined questions 2a and 2b. We selected five different frameworks for inclusion that met our criteria:

- Two are generic frameworks devised by an international body – the World Health Organization (WHO)) Human Resources for Health (HRH) Action Framework and the European Union (EU) Joint Action on Health Workforce Planning and Forecasting framework
- Two are national-level frameworks (England and Canada)
- One is a provincial-level framework (Alberta).

We selected these frameworks for inclusion, as they fulfilled our definition of 'framework' and our inclusion criteria. A brief synopsis of the main features of each framework is provided in Table 5 and this is followed by a more in-depth description of each framework. Each of the frameworks has been developed since 2005, and they have all been used to implement HWF planning systems. We have included the WHO framework even though it appears to have only been used in developing countries to date, as it was designed for use in any country and the guidance to its use does not specify that it is for use in developing countries only.

Table 5 Main features of the five included frameworks

Region	Year	Who developed it	Main components	Guidance available	Use in HWF planning	Enablers
EU	2013–2016	European experts; HWF planning systems from seven countries were studied to inform framework. Also used existing literature, EU Joint Action reports and workshops.	Five main elements: goals, data, forecasting model, organization and link to policy. Both process and data elements are included. Other important considerations: stakeholder involvement, political commitment, legislation, current situation analysis, and monitoring and evaluation.	Website, handbook, numerous reports, and toolkit on HWF planning	Yes, on a pilot basis to date in a number of EU countries	• Multiple stakeholders and multisectoral cooperation • Supportive legislation • Availability of appropriate data • Clarity on roles • Monitoring and evaluation • Dedicated HWF planning group
WHO	2005	Representatives of multilateral and bilateral agencies, donors, NGOs, and academics; sponsored by the WHO and USAID.	Six action fields (HR management systems, leadership, partnership, finance, education and policy) and an action cycle illustrating the steps to take to apply the framework (situational analysis, planning, implementation, and monitoring and evaluation)	Website and guidance documents	Yes, in a number of developing countries	• Multisectoral engagement • Government-supported commitment • System-linked alignment • Monitoring and evaluation
England	2013, revised in 2014	CfWI, on behalf of the Department of Health and Social Care.	Five elements: focal question, horizon scanning, scenario generation, workforce modelling, and policy analysis.	Numerous reports. No website since 2016.	Yes, unclear of status since 2016	Not fully addressed, but the CfWI stresses the importance of stakeholder engagement and consideration of policy
Canada	2007	Originally developed in 1997 and later revised by the same researchers for the WHO Collaborating Centre on Health Workforce Planning and Research based in Canada.	Starts with population health needs; works with the current supply of providers, which is maintained by new providers, flow of services, financial resources and models of service delivery. This is influenced by deployment and utilization of resources. All this takes account of contextual factors.	Dedicated website	Used in some Canadian provinces and in Brazil and Jamaica	• Stakeholder engagement • Leadership • Clarity on roles • Availability of appropriate data • Monitoring and evaluation • Accountability
Alberta	2003, revised in 2008	Developed by Alberta Health and Wellness after a consultative process with multipartner involvement.	Four phases: set organizational strategic direction; conduct workforce analysis; implement human resources plan; monitor, evaluate and revise.	One report describing framework	Used in Alberta	• Stakeholder involvement • Dedicated HWF planning team • Continuous feedback • Accountability

8.1 Framework 1: EU Framework

The EU undertook a Joint Action on Health Workforce Planning and Forecasting from 2014 to 2016, which aimed to improve HWF planning and forecasting capacity in the EU. While the Joint Action literature does not explicitly state that it has developed a framework to aid with implementing a HWF planning system, it does contain a number of diagrams or models that fit our definition of 'framework' and we have described them as such. The Joint Action authors studied the HWF planning systems in the seven countries – Belgium, Denmark, England, Finland, Norway, Spain and the Netherlands – that they felt would provide interesting and relevant examples of good practice. The selected countries all used forecasting models that are both demand- and supply-based, used a projections tool, and had relevant experts available to provide information in relation to HWF planning in their country. This analysis formed the basis of the Joint Action *Handbook on Health Workforce Planning Methodologies across EU Countries*,[44] which was one of the main outputs of the Joint Action. Other outputs included a detailed website, reports, workshops and toolkits. The Joint Action team developed a flow chart[44, 47] (Figure 3) that points out some essential steps and elements that impact HWF planning data management. It defines the five key elements of a HWF planning system – goals, data, forecasting model, organization and link to policy – and these are represented by the blue boxes. For each element, the Handbook provides links to examples of good practice in the seven selected countries; it also provides information on the findings relating to each element and the lessons learned. The numbers 1–6 represent the main barriers encountered when implementing HWF planning systems.[48] These barriers are linked to planning processes and include:

1. Lack of resources (e.g. financial, human, technical resources)
2. No tracking of shortages and surplus of HWF (e.g. role of HWF mobility)
3. Complicated, unclear structure of HWF planning
4. Unclear roles and responsibilities of stakeholders involved in HWF planning
5. No consideration of supply and demand sides in HWF planning
6. Information and data flow failures.

The Handbook also presents a specific pathway for implementing the framework, which has seven steps: knowing about the current HWF inventory, assessing the current HWF situation, organizing the stakeholder involvement, making future HWF forecasts, setting the goals, linking plans with policy actions, and planning capacity evaluation. For each of these steps there are links to guidelines and suggestions, which are based on the seven countries' experiences.

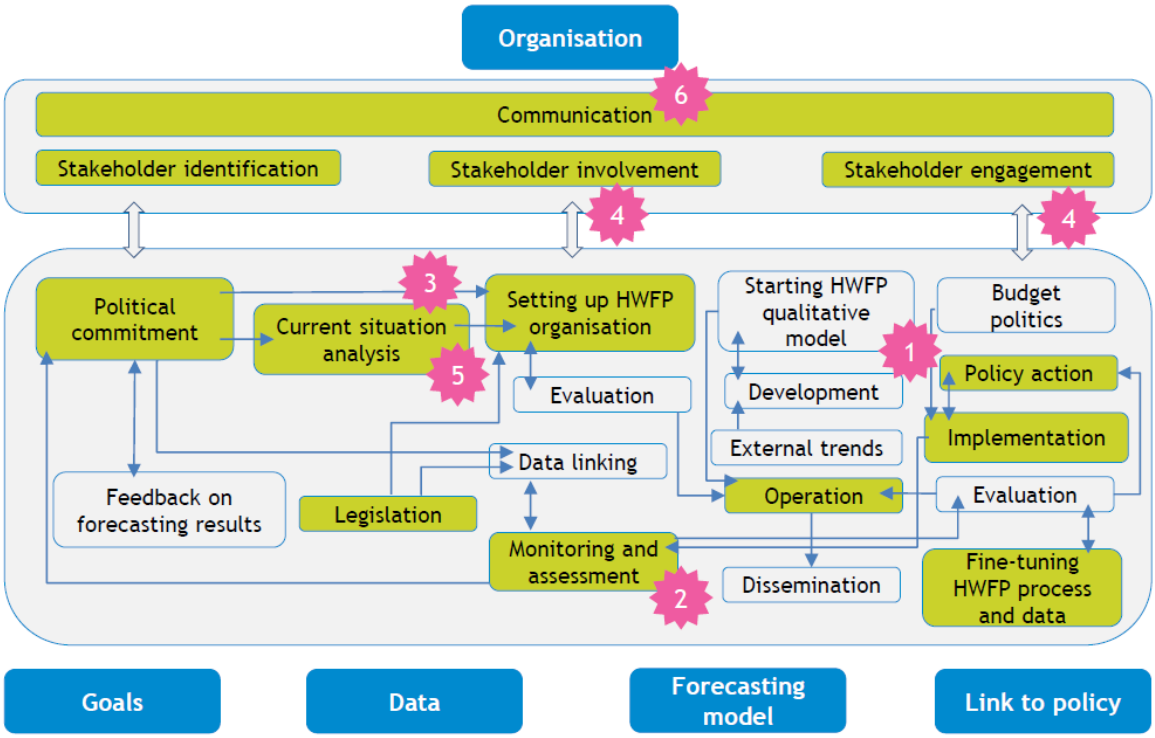

Figure 3 EU Joint Action HWF framework

8.1.1 Main components of framework

The EU Joint Action framework has identified five key elements of a HWF planning system. Their description of each of the elements is outlined below.

Goals

At a minimum, the goals should be SMART (specific, measurable, achievable, realistic and time-related) in relation to the targeted quantities for any health profession and the year in which these set quantities are to be accomplished. The Joint Action claims that a goal is more achievable if it is accepted and agreed by the stakeholders involved in the planning process. The goal has to be realistic from the perspective of both the government and other stakeholders. For governments, the financial implications of the set goal may be a limiting factor. Due to the prolonged training period of many health professions and the time required to overcome legislative hurdles, they state that it may also be prudent to dampen short-term expectations.[44]

Forecasting model

The Joint Action identifies that defining and implementing the forecasting model is a core part of the HWF planning process. The forecasting model and its results (projections' and scenarios' construction) are essential to support decisions and actions of the planners. Defining the model is complex and the following aspects should be considered: variables on supply and demand, the algorithm to join them, the method to be used for the definition of the estimates, the assumptions to start from, the number of scenarios, etc. It is essential to clearly outline the assumptions behind the planning tools, maintain a flexible approach, and adapt the planning strategy as needed. As HWF

planning is not an exact science, projections should be viewed as an iterative process. Projections can identify current and emerging trends to which planners need to respond. Various quantitative methods may be used in the countries to forecast the future supply and demand, including classical time series analysis, stochastic time series analysis, and multiple regression analysis. Qualitative methods – including Delphi, brainstorming, market surveys, and elicitation methods – are also used to set some future scenarios and to feed the forecasting model. The result of the forecasting exercise is one or more scenarios showing the future situation. The HWF forecasting model may also produce different scenarios based on different pattern values (i.e. university training capacity, attrition rates, retirement patterns, migration flows). The projection period might be different depending on the parameters, professions considered, goals defined, etc. The frequency of updating the forecasting exercise is important in order to take into consideration changing circumstances, new data, and new policies and programmes. The majority of EU member state Joint Action participants update the forecasting exercise every two or three years.[44]

Data

The EU Joint Action states that the data used in the forecasting model are usually derived from a number of sources whose purpose may not necessarily be to specifically collect HWF planning data. The principal sources of data include the registers that health professionals are obliged to be enrolled in so they can practise their profession, and payroll registers. The data used in the forecasting model should be updated regularly to ensure a realistic picture of the current HWF situation regarding demand and supply. The HWF planning tool considers the entire work life cycle (supply side). Data collected on current stock of HWF include: number of active professionals, number of full-time equivalents, types of providers, where professionals work, professionals'skills, and the services professionals provide. The HWF planning tool uses demand data which allows for estimating healthcare utilization and population needs, in addition to size and structure (age and sex) of the population.

The evidence from the pilot studies showed that obtaining a complete picture of the current situation is most easily achieved by having workforce data collected at a personal level in a single dedicated database; however, implementation of a professional register requires time and resources. When necessary data are not available and it is not feasible to collect them during the planning time frame, the missing information may be estimated by means of detailed assumptions based on already existing data.

Link to policy actions

The EU Joint Action advises that to achieve the HWF goals, it is important to use the right levers. In relation to education and training, a number of levers are used and include defining the *numerus clausus* in university, limiting the number of places at the postgraduate level, or limiting entrance to the labour market. In some cases, future working conditions are taken into account to define the correct quantity of professionals. They report that from an organizational point of view, it is also important to define the responsibilities relating to these levers. It is crucial that monitoring is undertaken to ensure that desired results and goals are achieved. The evaluation of a planning strategy and system can take place at different stages of the HWF planning process.[44]

Organization

The EU Joint Action states that due to its complexity, a HWF planning system requires organization at all phases. Therefore, it is important that the roles and responsibilities of the people involved in the organization are clearly defined and the widest participation throughout the process is guaranteed. The organization is strongly affected by regulations, the involved actors, and the approach to be followed (top down/bottom up). HWF planning may be managed at a central level for the whole country, or may be decentralized at a local level. In the seven countries reviewed by the Joint Action, decisions are made at the central level where a number of organizations are involved, with important roles for the ministries of health and education. In most cases, the responsibility for taking HWF planning decisions lies with a single body, e.g. the Minister. Decisions are taken following a process which includes the input of stakeholders, including healthcare providers (public and private), healthcare trainers, healthcare funders, healthcare workforce professional bodies, and healthcare users.[44]

The EU Joint Action authors also highlight a number of other important considerations when setting up a HWF planning system:[44]

- **Communication** is a crucial aspect in the HWF process. It is important to be able to communicate the objectives of the process to facilitate the involvement of stakeholders and clarify their contribution. In the countries analysed, most foresee the publication of an Internet report, accessible to everyone and containing the goals and the output of the process in a very detailed form.
- **Stakeholder involvement** at all stages of the process is considered key to successful planning. Their role is usually advisory. They try to direct and influence the decision-maker towards the most correct choices and to reach consensus. They often contribute to the collection of useful data and help in its correct interpretation. Stakeholders are involved throughout the process as steering members, and in committees dedicated to HWF planning. They often include representatives of local entities (regions, local providers) and education and professional bodies. Patients associations or representatives of commercial entities, e.g. drug and medical devices producers, are generally not involved.
- **Political commitment** is required to provide the authority to intervene and implement actions in order to ensure high-quality, timely and accessible services for the population.
- **Current situation analysis** includes data management processes, HWF data collection, analysis of the current HWF situation and calculations on imbalances. This is linked to the daily operation of HWF planning systems and the monitoring and assessment box, which ideally performs a continuous evaluation of existing systems.
- **The establishment of a national HWF planning committee**, with clear decision-making levels and roles, is recommended; this would require capacity building and multidisciplinary expertise in health management, health policy, health financing, statistics, epidemiology, sociology, data analysis, and communication, as well as HR information system managers, technical officers/computer operators, administrative support personnel, etc.
- **Investment** in HWF planning resources (financial, human, infrastructural, technical, skills-related) and annual/biannual revision.
- **Evaluating** the HWF process is important. Regular evaluation, revision and fine tuning are needed in order to further modify and develop HWF planning. The Joint Action has provided a toolkit which provides tools that may be useful during the evaluation process.

8.1.2 Use of framework

It is unclear what countries are currently using theEU Joint Action framework or guidance with respect to their HWF planning systems. As part of the Joint Action project, Italy and Portugal each undertook a pilot study, whereas a feasibility study was undertaken by Germany and by Moldova and Romania in partnership.[49] The aim ofpilot and feasibility projects this projects was to determine if the knowledge produced by the Joint Action was useful in the implementation of aspects of the four HWF systems, in particular the *Handbook on Health Workforce Planning Methodologies across EU Countries*[44] and the *Report on Health Workforce Planning Data*.[48] Overall, the authors concluded that the knowledge and tools provided by the Joint Action were useful in implementation.[49] The knowledge generated had a significant impact in relation to raising awareness, initiating discussion on HWF planning, underlining the importance of planning, and fostering dialogue between stakeholders from the policy and technical levels. The high involvement of stakeholders resulted in knowledge exchange, increasing commitment, sharing of common goals and clarifying details of methodological steps in HWF planning.

Following the pilot studies, the Joint Action delivered an addendum to the Handbook to incorporate some of the learning from the pilot studies.[50] In relation to the five key elements of a planning system, the following conclusions were made:

- Goals: Setting the goals at the national level is difficult, as it forces a consensus on long-term targets. From a local perspective or from a professional body perspective, in order to reach long-term targets, it is necessary to know the goals and strategies of the other stakeholders. It is important to have a vision and a strategy, including both a local and international perspective. To ensure collaboration of stakeholders, a basic approach should be adopted and then scaled up with a more ambitious vision.
- Forecasting: This is feasible at different levels of complexity, using basic indicators or more sophisticated mathematical tools. Information gathered through qualitative methods enhances the efficacy of the model, and qualitative data should be used in the mathematical tool. It is important to decide the geographical 'magnitude' of the forecasting: some dimensions are better forecasted at a local level (e.g. population needs), while others are better forecasted at a national (inflows from education) or international (mobility flows) level. It is also important to invest in the development of a comprehensive and intelligible forecasting model that is accessible to a broader panel of stakeholders.
- Data: Assessing the current situation is most easily achieved by having HWF data collected at a personal level in a single dedicated database; however, implementation of such a register requires time and resources. If data are not available and it is not feasible to collect them during the planning time frame, the missing information may be estimated by means of detailed assumptions based on already existing data. Useful data for assessing the current stock are the type of profession (and specialization), status of activity, and year of birth, while the full-time equivalent count and data on mobility flows remain challenges.
- Link to policy action: Strengthening the link between education and HWF planning helps to ensure a robust HWF planning system. Implementing complementary policy actions (retention, retirement, flexibility, and financial mechanisms) to solve current or foreseen challenges of the labour market is also recommended. These strategies should be developed in the more general context of human resource management.
- Organization: The pilot studies also highlight the need to periodically check the stakeholders' analysis, establish a step-by-step action plan, establish a small management team to lead the

HWF plan, assign a limited time frame in which to achieve concrete results, and foster discussion among experts and learn from best practices.

These pilot projects also concluded that the minimum data set needs to be reviewed further and simplified. The pilot projects demonstrated the importance of having an inventory of the current stock and reported challenges in assessing the gaps between supply and demand. The Joint Action reports that improvements could be made by taking account of different perspectives (local and global), different points of view (professional bodies, citizens) and different approaches (more advanced and innovative solutions). It is proposed that the pilot projects in Italy and Portugal will continue to be implemented.[47]

As part of the Joint Action, a toolkit was developed to help countries implement or improve their HWF planning systems. The toolkit consists of 10 tools that aim to help the user: measure the maturity level of HWF planning; measure the information and coordination flow; provide an overview of the protocol for information flow and communication management; measure the optimal skill list of the HWF planning committee; measure and evaluate stakeholder coverage; provide an overview of the HWF planning training modules; measure data management and handling; measure the optimal skill set of data specialists; measure data improvements; and provide an overview of the qualitative methods in HWF planning.

8.1.3 Enablers/critical success factors

In order to assess barriers and critical points in HWF planning, the Joint Action team administered a brief questionnaire survey and 12 country responses were received: Belgium, Finland, Germany, Greece, Hungary, Iceland, Italy, Poland, Portugal, Slovakia, the Netherlands, and Spain.[48] The survey concerned both the process of HWF planning (data collection, data reporting, data management, data flows) and the required data (data sources, datasets, data collection methodology). The strengths reported by member states included:

- Multiple stakeholders
- Data warehouses
- Straightforward implementation
- Supportive legislation
- Adequate amount of data that is developed continuously.

The weaknesses or barriers experienced by member states included:

- No use of qualitative data and no complementation of quantitative data with qualitative data
- Fragmented regions
- Lack of comprehensive and regularly updated data
- Widespread aggregation of data
- Significant amount of suitable data available but not used for HWF planning
- Lack of planning capacity, insufficient skills
- Lack of precise mobility indicators and data.

The most critical success factor in the majority of respondent countries is the high-level involvement and collaboration of multiple stakeholders and multisectoral cooperation. Legislation can either

support or limit HWF planning; some member states emphasized the importance of codified laws on HWF planning and data collection. They also highlighted the strong link between policy and implementation and how this can be restricted by slow and bureaucratic processes. Countries with territorial fragmentation may also struggle with unclear HWF planning structures. Lack of planning capacity and resources was also identified as a barrier. In relation to data, integrated, interlinked data sources and data warehouses were identified as a strength, as well as having an adequate amount of existing data and data collections that are continuously developed. However, weaknesses included the fact that a significant amount of data are not used for HWF planning and may lack comprehensiveness, coherence and consistency. The lack of precise mobility indicators and gaps in the use of mobility data were stressed by all 12 countries as one of the most challenging areas. Finally, countries with more systematic HWF planning systems reported more strengths. These countries reported high political commitment and tended to implement directives and policies quite efficiently. They had broad datasets and did not suffer from a lack of data. For these countries, their main problems related to the refinement of HWF planning data.

Based on the experiences of the 12 member states, a list was compiled of the essential elements of a systematic, advanced, and comprehensive HWF planning system:[48]

1. Extended attention to and awareness of HWF planning at the policy/political level
2. Setting up clear and explicit goals and commitment to the goals
3. Incorporating experiences and traditions with a long-standing presence in the policy agenda
4. A dedicated group with high-level stakeholder involvement and commitment to HWF planning
5. A proper and adequate communication flow
6. Support of online platforms and an information-technology solution or a health information system
7. Clarity of the current country situation
8. Excellent data coverage and quantitative models
9. Easy data source linking
10. Mostly individual, but anonymous, datasets
11. Implementation linked to policy actions
12. Evaluation and maintenance of established and sustainable systems
13. Human, technical and financial resources ensured.

Each country was also asked how frequently they faced each of nine process barriers in relation to HWF planning on a scale of 0–4 (Table 6). The most fundamental barriers were lack of resources, no tracking of shortages and surpluses of the HWF, and complicated HWF planning.

Table 6 Barriers in relation to the HWF planning process identified by EU countries

Rank	Barriers in relation to the HWF process	Mean score (out of 4)
1	Lack of resources (e.g. financial, HR)	3.3
2	No tracking of shortages and surpluses of the HWF (e.g. role of HWF mobility)	3.2
3	Complicated or unstructured HWF planning	3.0
4	No consideration of the supply and demand sides in HWF planning	2.5
5	Unclear roles of actors and shared responsibilities	2.6
6	Information flow failures	2.5

7	Lack of collaboration at EU/international level	2.3
8	Low level of stakeholder engagement	2.0
9	National legislation and regulation difficulties	1.8

In relation to HWF planning data, 11 barriers were identified and were ranked by the participating countries (Table 7). The most significant barrier cited by the countries was the unavailability of data.

Table 7 Barriers in relation to HWF planning data identified by EU countries

Rank	Barriers in relation to the HWF process	Mean score (out of 4)
1	Non-available data (e.g. full-time equivalent or headcount)	3.2
2	Lack/misuse of models/methods/data	2.9
3	No good-quality data (validity, reliability)	2.9
4	No use of qualitative data	2.9
5	No complementation of quantitative data with qualitative data	2.9
6	No data source linking	2.8
7	No exact data, but estimates/sample data	2.7
8	No accessible data (privacy)	2.4
9	No up-to-date data (timeliness)	2.3
10	No clear definitions for key indicators	1.8
11	No clear categories (e.g. for specializations)	1.8

8.2 Framework 2: World Health Organization Human Resources for Health (HRH) Action Framework

The WHO has adopted the Human Resources for Health (HRH) Action Framework, which was developed in 2005 by representatives of multilateral and bilateral agencies, donors, partner countries, NGOs, and the academic community who came together at a consultation sponsored by the WHO and USAID.[51] Their goal was to agree on a simple but comprehensive technical framework to assist governments and planners to develop and implement strategies to achieve an effective and sustainable HWF. Following the initial meeting in Washington D.C, a steering group was formed and was charged with identifying tools and resources to support the implementation of the framework and to create a website for easy access for all members of the public health community (www.capacityproject.org/framework).

8.2.1 Main components of framework

The WHO framework (Figure 4) includes six action fields (human resources management systems, leadership, partnership, finance, education and policy) and an action cycle which illustrates the steps/phases to take in applying the framework (situational analysis, planning, implementation, and monitoring and evaluation).[52] HWF management systems are at the centre of the framework due to their importance in integrating all the other components. More detail on the six action fields is presented in Table 8.

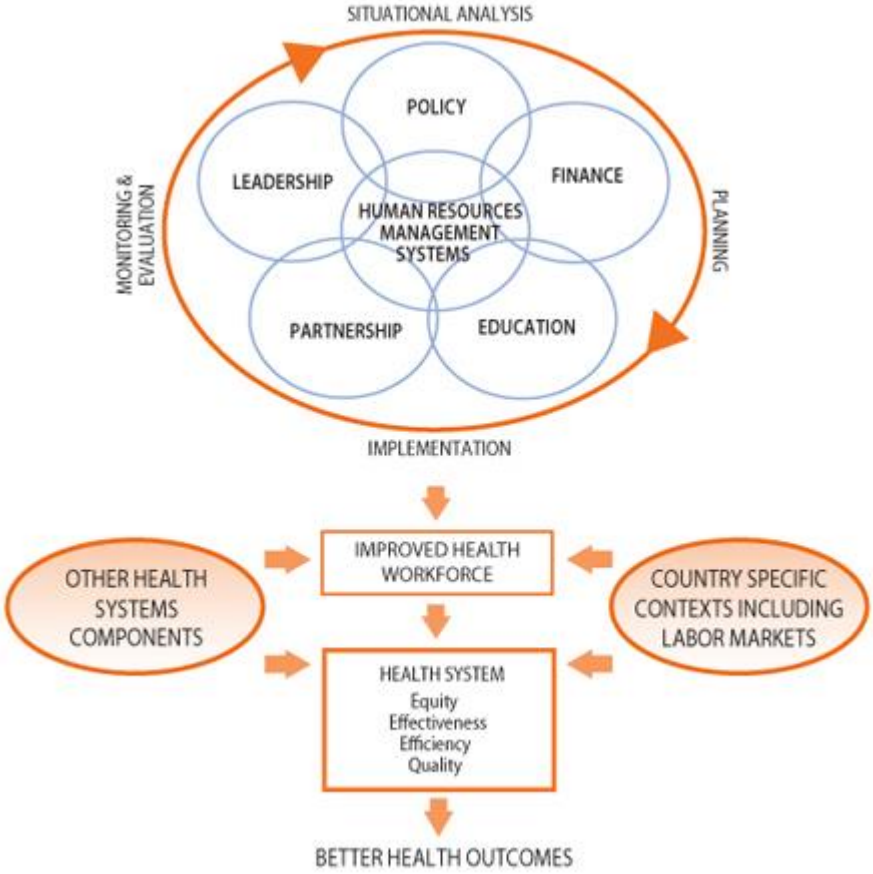

Figure 4 WHO Human Resources for Health (HRH) Action Framework[53]

Table 8 Six action fields: Definitions, areas of intervention and indicators

Field	Definition	Areas of intervention	Indicators
Human resources management systems	The integrated use of data, policy and practice to plan for necessary staff, recruit, hire, deploy and develop health workers.	• Personnel systems: HWF planning, recruitment, hiring, and deployment • Work environment and conditions: employee relations, workplace safety, job satisfaction, and career development • HR information system: integration of data sources to ensure timely availability of accurate data required for planning, training, appraising, and supporting the workforce • Performance management: performance appraisal, supervision, and productivity.	• HR management units in place and strategically located at national and local levels • HR information system in place and used for HWF planning at all levels • Performance management system in place.
Leadership	Capacity to provide direction, align people, mobilize resources and reach goals.	• Capacity for leadership and management at all levels • Capacity to lead multisector and sector-wide collaboration • Strengthening professional associations to provide leadership among their constituencies.	• Evidence of high-level advocacy to promote HWF plan implementation • Leadership development programme for managers at all levels • Stakeholder involvement in policy and decision-making.
Partnership	Formal and informal linkages aligning stakeholders to maximize resources.	• Mechanisms and processes for multi-stakeholder cooperation • Public–private sector agreements • Community involvement in care, treatment, and governance of health services.	• Mechanisms in place for coordination • Agreements in place between Ministry of Health and other health providers • Mechanisms in place to involve communities in health service.
Finance	Obtaining, allocating, and disbursing adequate funding for human resources.	• Setting levels of salaries and allowances • Budgeting and projections for HWF intervention • Resource requirements, e.g. salaries, education, and incentive packages • Increasing fiscal space and mobilizing financial resources • Data on HWF expenditures (e.g. national health accounts).	• Salaries and allowances competitive in local labour market • Salaries and allowances equitable between cadres of workers • National health accounts routinely collecting data on HWF expenditures.
Education	Production and maintenance of a skilled workforce.	• Pre-service education tied to health needs • In-service training • Capacity of training institutions • Training of community health workers and non-formal care providers.	• Ratio of graduates of pre-service training programmes to projected demand by type of health worker • Attrition of students in pre-service training programess • Pre-service curricula updated periodically • In-service training coordination and evaluation mechanisms • Student/teacher ratios by pre-service institutions and cadres.
Policy	Legislation, guidelines and regulations for conditions of employment, work standards, and HWF development.	• Professional standards, licensing, and accreditation • Authorized scopes of practice for health cadres • Political, social, and financial decisions that impact HWF • Employment law and rules for civil service and other employers.	• HWF policies in place • Appropriate scopes of practice defined for all cadres.

Applying the action cycle

As well as the six action fields, there is an action cycle consisting of four phases: situational analysis, planning, implementation, and monitoring and evaluation (Table 9). Before starting, it is important to gain agreement at the highest level of decision-makers; this will help ensure the collaboration of stakeholders and a commitment to achieving goals. It is also important to identify key stakeholders and members of a leadership group to support the process of implementing HWF planning.

Table 9 Action cycle: Objectives and desired outcomes

Phase	Objectives	Desired outcomes
Situational analysis: Gather all data about staffing shortages and health priorities and project these over the next 5–10 years. Inputs from key stakeholders and a review of existing HR documents, strategies, and reports will provide important information.	• Conduct a stakeholder meeting • Review existing HR documents, strategies and reports • Gather information from focus groups and interviews with key informants.	• A list of key stakeholders and members of the leadership group • HWF situational report • Data on the quantity and composition of the existing workforce and gaps identified • Information on influence of country context (e.g. labour market, environment).
Planning: Develop a set of recommendations, based on the situational analysis, which have been costed and vetted with the leadership group and will form the basis of the implementation plan.	• Develop a set of short- and long-term recommendations • Calculate the cost to implement the recommendations • Review the recommendations with the leadership group.	• HWF planning policy and plan • Short- and long-term recommendations developed • Alignment of key stakeholders around the recommendations, with priority actions identified • Costs calculated for implementing recommendations.
Implementation: Identify a small number of priorities at the beginning and ensure that leadership support, funding, and time exist to address them. Working groups or individuals should take responsibility for specific recommendations. It may be helpful to write terms of reference or scopes of work. Progress should be monitored by the leadership group.	• Develop an implementation plan • Enlist the support of the leadership group to secure funding for implementation • Clarify roles and responsibilities and build in regular meetings to provide ongoing support • Establish a budget and mechanisms for distribution of the funding.	• A detailed implementation plan • Commitment of the leadership group to support and monitor progress • Adequate funding and resources procured.
Monitoring and evaluation: Establish a routine monitoring process that will provide information on the progress being made on the key elements of the HWF strategy. Monitor the critical success factors. The monitoring and evaluation plan should include process, outputs, and outcome indicators.	• Identify stakeholders to finalize indicators for monitoring and evaluation • Identify indicators and gain agreement from leadership group on their definitions • Identify the data sources needed to track progress • Clarify roles and responsibilities of individuals for monitoring the plan.	• A clear, realistic monitoring and evaluation plan • Commitment of individuals to collect data and measure for results • A plan and timetable to communicate results of monitoring and evaluation.

8.2.2 Use of framework

The website and guidance document state that the framework has been used in many countries and cite Uganda, Kenya, Peru and Vietnam as examples, as well as the global National Tuberculosis Programme. It does not explicitly state that this framework was designed for developing countries; however, we found no documented evidence of its use in OECD or EU member countries. A guidance document was published in 2009 based on practical experience in using the framework since it was developed in 2005.[53]

Other WHO documents on HWF planning have identified enablers to facilitate HWF planning. In 2016, the WHO *Global strategy on human resources for health: Workforce 2030*[54] set out policy options for countries to improve their HWF planning. These include:

- Establishing a HWF unit or department reporting to a senior level within the Ministry of Health
- Strengthening HWF information systems for the effective collection, reporting and analysis of reliable HWF data, such as national HWF registries and HWF accounts
- Monitoring progress on policy implementation and planning
- Promoting multisectoral collaboration to generate the required support from ministries of finance, education and labour that is facilitated by the health sector.

Following on from the WHO Global Strategy, the WHO Regional Office for Europe has developed a framework for action to accelerate progress towards achieving the population health objectives of Health 2020[55] and longer-term health goals by sustaining a transformed and effective health workforce within strengthened health systems. The WHO announced that it is going to publish a toolkit to support EUmember states in the implementation of the WHO European Region framework for action. The draft version of the toolkit was presented during the Fourth Global Forum on Human Resources for Health in Dublin in November 2017.[56]

8.2.3 Enablers/critical success factors

In the WHO framework guidance document the authors note that HWF strategic plans are not always implemented in a systematic way that will achieve the intended outcomes. Often the reason cited for this failure is lack of funding, but even with adequate funding, many plans will fail to achieve the hoped-for results because they are not grounded in a comprehensive framework, which highlights the need for a framework to underpin HWF planning. Implementation can also fail if it lacks multisector leadership and the long-term support of governments. Other challenges to the implementation of HWF planning systems include unrealistic time frames, limited national HWF capacity, and interventions that are not grounded in sustainable management systems and policy. A number of content- and process-related factors have been deemed critical to the successful application of the WHO framework.[53]

Content-related factors

- **Results-focused** HWF strategies aimed at achieving measurable improvements
- **System-linked alignment** so that HWF strategies are harmonized with relevant components of the health system (e.g. monitoring and evaluation, supply chain, finance)
- **Knowledge-based decision-making,** which reflects the best available documented HWF experience
- **Learning-oriented perspectives:** monitoring and evaluation can identify lessons learned and best practices to share in-country and globally

- **Innovative solutions:** openness to exploring new solutions to overcome chronic HWF issues
- **Comprehensive and integrated approaches:** HWF strategies are informed by, interact with and cut across the health sector as a whole using a holistic approach.

Process-related factors

- **Country-led Initiatives** to improve the HWF are carried forward by the public sector in the country, rather than by external partners
- **Government-supported** commitment to support actions that contribute to a sustainable HWF
- **Multisectoral engagement** by all sectors relevant to building the HWF (e.g. finance, education, NGOs, patient groups, professional associations, etc.)
- **Multi-stakeholder inclusion** of interest groups relevant to particular actions (e.g. NGOs, patient groups, professional associations, donor coordinating committees, etc.)
- **Gender differences** are accounted for in analysis and development of HWF strategies.

The the WHO Regional Office for Europe identified the following enablers in relation to HWF planning:[55]

- Strong national leadership
- Evidence base and labour market analysis
- Strategic approach to managing change
- Political commitment
- An inclusive, multisectoral and multi-stakeholder approach
- Collaboration at the subregional, regional and international levels.

8.3 Framework 3: England

The CfWI was established in 2010 and was contracted by the Department of Health and Social Care in England to provide workforce planning advice across all levels of the health system. In 2013, the CfWI developed a HWF planning approach that is referred to as the Robust Workforce Planning framework.[57] Since then, the CfWI has published a number of technical papers reviewing and recommending improvements to the framework, and the revised version reflects input from practical experience.[58] The revised framework[59] (Figure 5) combines five elements: focal question, horizon scanning, scenario generation, workforce modelling, and policy analysis.

Figure 5 The CfWI Robust Workforce Planning framework[59]

8.3.1 Main components of framework

The Robust Workforce Planning framework has five main components: focal question, horizon scanning, scenario generation, workforce modelling, and policy analysis. The CfWI's description of each component is outlined below.

1. **Focal question** – The Robust Workforce Planning framework revolves around a key focal question (for example, the requirements of the future workforce, their numbers, and their proportions). This stage starts to identify the stakeholders and expert groups, and puts an engagement plan and communications strategy in place. The main steps are as follows:
   - **Problem** – Define the key question or issue of concern; this may be revised as further understanding is gained of the system and the root cause of the issues.
   - **Scope and boundaries** – Define the system under investigation, the scope and the boundaries. Confirm and agree what areas are in or out of scope.

2. **Horizon scanning** explores the potential challenges, opportunities and likely future developments that could influence workforce planning, including technological, economic, environmental, political, social and ethical influences. The main steps for horizon scanning are:
   - **Idea generation** – Identify and engage with stakeholders and experts to collect narrative ideas or stories about the future. Conduct one-to-one interviews to source ideas. Ask respondents to quantify how significant ideas are with respect to the focal question.
   - **System mapping** – Synthesize relevant projects and research, and establish how today's situation has been reached. Identify the trends, driving forces and factors. Map the system using causal loop diagrams. Conduct systemic analysis to understand the system behaviour and determine the critical uncertainties. Discuss the policy options and potential levers of change with decision-makers.
   - **Data gathering** – Collect historical and current data. Engage with stakeholders and data providers to identify and access data sources, investigate the available data and determine data quality. Identify any known gaps and quality issues and where assumptions may need to be made. The availability of data will determine what can be modelled.

3. **Scenario generation** focuses on how the future might evolve and explores plausible but challenging futures that need to be addressed. Scenarios are particularly useful, since a range of futures can be generated and demand and supply projections made. Workforce plans can then be assessed against the scenarios for robustness. A unique feature of the framework is the use of a Delphi process to quantify key workforce variables. Experts make quantitative judgements and share the reasoning behind them over several rounds to decrease uncertainty and refine the values. The main steps for scenario generation are:
   - **Scenario context** – Conduct workshops with stakeholders to identify, refine and simplify the factors in the system relevant to the focal question. Order factors by impact and uncertainty of outcome, and use them to select the scenario dimensions.
   - **Scenario development** – Conduct scenario workshops with stakeholders to create consistent scenarios based around four factors of high impact and high uncertainty. Engage with stakeholders to review and refine the scenarios, and produce fully described narrative stories for each scenario. Generate additional consistent scenarios using cross-impact analysis with a wider range of key factors.
   - **Parameter quantification** – Engage with experts to determine values for critical parameters that are intrinsically unknowable using a formal elicitation process. Determine a probability distribution for those parameters that are particularly influential for the model outputs.

4. **Workforce modelling** projects demand and supply for a range of plausible futures, as described by the scenarios. Further modelling is then conducted to determine the robustness of policy options for achieving a sustainable balance of demand and supply. The main steps for workforce modelling are:
   - **Scoping** – Develop a clearly defined model specification, which is to include the purpose of the model to be developed, key policy questions to be answered, outputs to be calculated, the model architecture and the minimum dataset.
   - **Construction** – Develop the model based on the specification, then document and test the model. Construction is completed when the documentation has been written and the model has passed the testing phase.

- **Simulation** – Run the model with the data to simulate the future workforce. Repeat across the set of scenarios defining challenging futures. Simulation may also include sensitivity analysis to determine what data the model outputs are most sensitive to, and where data improvements may be needed.

5. **Policy analysis** is important to ensure that robust decisions are made that work best across uncertain futures. Workforce intelligence focuses on analysing future uncertainties and the impact of policy options, and presenting the findings. The main steps in policy analysis are:
   - **Policy evaluation** – Agree on the prospective policies to be tested, including combinations. Decide on approaches for measuring the effectiveness of a policy. Test the policy options using the model to evaluate their effectiveness. Determine the uncertainty inherent in the data and multiple views of the future.
   - **Robust decision-making** – Evaluate the robustness of the alternative policy options. Identify the vulnerabilities and trade-offs. Make recommendations on the desirability of the options, including consideration of uncertainty.
   - **Performance monitoring** – Identify which futures are the most desirable or the most difficult. Determine the signals that a favourable or unfavourable future may be unfolding. Scan for signs of change so that mitigating actions can be taken if needed.

The stages of the framework are not sequential and there is significant overlap between stages (Figure 6). All the stages sit within the focal question, which defines the purpose of the study. This may be refined during the project as greater information and understanding are gained. Policy analysis (the final stage) may be followed by horizon scanning to look for signs of favourable or unfavourable changes. However, it may be that a new focal question has emerged and the process starts again. A major feature of the framework is the high degree of stakeholder involvement. Stakeholders are involved from the start in agreeing the scope and time frame for the investigation, and in all subsequent stages. It is also worth noting that the framework can be used as a whole or in part. If significant information is already available about the future, or where scenarios have been produced, some stages may be simplified or omitted. However, to perform workforce modelling, critical uncertainties that impact workforce demand and supply will need to be quantified, and decisions made about what policy levers are available to decision-makers.

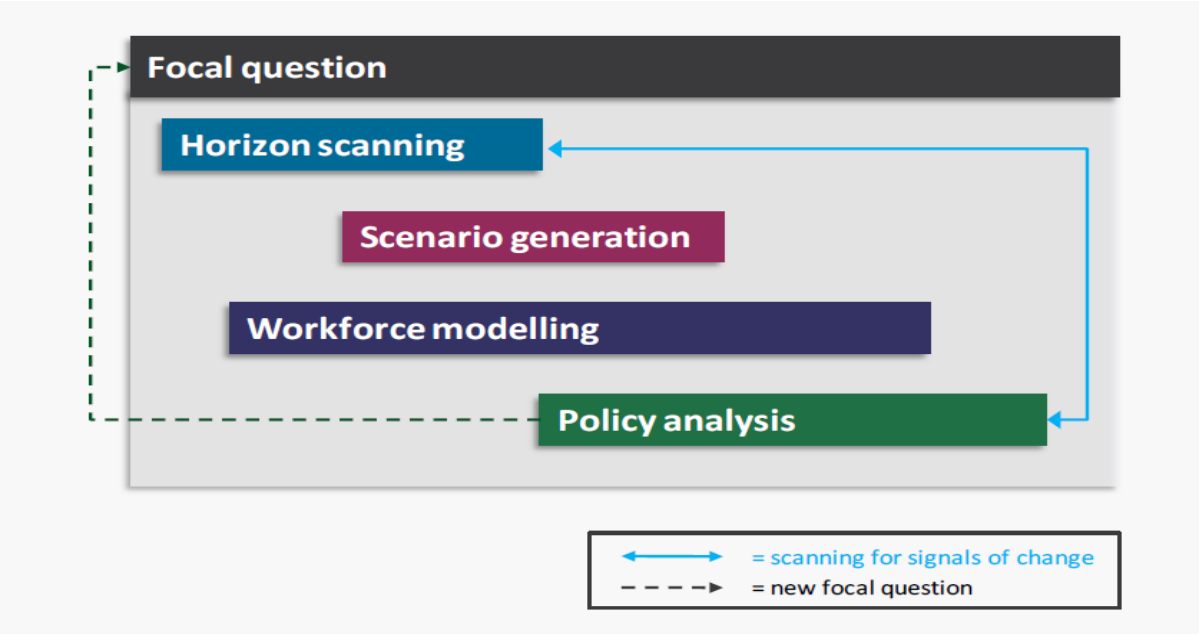

Figure 6 Stages of the Robust Workforce Planning framework

8.3.2 Use of framework

The robust workforce planning framework described here has been used for a number of projects, including the Medical and Dental Student Intakes Project which modelled the future demand and supply of doctors and dentists.[60] It has been used in CfWI projects across health, public health and social care, most notably in the CfWI Horizon 2035 programme, which looked at skills and competency needs in all three sectors over the next 20 years.[61] The CfWI was also a partner of the EU Joint Action Health Workforce Planning and Forecasting. They compiled user guidelines in relation to qualitative methods in HWF planning, and outlined how horizon scanning could be applied to other countries.[62] The CfWI published numerous reports in relation to workforce planning between 2014 and 2016. However, since 2016, the functions of the CfWI have been delivered by the Department of Health and Social Care and Health Education England. There appear to have been no publications relevant to HWF planning frameworks since then. It is unclear what work has been undertaken in relation to HWF planning since 2016.

8.3.3 Enablers/critical success factors

We did not identify any published information in relation to enablers or success factors in the UK. However, the CfWI has stated that the major strength of this framework is system dynamics modelling as this allows workforce planners to:

- Better understand the dynamic behaviour of the system over time
- Simplify complexity through the process of scenario generation which allows them to better understand causality, feedback and delays
- Be highly involved in the process, thereby providing as much value as the end product resulting from the process
- Consider the implications of policy in a more robust manner, thereby avoiding the implementation of policies that may lead to unexpected consequences.

The important role that stakeholder involvement plays throughout the planning process has also been highlighted.

As part of the EU Joint Action, the Robust Workforce Planning framework, namely the horizon scanning stage and use of the Delphi method, was piloted in Belgium[63] as part of their national review of the general practitioner (GP) workforce. A good range of experts were engaged and ideas collected in order to better understand the landscape and pressures affecting the GP workforce. Following on from the pilot study, it was decided that these methods will be used again as part of workforce planning and integrated into the overall approach by Belgium for the future. A number of lessons were learned during this pilot:

- Stakeholders should be involved in every stage of the workforce review
- Goals and objectives should be clear at the start of the project
- Overall planning, timing and budgetof the work must be realistic
- Strong project management is essential for success
- The right tools and templates must be available to the project team
- Complete an evaluation process at each stage of the project.

8.4 Framework 4: Canada

In Canada, each provincial/territorial jurisdiction is responsible for developing and implementing its own health workforce policies, plans and service models. However, it is recognized that jurisdictions cannot plan in isolation and require a collaborative pan-Canadian approach to certain aspects of HWF planning. Canada's Federal/Provincial/Territorial Advisory Committee on Health Delivery and Human Resources (ACHDHR) adopted the framework developed by O'Brien-Pallas *et al.*[64] in 2001 to promote a pan-Canadian collaborative approach to planning that facilitates the enhancement of partnerships between government and stakeholders (Figure 7).[65] Each jurisdiction is encouraged to undertake its HWF planning within the context of this framework.

8.4.1 Main components of framework

The framework proposed by O'Brien-Pallas *et al.* includes the essential elements of HWF planning in a way that captures the interplay among a number of factors that have previously been conceptualized in isolation of one another. It takes account of current circumstances (e.g. supply of workers) as well as those factors which need to be accounted for in HWF planning (e.g. financial resources, changes in worker education and training), and it also considers contextual factors. At the core is the recognition that the HWF must be matched as closely as possible to the healthcare needs of the population. The outer circle of the framework indicates that HWF planning occurs within the context of many social, political, geographical, technological, and economic factors. However, HWF planning starts with the population health needs of the jurisdiction for which one is planning. Across all sectors of care (system design) it works with the current practice pool (supply) of providers. Supply is maintained by the production of new providers, and the flow of services from that supply is influenced by the level of financial resources applied and the management, organization and delivery of services. The flow of services from that supply of human resources will also be influenced by the deployment (e.g. direct clinical care versus administration and research) and utilization (e.g. full- versus part-time) of these resources. These human resources, when supported by non-human resources (e.g. facilities and

technology), yield patient, provider and system outcomes that are optimized when there is an efficient mix of human and non-human resources in the jurisdiction.

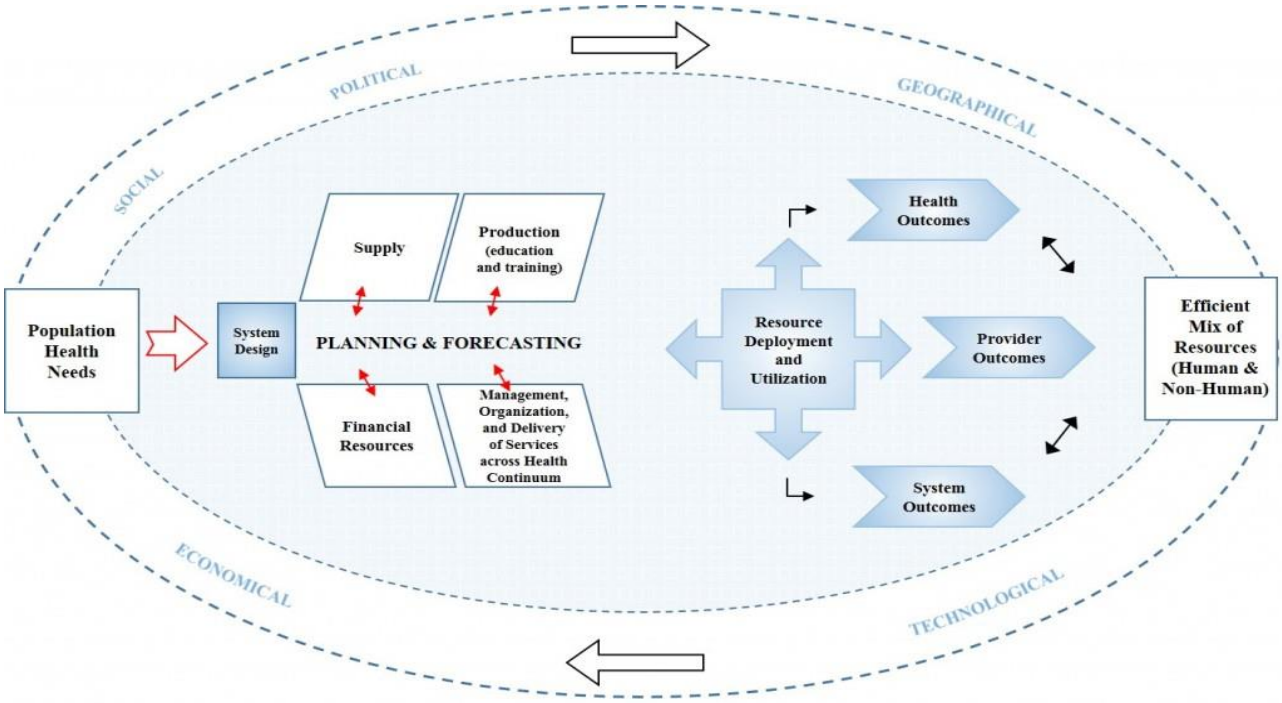

Figure 7 Framework for needs-based HWF and health systems planning[65]

The main components of the framework from O'Brien-Pallas *et al.* are:

- **Population healthcare needs (needs-based factors)** reflect the characteristics of individuals in the population that create the demand for health services. They are influenced by actual and perceived population health status, socioeconomic status, demographics, health behaviours, and contextual factors. It is important for planners to have an accurate picture of the current and predicted health status of the population.
- **System design** – The design of healthcare services impacts on human resources requirements. Governments, in partnership with stakeholders, determine the delivery models (e.g. primary healthcare and acute care facilities) to deliver services, and the associated level of services required.
- **Planning and forecasting** reflects the available HWF planning practices and models and their assumptions, methods, data requirements, and limitations. Predictions of healthcare provider requirements vary according to the methods used to make those predictions. The choice of method can be determined by a number of factors, including traditional practices, data availability, political pressure, and the question that is being asked. It is important that forecasting and planning activities be conducted continuously with regular data analysis and outcomes assessment.
- **Supply** reflects the actual number, type, and geographic distribution of healthcare providers; it is fluid and is related to production as well as to factors such as recruitment and retention, licensing, regulation, and scope of practice. Supply is subject to alteration due to participation

rates, provider-to-population ratios, demographic and educational characteristics of providers, and employment status. Death, retirement, emigration and immigration also affect supply. The geographic distribution of providers may vary according to general economic trends, work incentives, and lifestyle choices. Distribution of providers may depend on production-related factors, such as the number of medical residency spaces available, the availability of postgraduate nursing specialty training, and the technological sophistication and working conditions of competing market segments. Supply also includes the type of service each provider is competent to provide. This is related both to production and to issues of standards and scope of practice, as well as governance.

- **Financial resources** provide an economic context for HWF planning decisions and involve estimating the future size of the economy from which the workforce will be funded. Decisions about the allocation of resources to healthcare are likely to be based on population needs. It refers to the total portion of the GDP that is allocated to healthcare, health provider education, and health-related research. Balance must be sought between human and physical capital, which involves determining the appropriate quantity, mix, and distribution of health services. Financial resources must be directed to those initiatives and capital expenditures that are most likely to meet the healthcare needs of the population. The mix of financial resources for health must strike a balance between non-human resources (e.g. technology, drugs, hospital beds, etc.) and human resources.
- **Production** involves the education and training of future health providers. Educational programmes differ in the level of qualifications required and approaches to learning. The number of formal positions offered in any educational institution is influenced by financial resources and the number of funded seats. The link between population healthcare needs and future capacity to meet those needs ought to be considered in setting production targets for seats in any health discipline.
- **Management, organization and delivery of health services** (such as structural arrangements, the degree of formalization and centralization, environmental complexity, and culture) influence the way work gets done, the amount and quality of care provided, provider health and satisfaction, costs associated with delivery of services, and outcomes.
- **Resource deployment and utilization** reflects the amount and nature of the resources deployed to provide health services to the population. Utilization reflects the nature and type of resources utilized by the population to meet healthcare needs. The efficiency and effectiveness of service delivery depends to a great extent on the efficient and effective deployment and use of personnel. Decisions made about the deployment and use of personnel across all sectors of the system influence access to services and utilization by the population, and outcomes.
- **Health outcomes** are classified into individual and population health outcomes. Indicators include: premature mortality rate; life expectancy; standardized mortality rate; mortality from cancer, injury, and chronic diseases; disease incidence; medical conditions associated with poor functional status and poor perceived health status; low birth weight; and prenatal care outcomes.
- **Provider outcomes** include provider health status, retention rates, turnover rates, sick time, job satisfaction, and levels of burnout to work and the work environment.
- **System outcomes** are the outcomes in terms of costs, benefits, and changes associated with the provision and use of healthcare resources. Measures include hospitalization and readmission rates, expenditures on the various health sectors, the number of people treated,

the neediness of the population being serviced, case intensity, cost efficiency, discharge efficiency, proportion of acute versus non-acute care, outpatient and inpatient surgery rates, and bed occupancy rates.

- **Contextual features** include the social, political, geographical, technological and economic context in which HWF allocations are made. They draw attention to the broad policy framework within which HWF policy must operate. HWF planning decisions are also influenced by the presence or absence of political will to incur the costs of promoting healthcare system reform among competing priorities. The introduction of new technologies affects the production, supply and efficiency of providers. Economic factors contribute to both the health status of the population and the degree to which healthcare needs can reasonably be met. In addition to these contextual factors, planners need to consider the possibility of unanticipated 'shocks to the system' which happen from time to time and may influence the health human resource process (e.g. sudden downswings or upswings in the economy).
- **Efficient mix of resources (human and non-human)** is the number and type of resources that are required to achieve the best health, provider and system outcomes. The framework provides the basis for health system simulations which, in turn, provide needs-based estimates of HWF requirements aimed at optimizing the range of outcomes of interest. The HWF is informed by research at the micro, meso, and macro levels. This is necessary in order to capture the complexity of the relationship among elements of the health human resource process.

8.4.2 Use of framework

It appears from the WHO Collaborating Centre on Health Workforce Planning and Research, based in Canada, that this framework has been used in a number of Canadian provinces and territories and in a number of countries, including Brazil and Jamaica.

8.4.3 Enablers/critical success factors

To apply the overall planning framework and implement the action plan, a number of critical success factors have been identified:

1. **Appropriate stakeholder engagement:** As a variety of factors affect the HWF, a wide range of stakeholders must be engaged. Stakeholder engagement will evolve over time and will involve consultation and timely communication, as well as incentives to support new ways of doing business.
2. **Strong leadership and adequate resources:** Effective change requires leaders. The system must identify leaders at all levels – within each jurisdiction, in the education system, among employers and among providers – who will work as a team to champion collaborative HWF planning and share the vision. Effective, collaborative HWF planning will also require government commitment and is dependent on government continuing to allocate resources to support the planning function.
3. **Clear understanding of roles and responsibilities:** HWF planning initiatives are occurring at many levels. Some issues are best managed at a local level, some at a provincial level, some through bilateral agreements between jurisdictions, some through regional collaboration and some through pan-Canadian collaboration. All those involved must have a clear understanding of their roles and responsibilities.

4. **A focus on cross-jurisdictional issues:** Leaders should work to add value to existing jurisdictional planning and develop tools that will support and enhance each jurisdiction's ability to develop HWF policy and plans. Priorities will be established based on consultation with all jurisdictions, and will reflect common cross-jurisdictional issues.
5. **A change in system or organizational culture:** A more collaborative pan-Canadian approach to HWF planning will involve a change in culture. To make these changes, the system must understand the current cultural landscape (e.g. the attitudes and expectations of educators, employers and providers; traditional ways of working), the changes required, the changes already occurring, and the readiness to change. Stakeholders will focus on healthcare providers as a valuable asset, and take into account their needs and aspirations. Systems planning will include identifying issues that affect recruitment and retention and making decisions that support healthy workplaces and increase job satisfaction.
6. **Flexibility:** A HWF framework must be flexible and responsive to any jurisdiction's changes to its system design and the impact of those changes on HWF.
7. **Accountability:** Ongoing monitoring and reporting on progress will help ensure that the action plan is continually revised and updated to reflect changes in population health, the health system, and HWF needs.

Challenges in applying the framework

The authors state that all Canadian jurisdictions are limited in their ability to apply the proposed framework by the lack of:

- High-quality, consistent data on all major health disciplines, and of national data standards, including common definitions and a common approach to collecting data
- Consistent information on HWF productivity, workload, utilization, demand and efficacy
- Information about educational facilities and their capacity
- Capacity to assess health needs, model delivery systems, and forecast the demand for health human resources
- Capacity to analyse HWF data and translate it into useful knowledge
- Funding for ongoing data and modelling initiatives.

8.5 Framework 5: Alberta (Canada)

Alberta Health and Services (AHS) and health authorities each have roles and responsibilities in HWF planning that are both distinct and complementary. AHS is a single entity responsible for providing hospital, continuing care services and public health throughout Alberta.[45] Alberta has developed a HWF planning framework that differs from the proposed pan-Canadian framework. It was first described in 2003[66] and updated in 2008.[67] It was developed following a consultative process with multi-partner involvement. The framework describes the four phases of the HWF planning process (Figure 8).

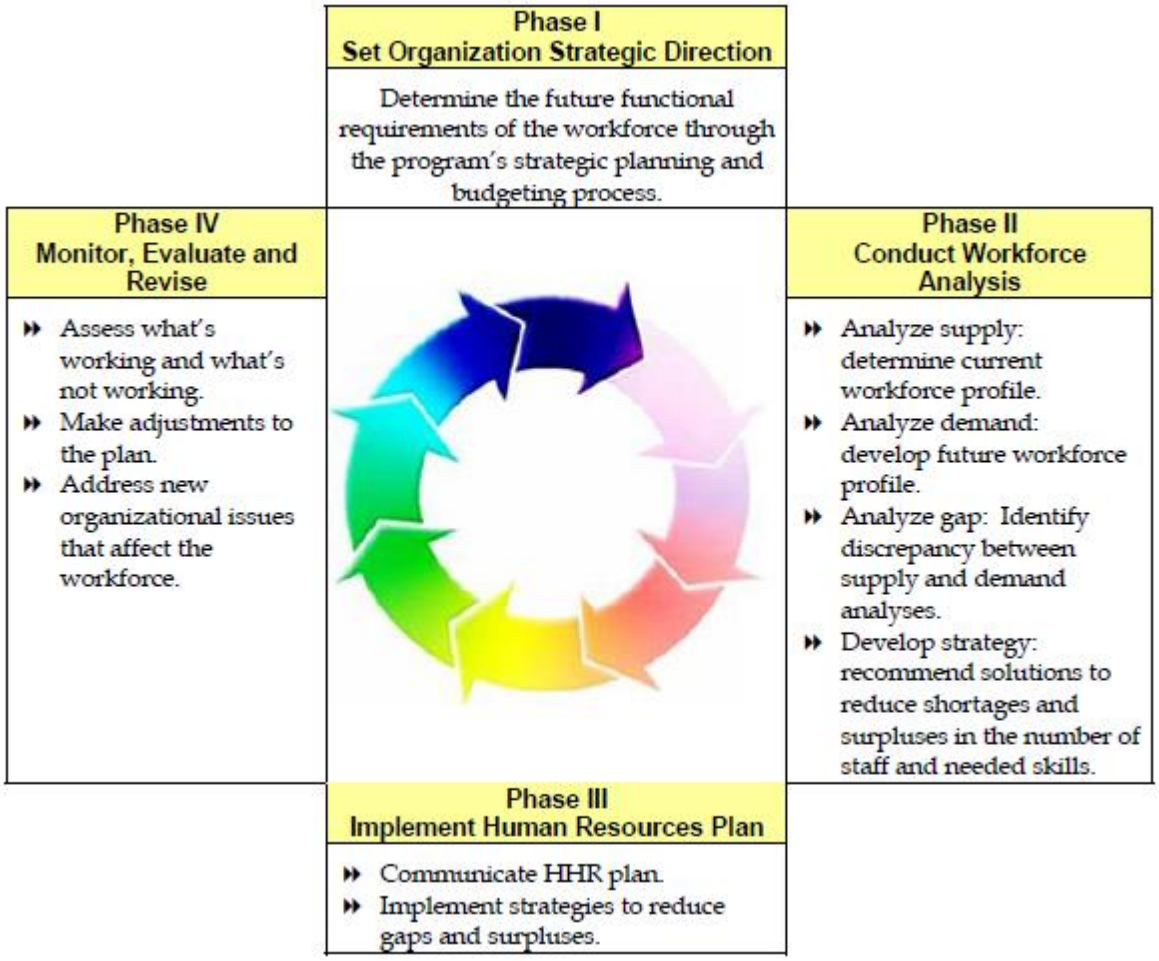

Figure 8 Four phases of the Alberta HWF planning framework[67]

The capacity to perform effective HWF planning will take time to develop. HWF planning requires a variety of input from cross-functional areas and levels within the organization. It is critical to begin carefully and not take on too much too soon. Health authorities might find it helpful to begin planning for a subset of the health human resources and then extend HWF planning through the remainder of the organization. Before starting HWF planning, it is necessary to:

- Clearly understand the purpose of HWF planning
- Determine the time frame
- Identify the resources available

- Adapt models, strategies, tools, and processes specific to the health authority's culture and needs
- Identify planning outputs that are meaningful to the organization and that support health authority objectives, budget requests, staffing requests, and strategic plans.

8.5.1 Main components of framework

The four phases of the Alberta framework are:

Phase I: Set organizational strategic direction

Workforce planning is integral and complementary to strategic planning. One of the main purposes of HWF planning is to inform the health authority about the required human resources to support its mission and strategic plan. In Phase I, those responsible for HWF planning should identify the health authority's mission and the key goals and objectives of its strategic plan. A strategic plan charts the future with broad mission-related targets and milestones. A HWF plan translates strategic thinking into concrete action in the area of staffing and training needs.

Phase II: Conduct workforce analysis

Analysis of workforce data is the key element in the HWF planning process. This involves four steps:

1. Analyse supply to determine current workforce profile. This requires information on demographics, percentage of workforce eligible to retire within the next five years, turnover, projected employee turnover rate over the next five years, and workforce skills.
2. Analyse demand to develop future workforce profile. This requires information on expected workforce changes due to changing strategies, technology, workloads, work processes, etc.; future workforce skills needed; anticipated change in the number of employees needed to do the work; and critical functions that must be performed to achieve the strategic plan.
3. Perform a gap analysis to identify shortages and surpluses in staffing and skill levels needed to meet future service delivery requirements.
4. Develop strategy to recommend solutions to reduce shortages and surpluses in the number of staff and needed skills.

Phase III: Implement human resources plan

Before implementing the plan, workforce planners should:

- Ensure that there is executive support for the plan
- Allocate necessary resources to carry out workforce strategies
- Clarify roles and responsibilities in implementing strategies. This includes identifying who is involved in implementing what, and identifying the need for coordination among different parts of the health authority.
- Establish timelines
- Define performance outcome measures and expected deliverables
- Communicate the plan.

Phase IV: Monitor, evaluate and revise

Ongoing evaluation and adjustments are important; consequently, a process should be established that allows for a regular review of HWF planning in order to:

- Review performance measurement information
- Assess what is working and what is not working

- Adjust the plan and strategies as necessary
- Address new workforce and organizational issues that occur.

The following sources of information may help determine if the HWF plan is achieving results: satisfaction surveys, reports (e.g. quarterly performance reports), questionnaires (e.g. exit interviews), and information available in accordance with accreditation standards.

8.5.2 Use of framework

This framework was proposed in 2003 and an updated version was presented in 2008. It appears to be very much focused on the health sector. Brief reference is made to the need to include educators in the guidance provided, but apart from this, there is no mention of the need to include education or indeed other sectors in the HWF process.

8.5.3 Enablers/critical success factors

The report's authors state that the following techniques may help to build support for the HWF process:

- Obtain **support from senior leaders** within the health authority. It is important they understand the value of HWF planning; their commitment can determine its success or failure.
- **Communicate the benefits and results** of HWF planning to managers and workers. Management should be involved in understanding the link between health human resources plans and the budget, and workers need to understand how HWF planning affects them.
- Establish a **HWF planning team** consisting of dedicated and knowledgeable employees from different functional areas and organizational levels. Trust for the HWF plan can be achieved by involving employees in the planning process.
- Develop and implement a plan to **ensure accountability** throughout the health authority. This will help ensure success of the strategies within the plan and identify accountabilities of those participating.
- Solicit **continuous feedback** for improvements to the process. The HWF planning process should be continually reviewed and refined to ensure effectiveness and continuous improvement.
- Gaining and maintaining **management and staff commitment** to the HWF planning process is key to developing an effective HWF plan.

9 Question 2: Discussion

HWF planning is necessary for the proper management of a country's healthcare system. It is recognized that HWF planning is a challenging process that requires input from diverse stakeholders. It can also be impacted by complex factors that create uncertainties that affect the ability to make accurate projections of the health workforce. A HWF planning framework can assist governments and planners to develop and implement strategies to achieve an effective and sustainable HWF. The five frameworks presented in this review were all developed since 2005 and, with the exception of the Alberta framework, were developed for use at a national level. The frameworks designed by England and Alberta were designed for their own specific health system, while the remaining three are generic HWF planning frameworks that have been developed for any country to adapt and use in its own health system.

For the EU, WHO and Canadian frameworks, there are a number of resources available to assist with the use of the frameworks. The EU Joint Action has the most comprehensive accompanying resources. As part of the Joint Action project a comprehensive toolkit was developed, which is a collection of protocols, guidelines, checklists, check sheets, fact sheets and rating scales developed and designed to help countries to adapt standardized HWF planning processes. The toolkit can help planners design a new HWF system from scratch or it can be used to help planners understand the current state and existing weaknesses of their existing system and direct attention to possible points of improvement. It may also help planners to formulate appropriate questions and develop a plan for implementation. Countries can adapt the toolkit to suit their own circumstances and choose the tools they find the most useful.

The English Robust Workforce Planning framework was the only national-level framework that was specifically developed for that country. The English HWF planning system was described by the EU Joint Action as one of the seven most advanced HWF planning systems, and many aspects of it were described as being examples of good practice in the Joint Action literature. It is very data driven, requiring extensive data analysis and forecasting, and this may not be feasible to replicate in countries with lower-quality data. The CfWI, which developed the framework, also had a large team available to undertake this work. Between 2014 and 2016, the CfWI was prolific in relation to pushing reports on HWF planning across the health, public health and social care sectors. In 2016, the functions previously undertaken by the CfWI were transferred to the Department of Health and Social Care and the CfWI appears to have been disbanded. In March 2016, the UK government stated on its website that the Department of Health and Social Care, Public Health England and Health Education England now provide workforce information to inform workforce planning decisions at a national and local level. A draft workforce strategy was published for consultation in December 2017.[68] It is unclear to what extent the work that had been undertaken by the CfWI will be continued and if the Robust Workforce Planning framework will continue to be used.

Given that Ireland is a member of the EU, it may be worth considering reviewing the framework developed by the EU Joint Action in more detail. This framework was designed specifically for European countries, as it recognizes that there are crucial differences between European and non-European countries when it comes to HWF planning and it takes into account the realities or context associated with Europe. Firstly, the healthcare systems of European countries are generally based on the principle of universal coverage, which strongly influences the demand for health services. There are also unique European challenges with the EU Directive 2011/24/EU on the application of patients' rights in cross-border healthcare, which sets out the conditions under which a patient may travel to another EU country to receive medical care and reimbursement. Many European countries are faced with health workforce imbalances. These imbalances are primarily driven by demographic changes in the population, an increasing demand for healthcare, an ageing workforce, and recruitment and retention difficulties. In addition, the migration of health professionals poses challenges to countries when trying to forecast the supply of health professionals. This is made more complex by the countries' differences in training options and the level of training. In late 2017, a joint tender was supported by the Health programme of the European Union – Support for the health workforce planning and forecasting expert network – which aims to build on the results of the Joint Action work. It specifically aims to establish an expert network on HWF planning and forecasting, to structure and exchange knowledge in HWF and to provide tailor-made, country-specific support to some countries on the national implementation of

HWF planning. From an Irish perspective, this may be an opportunity to gain additional knowledge and insight in relation to HWF planning.

A number of enablers to successful HWF planning were consistently identified across the frameworks. It appears to be essential to have high-level involvement and collaboration of multiple stakeholders and to have multisectoral cooperation. Each of the frameworks cited this as a critical success factor. The availability of high-quality, up-to-date data was another critical success factor that was cited in each framework. Other enablers included: having clear goals, monitoring and evaluating the implementation process, having clear roles and responsibilities, and having adequate resources. Although each framework to a certain extent identifies enablers to successful HWF planning, there is no indication how these were identified, with the exception of the EU Joint Action, which surveyed 12 countries about the enablers and barriers they had encountered in implementing their HWF planning systems. The Joint Action also provided numerous examples of best practice that it observed in the most advanced HWF systems in Europe, which may be particularly useful when setting up a new national HWF planning system.

It should also be noted that no robust evaluation of any of the frameworks' effectiveness in implementing HWF planning systems have been undertaken. While there are descriptions of their use – e.g. the WHO website describes examples of its framework being used in a number of countries and the EU Joint Action undertook pilot studies in some EU countries to assess its framework's potential effectiveness – no robust independent evaluation of any HWF planning framework appears to have been completed. The lack of evaluation should also be considered when choosing a HWF planning framework.

10 Overall conclusions

The health sector in Ireland is experiencing challenges in the recruitment and retention of health workers, and its current capacity to meet these challenges is limited. HWF planning is a difficult process that requires input from a range of diverse, cross-sectoral stakeholders. A HWF planning framework can assist governments and planners to develop and implement strategies to achieve an effective and sustainable health workforce. In this context, the DoH is developing a HWF planning system, in order to identify, agree and implement appropriate short-, medium- and long-term human resource and policy solutions (either within the health sector or cross-sectorally with other partners).

This evidence review comprised two parts; the first part sought to identify examples of horizontal cross-sectoral interventions that had been prospectively implemented using an implementation framework. This was to determine if any similar interventions in terms of complexity and cross-sectoral partners had been implemented, which could provide useful learnings for the DoH in the implementation of a national HWF planning system. The field of implementation science is an emerging one and this may explain why very few relevant examples were found. Six examples, not all of which were implemented, were found, and while they all had cross-sectoral partners, they varied considerably in terms of complexity. The examples that were most similar to a national HWF planning system in relation to complexity were the Housing First model and to a lesser extent SafeCare, none of which had been implemented or evaluated. It is therefore difficult to suggest a useful framework based on the examples that were identified in this review.

Implementing a national HWF planning system requires multilevel involvement, and context should be considered. Based on the framework classification proposed by Nilsen, it would appear that a determinant framework would be the most appropriate for this type of intervention. These frameworks specify determinants which act as barriers and enablers that influence implementation outcomes. Many are multilevel and recognize that implementation is a multidimensional phenomenon, with multiple interacting influences. The aim is to understand and/or explain influences on implementation outcomes, rather than addressing how change takes place, or any causal mechanisms. An example is the CFIR, which was used in one of the interventions presented in this review; it specifies constructs within five domains (intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation) that are believed to influence (positively or negatively) implementation.

While a generic implementation framework may underpin the overall implementation of a HWF planning system in Ireland, a specific HWF planning framework would provide particular assistance in implementing and identifying the necessary steps required to implement a HWF planning system. The EU Joint Action framework is a good example of a HWF planning system. It was designed specifically for European countries and it takes into account the realities or context associated with Europe. The framework defines the five key elements of a HWF planning system – goals, data, forecasting model, organization and link to policy – and provides examples of good practice in relation to each element. It also presents a specific pathway for implementing the framework. It has been implemented on a pilot basis in a number of countries, and these countries all reported positive results. It also provided numerous examples of best practice that it observed in the most advanced HWF systems in Europe and the lessons learned, which may be particularly useful when setting up a new national HWF planning system. In addition, a comprehensive toolkit has been developed to help planners understand the current state and existing weaknesses of their existing system and to help identify possible points of improvement.

In the review of the implementation of cross-sectoral interventions, a number of enablers to implementation were identified. These included the use of an advisory board or workgroup to help oversee the implementation process, identifying and preparing champions who are committed to the process, involving end users, good communication, and adequate funding. In the review of HWF frameworks, high-level involvement and collaboration of multiple stakeholders, multisectoral cooperation, availability of high-quality, up-to-date data, clear roles and responsibilities, adequate resources, and a monitoring plan were considered to be important enablers. Irrespective of which framework(s) are selected to aid the implementation of a HWF planning system in Ireland, these enablers should be considered.

A national HWF planning system may be described as a complex, cross-sectoral intervention and its implementation will be a challenging process, requiring input from diverse stakeholders. There are few published examples of similar-type interventions that have been implemented using a framework and that have been evaluated. This makes selecting an appropriate framework more difficult. In both parts of this review, it appears that little evaluation of either implementation or HWF-specific frameworks has taken place. The lack of robust evaluation should be considered when selecting either type of framework.

Appendix 1 List of implementation frameworks

1. CFIR (Consolidated Framework for Implementation Research)[22]
2. RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance)[27]
3. Greenhalgh conceptual model of implementation phases and factors affecting implementation in public service sectors[20]
4. Active Implementation Framework[69]
5. PARIHS (Promoting Action on Research Implementation in Health Services)[19]
6. Knowledge to Action Framework[70]
7. PRECEDE-PROCEED (Predisposing, Reinforcing and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation-Policy, Regulatory and Organizational Constructs in Educational and Environmental Development)[35]
8. QUERI (Quality Enhancement Research Initiative)[71]
9. Theory of Diffusion[9]
10. Normalization Process Theory[72]
11. Framework by Proctor *et al.*[38]
12. Implementation Effectiveness Model[73]
13. Aarons *et al.*'s Conceptual Model of Evidence-Based Practice Implementation in Public Service Sectors (EPIS)[2]
14. Sticky Knowledge[74]
15. ISF (Interactive Systems Framework)[75]
16. ARC (Availability, Responsiveness and Continuity) organizational and community intervention strategy[76]
17. REP (Replicating Effective Programs) framework[77]
18. Ecological Framework by Durlak and DuPre[21]
19. PRISM (Practical, Robust Implementation and Sustainability Model)[78]
20. Knowledge Translation Model of Tehran University of Medical Sciences[79]
21. Pronovost *et al.*'s 'Four Es' Process Theory[80]
22. Ottawa Model of Research Use[81]
23. Knowledge-value chain[82]
24. Canadian Institutes of Health Research (CIHR) Model of Knowledge Translation[83]
25. Grol and Wendsing's 10-step model for inducing change in professional behaviour[84]
26. CRARUM (Critical Realism and the Arts Research Utilization Model)[85]
27. Davis *et al.*'s Pathman-PRECEED Model[86]
28. PROSPER (PROmoting School–community–university Partnerships to Enhance Resilience)[87]
29. Quality Implementation Framework[4]
30. Theoretical Domains Framework[26]
31. COM-B (Capability, Opportunity, and Motivation Behaviour) system[7]
32. Absorptive Capacity[88]
33. Organizational Readiness[89]
34. Model by Huberman[90]
35. Iowa Model[91]
36. ACE Star Model of Knowledge Transformation[92]
37. Understanding User Context Framework[93]
38. Framework by Grol *et al.*[94]
39. Framework by Cochrane *et al.*[95]

40. Framework by Nutley *et al.*[96]
41. Framework by Gurses *et al.*[97]
42. Framework by Ferlie and Shortell[98]
43. Health Promotion Technology Transfer Process[99]
44. Real-World Dissemination[100]
45. A Framework for the Transfer of Patient Safety Research into Practice[101]
46. Interacting Elements of Integrating Science, Policy, and Practice[102]
47. Push-Pull Capacity Model[103]
48. Research Development Dissemination and Utilization Framework[104]
49. Utilization-Focused Surveillance Framework[105]
50. '4 E' Framework for Knowledge Dissemination and Utilization[106]
51. Dissemination of Evidence-based Interventions to Prevent Obesity[107]
52. Multi-level Conceptual Framework of Organizational Innovation Adoption[108]
53. Facilitating Adoption of Best Practices (FAB) Model[109]
54. A Six-Step Framework for International Physical Activity Dissemination[110]
55. Pathways to 'Evidence-Informed' Policy and Practice[111]
56. CDC Division of HIV/AIDS Prevention Research-to-Practice Framework[112]
57. Conceptual Model of Implementation Research[113]
58. Conceptual framework for sustainability of public health programs[114]
59. Sustainability planning model[115]
60. Capacity for sustainability framework[116]
61. TCU (Texas Christian University) Program Change Model[117]
62. Model of sustaining innovations in their effectiveness[118]
63. Integrated two-phase TCU (Texas Christian University) approach to strategic system change[119]
64. ATTC Network model of technology transfer in the innovation process[120]
65. Factors that Determine the Rate of Adoption of Innovations from Research into Practice[121]
66. Conceptual framework of complex innovation implementation[122]
67. General theory of implementation[123]
68. Model for success and breakdown factors of shared governance[124]
69. Model and checklist for telehealth[125]
70. Three-phase implementation model[126]
71. Contingency model of innovation adoption[127]
72. Model matrix of factors in implementation of practice change[128]
73. Guideline implementability framework[129]
74. Analytic framework: moving knowledge into action[130]
75. Joint Venture Model of Knowledge Utilization[131]
76. Multisystem model of knowledge integration and translation[132]
77. Knowledge Use in Pain Care (KUPC)[133]
78. Collaborative model of knowledge translation in clinical settings[134]
79. Knowledge integration model[135]
80. Trinity model of evidence-based practice[136]
81. Process for the use of evidence-based practice model for staff nurses[137]
82. Tyler collaborative model for evidence-based practice[138]
83. Steps in building an EBP Program[139]
84. Advancing Research and Clinical Practice Through Close Collaboration Model (ARCC)[140]
85. CHANGE model (customized, holistic, analytical, network-building, grassroots, evaluatory)[141]

86. CASEL (Collaborative for Academic, Social, and Emotional Learning)model[142]
87. Getting to Outcomes[143]
88. Implementation of school-based preventive interventions[144]
89. Framework by Guldbrandsson[145]
90. Framework by Hall and Hord[146]
91. Communities That Care framework[147]
92. Framework to implement strategies in organizations[148]
93. Partnerships for Success[149]
94. A prevention service development model[150]
95. Framework by Van de Ven *et al.*[151]
96. Framework by Stith *et al.*[152]
97. Framework by Walker and Koroloff[153]

Appendix 2 Search strategies used to find articles

Table 10 Database searches undertaken for Question 1

Database	Date of search	Search string	Results
Ovid MEDLINE® Epub Ahead of Print, In-Process and Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946 to Present	20/04/2017	1 *Intersectoral Collaboration/ 2 ((multi-sector* or (multi adj sector*) or multi-agency or multi) adj agency).mp 3 (cross-sector* or (cross adj sector*)).mp 4 (inter-sector* or intersector* or interagency or inter-agency).mp 5 (inter-sector* or intersector* or interagency or inter-agency).mp 6 exp "Delivery of Health Care, Integrated"/mt [Methods] 7 (collaborati* or cooperati* or co-operation).mp 8 or/1-7 9 ((Concept* or integrat* or theor* or implement* or policy or consolidat*) adj3 framework*).mp 10 8 and 9 11 limit 10 to yr="2006–Current" 12 limit 11 to English language	1,632
Ovid MEDLINE® Epub Ahead of Print, In-Process and Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946 to Present	19/04/2017	1 *Intersectoral Collaboration/ 2 (multi-sector* or (multi adj sector*)).mp 3 (cross-sector* or (cross adj sector*)).mp 4 (inter-sector* or intersector*).mp 5 1 or 2 or 3 or 4 6 limit 5 to English language 7 limit 6 to yr="2006–Current"	1,194
CINAHL with Full Text (EBSCO)	20/04/2017	S1 (MH "Health Care Delivery, Integrated/MT") S2 TI (multi-sector* or (multi adj sector*) or multi-agency or multi) N1 agency) OR AB (multi-sector* or (multi adj sector*) or multi-agency or multi) N1 agency) S3 TI (cross-sector* or (cross N1 sector*)) OR AB (cross-sector* or (cross N1 sector*)) S4 TI ((inter-sector* or intersector* or interagency or inter-agency) OR AB ((inter-sector* or intersector* or interagency or inter-agency) S5 (MH "Interprofessional Relations+") S6 TI (collaborati* or cooperati* or co-operation) OR AB (collaborati* or cooperati* or co-operation) S7 S1 OR S2 OR S3 OR S4 OR S5 OR S6 S8 TI (((Concept* or integrat* or theor* or implement* or policy or consolidate*) N3 framework*)) OR AB (((Concept* or integrat* or theor* or implement* or policy or consolidate*) N3 framework*)) S9 S7 AND S8 S10 S7 AND S8 (Limiters – Published Date: 20060101–20171231)	491

Table 11 Database searches undertaken for Question 2

Database	Date of search	Search string	Results
CINAHL with Full Text (EBSCO)	27/09/2017	S1 (MM "Workforce")	2,676
		S2 TI "Health Human Resource Planning" OR AB "Health Human Resource Planning"	17
		S3 TI "human resources for health" OR AB "human resources for health"	147
		S4 TI "health workforce planning" OR AB "health workforce planning"	42
		S5 TI "health human resource*" OR AB "health human resource*"	158
		S6 TI "workforce planning" OR AB "workforce planning"	447
		S7 (MM "Nursing Manpower")	2,698
		S8 (MM "Health Manpower")	870
		S9 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8	6,552
		S10 TI framework OR AB framework	41,530
		S11 TI model OR AB model	186,188
		S12 TI guide OR AB guide	40,146
		S13 S10 OR S11 OR S12	251,051
		S14 S9 AND S13	523
		S 17 Published Date: 2000 01 01–2017 12 31	360
		S 18 Limiters – English language only	352
		S 19 Limiters – Exclude MEDLINE records	216
		S 20 Limiters – Source academic journals only	**110**
Ovid MEDLINE® Epub Ahead of Print, In-Process and Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® 1946 to Present Searched 27 September 2017		1. exp Health Manpower/ 2. "Health Human Resource Planning".ti,ab. 3. "human resources for health".ti,ab. 4. "workforce planning".ti,ab. 5. "manpower forecasting".ti,ab. 6. "workforce forecasting".ti,ab. 7. "manpower planning".ti,ab. 8. (model or guide).mp. 9. framework.mp. 10. 1 or 2 or 3 or 4 or 5 or 6 or 7 11. 8 or 9 12. 10 and 11 13. limit 12 to English language 14. limit 13 to yr="2000–Current"	**525**

Appendix 3 Detailed case studies of each intervention

Case study 1: The Live 5-2-1-0 initiative

Sustainable Childhood Obesity Prevention through Community Engagement (SCOPE) in British Columbia developed and implemented the Live 5-2-1-0 initiative, which works with stakeholders to share the Live 5-2-1-0 message: at least 5 vegetables and fruits, less than 2 hours of screen time, at least 1 hour of physical activity, and zero sugary drinks per day.

Description of frameworks used to implement the Live 5-2-1-0 initiative

The RE-AIM and KTA frameworks were adapted to form the RE-FRAME framework.

RE-AIM framework

The RE-AIM framework was developed to evaluate public health interventions across five dimensions:

- **Reach** the target population
- **Effectiveness** or efficacy
- **Adoption** by target staff, settings, or institutions
- **Implementation** consistency, costs and adaptions made during delivery
- **Maintenance** of intervention effects in individuals and settings over time

Reach is an individual-level measure of participation. It refers to the percentage and risk characteristics of persons who receive or are affected by a policy or programme. If accurate records are kept of both the numerator (participants) and the denominator (population), calculation of participation rates is straightforward. Reach also concerns the characteristics of participants.

Efficacy or effectiveness is measured at the level of the individual and is reflective of the success of an intervention when implemented as per intervention guidelines under optimal conditions or in real-world situations, respectively. When reporting on efficacy, it is important to assess both positive and negative or unintended consequences of the intervention, and to include behavioural, quality of life, and participant satisfaction outcomes.

Adoption refers to the proportion and representativeness of settings that adopt a given policy or programme. Adoption is usually assessed by direct observation or structured interviews or surveys. Barriers to adoption should also be examined when nonparticipating settings are assessed.

Implementation is the extent to which a programme is delivered as intended. It may be thought of as interacting with efficacy to determine effectiveness, i.e. efficacy × implementation = effectiveness. There are individual- and programme-level measures of implementation. At the individual level, measures of participant adherence to regimens are necessary for interpreting study outcomes. At the programme level, implementation refers to fidelity to the various elements of an intervention's protocol. This includes consistency of delivery as intended and the time and cost of the intervention.

Maintenance measures the extent to which innovations become a relatively stable, enduring part of the behavioural repertoire of an individual or organization**.** A major challenge at both the individual and organization level is long-term maintenance of behaviour change. At the individual level, relapse following initial behaviour change is pervasive. Equally essential is the collection of programme-level measures of institutionalization, i.e. the extent to which a policy becomes routine and part of the everyday culture and norms of an organization.

KTA framework

The KTA framework is designed to bridge the gap between knowledge and practice. It is divided into two concepts: knowledge creation (central triangle) and knowledge action (surrounding cycle), each comprising distinct phases (Figure 9). The process is complex and dynamic, and the boundaries between the two concepts are fluid and permeable. The action phases may occur sequentially or simultaneously, and the knowledge phases may influence the action phases and vice versa.

Knowledge creation

The funnel symbolizes knowledge creation and consists of the major types of knowledge or research that exist and can be used in healthcare.

Knowledge inquiry is first-generation knowledge, e.g. primary studies or information of variable quality that is available and that may or may not be easily accessed.

Knowledge synthesis is second-generation knowledge, which represents the aggregation and synthesis of existing knowledge.

Knowledge tools and products are third-generation knowledge, e.g. synopses presenting knowledge in a clear, concise and user-friendly format, to facilitate the uptake and application of the knowledge.

Action cycle

The central triangle is surrounded by the action cycle. This part of the process can be thought of as a cycle leading to implementation or application of knowledge. The steps involved are:

1. Identify the problem
2. Adapt knowledge to local context
3. Assess barriers to knowledge use
4. Select, tailor and implement interventions to facilitate and promote awareness and implementation of the knowledge
5. Monitor knowledge use
6. Evaluate outcomes
7. Sustain knowledge.

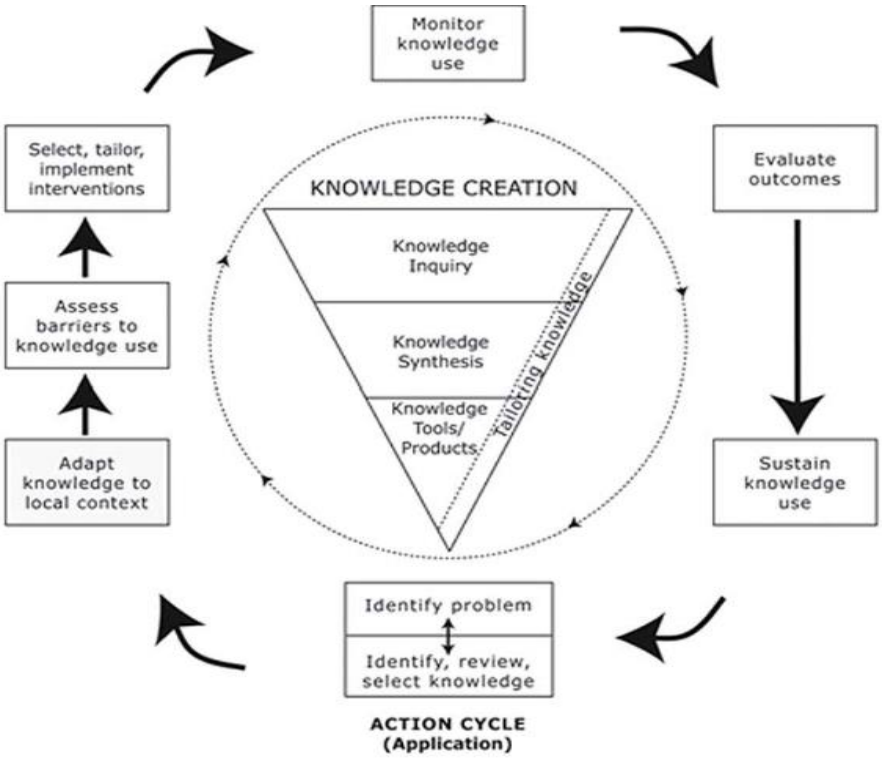

Figure 9 KTA framework

RE-FRAME framework

Both the RE-AIM and KTA frameworks were used to develop the RE-FRAME framework, which was used to implement the Live 5-2-1-0 initiative (Figure 10). The action cycle surrounding knowledge creation represents the application of the knowledge exchanged into community-level action that supports children in achieving healthier lifestyles. Key steps in progressing from knowledge to action include adaptation of the knowledge to the local context, identifying barriers and facilitators to knowledge use, and building capacity among the stakeholders who interact with children, followed by implementation, evaluation and maintenance. The RE-FRAME model is designed to support these steps so that action implementation is planned and deliberate, rather than passive and unprepared, and is adaptive and responsive to changing community dynamics in order to optimize sustainability.

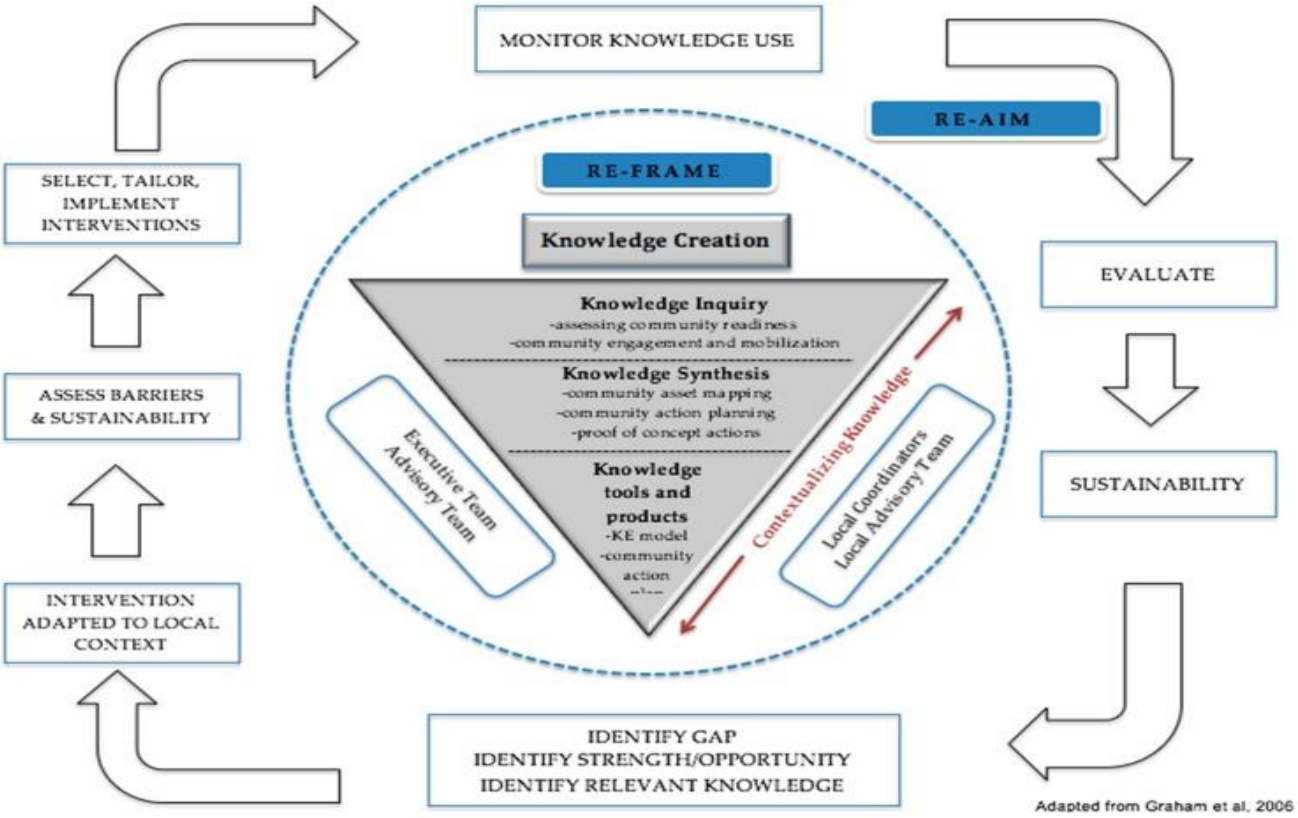

Figure 10 RE-FRAME framework (adapted from the RE-AIM and KTA frameworks)

The components of the RE-FRAME framework are presented in Table 12.

Table 12 The RE-FRAME knowledge exchange model

Framework component	Description
Reach	The extent of the key players, partnerships, and collaborations that are actively participating in the development and implementation of the project
Engagement	Developing, sustaining and fostering relationships that facilitate knowledge exchange and sharing
Facilitation, coaching, training	Technical support and sharing of expertise through active participation of knowledge users and on-site coaching
Resources	Development of new or contextualization of existing resources to enhance self-efficacy and skills around administering childhood obesity prevention initiatives
Adaptation	Continuous tailoring and adapting of activities to local settings, contexts, needs and priorities
Mobilization of champions	Identifying and mobilizing key champions and early adopters who represent various community sectors
Exchange of knowledge	Multiple levels of continuous, bi-directional exchange of knowledge, learning, and expertise

Rationale for selecting the RE-FRAME framework

RE-FRAME is a multi-layered tool that repositioned evaluation from a focus on outcomes to understanding the reach of complex community initiatives and the processes that support them. It

encompasses the concept of 'adaptation' which is critical when scaling up an initiative such as Live 5-2-1-0 to inform resource needs and implementation processes in new communities, fueling the knowledge-to-action cycle. It also provided a framework upon which the evaluation protocol was designed and analysed.

How was the RE-FRAME framework applied to the Live 5-2-1-0 initiative?

RE-FRAME was applied to the Live 5-2-1-0 initiative through components presented in Table 13. For each of the components of RE-FRAME, indicators measuring reach, effectiveness, adoption, implementation, and maintenance were identified.

Table 13 Application of the RE-FRAME framework to the Live 5-2-1-0 initiative

Framework components	How components were implemented
Resources Facilitation, coaching and training	The Live 5-2-1-0 online resource map houses resources that can be downloaded for free and used across multiple community settings to build capacity among community stakeholders (service providers, recreation facilitators, health professionals, and educators) to support and implement Live 5-2-1-0. This is supported by the SCOPE team, which provided insights on best practice and strategies to align with regional and provincial programmes as well as the financial support necessary to create high-quality materials.
Exchange of knowledge Adaptation Facilitation, coaching and training	Webinars are organized and held quarterly to provide the opportunity for new communities to interact with coordinators and stakeholders from existing Live 5-2-1-0 communities so that challenges and solutions to implementation, experiential learning, ongoing adaptation, and new ideas are shared.
Engagement Facilitation, coaching and training Resources Adaptation Mobilization of champions Exchange of knowledge	The SCOPE team provides coordination, facilitation and training, and resource development and/or adaptation while also supporting local and provincial stakeholder engagement, communications and evaluation. The team leads the implementation of the knowledge exchange model through a comprehensive community engagement process. This is achieved via presentations to community groups representing multiple sectors (i.e. healthy partnership table) or a single sector (schools, health, community services), formal workshops, and practical continuous ad hoc communication via email and phone. SCOPE also mobilizes funding to support local coordination, action implementation, and evaluation.
Adaptation Exchange of knowledge Facilitation, coaching and training	A linking system connects knowledge providers and knowledge users so that there is a two-way exchange of knowledge. The SCOPE team translates knowledge to community stakeholders (ideas, solutions, tools, linkages, best practice, resources) but also receives knowledge on the needs, priorities, contexts, and strengths of the local community, as well as their ideas for innovative local action. The linking system supports a process of continuous tailoring to meet the needs of local settings, contexts, and priorities (adaptation) and also supports opportunities for exchange of knowledge and facilitation, coaching and training.

Users' experiences of the RE-FRAME framework

The users reported that the RE-FRAME framework was useful in that it served two functions: it guided the refinement and further development of key elements of the intervention and it provided a framework upon which the intervention evaluation was designed and analysed. It also repositioned evaluation from a focus on outcomes to understanding the reach of complex community interventions and the processes that support them. This provided the users with information that is critical to refining

and improving the intervention. The users also considered the fact that RE-FRAME encompasses the concept of 'adaptation' to be important, as adaptation is critical when scaling up such an intervention. They conclude that their use of RE-FRAME demonstrates how data can be used to improve an initiative, rather than prove the success of the initiative's efficacy/effectiveness.

Methods used to evaluate the framework's effectiveness in supporting implementation

A mixed-methods approach was used to evaluate the framework's effectiveness in supporting the development and maintenance of multisectoral partnerships as well as the transfer and exchange of knowledge leading to community-wide action that shares and supports Live 5-2-1-0. This comprisedqualitative and quantitative analyses:

- The Partnership Tracking Tool is a data-collection platform that tracks new and existing community partners engaged in sharing and supporting Live 5-2-1-0.
- The Community Capacity Building Tool measures change in community capacity building with questions that cover nine domains (participation; leadership; community structures; role of external supports; asking why; obtaining resources; skills, knowledge, and learning; linking with others; and sense of community). It was completed by each community at baseline with a plan to repeat the survey yearly for the duration of the project.
- Surveys of community stakeholders who participate in SCOPE's knowledge exchange initiatives, i.e. webinars and workshops.
- Semi-structured interviews were held with local community coordinators who lead the Live 5-2-1-0 initiative within their communities and other stakeholders representing various sectors who were engaged in implementing Live 5-2-1-0 in their organization or local business.
- The website is monitored quarterly using web analytics where number of visitors to the resource page and resource downloads are tracked over time.

Results of evaluation

In the more experienced communities, successful implementation of Live 5-2-1-0 was characterized by: (1) consistent use of Live 5-2-1-0 communication and campaign resources; (2) a synergy among compatible existing initiatives and partners to promote healthy living across multiple settings; and (3) over time, the pervasiveness of the Live 5-2-1-0 message throughout the community. Existing communities also relied heavily on local partnerships and champions to disseminate and utilize Live 5-2-1-0 to create healthier environments for children and families. In newer communities, the experience of implementing Live 5-2-1-0 was still finding its way. Despite an overall lower awareness and less sharing of the message, participants cited its credible and simple message as important attributes of their ability to feel confident in adopting and integrating it into local efforts.

Enablers

From the list of 73 implementation strategies compiled by the Expert Recommendations for Implementing Change group, we have identified the following strategies (enablers) that were utilized in the implementation of Live 5-2-1-0:

- Access new funding
- Build a coalition
- Capture and share local knowledge
- Conduct educational meetings

- Conduct ongoing training
- Develop educational materials
- Develop resource-sharing agreements
- Distribute educational materials
- Facilitation
- Identify and prepare champions
- Promote adaptability
- Provide ongoing consultation
- Use advisory boards and workgroups
- Use mass media.

Summary

The Live 5-2-1-0 initiative was implemented using an adaptation of the KTA and RE-AIM frameworks – the RE-FRAME framework. Both frameworks are well-established and widely used. The KTA Framework was designed to facilitate the use of research knowledge by stakeholders while the RE-AIM framework is commonly used to evaluate the implementation of interventions. The resultant RE-FRAME framework does not explicitly list barriers or enablers; however, its components allow for the identification of enablers. In the implementation of the Live 5-2-1-0 initiative, key enablers included adaptation of knowledge to the local context, building capacity among and engaging the stakeholders who delivered the intervention, and facilitating partnerships and a two-way exchange of knowledge between SCOPE and community-based stakeholders. While the adapted version of the KTA and RE-AIM frameworks appears to have been appropriate to the Live 5-2-1-0 initiative, it is debatable whether either of these frameworks would be useful for implementing a large multisectoral intervention such as a national HWF planning system. In comparison to a national HWF planning system, the Live 5-2-1-0 initiative had a low level of complexity. While elements such as translating research evidence into action and evaluation may play some role in implementing a HWF system, neither framework really considers multiple levels or context, both of which need to be considered when implementing such a system.

Case study 2: Implementing policies that promote immediate postpartum long-acting reversible contraception (LARC) use

The Immediate Postpartum LARC Learning Community aims to promote immediate LARC use across states.

Description of framework used to implement policies promoting LARC

The Consolidated Framework for Implementation Research (CFIR)[22] specifies a list of constructs within five domains that are believed to influence (positively or negatively, as specified) implementation, but does not specify the interactions between those constructs (Figure 11). The five domains are: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation, each of which contains a number of constructs. The first domain of the CFIR is intervention characteristics. Without adaptation, interventions usually come to a setting as a poor fit, resisted by individuals who will be affected by the intervention and requiring an active process to engage individuals in order to accomplish implementation. The next two domains in the CFIR are

inner and outer setting. Generally, the outer setting includes the economic, political and social contexts within which an organization resides and the inner setting includes features of structural, political and cultural contexts through which the implementation process will proceed. However, the line between inner and outer setting is not always clear and the interface is dynamic and sometimes precarious. The fourth domain is the individuals involved. Individuals have agency; they make choices and can wield power and influence on others with consequences for implementation. The fifth domain is implementation process. Successful implementation usually requires an active change process aimed to achieve individual and organizational-level use of the intervention, as designed. The implementation process may be an interrelated series of sub-processes that do not necessarily occur sequentially.

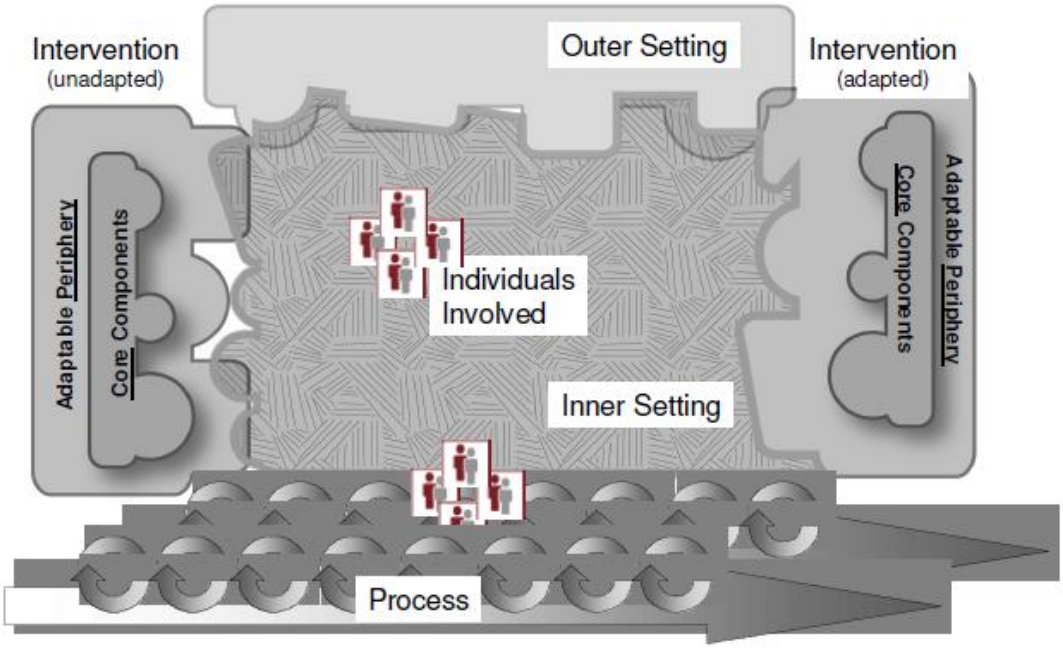

Figure 11 Consolidated Framework for Implementation Research (CFIR)

The domains and constructs of the CFIR are as follows:

I. Intervention characteristics

1. **Intervention source** – Perception of key stakeholders about whether the intervention is externally or internally developed.
2. **Evidence strength and quality** – Stakeholders' perceptions of the quality and validity of evidence supporting the belief that the intervention will have the desired outcomes.
3. **Relative advantage** – Stakeholders' perceptions of the advantage of implementing the intervention versus an alternative solution.
4. **Adaptability** – The degree to which an intervention can be adapted, tailored, refined or reinvented to meet local needs.
5. **Trialability** – The ability to test the intervention on a small scale, and to be able to reverse course (undo implementation) if warranted.
6. **Complexity** – Perceived difficulty of implementation, reflected by duration, scope, radicalness, disruptiveness, centrality, and intricacy and number of steps required to implement.

7. **Design quality and packaging** – Perceived excellence in how the intervention is bundled, presented and assembled.
8. **Cost** – Cost of the intervention and costs associated with implementing the intervention, including investment, supply and opportunity costs.

II. Outer setting

1. **Patient needs and resources** – The extent to which patient needs, as well as barriers and facilitators to meet those needs, are accurately known and prioritized by the organization.
2. **Cosmopolitanism** – The degree to which an organization is networked with other external organizations.
3. **Peer pressure** – Competitive pressure to implement an intervention; typically because most or other key peer or competing organizations have already implemented it or are in a bid for a competitive edge.
4. **External policy and incentives** – This includes external strategies to spread interventions, including policies and regulations, external mandates, recommendations and guidelines, pay-for-performance, collaboratives, and public or benchmark reporting.

III. Inner setting

1. **Structural characteristics** – The social architecture, age, maturity and size of an organization.
2. **Networks and communications** – The nature and quality of webs of social networks and the nature and quality of formal and informal communications within an organization.
3. **Culture** – Norms, values and basic assumptions of a given organization.
4. **Implementation climate** – The absorptive capacity for change, shared receptivity of involved individuals to an intervention, and the extent to which use of that intervention will be rewarded, supported and expected.
    - Tension for change
    - Compatibility
    - Relative priority
    - Organizational incentives and rewards
    - Goals and feedback
    - Learning climate.
5. **Readiness for implementation** – Tangible and immediate indicators of organizational commitment to its decision to implement an intervention.
    - Leadership engagement
    - Available resources
    - Access to knowledge and information.

IV. Characteristics of individuals involved

1. **Knowledge and beliefs about the intervention** – Individuals' attitudes towards and value placed on the intervention as well as familiarity with facts and principles related to the intervention.
2. **Self-efficacy** – Individuals' belief in their own capabilities to execute courses of action to achieve implementation goals.
3. **Individual stage of change** – Characterization of the phase an individual is in, as he or she progresses towards skilled, enthusiastic and sustained use of the intervention.

4. **Individual identification with organization** – Related to how individuals perceive the organization and their relationship with and degree of commitment to that organization.
5. **Other personal attributes** – Includes other personal traits such as tolerance of ambiguity, intellectual ability, motivation, values, competence, capacity, and learning style.

V. Process of implementation

1. **Planning** – The degree to which a scheme or method of behaviour and tasks for implementing an intervention are developed in advance, and the quality of those schemes or methods.
2. **Engaging** – Attracting and involving appropriate individuals in the implementation and use of the intervention through a combined strategy of social marketing, education, role modelling, training, and other similar activities.
    - Opinion leaders
    - Formally appointed internal implementation leaders
    - Champions
    - External change agents.
3. **Executing** – Carrying out or accomplishing the implementation according to plan.
4. **Reflecting and evaluating** – Quantitative and qualitative feedback about the progress and quality of implementation accompanied with regular personal and team debriefing about progress and experience.

Rationale for selecting the CFIR

The authors state that the CFIR is well-suited for studying the implementation of immediate postpartum LARC policies, as this is an example of an evidence-based strategy requiring adaptation for different contexts (i.e. inner and outer settings), an important construct in the CFIR. The role of individuals, e.g. policy implementers and other stakeholders, is also acknowledged as being important in influencing implementation. The CFIR also describes the often non-linear process of implementation, which has been observed in states implementing immediate postpartum LARC policies. The CFIR allows for the identification of the facilitators of and barriers to implementation and also places emphasis on the importance of context.

How was the CFIR applied?

The authors used the five domains to identify enablers of and barriers to implementation and to subsequently identify relevant implementation strategies to overcome these barriers. The CFIR also allows the authors to illustrate the multilevel and complex nature of this intervention (Table 14). For the purposes of this example, the 'inner setting' is the birthing facility because LARC provision occurs at that level.

Table 14 Multilevel application of the CFIR

Level	Stakeholders
National	Association of State and Territorial Health Officials, Centers for Disease Control and Prevention, Centers for Medicare and Medicaid Services, Office of Population Affairs, American Congress of Obstetricians and Gynecologists, National Family Planning and Reproductive Health Association, Association of Maternal and Child Health Programs
State	Health department, provider groups, Medicaid agency
Birthing facilities	Administration, pharmacy, labour and delivery, and postpartum units
Providers	Obstetricians, midwives, nurses, primary care physicians
Patients	Women, partners, children

Users' experiences of the CFIR framework

The users' experience of applying the CFIR to the implementation of immediate postpartum LARC policies was positive. This intervention required adaptation for different contexts; as context is an important construct in the CFIR, this meant that the CFIR was an appropriate framework to select. The intervention was also complex and involved non-linear implementation across multiple levels, again reinforcing that the CFIR was an apt framework. Users concluded that similar use of the CFIR framework may lead to more effective implementation in other states and could also be applied more broadly to the implementation of other evidence-based practices to improve health services and outcomes for women, infants and children.

Enablers

An assessment of each of the CFIR domains allowed the authors to identify barriers and facilitators to implementation. A summary of this assessment is presented in Table 15. The study's authors identified the implementation strategies compiled by the Expert Recommendations for Implementing Change group that that facilitated implementation:

- Conduct education meetings
- Create a learning collaborative
- Change physical structure and equipment
- Involve patients/consumers to enhance uptake and adherence
- Obtain and use patients'/consumers' and family feedback
- Conduct educational outreach visits
- Make training dynamic
- Identify and prepare provider champions.

Table 15 How the CFIR was applied to implement immediate postpartum LARC policies

CFIR domain	CFIR construct	Immediate postpartum LARC example	Associated implementation strategy	Implementation strategy label
Intervention characteristics	Evidence strength and quality	Strong evidence of safety and efficacy of immediate postpartum LARC; provider misperceptions about the impact of expulsion rates and interference with lactation	Provider outreach and education at provider professional meetings	Conduct educational meetings
Outer setting	External policies and incentives	State reimbursement strategies differ from typical reimbursement practices	Association of State and Territorial Health Officials established a multi-state learning community for immediate postpartum LARC	Create a learning collaborative
Inner setting	Readiness for implementation	Lack of devices stocked at facilities	Stocking devices in a secured, automated medication dispensing system on labour and delivery floor; bedside tackle boxes stocked and available on postpartum floor	Change physical structure and equipment
Characteristics of individuals involved	Personal attributes of patients	Women's knowledge, preferences and prior experiences with healthcare and contraception	Incorporate women's perspectives about implementation efforts, specifically counselling and consent	Involve patients/consumers; obtain and use patient/consumer feedback
	Provider self-efficacy	Lack of provider skills to insert immediate postpartum intrauterine devices	Outreach training to perinatal centers with special pelvic models for hands-on training	Conduct educational outreach visits; make training dynamic
Process of implementation	Planning	Facility-specific protocols for immediate postpartum LARC are needed to support implementation	Develop toolkits to facilitate implementation in birthing facilities	Identify and prepare provider champions

Summary

This paper clearly describes the usefulness of the CFIR when implementing immediate postpartum LARC. The intervention was multilevel, complex and multisectoral and the CFIR was considered an appropriate framework, as it enabled the authors to identify relevant facilitators and barriers and emphasized the importance of context. By undertaking an assessment of each domain, the authors were able to identify barriers and implement strategies to overcome these. Based on this example, the CFIR appears to be an appropriate framework for implementing a multilevel and multisectoral intervention and its use should be considered when implementing a national HWF planning system in Ireland. However, it should be noted that no evaluation was undertaken; although the authors recommended the use of this framework, this is not based on a thorough evaluation of the implementation process.

Case study 3: Rehabilitation Living Lab in the Mall

Rehabilitation Living Lab in the Mall (RehabMaLL) is a project that aims to transform a shopping complex in Montreal, Canada into an inclusive environment optimizing the participation and social inclusion of all people.

Description of framework used to implement the RehabMaLL project

The PRECEDE-PROCEED framework was first proposed in 1974[25] and revised in 2005[35] to help health programme planners, policy-makers and other evaluators analyse situations and design health programmes efficiently. The PRECEDE-PROCEED framework directs initial attention to outcomes rather than inputs. It guides planners through a process that starts with desired outcomes and then works backwards to identify strategies for achieving those objectives (Figure 12). The framework requires the active participation of its intended audience; that is, the participants should take an active part in defining their own problems, establishing their goals and developing their solutions. In this framework, health behaviour is regarded as being influenced by both individual and environmental factors, and hence has two distinct parts. First is PRECEDE, an acronym for Predisposing, Reinforcing and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation. Second is PROCEED, an acronym for Policy, Regulatory and Organizational Constructs in Educational and Environmental Development.

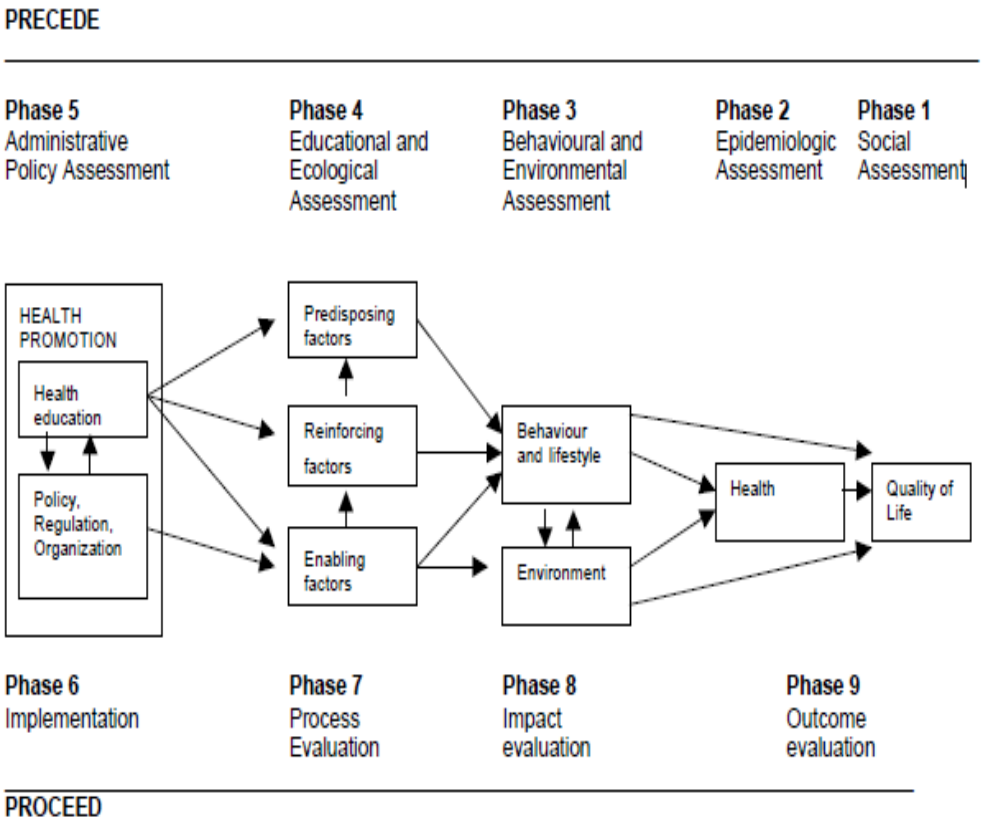

Figure 12 The PRECEDE-PROCEED framework

The five planning components of the framework (PRECEDE) include:

1. Social assessment – To identify the needs of the target community and the desired outcome
2. Epidemiological assessment – To identify the characteristics of the community in relation to the identified problems
3. Behavioural and environmental assessment – To identify the behavioural and environmental factors most likely to influence the programme being implemented
4. Educational and ecological assessment – To identify the predisposing, reinforcing and enabling factors that need to be in place to initiate and sustain the change process to inform the development of the programme interventions
5. Administrative and policy assessment – Analysis of the policies, resources and organizational situations that could hinder or facilitate development and implementation of interventions.

The implementation and evaluation components (PROCEED) include four phases:

1. Implementation – The implementation of interventions or other programme components
2. Process evaluation – Evaluation of how the programme was implemented according to protocol
3. Impact evaluation – Assess change in predisposing, reinforcing and enabling factors as well as in behavioural and environmental factors
4. Outcome evaluation – To determine the effect of the programme on health and quality of life indicators.

Predisposing factors are the antecedents that provide motivation for action. They include the knowledge, attitudes, beliefs, values and confidence of stakeholders (mall owners and mall patrons). Enabling factors are the internal factors that enable stakeholders to act on their predispositions and include the availability of material and financial resources, as well as the mall personnel. Reinforcing factors provide the external rewards or incentives for the continuation of behaviours of the person at the mall; they include feedback and influences from health professionals, local laws and policies, media, and more. Additional materials on using the framework may be accessed at www.lgreen.net/precede.htm.

Rationale for selecting the PRECEDE-PROCEED framework

PRECEDE-PROCEED was considered to be well-suited for the RehabMaLL project, as it is a community-oriented and participatory planning model that relies on the participation of the target population. As such, the framework requires that the target population and stakeholders partake in every phase of model development, which makes it compatible with the participatory approach required for the development, implementation and sustainability of RehabMaLL. The model can be used to iteratively integrate planning and evaluation stages, help set priorities and allocate resources, and provide a framework to guide network activities. The desired outcomes are decided at the beginning of the planning phases, permitting the establishment of metrics important in evaluating the programme. PRECEDE-PROCEED could also be used to promote the transferability of the processes of the RehabMaLL project to similar environments and at the national and international levels.

How was the PRECEDE-PROCEED framework applied to the RehabMaLL project?

Phases 1 and 2: Social and epidemiological assessment

The social assessment focused on identifying the needs of the mall patrons, the social problems impacting on their quality of life, and their desired outcomes. The epidemiological assessment phase involved identifying the characteristics of the target community at the mall. The types of functions impacted in individuals with disabilities at the mall were mapped. In order to gather baseline data on the characteristics of the mall patrons, a series of observations including 'people counts' were conducted at the mall. The baseline observations revealed that between 4% and 8% of mall patrons had reduced mobility. A number of inclusivity issues in activity and participation were also identified.

Phase 3: Behavioural and environmental assessment

This phase was informed by numerous projects exploring obstacles and facilitators in the social and physical environment. For example, some research projects described the physical space characteristics, floor plans and metrics charts to identify obstacles to navigation, while other research projects included focus groups with mall users with and without disabilities to synthesize information on the experiences and expectations in relation to inclusivity measures. The synthesis of information was facilitated by holding working groups where researchers, community members and other stakeholder groups helped prioritize the issues identified by the research projects.

Phase 4: Educational and organizational assessment

This phase informed the development of the programme interventions by determining the predisposing, enabling and reinforcing factors. The most common factors were knowledge; awareness, and perceptions of stakeholders at the mall; communication/feedback mechanisms; and information access. A cost-benefit comparison was conducted in order to prioritize issues based on their degree of

feasibility/changeability. For example, signage improvements were considered as low-cost environmental modifications with a high degree of feasibility, and were expected to have a significant impact on the inclusivity of patrons with vision impairments. On the other hand, changes at the policy level, such as implementing mandatory training of employees, were less feasible and were associated with higher costs.

Phase 5: Administrative and policy assessment
Phase 5 involved determining whether the proposed interventions were feasible with available resources and were compatible with mall administrative policies. Potential interventions/solutions were identified for each of the issues prioritized in phase 4. The activities within this phase were conducted by the project leaders/researchers in collaboration with mall administrators, leveraging the information collected and synthesized from all previous phases of the PRECEDE-PROCEED framework. For example, to remediate poor interior signage and improve navigation, the addition of a number of signs and floor identifiers were planned in key locations. Prior to doing so, an analysis of the policies, resources and circumstances at the mall that could hinder or facilitate the development and implementation of each of the interventions or modifications to the mall setting was undertaken.

Implementation phase
Phase 6: Implementation of programme components and activities
This entails the selection of intervention implementation methods and strategies, as well as identification of resources and required policy changes. The RehabMaLL project implementation activities were dependent on continuous collaboration with the mall owners. Mall management and the research team met frequently to provide updates and to discuss ways to integrate research findings into renovation plans. The RehabMaLL interventions have been implemented gradually over the years. Some projects are still in progress, requiring constant maintenance and effort.

Phases 7, 8, and 9: Process, impact, and outcome evaluation
The process evaluation includes an analysis of procedures in place for reaching the target population and examining whether these processes are working as planned. It is recommended that the evaluation measures whether the interventions addressed the factors identified at phase 4 (educational and organizational assessment). An example of a metric for this phase would be reporting on the percentage of recommended interventions/solutions that were accepted by mall management. For the interventions/solutions that were accepted, an analysis on the gaps between what was planned and what was actually implemented will be conducted. During the process evaluation, an analysis of the key predisposing, enabling and reinforcing factors that were targeted for change by the selected interventions is also planned. The impact and outcome evaluations examine the immediate and long-term in-vivo effects of the interventions on physical and cognitive function, social participation, and inclusion of persons with disabilities. Sustainability of these effects will also be investigated. The impact evaluation will measure baseline and post-implementation experiences, knowledge, attitudes, and beliefs of mall patrons with disabilities.

Users' experiences of the PRECEDE-PROCEED framework

The users' experiences of applying the PRECEDE-PROCEED framework were generally positive and they felt it was an appropriate framework for their intervention. They highlighted the importance of identifying predisposing, enabling, and reinforcing factors, and the activities resulting from the planning phases of the framework supported decision-making. They reported that the framework was flexible

and that it facilitated the integration and synthesis of information from many different sources, as well as the identification and prioritization of key issues to address in order to improve inclusiveness of people with disabilities. The framework also helped frame and drive the implementation and evaluation of the ongoing components of the intervention. The authors note, however, that there are limitations to using such a planning-focused framework, particularly with respect to the evaluation of the intervention. They state that while there are established procedures to guide the synthesis and prioritization of information in the planning phases, there is less guidance available regarding the PROCEED evaluation phases, aside from the recommendation to link particular evaluative phases to specific PRECEDE phases.

Methods used to evaluate the framework's effectiveness

The evaluation of the RehabMaLL project is ongoing and the authors state that results will be published subsequently.

Enablers

- Change physical structure and equipment
- Conduct educational meetings
- Conduct local needs assessment
- Develop academic partnerships
- Facilitation
- Involve patients/consumers to enhance uptake and adherence
- Obtain and use patients'/consumers' and family feedback
- Prepare patients/consumers to be active participants
- Use advisory boards and workgroups.

Summary

In this case study, PRECEDE-PROCEED was an appropriate framework to use, as it is a community-oriented and participatory planning model that relies on the participation of the target population – in this instance the people with disabilities who intended to use the mall. As such, it requires that the target population and stakeholders partake in every phase of the process. The framework facilitated the identification of relevant epidemiological, environmental, ecological and administrative factors that impacted the implementation process. This framework has been used extensively in planning health programmes; however, it does not take account of implementation at different levels and does not place emphasis on context. In relation to HWF planning, the framework may be useful in guiding the assessment phase at the start of the implementation process. It highlights the importance of including the end users in the implementation process, which may be of relevance, and it may also be used to guide the evaluation. However, it does not take into account the multilevel aspect of the intervention and does not consider context in detail, which may reduce its usefulness when implementing a national HWF system.

Case study 4: Child Pedestrian Injury Prevention Project

The Child Pedestrian Injury Prevention Project is a three-year intervention trial that aims to reduce injury to child pedestrians.

Description of framework used to implement the Child Pedestrian Injury Prevention Project

The PRECEDE-PROCEED framework was used to implement the Child Pedestrian Injury Prevention Project (Figure 13). A description of this framework may be found on page 84 of this review.

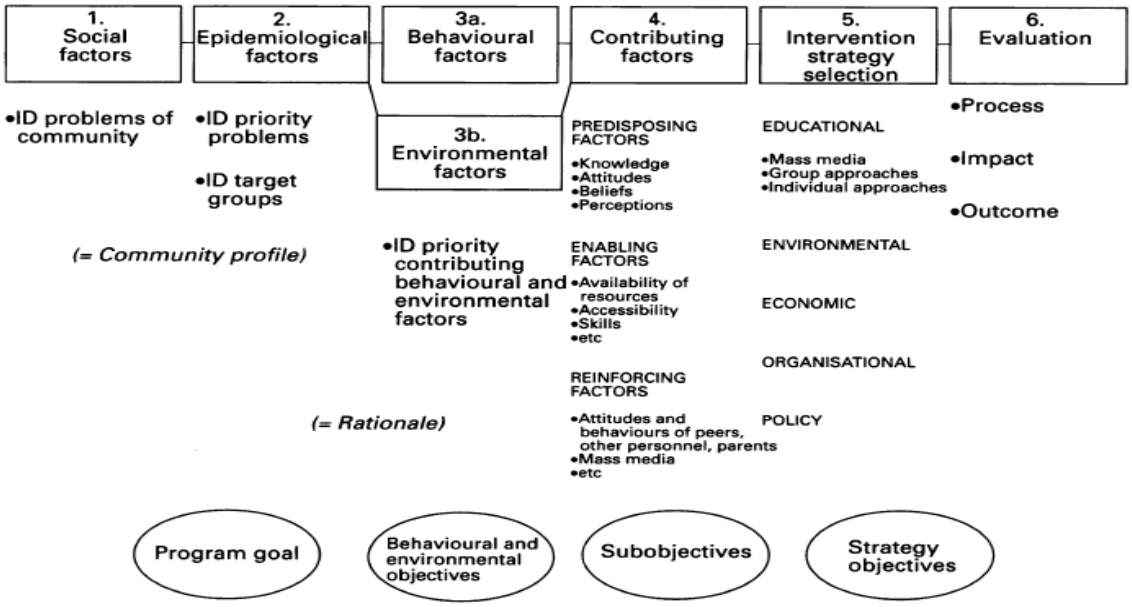

Figure 13 PRECEDE-PROCEED framework used to implement the Child Pedestrian Injury Prevention Project

Rationale for selecting the PRECEDE-PROCEED framework

A value of the PRECEDE-PROCEED framework is that it forces the planner to thoroughly assess the factors associated with the problem that is the focus of concern. A series of diagnoses precedes the development of the interventions, their implementation, and their evaluation. The authors state that the PRECEDE-PROCEED framework provides a useful checklist addressing many of the main components that need to be considered during programme planning. This can help to clarify the potentially complex process of planning. The main benefit of the framework is that appropriate interventions are likely to result and the likelihood of a rigorous evaluation design is enhanced.

How was the PRECEDE-PROCEED framework applied to the Child Pedestrian Injury Prevention Project?

The starting point for planning the Child Pedestrian Injury Prevention Project was the epidemiological factors assessment.

Step 1 Epidemiological factors assessment
This involved identifying the epidemiological details of the problem and characteristics of the groups at risk. The information reviewed included mortality and morbidity data and risk factors that contribute to childhood pedestrian injury.

Step 2 Environmental assessment
In this phase of the planning process, factors causally associated with child pedestrian injuries were identified. Behavioural and environmental factors were considered as risk factors, and objectives were developed for each risk factor. For the behavioural assessment, the main risk factors and behavioural objectives were identified. Two main risk factors were identified: inappropriate road crossing behaviours and children not seeking help to cross the road. Five behavioural objectives were formulated to guide interventions aimed at reducing the effect of the risk factors. For the environmental assessment, five main risk factors and eight environmental objectives were identified for the three general groups of relevant environmental factors: traffic volume and speed, road design, and roadside obstacles.

Step 3 Contributing factors assessment
Twenty contributing factors were classified into predisposing, enabling, and reinforcing factors. Predisposing factors related directly to child pedestrians included lack of knowledge about safe road-crossing behaviour and perception of low risk of injury while crossing busy roads. The enabling factors for this group included: inability to identify safer road crossing sites; poorly developed road-crossing skills; lack of social skills required to ask people to help them cross roads; and inadequate school road-safety education. Two reinforcing factors were: parents allowing children to cross roads alone and parents' perceptions that their children had adequate abilities to cross roads safely, unaccompanied.

Step 4 Intervention strategy selection
During step 4, 13 strategy objectives were developed to address each of the sub-objectives. The intervention strategies were then selected to address these strategy objectives. To maximize the likely impact of the intervention strategies, it was recognized that a combination of educational and environmental approaches was needed. The educational strategies can be classified into two main types. First, there are those activities that aim to directly influence road-crossing behaviour, which are delivered by mass media, group and individual approaches. The main target groups here are children, their parents, and teachers. In-service training of teachers to effectively conduct road-safety education for the students in schools is an example of this education. The second type involves support for the children's road-crossing behaviours by influencing environmental changes that help make the roads safer. Individual communication with appropriate opinion leaders – including city councillors and staff – and members of the Road Safety Advisory Committee are examples. It also includes the provision of mass-media information directed to residents to increase their awareness about the need for environmental changes, such as lowering speed limits and the installation of roundabouts, and to increase their support for such changes.

Users' experience of using the PRECEDE-PROCEED framework

The users considered PRECEDE-PROCEED to be a useful framework, as it forces the planner to assess both qualitative and quantitative data to identify priorities and to justify why a particular health problem is selected for intervention. The identification and assessment of the predisposing, enabling, and reinforcing factors helps to show their relative importance as contributing factors.

The orderly and sequential nature of the framework facilitates the selection of programme goals, and behavioural and environmental objectives, on which a programme can be based. This ensures that consideration is given to many of the relevant factors as a basis for selecting appropriate intervention strategies and that appropriate diagnoses are made before the intervention is designed. Prompting the writing of clear, measurable goals and objectives is another strength of the framework and this directs the development of process, impact, and outcome evaluation of the programme. The users concluded that the ultimate benefit of the framework is that appropriate interventions are likely to result and the likelihood of a rigorous evaluation design is enhanced.

Methods used to evaluate the framework's effectiveness in supporting implementation

The authors state that several months after the commencement of the prevention programme a review was undertaken to assess its implementation. However, no comprehensive information on the methodologies used and the results of the evaluation are reported. They state that the strategy objectives and sub-objectives were reviewed to ensure that the process evaluation procedures were assessing the extent to which those objectives were being implemented. The strategies associated with the behavioural objectives were found to be implemented adequately, but there were significant deficiencies in the implementation of the environment-oriented strategies. However, no data is provided to corroborate this.

Enablers

The project team identified a number of facilitators during the assessment part of the PRECEDE-PROCEED framework. These included:

- Conduct educational meetings
- Conduct local needs assessment
- Facilitation
- Involve patients/consumers to enhance uptake and adherence
- Obtain and use patients'/consumers' and family feedback
- Prepare patients/consumers to be active participants
- Use advisory boards and workgroups
- Use mass media.

Case study 5: Housing First model

The Housing First model (HFM) is an evidence-based practice designed to serve chronically homeless individuals. As the HFM has expanded nationally, it has proven difficult to implement for a number of reasons, including a lack of replication guidelines, contextual barriers (e.g. funding requirements, structure of available housing, and pervasiveness of education in treatment-first practices among staff), and because the complexity of housing interventions requires significant coordination between multiple levels and systems in order for the model to be successful.

Description of frameworks used to implement the HFM

A combination of two separate frameworks by Chaudoir *et al.* (2013)[17] and Proctor *et al.* (2011)[38] were used. Chaudoir *et al.* describe a five-factor multilevel framework (Figure 14). The left side of the figure depicts causal factors, or the structural-, organizational-, patient-, provider-, and innovation-level constructs that are hypothesized to cause or predict implementation outcomes. Within these five factors there are 62 constructs. These factors represent multiple levels of analysis, from the micro level to macro level, such that a specific innovation is implemented by providers to patients who are nested within an organization, which is nested within a broader structural context. The right side of the figure depicts the implementation outcomes – such as adoption, fidelity, implementation cost, penetration, and sustainability – that are affected by the causal factors. Together, these factors illustrate a hypothesized causal effect wherein constructs lead to implementation outcomes.

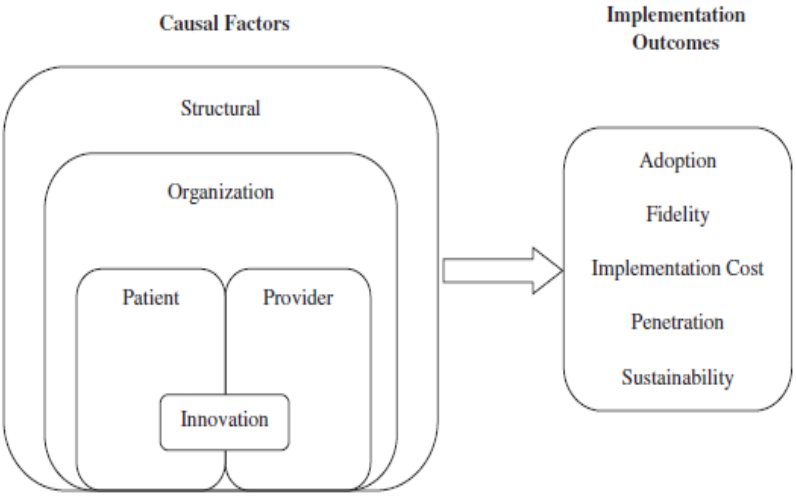

Figure 14 Framework by Chaudoir *et al.*

Proctor *et al.* proposed a framework that posits nested levels and distinguishes but links key implementation processes and outcomes (Figure 15). It also illustrates three distinct but interrelated types of outcomes: implementation, service, and client outcomes.

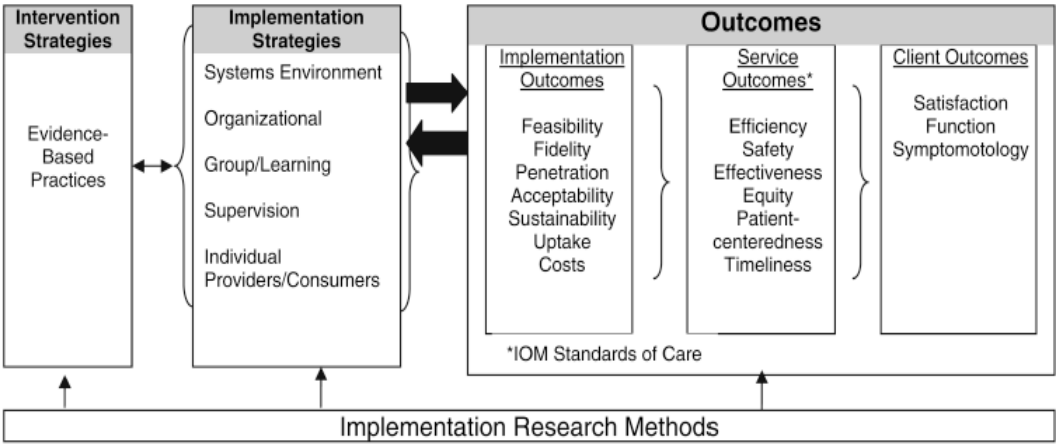

Figure 15 Framework by Proctor *et al.*

It also provides for classification of multilevel implementation strategies and identifies four levels where change can occur (Figure 16). No further information is provided on how to apply this framework when implementing an intervention.

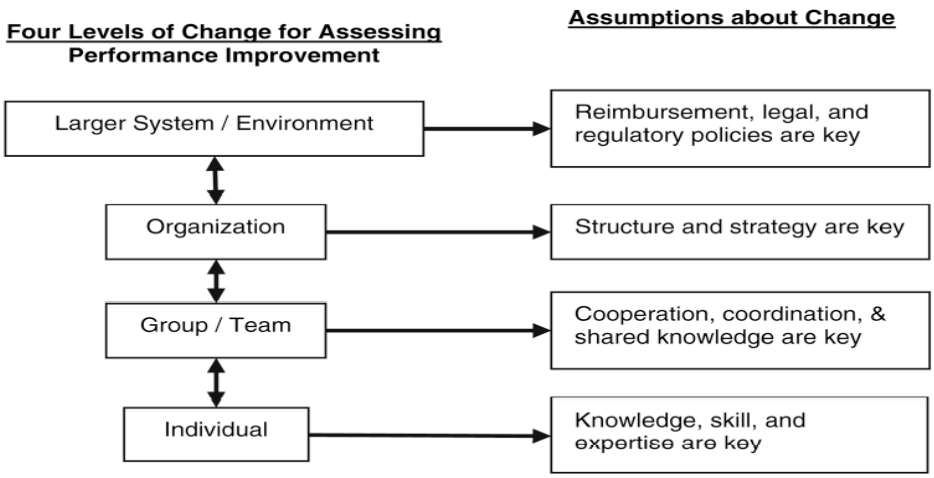

Figure 16 Framework by Proctor *et al.*: Levels of change

Rationale for selecting this framework

The authors chose to integrate these two frameworks because Chaudoir *et al.* specifically highlight the importance of the structural levels (e.g. external systems and the community) important to consider with complex interventions such as the HFM, and Proctor *et al.* explicitly consider implementation strategies. Both frameworks define implementation outcomes as distinct from both service and client outcomes, making them highly compatible.

How the frameworks were applied to the HFM intervention

The combined framework (Figure 17) recognizes that implementation can occur separately or simultaneously at one or more levels (e.g. system, organizational, group, individual) and that appropriately targeted implementation strategies should lead to effective change. The framework proposes the following: (1) the implementation strategy (HFM) affects various constructs at multiple levels within which the intervention is located; (2) constructs at these levels also affect the implementation strategy through barriers and facilitators existing within (as represented by the bi-directional arrows); (3) an intervention often has to be adapted to fit the broader context in which it is situated (represented by the dashed lines); and (4) changes at these levels have effects on a variety of outcomes. The double asterisks represent outcomes of interest in the current HFM study.

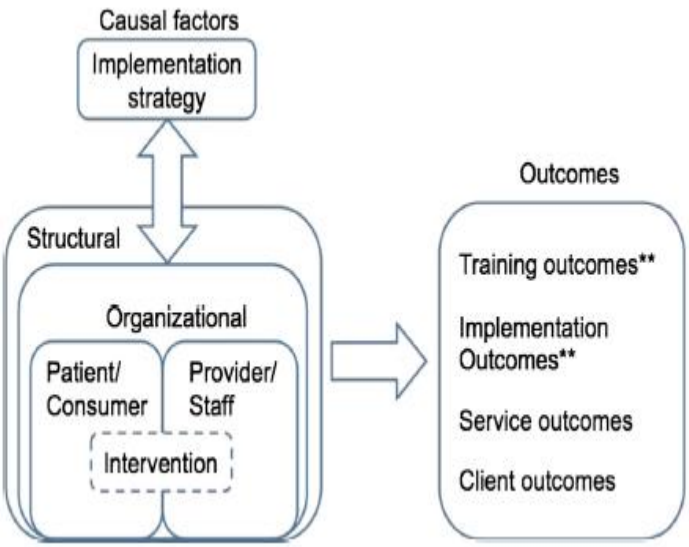

Figure 17 Proposed framework for implementing the HFM, adapted from Chaudoir *et al.* and Proctor *et al.*

Proposed methods to evaluate the framework's effectiveness in supporting implementation

There is no published documentation to indicate whether this intervention was implemented as planned. At the protocol stage the authors had proposed a very comprehensive mixed-methods approach to evaluate implementation effectiveness. This will be divided between Chicago and Central Indiana, two areas with significantly different barriers to implementation. Providers will be requested to keep a detailed log of their experience, complete the modules, and participate in one of two focus groups. After refining the modules based on alpha test results, the strategy will be tested among a sample of four housing organizations (two from Chicago and two from Indiana). Qualitative and quantitative data from administration and staff will be analysed. Measures of interest include causal factors affecting implementation, training outcomes, and implementation outcomes. The proposed evaluation will have a strong focus on implementation outcomes; the authors have developed the HFM Fidelity Index to measure fidelity; the Stages of Implementation Completion instrument will measure implementation process organizational change; the Evidence-Based Practice Attitude Scale will measure acceptability of the intervention; and individual interviews will be conducted to assess feasibility, appropriateness, adoption and penetration.

Enablers

As the implementation process of the intervention has not been published, it is not possible to determine what enablers were identified. The framework being utilized acknowledges the role of barriers and facilitators and the need to address these.

Summary

The HFM is a complex intervention and its national implementation has been impacted due to contextual barriers and its complexity, which requires significant coordination between multiple levels

and across sectors. In terms of complexity, it is similar to the HWF system being proposed in Ireland. The authors have chosen a framework adapted from frameworks originally described by Chaudoir *et al.* and Proctor *et al.* This adapted framework recognizes that implementation can occur at different levels and the need to identify barriers and facilitators at each level, and it also states that an intervention often has to be adapted to fit the context in which it is situated. Compared to other named frameworks, there is little guidance on how to use the adapted framework or either of the two original frameworks. In addition, the two frameworks do not appear to have been widely used to aid the implementation of interventions, and the adapted framework is an original framework. Given the complexity of the HFM, it will be very interesting to analyse the results of the implementation process and the evaluation in order to determine the usefulness of the adapted framework. Until these results are available, it is difficult to recommend the use of the adapted framework.

Case study 6: SafeCare

SafeCare is a behavioural and psychosocial evidence-based practice developed to prevent child neglect. It comprises three modules addressing the following issues: infant and child health, home safety and cleanliness, and parent–child interactions.

Description of frameworks used to implement SafeCare

The proposed intervention is to be implemented using the Dynamic Adaptation Process (DAP), which is adapted from the EPIS framework. The EPIS framework was designed by the study's authors specifically for use in public service sectors such as mental health, substance abuse, juvenile justice, and child welfare. It has four phases – exploration, preparation, implementation, and sustainment – and examines contextual factors at two primary levels: outer and inner. The outer context represents larger, often external, factors that can either support or slow implementation, such as federal, state, county or local policies; funding and mandates; and organizational relationships. The inner context represents what is happening within a community or organization that is implementing an evidence-based practice, such as staffing, policies and procedures, and organizational culture and climate. Different aspects of the outer and inner context may be more prominent or manifest differently during different phases.

- **Exploration phase** – Potential implementers consider what evidence-based practices might best solve a clinical or service problem while also considering opportunities or challenges in the outer and inner contextual factors.
- **Preparation phase** – Implementers plan for integrating the evidence-based practice into the existing system, including a realistic and comprehensive assessment of implementation challenges.
- **Implementation phase** - The system/organization is in the process of the evidence-based practice at this time. Implementation factors range from large system issues, such as political and funding concerns (availability of start-up funding, sustained funding in place), through clinician issues (fit with productivity and work demands), to consumer concerns (potential for stigma, applicability of practices for client needs and culture).
- **Sustainment phase** – The intervention is engrained in the organization, including stable funding and ongoing monitoring and/or quality assurance processes.

Rationale for selecting the EPIS framework

As there has been limited research on frameworks that allow for intervention and contextual adaptation while maintaining fidelity, the authors proposed the EPIS framework which is based on current literature and their own research and experience. The EPIS framework provides a four-phase process for implementing an evidence-based practice that takes into account the multilevel context of services delivery, engages multiple stakeholders, and provides appropriate expertise and feedback during implementation to guide, monitor, and address system, organization, and model adaptations while maintaining fidelity to the core elements of an evidence-based practice.

How will the EPIS frameworks be applied to the SafeCare intervention?

In applying the DAP model to SafeCare implementation, the investigative team works along with child-welfare system directors and staff, programme leaders, clinicians, and model developers to use the DAP to guide and provide appropriate adaptation of the evidence-based practiceand the service context. A feature of the DAP is the presence of an Implementation Resource Team, which consists of experts in SafeCare and implementation science, as well as members of the county and organizations involved in the local implementation. This team meets monthly via a conference call or in person to examine adaptation needs and fidelity data and guide the implementation with adaptation support.

Exploration phase – This phase involves a multilevel assessment of system, organization, provider, and client characteristics. A continuous information feedback loop is created such that information gathered during the assessments is used by the Implementation Resource Team to make adjustments to the way that SafeCare is trained and delivered so that it can be implemented effectively in each local context (Figure 18).

Preparation phase – This phase involves making information gathered in the exploration phase available to the entire Implementation Resource Team, which then examines exploration phase results, descriptions of service contexts, data reports, and other materials pertinent to adaptation in the proposed service context to determine what adaptations may be needed in the service context and how such adaptations are to be accomplished.

Implementation phase – Based on the outcome of the preparation phase, training with adaptation support begins in this phase. There is discussion of adaptation during provider training, including why one might adapt, what one might adapt, what one might not adapt, and when to seek guidance on adaptation. In addition to intervention adaptation, the need for adaptation at the system and organizational levels is also an ongoing target for change.

Sustainment phase – This involves ongoing use of client and system data to provide feedback to the coaches and the Implementation Resource Team, which can use that information to better understand home-visitor fidelity, client satisfaction with services, and client satisfaction with SafeCare.

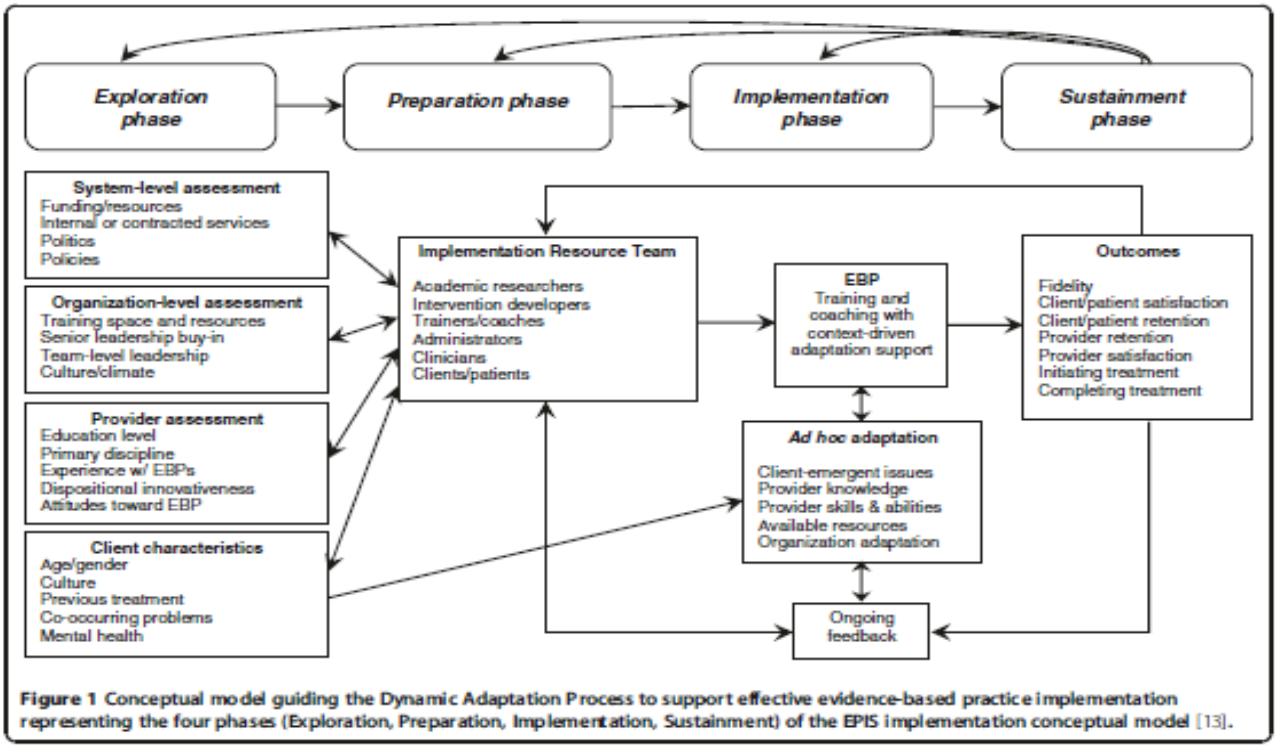

Figure 18 Proposed EPIS framework for implementing the SafeCare intervention[39]

Proposed methods to evaluate the EPIS framework's effectiveness in supporting implementation

An evaluation incorporating mixed methods is proposed and will include both intervention and implementation outcomes. This qualitative portion of the study will involve recruiting 30 home visitors and all team leaders/clinical supervisors and up to 30 provider staff. Administrative data and questionnaires will be analysed to determine client satisfaction, provider fidelity and factors related to fidelity.

Enablers

This is a study protocol; while the authors have set out what they plan to do, it is not possible to identify enablers, as it has not yet been implemented.

Summary

The EPIS framework was designed by the study's authors to be applied to public sector services serving children and families. It highlights the importance of considering context at different levels, and the process is iterative in that it can be adapted as needed. It also allows for evaluation of both intervention and implementation outcomes. It may be useful to consider this framework, or aspects of it, when implementing a national HWF planning system in Ireland. While the authors have described a detailed account of how this framework will be used and it appears to be appropriate for the SafeCare intervention, there is no published information on the implementation process or the evaluation. It has

only been applied in limited settings and the scales of these interventions are smaller than the proposed Irish HWF system.

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