As the field of implementation science has matured, increasing attention has been paid to whether and how newly implemented interventions and programs can be sustained over time. Questions regarding the extent to which innovations in cancer prevention and care can best be sustained to provide desired benefits are essential to consider because many practices and programs require a substantial upfront investment of time and resources. Stakeholders make this investment with the expectation that the interventions will be delivered and that the intended recipients will benefit from them over the long term, but there is increasing evidence that sustainability of evidence-based programs and interventions remains precarious.\(^1\) Consider the case of the Comprehensive Health Enhancement Support System (CHESS), an online social support tool for cancer survivors developed at the University of Wisconsin, tested for efficacy and effectiveness in multiple health care delivery systems, and then subjected to implementation study in two Colorado delivery systems. CHESS had been the object of multiple randomized controlled trials that documented its effectiveness. Nevertheless, Colorado decision makers engaged in a lengthy introduction, review, and redesign process before it was approved for implementation. Even after this substantial groundwork was in place, continued reminders and checks were needed to sustain its visibility and use by providers and patients.\(^2\) Clearly, evidence of effectiveness can be insufficient even for the sustained use of effective cancer prevention and care innovations, let alone for sustained benefit to patients.

\textit{Sustainability} has been defined as the continued use of program components and activities for the continued achievement of desirable program and population outcomes.\(^3\) Sustainability has sometimes been distinguished from the term \textit{sustainment}, defined as the continued use of an intervention within practice,\(^4\) meaning that sustainability then refers to the extent to which an evidence-based intervention can deliver its intended benefits over an extended period of time after external support is terminated.\(^4\)
In this view, sustenance equates with normalization; when organizational delivery staff continue to offer programs and engage in practices and no longer perceive them to be new, the sustenance of programs and practices has occurred, and sustainability encompasses whether the program and its intended benefits are maintained. A recent review of the sustainability literature suggested that a program or intervention may be considered to be sustained at a given point in time if, after initial implementation support has been withdrawn, core elements are maintained (e.g., remain recognizable or delivered at a sufficient level of fidelity or intensity to yield desired health outcomes) and adequate capacity for continuation of these elements is maintained. Arguably more important, however, is whether a program or an intervention’s impact is sustained—that is, if desired health benefits remain at or above the level achieved during implementation and this increase can be attributed to continuation of the program. Thus, in considering sustainability, it is useful to consider a number of potential outcomes.

**SUSTAINABILITY OUTCOMES**

In addition to listing sustainability as an important implementation outcome, Proctor and colleagues identify several other implementation outcomes that are also relevant to sustainability: acceptability, appropriateness, costs, feasibility, fidelity, and penetration. Depending on the nature of the program or intervention, appropriate outcomes to assess may include consumer-, patient-, or recipient-level outcomes (e.g., health outcomes); fidelity; modifications or adaptations to the intervention; capacity to administer or deliver the program or intervention; and maintenance of necessary collaborations between key stakeholders or coalitions. To inform research and assessment of sustainability outcomes, Scheirer recommends differentiating six types of interventions according to their structure—who and what are required for continued delivery—that is, to their health context area. As indicated in Table 6.1, the different forms of programs and interventions have implications for planning, selecting strategies to promote sustainment, and determining whether the program or intervention is sustained. The programmatic outcomes that will be most relevant will be determined by the type of program. For example, interventions delivered by individual providers may include a focus on sustained provider skill or fidelity, the number of providers available to provide the intervention, penetration (proportion of eligible consumers who receive the intervention), and clinical outcomes. Interventions that focus on partnerships and coalition building may instead evaluate communication patterns, coalition activities, member engagement, and other indicators that the partnership remains active. Stakeholder goals should also inform evaluations of sustainability to ensure that outcomes that are relevant to key partners and decision makers are reflected in evaluations. In every case, however, a critical outcome to examine is whether the desired health benefits for intended beneficiaries have been maintained or improved upon.

In addition, there will be circumstances under which discontinuation or reinvention of an existing practice or program, or adoption and implementation of a more effective, efficient, or better fitting intervention, is desirable. All of these considerations should factor into planning and evaluation of long-term sustainment.

**SUSTAINABILITY FRAMEWORKS**

A number of frameworks have been put forth to conceptualize sustainability, either in the context of a broader implementation framework or as a separate consideration. Table 6.2 lists 27 frameworks that describe processes or factors related to sustainment. These frameworks have been developed in a number of areas, such as mental or physical health, prevention, and public health. The majority of the frameworks describe factors that are also highlighted in implementation frameworks discussed in previous chapters of this book, classified broadly as follows: outer context (e.g., sociopolitical context), inner context (e.g., organization-level factors, including climate, culture, leadership, and resources), provider level (e.g., training backgrounds and attitudes), and intervention or program characteristics (e.g., relative advantage, complexity, compatibility, and cost). Some conceptualizations of sustainability emphasize the likelihood of mutual influence between factors at the different levels. For example, policy related to health care financing is likely to influence the level of leadership support that a program receives within a health care organization. The relative influence of these different factors on sustainment may be different than that during the post-adoptive implementation phase. Although organizations may find ways to absorb
Table 16.1. Key Sustainability Outcomes by Program Type

<table>
<thead>
<tr>
<th>PROGRAM TYPE</th>
<th>EXAMPLES OF INTERVENTIONS</th>
<th>SUSTAINABILITY OUTCOME IN ADDITION TO DESIRED HEALTH BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention delivered by individual providers</td>
<td>Health education, psychotherapy (e.g., Project HEAL⁶⁰)</td>
<td>Whether, and to what extent, the core elements (the elements most closely associated with desired health benefits) are maintained</td>
</tr>
<tr>
<td>Intervention requiring coordination between multiple providers</td>
<td>Community–academic cancer prevention programs, surgical procedures (e.g., short-stay program after breast cancer surgery⁶⁰)</td>
<td>Continuation of program elements or activities, particularly those most closely linked to desired health benefits</td>
</tr>
<tr>
<td>New technologies, policies, or procedures</td>
<td>Screening, electronic reminders, smoking bans (e.g., CHESS program⁶²)</td>
<td>Continued availability and use of the technology; continued adherence to the policy or procedure</td>
</tr>
<tr>
<td>Interventions that build capacity or infrastructure</td>
<td>Leadership training, board development, strategic planning (e.g., national or local Cancer Prevention Coalitions)</td>
<td>Maintenance or expansion of capacity and infrastructure and resources</td>
</tr>
<tr>
<td>Collaborative partnerships or coalitions</td>
<td>Community-based smoking cessation programs</td>
<td>Maintenance or expansion of partnerships</td>
</tr>
<tr>
<td>Broad-scale system change</td>
<td>Comprehensive cancer programs, integrated medical and behavioral health</td>
<td>Changes in the ways that organizations, practitioners, financial sources, and other factors interact to impact problem area; culture change</td>
</tr>
</tbody>
</table>

Initial costs of implementation activities such as training and purchasing equipment or materials that contribute to initial implementation success, ongoing cost–benefit assessments may determine whether a program or intervention is sustainable. As Scheirer⁷ notes, the nature of the program or intervention will factor in to the relative salience of potential influences, as well as the outcomes when considering sustainability. As illustrated in Table 16.2, the frameworks that attend to sustainability span a number of domains and fields, and they may therefore emphasize different factors and processes depending on the field and context from which it originated. Thus, selection of a framework to guide planning or evaluation should be informed by the type of program, the goals, and the complexity of the intervention.

Although the concept of sustainability has implied a static, rather than evolving, form of ongoing implementation, a more dynamic concept of sustainability has recently been proposed as the Dynamic Sustainability Framework.⁸ This framework explicitly addresses the importance of considering the fact that programs and interventions are implemented in rapidly changing contexts and that mechanisms for adapting to these changes to...
<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>FOCUS</th>
<th>HOW SUSTAINABILITY IS DEFINED</th>
<th>INTERVENTION</th>
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<td></td>
<td>EXPPLICIT DEFINITION</td>
<td>SUSTAINABILITY OUTCOMES CONSIDERED</td>
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<tr>
<td>Aarons et al. 56</td>
<td>Conceptualizing implementation</td>
<td>No</td>
<td>Intervention activities</td>
</tr>
<tr>
<td>Adelman and Taylor 57</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Intervention activities, organizational policies, replication</td>
</tr>
<tr>
<td>Akerlund 58</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Intervention activities, replication</td>
</tr>
<tr>
<td>Altman 60</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Intervention activities, community partnerships, organizational policies</td>
</tr>
<tr>
<td>Beery et al. 60</td>
<td>Evaluation/measurement</td>
<td>No</td>
<td>Consumer benefits, Intervention activities</td>
</tr>
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</table>

(continued)
<table>
<thead>
<tr>
<th>AUTHORS</th>
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<th>HOW SUSTAINABILITY IS DEFINED</th>
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<th>TYPE</th>
<th>DOMAIN</th>
<th>INTENT</th>
<th>SETTING TYPE</th>
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<tr>
<td>Chambers et al.⁴</td>
<td>Conceptualizing sustainability</td>
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<td>Intervention activities, benefits</td>
<td>Individual providers, multiple staff, policies/procedures/technologies, capacity/infrastructure building</td>
<td>Health care</td>
<td>Prevention, treatment</td>
<td>Organization, community</td>
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<tr>
<td>Feldstein et al.⁶¹</td>
<td>Conceptualizing implementation</td>
<td>No</td>
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<td>Individual providers, multiple staff</td>
<td>Health and human services</td>
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<td>Organization</td>
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<td>Glaser⁶²</td>
<td>Conceptualizing sustainability</td>
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<td>Intervention activities</td>
<td>Individual providers</td>
<td>Mental health/substance abuse</td>
<td>Treatment</td>
<td>Organization</td>
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<tr>
<td>Goodman and Steckler⁶³</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Intervention activities, organizational policies</td>
<td>Individual providers, multiple staff, policies/procedures/technologies</td>
<td>Public health</td>
<td>Promotion</td>
<td>Organization</td>
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<td>Gruen et al.⁶⁰</td>
<td>Conceptualizing sustainability</td>
<td>No</td>
<td>Intervention activities</td>
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<tr>
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<td>Conceptualizing sustainability</td>
<td>Evaluation/ measurement</td>
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<td>Hap and Weiss</td>
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<td>Johnson et al.</td>
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<td>Marcini and Marek</td>
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<td>Miles</td>
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<td>Nielsen et al.</td>
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<td>Olsen</td>
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<td>Pluye et al.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>AUTHORS</td>
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<tr>
<td>Rosenheck(^70)</td>
<td>Conceptualizing implementation</td>
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<td>Intervention activities</td>
<td>Individual providers</td>
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<td>Sarriot et al.(^71)</td>
<td>Evaluation/measurement</td>
<td>Yes</td>
<td>Community partnerships, policies/procedures/technologies</td>
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<td></td>
<td>Public health Prevention</td>
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<td>Savaya et al.(^72)</td>
<td>Conceptualizing sustainability</td>
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<td></td>
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<td>Prevention, treatment Organization</td>
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<td>Scheier and Dearing(^3)</td>
<td>Research agenda</td>
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<td>Schell et al.(^49)</td>
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<td>Individual providers, public health</td>
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<p>| SETTING TYPE |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Conceptualizing sustainability</th>
<th>Yes</th>
<th>Contributions</th>
<th>Frameworks</th>
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</thead>
<tbody>
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<td>Sbediac-Rizkallah and Bone</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Client benefits, intervention activities, community partnerships, organizational policies</td>
<td>Individual providers, multiple staff, policies/procedures/technologies, capacity/infrastructure building</td>
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<td>Shelton et al.</td>
<td>Conceptualizing Sustainability</td>
<td>Yes</td>
<td>Client benefits, intervention activities, community partnerships, organizational policies</td>
<td>Individual providers, multiple staff, policies/procedures/technologies, capacity/infrastructure building</td>
</tr>
<tr>
<td>Swerissen and Crisp</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Client benefits, intervention activities, organizational policies</td>
<td>Policies/procedures/technologies, capacity/infrastructure building</td>
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<tr>
<td>Yin et al.</td>
<td>Conceptualizing sustainability</td>
<td>Yes</td>
<td>Intervention activities, organizational policies</td>
<td>Policies/procedures/technologies</td>
</tr>
</tbody>
</table>

Source: Sarah Behler, PhD, and Amber Calloway, MA, contributed to the development of this summary of sustainability frameworks.
promote sustainability may increase the likelihood that programs are sustained in a manner that meets stakeholder needs. Rather than emphasizing fidelity to an intervention as originally developed, this framework suggests that an intervention should not be considered optimized until it has been delivered, tested, and adapted in the setting in which it will ultimately be deployed, and implementers in delivery organizations continue to attend to opportunities to further fine-tune the program as the organizational external and internal contexts evolve. Especially with programs and interventions that rely on people to deliver them to prospective beneficiaries, a tension exists between maintaining fidelity to the intervention as previously tested and adapting it as needed to an evolving environment to ensure compatibility between the context and intervention, although the degree of control necessary or desired will vary depending on the intervention in question and the objectives of the original source organization and the delivery organization. Although changes to core components have the potential to erode the impact of the intervention, there is the possibility that certain adaptations by program staff can both provide greater benefits and be more compatible with the delivery organization, thus promoting sustainability. The Dynamic Sustainability Framework suggests that adaptation should be an expected part of the implementation process, although it should occur in a manner that allows stakeholders to ensure that the changes have a positive impact on the desired program outcomes. This framework suggests the use of quality improvement methods such as plan–do–study–act cycles that delivery staff themselves design, manage, observe, and assess to optimize fit in response to changes within a particular context while carefully evaluating the impact of adaptations. For example, if budget cuts lead to shortages in delivery personnel, rapid tests of change may be used to determine whether adaptations such as changes in mode of delivery (e.g., shifts from individual- to group-level interventions, delivery by paraprofessionals, or delivery by web or app), induction strength (fewer hours in group sessions or fewer meetings), or a reduced number of program components (keeping a weekly group meeting and social media reminders but eliminating an online discussion forum and quarterly check-up) are feasible and result in acceptable levels of desired outcomes.

The importance of considering and planning for sustainability during initial intervention design and throughout the conduct of formative evaluation has been called for in program planning processes, partly by emphasizing "pull" strategies for attracting, engaging, and rewarding implementation staff in health delivery organizations. Comprehensive program planning can help surface a variety of factors important to program effectiveness and sustainability, including the identification of aspects of the intervention that are necessary to promote the desired outcomes and that can guide design and/or implementation decisions about whether and how to make adaptations. Furthermore, research suggests the importance of considering the decisions or events that have the potential to influence the sustainability of program-related activities from the very early stages of implementation. This approach departs from linear stage models of implementation, in which sustainability is only considered after programs are implemented.

Rather than thinking of sustainability as maintaining what had been implemented, consideration of how the same decision may have different effects over the long term versus the short term may aid in planning for sustainability. For example, devoting substantial, nonrecurring resources to a program by hiring special staff to deliver an intervention may positively impact implementation in the short term by increasing penetration throughout the community or system. However, over the longer term, it may not be feasible to continue to allocate limited resources to a dedicated staff position, and failure to integrate the program into the existing workforce and personnel structures may lead to the disappearance of the program when that position is cut. Thus, as Pluye and colleagues warn, too many external resources may actually be unfavorable to sustainability. Consistent with the notion that sustainability should be planned for and considered prior to and throughout the process of implementation, Lyne and colleagues emphasize the importance of planning, feasibility testing, and piloting before scaling-up cancer screening programs. These steps allow potential threats to sustainability to be discovered and addressed before large-scale implementation. Key indicators that Lyne et al. recommend assessing include societal acceptance, local ownership, evidence-based practice, and verification of adequate performance in each phase of implementation. Qualitative investigation can identify events and vulnerabilities that may have
implications for sustainability, which should be addressed before continuing to scale.

A DEEP AND LASTING CHANGE?

Concepts such as embedding and changing the culture and routines of an organization have been studied in relation to implementation and sustainability. Researchers who develop and test educational interventions both in the kindergarten through 12th grade and higher education contexts have studied practice and program sustainability for years, most commonly by studying what teachers do in classroom settings and what students learn as a result, over time. Thus, they are frequently studying organizations that embed multiple layers of authority and approval (district school boards, superintendents, principals and teachers, and students and their families) that share certain commonalities with health care systems in terms of degree of complexity.

In an influential 2003 article, Coburn conceptualized sustainability primarily in terms of time and the extent to which districts and schools institutionalized support for changed teacher practice, but she also argued for the primacy of depth of the changed behavior and the shift of felt ownership as key determinants of whether a practice or program and its effects would persist. Depth, in this sense, meant not just changes in materials, classroom organization, or activities with students but, more important, altered teacher beliefs, norms of interaction among teachers and students, and underlying pedagogical principles. Shift meant whether an intervention eventually became understood by teachers as being generated internally versus coming from an external source. Other subsequent educational researchers have also come to view sustainability as being dependent on depth and shift. Both depth and shift relate to the intrinsic motivation and sense of personal responsibility on the part of delivery staff to best help their potential beneficiaries, whether they be students or patients. In the literature on health intervention sustainability, this shift is often characterized as a culture shift, and although there has been less research on culture change in organizations that deliver cancer interventions and programs, some research findings in other areas of health care suggest that organizational culture has the potential to influence sustainability, which may in fact need to shift to facilitate positive long-term outcomes.

RESEARCH ON SUSTAINABILITY OF CANCER INTERVENTIONS AND PROGRAMS

In the area of cancer control, attention to sustainability has increased in recent years. A recent review of grants awarded by the National Cancer Institute indicated that although only 38% examined sustainability explicitly, approximately half of grant awards proposed cost indicators and other considerations relevant to sustainability. Research and evaluation projects that focus on sustainability illustrate some of the previously described concepts that are relevant to sustainability. In this section, we consider research on a number of different program types, such as prevention programs, screening programs, and tobacco control. In doing so, we highlight concepts from implementation frameworks and consider findings related to implementation success and factors that influence these outcomes.

Community-Based Prevention Programs

The sustainability of skin cancer prevention programs has been examined in multiple studies. The programs that have been studied, such as the Pool Cool Program and Go Sun Smart, are multicomponent in nature and include resources such as toolkits that describe how to implement the program, lesson cards, visual aids and posters, sunscreen dispensers, and tip signs. Enhanced implementation strategies that have been tested in research on these programs have included additional sun safety items for distributions, tip sheets, reinforcement, incentives and feedback, and supplementary materials with guidance to promote implementation and sustainability. Research conducted several years after initial implementation of Go Sun Smart indicated that the organizations that received the enhanced support were more likely to yield desired long-term outcomes, such as fewer sunburns among staff. Consistent with previous evaluation of the Pool Cool program that found that a majority of pools maintained the program over several years, a recent study found that organizations that received enhanced implementation support demonstrated evidence of sustained program implementation. Glanz and colleagues found that the organizations that received enhanced implementation support had significantly greater overall maintenance of the program over three summers of participation.
Furthermore, organizations that received enhanced support established and maintained significantly more sun-safety policies and supportive environments over time. Collectively, these findings suggest that enhanced implementation support, ease of use and accessibility of necessary supplies and program components, and ability to integrate program activities into routines are associated with sustainability of prevention programs of this nature.

Community-Based Screening and Health Promotion Programs

Other sustainability research has focused on cancer screening programs, including the use of lay health advisors (LHAs), or community health advisors, to promote cancer screening behaviors among underrepresented populations. A number of potential barriers to sustainability of these programs have been identified, including factors in the outer context such as lack of funding, lack of national standards and policies to guide program implementation, and difficulty conducting program evaluation to provide data to support program continuation.24-26 

In addition, intervention factors, such as costs of implementing programs, and inner context factors, including availability of time and resources required for training, dissemination of materials, space, and resources for program evaluation, have been identified.26 At the provider level, recruitment and retention of LHAs have been challenging, particularly when, as is often the case, health advisors are volunteers who receive little, if any, compensation.24,27 These factors can lead to high turnover and low retention and also limited activity among health advisors, which in turn impacts the sustainability of programs that rely on LHAs. Thus, although there has been increased interest in non-professional delivery of interventions, attention must be paid to the potential for sustainability of such programs.

Shelton and colleagues24 recently investigated retention among LHAs for the National Witness Project (NWP), one of the National Cancer Institute’s “Research Tested Intervention Programs.”28 The NWP is an evidence-based program that has been found to be effective in increasing breast and cervical cancer screening among African American women.28 The NWP has been implemented in more than 40 sites throughout the United States. During group-based meetings in community settings, trained African American LHAs provide education, support, and resources to African American women.20 In the NWP model, at least half of the LHAs are African American breast and cervical cancer survivors who serve as “role models” and deliver testimonials to empower women to get screened for cancer and engage in healthy behaviors.25,31 These LHAs work together with project directors from their sites to organize meetings and recruit participants.

Because one factor that reduces the impact and sustainability of the programs is turnover among LHAs,20,23 Shelton and colleagues24 examined whether differences across NWP programs were associated with LHA retention. There is some variation in the ways in which NWP is implemented, including the type of host institution and compensation for LHAs and project directors. Findings suggested that LHAs based at non-academic sites such as churches were less likely to remain engaged in the program. Duration of involvement in the program also predicted retention, with LHAs who had been involved in the program longer being less likely to remain involved over the follow-up. Greater role clarity and commitment among LHAs were associated with a greater likelihood of retention. After adjustment for self-reported baseline LHA activity status, however, only affiliation with an academic site was significantly associated with increased odds of LHA retention.24 Factors such as educational background, paid versus voluntary positions, and breast cancer survivorship were not associated with retention. These findings provide some guidance that is relevant to efforts to plan for sustainability in programs of this nature. First, affiliations with academic institutions (which may have access to resources that are not available in other settings) may promote sustainability of programs that rely on LHAs. Second, rather than selecting LHAs based on certain characteristics, building commitment and increasing role clarity may increase retention rates. Finally, the finding that LHAs who had been involved with the program for longer periods of time were less likely to be retained suggests that planning for turnover and developing mechanisms to rapidly identify and train new LHAs when needed may be an important step to promote sustainability.

Another recent study involving LHAs examined the issue of training LHAs.34,5 Project HEAL (Health through Early Awareness and Learning) is a community-based participatory research project that relies on LHAs to improve cancer screening among African Americans.26 Traditional classroom
and online approaches to training LHAs were compared, with the 14 churches that participated in this project randomly assigned to training format. Although Project HEAL resulted in changes in knowledge across both conditions, participants expressed greater satisfaction with workshops from the online training approach, with greater increases in knowledge about prostate cancer at a 12-month follow-up among men taught by online-trained LHAs. The results of this evaluation suggest that in light of the turnover inherent in LHA-led cancer programs, online training can be used successfully to train new LHAs and may yield additional benefits at the consumer level. Sustainability is a focus for Project HEAL, which is ongoing, and future results will provide additional insight into factors associated with continued program activities and outcomes.34

Prevention and Treatment Interventions in Health Care Settings

As Scheirer indicates, research on processes and outcomes related to sustainability can vary greatly depending on the intervention type.35,37 Whereas LHA programs are delivered by individuals outside of a health care setting, other cancer control programs are delivered within health care organizations. A qualitative evaluation of tobacco treatment services in Massachusetts was undertaken to assess sustainability after funding for the Massachusetts Tobacco Control Program was substantially reduced in 2002.38 The study focused on 77 sites, which included hospitals, community health centers, mental health and substance abuse treatment agencies, and other agencies that had received funding. One-third of these sites reported no sustainment of tobacco treatment services, and approximately one-third reported minimal tobacco treatment services. Only 5% of the agencies were able to sustain their programs at the same level after external funding was removed. Consistent with other research on sustainment,39 these findings illustrate how significantly changes in funding can impact sustainability. In general, the results of the qualitative aspect of the evaluation suggested that creative use of resources and creation of demand were critical to sustainment. Five general strategies were identified as positively influencing sustainment: alignment of services with organizational goals, selecting acceptable and affordable services, locating alternative funding, changing staffing patterns, and assigning resources to create demand for services.39 The study also illustrated how, consistent with the Dynamic Sustainability Framework,40 efforts were made at low and moderate sustaining sites to adapt and retain some of their services. However, sites did not appear to use the quality improvement strategies suggested by the framework to rapidly evaluate and refine efforts to sustain the programs.

Research on cancer care programs has varied in approaches and findings related to sustainability. One study of a short-stay program after breast cancer surgery39 found high rates of sustainability (82%) 5 years after an implementation effort that used implementation strategies which were tailored to the needs of each individual setting.40 These penetration rates were comparable to the proportion in short stay after initial implementation. In addition, compliance to the key recommendations to facilitate short stay after breast cancer surgery increased from 65% directly after implementation to 78% 5 years after implementation. At least two key factors may have contributed to these promising findings. First, there are substantial economic incentives and reinforcers to short-stay programs within the financing structure of the health care system in which the program was implemented, and cost savings for the program have been documented.41 High levels of patient satisfaction and findings of no reductions in quality of life associated with the program further suggest that benefits of the program were experienced by stakeholders at multiple levels. Second, the use of tailored implementation strategies allowed potential barriers at each hospital to be carefully targeted and addressed, which may have had positive implications for long-term sustainability.42

IMPLICATIONS OF RESEARCH ON CANCER PROGRAM SUSTAINABILITY

Facilitators

The previously mentioned research points to several implications for future research. First, enhanced implementation strategies that include attention to the specific needs and contexts of organizations that will deliver cancer prevention or interventions to their local communities appear to enhance sustainability. Second, as the Massachusetts Tobacco Control Program evaluation and studies in other areas of health care indicate,43 funding is an important influence on sustainability. It is important to
develop a funding model that involves sustainable financing (e.g., reimbursement for services from insurance companies) or diversification of funding sources (e.g., grants and in-kind donations) unless financial benefits (e.g., reduced need for subsequent, costly intervention or decreased length of stay) can directly offset costs related to long-term implementation. It is likely necessary to plan for scarcity of resources to support long-term implementation by integrating programs into existing staffing and workflow models, identifying technology-based modes of delivery, or identifying sustainable approaches for training and supporting non-professional health workers to deliver interventions. In the case of the latter suggestion, identification of structures and processes to support these individuals and address workforce turnover appears to be especially critical.

Adaptation

Planning for and adapting to the dynamic contexts in which programs and interventions are implemented is another key implication from the current review. As the Tobacco Control evaluation illustrated, interventions and programs can be particularly vulnerable to reductions in funding and shifts in policy. Identifying creative, scalable ways to continue to deliver interventions and to rapidly adapt them to cuts in funding may be necessary for sustainability. In so doing, it is important to evaluate the impact of these adaptations on the key outcomes that have been identified by stakeholders, even if those assessments are based in localized improvement cycles managed by program delivery staff. For example, if changes in resource availability require a reduction in the number of program components that are delivered, the impact of the adapted intervention on key health behaviors or outcomes should be carefully evaluated.

Categorizing the types of adaptations that are made to programs and interventions can yield more specific information about which types of adaptations result in desired outcomes. Forms of adaptation can include changes to the mode of delivery (e.g., group vs. individual, and web or app vs. practitioner-delivered), personnel who deliver the interventions (e.g., trained medical professionals vs. lay workers), the target audience (e.g., translating an intervention developed for African Americans for delivery to Latinos), the intervention content (e.g., cultural adaptations and changes to core or peripheral aspects of the intervention), and altering the strength of the intervention (e.g., holding fewer group sessions or sending out fewer encouraging messages to a patient’s social network contacts). Within the category of intervention content, potential adaptations include changes to the duration or pacing of the intervention, removal of elements, addition of elements, integration of other intervention elements, tailoring of content (e.g., changing terminology or language, adaptation of intervention materials), reordering of elements, or substitution of elements. By identifying the nature of the adaptations that are made and examining program evaluation data (e.g., clinical outcomes and penetration), the impact of the adaptation can be explored. In the context of quality improvement methodologies, organizations or communities can plan and test adaptations to learn how adaptations might improve or erode fit, recipient-level outcomes, and penetration, and they can refine or plan accordingly.

Future Directions

The literature on sustainability of interventions and programs in health care settings has expanded rapidly during the past several years. Researchers are increasingly examining questions related to sustainability in many topical domains within health, education, and specifically in the area of cancer prevention and control. Over time, the sophistication of research on cancer prevention and control has expanded from published reports of program evolution to include prospective and experimental designs. Although progress is being made in identifying some factors associated with sustainability in this topical domain and within the broader literature on sustainability, very little research has been undertaken to identify and prioritize strategies to promote sustainability. Implementation researchers have identified 73 distinct implementation strategies that may hold promise for promoting sustainability. This may be too much for busy health care systems. Methods such as intervention mapping can be used to identify promising strategies and, in particular, packages of strategies that can be tested prospectively as plausible and cost-effective alternatives to one another. Furthermore, methodologies such as concept mapping or Delphi studies can be used to identify the broad categories of strategies that are most promising for different types of cancer control programs or interventions. Last, there is considerable potential to flip conventional study designs on their
heads and conduct observational studies of those interventions and programs for individuals at risk of cancer, cancer patients, and cancer survivors that have sustained for long periods of time in the operations of delivery organizations. Why do these long-running programs persist? What interests of their delivery organizations and/or patients are these sustained programs serving? Is their sustainability best explained by how they rank in a profile of innovation characteristics, because they satisfy organizational mission or well address organizational care priorities, because they demonstrate the desired health benefits, or is their sustained availability due more to consistency in the extraorganizational environment? Certainly, well-funded topical domains such as breast cancer have the resources to continue the delivery of breast cancer prevention and care programs. Is that what explains their persistence? If so, what combination of factors led to decisions to fund these programs at higher levels?

An important future direction for research in sustainability is the advancement of measurement. Although some tools have been developed to assess potential determinants of sustainability and some aspects of sustainability, comprehensive assessments of sustainability that include the full range of potential indicators have not been developed. The following considerations for identifying and developing measures and reporting findings can lead to more rigorous measurement and greater convergence in terminology:

- It remains necessary to determine whether unique measures of determinants of sustainability are needed or whether existing implementation measures are sufficient.
- Validated measures that include comprehensive assessments of all determinants included in sustainability frameworks can streamline assessment.
- Measures should be developed for administration at multiple time points.
- Measures of sustainability outcomes should include multiple indicators and allow projects to operationalize how each indicator is assessed but provide guidance regarding appropriate data sources and well-defined benchmarks (e.g., full, partial, or not sustained).
- When objective measures are not feasible (e.g., if observation of fidelity is not possible due to the size and spread of a program), triangulation between sources of information and measurement recipient-level impact should be employed.
- Consistency of language for characterizing processes, strategies, and adaptations that may lead to sustainability remains necessary. Interview guides, measures, and reports should clearly define each construct.

Implications for the Implementation of Cancer Interventions and Programs

Based on findings and recommendation from both the cancer literature and the broader literature on sustainability, we recommend the following to promote and study sustainment:

1. Plan for sustainability at the outset by designing low-cost, simple, and adaptable interventions and programs. Anticipate decreases in resources and build processes into existing structures, particularly in the absence of evidence that the intervention or program will have a cost-neutral impact.

2. Choose an implementation framework to guide an initial needs assessment; identify potential barriers and facilitators to long-term sustainment in addition to initial implementation; and assess the readiness of the program, delivery organization, and potential beneficiaries.

3. Design interventions for compatibility with implementation sites; provide guidance to implementers, showing them how to responsibly adapt the intervention so that customization maximizes beneficial effects for patients and residents; and evaluate the impact of these adaptations. Make and evaluate adaptations as changes in the broader context require them, using quality improvement strategies.

4. Identify a set of adaptations that are associated with desired outcomes and those that result in diminished outcomes to inform ongoing and future implementation efforts. Communicate these results back to implementers to further guide their future adaptations.

5. Use intervention mapping or system dynamics modeling approaches to identify strategies to address potential barriers to implementation or sustainability.

6. Use a process-oriented framework to guide the implementation program.

7. Conduct program evaluation with heavy emphasis on formative evaluation or quality improvement performed by front-line staff, and include outcomes that are relevant to key stakeholders. Use

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models of implementation and sustainability to inform the evaluation.\textsuperscript{4,5}

**SUMMARY**

The existing research on sustainability suggests that for some interventions and programs, the potential for long-term sustainment is fairly high.\textsuperscript{1,4} For other interventions, particularly those that are complex and multifaceted, or those that require increased personnel or resources, sustainability is more precarious and may always be at risk. Without careful planning and attention to relevant drivers of sustainment, programs may not be continued over the long term.\textsuperscript{3} In such cases, research on strategies to promote sustainment is necessary. Still, as indicated previously, the broader literature provides some guidance for those who seek to implement cancer programs and interventions with an eye toward sustainment. Practice-based research networks, prospective research, and reports of evaluation and quality improvement projects can all contribute to the growing literature on the sustainability of cancer programs. As the literature on sustainability, particularly in the area of cancer control,\textsuperscript{19} expands, we can look forward to additional guidance and innovative methods to achieve long-term implementation of effective programs and interventions.

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ADVANCING THE SCIENCE OF IMPLEMENTATION ACROSS THE CANCER CONTINUUM

Edited by
David A. Chambers, DPhil
DEPUTY DIRECTOR FOR IMPLEMENTATION SCIENCE
DIVISION OF CANCER CONTROL AND POPULATION SCIENCES
NATIONAL CANCER INSTITUTE
ROCKVILLE, MD

Cynthia A. Vinson, PhD, MPA
SENIOR ADVISOR FOR IMPLEMENTATION SCIENCE
DIVISION OF CANCER CONTROL AND POPULATION SCIENCES
NATIONAL CANCER INSTITUTE
ROCKVILLE, MD

Wynne E. Norton, PhD
PROGRAM DIRECTOR, IMPLEMENTATION SCIENCE
DIVISION OF CANCER CONTROL AND POPULATION SCIENCES
NATIONAL CANCER INSTITUTE
ROCKVILLE, MD

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