

Dissemination of Health Promotion Information in Cooperative Extension:
A multi-study exploration of channels, sources, and characteristics that influence intervention uptake

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SCIENTIFIC ABSTRACT

A translational gap exists between the development of an evidence-based health promotion intervention and its eventual implementation in the intended setting. This lack of translation impacts the uptake of health promotion interventions within delivery systems such as the Cooperative Extension Service (Extension). Within this system, Extension educators serve as the intermediaries addressing needs in the communities in which they are employed with support from Extension health specialists. Previous research has shown that educators utilize other peer educators and specialists to learn and adopt health promotion programming, but these studies are over two decades old (e.g., missing technological advances such as Internet and social media) and often focused on a single state Extension system.

The purpose of this research was to understand how evidence-based health promotion intervention information is shared within Cooperative Extension by 1) identifying information sources and channels of Extension specialists and educators while 2) identifying the characteristics of an intervention that aid in the adoption and uptake of these health promotion interventions. The first mixed-methods study aimed to identify information sources and channels used by Extension educators from a national sample and learn their preferences for information delivery. Results of this study (Manuscript 1), identified specialists as the key information source. Therefore, the second study (Manuscript 2) focused on Extension health specialists' preferences for information sources and channels while also 1) determine how specialists communicate with educators 2) preliminary thoughts on a dissemination intervention. The final study (Manuscript

3) explored the intervention characteristics that are both educator and specialists deemed most important to their adoption decision-making process.

The results of this dissertation inform the development of a dissemination intervention to bridge the translational gap across Extension. The information sources and channels used and trusted by both Extension educators and specialists are highlighted in this work. Additionally, specialists have given insight for consideration for an online repository that can be used on demand to both facilitate the adoption and uptake of health promotion interventions as needed by Extension Educators.

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DEDICATION

In memory of my grandparents, especially Mema, who instilled in me the dedication, compassion, and some stubbornness that propelled me through all the obstacles to reach this stage

I also dedicate this work to my brother, David Strayer. He has taught me so much in being a role-model, a positive influence, and how to support someone as they start their academic journey

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Manuscript 1: Thomas Strayer led all data collection and data analysis with oversight from Samantha Harden. All authors interpreted qualitative data and contributed to manuscript preparation and approval. All authors read and approved the final manuscript.

Manuscript 2: Thomas Strayer led all data collection and data analysis with oversight from Samantha Harden. Nithya Ramalingam and Thomas Strayer interpreted qualitative data and contributed to manuscript preparation and approval. All authors read and approved the final manuscript.

Manuscript 3: Thomas Strayer and Samantha Harden conceptualized the study and Thomas led all data collection and data analysis. All authors analyzed the qualitative data. All other authors provided input, feedback, and approval of the manuscript.

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CHAPTER 1: INTRODUCTION

Health Promotion Barriers and the Field of D&I

Obesity, diabetes, cardiovascular disease, and other noncommunicable diseases are rising in prevalence within the United State (U.S.)—which has led to the increased development and delivery of evidence-based health promotion interventions (Allen et al., 2013; Lim et al., 2017). However, even with an increased focus on the development and implementation of health promotion interventions, there still exists a 17-24 year lag time that impacts the translation of evidence-based interventions to practice (Morris, Wooding, & Grant, 2011; Aarons, Sklar, Mustanski, Benbow, & Brown, 2017; Norton & Mittman, 2010). However, these interventions often share similar components including programming goals (weight loss, physical activity changes, etc.), behavioral change strategies, and the necessity of similar resources (e.g., equipment, or time) for implementation (Chambers & Norton, 2016; Davy et al., 2013; Estabrooks, Bradshaw, Dzewaltowski, & Smith-Ray, 2008; Reiner, Niermann, Jekauc, & Woll, 2013). These intervention characteristics are what may attract or dissuade potential delivery personnel (e.g., health educators), and it is often the responsibility of the intervention developer to communicate the interventions to these delivery personnel (Wandersman, Chien, & Katz, 2012). However, in order to learn about the program and its components is an important first step in the adoption process, thus, one potential barrier may be the impact of ineffective dissemination of intervention information to the targeted delivery personnel (Aarons et al., 2017). To improve the uptake and delivery of evidence-based health promotion interventions and reduce the impact of the aforementioned time lag is the newer field of dissemination and implementation science has come about (Brownson, Colditz, & Proctor, 2012).

The emergent field of dissemination (active delivery of information) and implementation (study of intervention integration) sciences address barriers of knowledge transfer, increased program adoption, and scaling-out of programming (Brownson et al., 2012). Several barriers to dissemination exist, including resource burden for information campaigns, heavy time commitments of adopters, difficulty training staff, and a lack of recommendations for health promotion in a community setting (Brownson et al., 2012; Kahn et al., 2002; Norton & Mittman, 2010). The overall impact of these dissemination barriers on knowledge transfer—or the receipt of information about an intervention—from reaching delivery personnel, continues to limit health outcomes from health promotion programs in community settings (Brownson et al., 2012).

Some examples of dissemination include reaching the targeted audience through publications in open access journals (Koyio, Ranganathan, Kattappagari, Williams, & Robinson, 2016), education courses, outreach efforts,(Conway, Kennel, Zubieta, & Ohio, 2010; Grimshaw et al., 2004) websites, email usage (Schweier, Rompell, Richter, & Grande, 2016), and development and distribution of a manual for an intervention (Sholomskas et al., 2005). Diffusion, a popular and similar, but distinct term from dissemination, is the passive and non-targeted spread of information on an intervention that finds an interested party by chance (Brownson et al., 2012). An example of this could be two health educators at a conference who meet and discuss an intervention despite not intending to spread such information. Thus, it is important that chosen dissemination strategies actually reach the intended decision makers within a system and positively promote the adoption-decision-making process. The best outcomes derive from working directly with key decision makers to inform what dissemination strategies will be most impactful to ensure buy-in and build relationships with potential intervention targets (Harden, Johnson, Almeida, & Estabrooks; Israel, Eng, Schulz, & Parker, 2013).

In order to better understand the uses of dissemination strategies for health promotion it is first important to consider the various frameworks that exists within the field of dissemination science. Currently there are over a hundred different frameworks within the field but for the purpose of this dissertation, three frameworks will be discussed (Tabak, Khoong, Chambers, & Brownson, 2012). The first is Roger's Diffusions of Innovation (DOI), the most highly cited framework in the field (Holt & Chambers, 2017; Rogers, 2010). DOI considers multiple factors of intervention adoption and delivery including the characteristics of the innovation (intervention), adopting delivery personnel, and organizations (Rogers, 2010). Additionally, DOI recognizes a five-stage adoption process that consists of knowledge, persuasion, decision, implementation and confirmation. For this introduction, knowledge and persuasion are the two stages that will be further discussed. Knowledge is defined as the first time an individual is exposed to an intervention. Persuasion is when a targeted adopter actively seeks information to make a decision on adoption and implementation (Rogers, 2010). For example, an educator for a community health intervention must first learn of the intervention and the information presented must persuade the educator to move forward with adoption or implementation. However, the exact processes involved with spreading information are not deeply detailed in the framework. Thus, for this work, a marketing

framework known as Enterprise Planning is incorporated. Enterprise Planning is a business and marketing approach that has been used to augment DOI Theory in dissemination research (Allen et al., 2013). Enterprise Planning identifies which channels of communication operate within a specific systems, such as a health promotion delivery system (Kumar, Maheshwari, & Kumar, 2002).

The third major framework to be discussed is known as the Consolidated Framework for Implementation Research (CFIR) (Damschroder & Hagedorn, 2011). Like the DOI, CFIR puts consideration to the characteristics of the adopting organization and the targeted adopters and intervention. A difference between DOI and CFIR, is that CFIR considers a detailed premise into each of these constructs to better understand what information is pertinent and needs to be included or adapted when working within a health promotion programming delivering system (Damschroder & Lowery, 2013).

Introducing the Cooperative Extension Service

One such system that focuses on the delivery of health promotion programming in community settings across the United States is the Cooperative Extension Service (Extension). The purpose of Extension is to bring evidence-based research from universities to the public. Extension has accomplished this objective by embedding itself in communities across America for last century (Franz & Townson, 2008; Ramussen, 2002). The mission of Extension has evolved in parallel with the changing needs and demands of individuals and communities. For example, due to shifts in societal behavior, eating practices and health concerns, an initiative to target physical activity promotion was introduced in 2014 (Braun et al., 2014). Extension educators, often referred to as agents, are individuals within communities across the nation who deliver health promotion programming to their communities. Educators often use the research of state specialists, or trained researchers with a doctoral terminal degree. These state specialists provide training, technical assistance, and support for Extension educators to address community needs. Thus, Extension educators are those that deliver the programming and the specialist are those that provide support to facilitate evidence-based programming into practice.

In Extension, community-based educators are key determinants in program uptake because they serve as knowledge brokers—or intermediaries—who facilitate the knowledge transfer process between producers and

users to target the needs of communities (Brownson et al., 2012). Knowledge transfer is the process in which intermediaries deliver interventions within communities, thereby getting research knowledge from the producers to the potential users (Brownson et al., 2012). Extension has committed to this practice successfully in a variety of different fields including nutrition education programs, agriculture, and home economics (Agunga, 1995; Boone, Hersman, Boone, & Gartin, 2007; Ramussen, 2002). This successful history of knowledge transfer is in part due to successful translation of interventions within the system. One part of the translation process is that the characteristics of these target intermediaries, such as their personal and professional missions, values, and resources, must be understood in consideration to the adoption-decision making process for health promotion interventions (Damschroder & Lowery, 2013). One way to better understand the targeted audience and increase program translation is through partnering with the intended delivery system to impact public health has been suggested through a number of dissemination and implementation science studies (Andrews et al., 2013; Buchanan, Miller, & Wallerstein, 2007; Foster et al., 2010; Harden et al., 2016; Israel et al., 2013; Jagosh et al., 2015; Kathol, Butler, McAlpine, & Kane, 2010; Minkler, Vásquez, Tajik, & Petersen, 2008). Partnerships can be through a community-based participatory approach (Israel et al., 2013), also known as action research (Greenwood & Levin, 2006), or participatory action research (Bacon, Mendez, & Brown, 2005). Another partnership model is an integrated research-practice partnerships (IRPP) between researchers and key stakeholders (Harden et al., 2016). Some examples of these partnership approaches and their resulting health interventions are described briefly below.

Extension and Health Promotion Research

The first type of participatory partnership is the Community-Based Participatory Research approach (CBPR) (Israel et al., 2013). CBPR can be thought of as a “partnership approach to research that equitably involves, for example, community members, organizational representatives, and researchers and practitioners in all aspects of the research process and in which all partners contribute expertise and share decision making and ownership.” (Israel et al., 2013; Israel, Lantz, McGranaghan, Kerr, & Guzman, 2005). The aim of CBPR mimics the overall mission of Extension in that CBPR aims to improve knowledge transfer and integration from interventions in order to improve the quality of life of community members. The CBPR approach has been well-

documented and has a highly successful record working within Cooperative Extension (Kidd et al., 2016; Meister & de Zapien, 2005; Ramirez-Andreotta, Brusseau, Artiola, Maier, & Gandolfi, 2015). This success is embedded within the principles of CBPR, defined as: acknowledging community as a identity; building on the strengths and resources of a community; facilitating partnerships that focus on equal involvement in all phases of research; fostering co-learning and capacity building among all partners; striving for balance between knowledge generation and interventions; focusing on local relevance of public health problems; involving system development using a cyclical and iterative process; disseminating results to all partners involved; and involving a long-term process and commitment to sustainability (Israel et al., 2013).

An Arizona study conducted in conjunction among community members, Arizona Cooperative Extension, and researchers at the University of Arizona used a CBPR approach on building a co-created citizen science program (Ramirez-Andreotta et al., 2015). Researchers in this study used Extension's connections within the community and agriculture knowledge base to further sustain their research and benefit the community. The program, Gardenroots, was developed through a collaborative effort of various researchers, the Extension director, and local county educators. The Director provided gardening expertise while the educators provided marketing support through a press release and collected samples for data collection. The community was involved by using the program within its community setting and by providing feedback and guidance to the intervention development. Educators trained the community participants in data collection methods to improve the veracity of the data. For this study, Extension served as a middle entity for various partnerships, communication, program building, and data collection; however, other studies have used Extension in varying manners (Ramirez-Andreotta et al., 2015).

A second participatory approach, Integrated Research-Practice Partnership (IRPP) approach, has also been used within Extension. Similar to CBPR, the IRPP approach was focuses on forming a balance between scientific evidence and also the needs of the targeted systems and communities (Estabrooks & Glasgow, 2006; Harden et al., 2016). In CBPR, participants at all levels are involved at all intervention stages, but, an IRPP instead has a main focus between the system and the researchers. Like CBPR approaches, IRPP partnerships

can exist throughout the entire development or during certain stages of research dependent on the researchers and particular intervention (Harden et al., 2016).

An example is the evidence-based program of Lifelong Improvements through Fitness Together (LIFT), which was, in part, adapted from an existing Extension program. A participatory team of university researchers and Extension delivery personnel identified an evidenced-based strength training program delivered to older adults in Extension (Wilson, Strayer III, Davis, & Harden, 2018). The program, Stay Strong, Stay Healthy, had been delivered in Extension for over 10 years, and had demonstrated positive improvements in objectively measured functional fitness (Ball et al., 2013). When members of the participatory team were trained on Stay Strong, Stay Healthy, a number of adaptations were recommended. Members of the participatory team offered that the exercise program needed to include behavior change principles (goal setting, self-monitoring, and feedback), principles of group dynamics (support, interaction and communication), and a fruit/vegetable consumption component (Wilson, Strayer, Davis, & Harden, 2018). These adaptations were suggested to align with the delivery personnel's perception that they were health educators, not personal trainers, and that the need for dietary behavior counseling as well as improved physical activity existed. Rather than considering these suggested changes as a deviation from the Stay Strong, Stay Healthy program, research team members acknowledged these requests and conducted a feasibility study to ensure that the program adaptations did not detract from the effect of the original intervention. Notably, the original intent was to translate Stay Strong, Stay Healthy to the state system, but these practice-based adaptations were necessary to ensure buy-in from key personnel. This provided the opportunity to collect empirical data on the steps that were taken to adapt the program and its impact on the reach and effect of the intervention, while simultaneously impacting program delivery in practice (Wilson, Strayer III, et al., 2018). This work is underscored by equally valuing the research and practice needs of the participatory team.

Information Seeking in Extension

The importance of facilitating the adoption and implementation of health promotion programming, dissemination and implementation frameworks have been discussed and Cooperative Extension, one of the largest national health promotion systems in the country, have been introduced. This leads to the following

questions: how effective is Extension at the translation of programming at a national scale, and what specific sources and channels are being used within Extension to deliver information regarding programming?

In 1996, a study on information sources and channels explored the paths through which Extension educators sought information to find interventions to meet the needs of their unique communities. The study used a cross-sectional survey across eight states and obtained a sample size of 191 educator. The outcomes of this work included that Extension specialist were a primary source of information for educators, followed by immediate supervisors of the educators, other Extension educators, and non-extension university faculty (Radhakrishna & Thomson, 1996). The results of this study led to the current understanding of how educators receive evidence-based interventions and information. While this provided a crucial understanding of the network, the study is now over 20 years old and technological advances have changed how information travels within the Extension system (Kumar et al., 2002). Additionally, while this study contained educators from various backgrounds, it was primarily focused on agriculture educators. Thus with the recent shift in educator focus from agriculture to health promotion, targeting new needs and potentially using new information systems might be in effect thus making the previous work not generalizable to a public health educator population (Wang, 2014).

Two additional studies have been completed to update the results from 1996 (Radhakrishna & Thomson, 1996). The first, completed in 2012, focused on Montana State University Extension county educators. Technological advances, such as email and the Internet were reported as important sources of information for Extension educators. This study also reported on the educators' perception of the trustworthiness of sources and that the educator's perception had an impact on the adoption of an intervention. However, this study was limited to just one state system and as such, the generalizability of this data at a national level is unknown (Bailey, Hill, & Arnold, 2014). The second update study performed in 2014 focused on Minnesota Extension staff (Mastel, 2014). This study benefitted from reaching out to not just educators but specialists as well. The study echoed the previous study in Montana by highlighting that the Internet was being used by educators to view academic journals, technical and research reports, and government information. Extension staff also reported interest in being able to use advanced information-seeking tools and professional development opportunities to aid in

finding interventions to deliver in their communities (Mastel, 2014). However, the respondents expertise were still primarily agriculture-based and did not have a health focus, a newer focus of Cooperative Extension. These studies highlight the use of a variety of information sources and channels used within Extension but there are some limitations that must be acknowledged. First, the only study that looked at more than one state was the study conducted in 1996 while the other studies were single state systems. Thus, it is hard to understand the transferability of these results to a national scale.

Knowledge Translation in Extension—How Dissemination Fits

The common saying, “It’s not what you know, but it’s who you know,” summarizes the concept of a dissemination intervention in which information delivery is most effective within direct social networks (Cross & Prusak, 2002). Part of this process requires understanding where the information within a system is being relayed that promotes the adoption process. Implementation science includes frameworks and theories such as the CFIR and DOI that have highlighted that one central connection can be through key influencers in a system (Damschroder & Hagedorn, 2011; Rogers, 2010). CFIR contains a framework category which uses the terminology of “champions,” or individuals who serve as a focal point for the successful adoption and implementation of interventions and changes within organizations (Damschroder & Hagedorn, 2011). The DOI theory has a similar concept in which individuals known as “opinion leaders” are a necessity for successful intervention adoption and implementation (Rogers, 2010). In Extension, previous literature has shown that Extension specialist played a pivotal role in information intervention sources. However, with the increase in technology advances and a shift in focus from agriculture to health promotion, it is important to re-examine the system and determine the information sources and channels used within Extension at a national level.

In the context of a dissemination intervention, these central connectors represent the sources of information. A dissemination intervention would serve to utilize the best channels of communication to ensure delivery of the pertinent information to facilitate the adoption process and meet the demands of Extension professional nationally. Information seeking practices within and across the Extension system are not well understood. Gaps remain regarding what information sources and channels are used, what communication and dissemination networks are currently in place, and even what information is needed to be conveyed about an

intervention to facilitate the adoption process. The remaining chapters of this dissertation will focus on identifying those the Extension champions and key influencers in the information network used within Extension nationally, identify the information sources and information channels used by these key individuals, and identify the information pertinent to convey to facilitate the adoption process of health promotion programming. This work will serve to inform health promotion intervention developers, Extension educators, specialists and Extension administration about the health promotion intervention information delivery process within Extension and also this work will begin the groundwork for the development of a dissemination intervention for the National Cooperative Extension Service.

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CHAPTER 2

Manuscript 1: Cooperative Extension gets moving, but how? Exploration of Extension Health Educators' Sources and Channels for Information-Seeking Practices

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Abstract

Background: There are 17-24 years of lag time between research regarding interventions and their implementation in clinical settings. Less is known about the lag time in community settings, although it is recommended that health promotion programs be delivered within community settings for their large reach and potential scalability. Community, regional, and national health promotion systems exist around the world to bridge research to practice. One system in the United States (U.S.) is the health service system of Cooperative Extension System (Extension), that has community-based health educators. However, how evidence-based information is sought from Extension health educators and what information spurs the adoption-decision making process for health promotion programming is understudied. This study aimed to bridge the gap of knowledge surrounding information sources and channels used within community-based Extension.

Method: A sequential explanatory mixed-methods approach was used with a nationally distributed survey distributed with a follow-up semi-structured interview. Survey results were analyzed using a Kruskal-Wallis one-way analysis of variance test paired with Bonferroni post-hoc. Interview transcripts were analyzed using conventional content analysis.

Results: A total of 121 health educators from 33 states responded to the survey. Extension educators reported contacting Extension health specialists and peer Extension educators. Extension educators also reported using technological means of communication such as email and Internet simultaneously to reach information sources such as peers, specialists, academic journals, etc.

Conclusion: Extension educators' information-seeking practices are present in two forms, information sources for programming and the channels by which this information is communicated. Extension state specialists were preferred as primary sources for intervention information and technology was acknowledged as an easy contact channel. This study both a) identifies county-based health educators' information structures as well as b) justifies the need to consider future research on the role of specialists in communication efforts for Extension health educators. Improving the information network within Cooperative Extension may improve the translation of programming and overall reach of a national system. The process by which information-seeking practices

were determined may be applied to other public health systems to improve dissemination efforts and evidence-based program adoption.

Introduction

Healthcare outcomes are hindered by a 17-24 year time lag between research related to interventions' effects and implementation of these interventions in practice settings (Morris, Wooding, & Grant, 2011). This lag time impacts all healthcare, including interventions delivered in both clinical and community settings (Aarons, Sklar, Mustanski, Benbow, & Brown, 2017; Norton & Mittman, 2010). Existing evidence demonstrates that interventions conducted in community settings can impact preventive health services and as such, there are many intervention delivery systems where evidence-based interventions are translated into community-based settings (e.g., local health departments). In the United States (U.S.), the health service system of Cooperative Extension (herein: Extension) is one such system that exists as a bridge to deliver research-based and evidence-supported health interventions from the university setting based on the unique needs of each community. Practice- and academic- partnerships like Extension exist internationally to address health promotion. Extension, like other broad-reaching intervention delivery systems, uses locally derived knowledge (through methods such as information-seeking practices and adoption-decision making processes) to create policy, structure, or support (e.g., training and funding) for the whole system (Cross & Prusak, 2002). Understanding a system's infrastructure and the people working within it is complex but paramount in intervention uptake (Damschroder & Hagedorn, 2011).

Community-based educators are key determinants in program uptake (Harden et al., 2016). These educators serve as delivery personnel who facilitate the knowledge transfer process between producers (e.g., researchers and scientists) and users of knowledge to target the needs of communities (Brownson, Colditz, & Proctor, 2012). Therefore, characteristics of these target intermediaries – such as their personal and professional mission, values, and resources—need to be considered to inform and impact the adoption-decision making process (Damschroder & Lowery, 2013). For example, in Extension, health educators who engage in physical activity themselves are more likely to adopt physical activity interventions (Estabrooks, Bradshaw, Fox, Berg, & Dzewaltowski, 2004; Harden et al., 2016). What is less understood is how these community-based health educators within Extension seek information about which health interventions to deliver. One reason information-seeking practices in health promotion interventions are less understood is that although Extension

was originally formed in 1914 with the mission to “bring the university to the people,” it was only in 2014, (when the Cooperative Extension National Framework for Health and Wellness was released) that Extension professionals began to focus on health promotion needs and provided services for physical activity, health literacy, health insurance literacy, etc (NIFA, 2017; Ramussen, 2002; Braun et al., 2014). Prior to the 2014 directive, many evidence-based interventions were developed or adapted within Extension to meet the national demand for health promotion (e.g., FitEx (Harden et al., 2016), Stay Strong Stay Healthy (Ball et al., 2013), Walk Kansas (Estabrooks, Bradshaw, Dzewaltowski, & Smith-Ray, 2008), Eating Smart Being Active (Rees, 2010), Build Our Kids Success (Pojednic et al., 2016), Better Bones & Balance (McNamara & Gunter, 2012). Though multiple interventions exist, there are system-level barriers that inhibit wide-scale adoption and maintenance of these evidence-based programs such as time constraints, lack of perceived generalizability due to uniqueness in each state or local settings, cost, etc (Barnidge et al., 2013; Gravel, Légaré, & Graham, 2006; Norton & Mittman, 2010). Moreover, these programs are often not being translated outside of the state system of initial development, in part because Extension professionals, whether educator or a state-level Extension leader, are not learning about the interventions in the first place (Aarons et al., 2017).

Available evidence on information-seeking within the national Extension system is over two decades old. In one early study (1996) on information sources, (i.e., where the information is located) and channels, (i.e., how the information is communicated) researchers investigated the timeline and methods Extension educators use to gather program information for their targeted communities (Radhakrishna & Thomson, 1996). They found that the top information-seeking sources were Extension specialists, immediate supervisors, and other Extension workers or researchers (Radhakrishna & Thomson, 1996). As these data are over 20 years old, a paucity of evidence remains in understanding current information sources and channels, particularly within the paradigm of technological advances made since 1996. For example, many channels used today consist of media campaigns, email campaigns, social networking, email reminders, publication in open access journals, and website usage (Babor & Higgins-Biddle, 2000; Brownson et al., 2012; Collins & Sapiano, 2016; Sholomskas et al., 2005). Two studies have been performed as a follow-up to the 1996 work but are limited by the fact that the sample was recruited from one state system (Bailey, Hill, & Arnold, 2014; Mastel, 2014). Since the relationship

of information sources and channels of communication with intervention adoption nationally in Extension is unknown, it is important to identify and understand the means by which information is communicated to health educators in Extension and from what information sources. That is, understanding existing information-seeking practices may inform a dissemination intervention. Robust dissemination strategies in this system may address barriers and improve nation-wide scaling of evidence-based interventions.

Thus, in order to inform the development of a dissemination intervention, three key constructs need to be considered: determining the characteristics of the target audience (e.g., their role within the system, values), identifying the sources of relevant information (e.g., peer-reviewed journal, highly credentialed website), and also the channels by which the information can be delivered to the targeted audience (e.g., conversation, Internet) (Brownson et al., 2012). Greater understanding of the adoption and communication process has the potential to improve program translation and reduce the program duplication and other negative effects associated with a lack effective translation of programming. Therefore, this study serves as a preliminary exploration to aid in identifying both the key sources and channels of information-seeking for educators, and this study was meant to inform subsequent steps for development of a dissemination intervention in Extension. A similar process may be applied to understanding dissemination strategies and their influences on the adoption-decision-making process in other systems. Although not an *a priori* aim, this study also identified a number of health promotion programs being delivered by Extension health educators that informs the wide range of programming targets, responsibilities, and duplicated efforts of Extension health educators.

Methods

Framework

Out of more than 100 frameworks and models within the emergent field of dissemination science research, the Diffusions of Innovations (DOI) Theory has been identified as the most commonly used framework, with ~40,000 citations (Rogers, 2010; "Dissemination & Implementation Models in Health Research & Practice, 2017" ; Holt & Chambers, 2017). The DOI Theory describes characteristics of innovations, adopting delivery personnel, and organizations that may speed or impede translation into practice (Damschroder & Hagedorn, 2011; Rogers, 2010). According to the DOI Theory, the first stage in the adoption-

decision making process is learning about an intervention, which assumes that the adopting delivery personnel already possess the necessary intervention information. Thus, there are fundamental missing pieces from the DOI Theory that are needed to understand Extension health educator information channels, information sources, and processes surrounding intervention adoption. The use of concepts from other fields similar to dissemination, such as marketing and enterprise planning, can fill in these theoretical gaps and augment DOI Theory to understand how information travels within Extension's pre-existing networks and how dissemination may be occurring and may be improved upon.

Design and Setting

This study used a sequential explanatory mixed-methods approach (i.e., the quantitative phase occurring prior to the qualitative phase) (Creswell, 2013). A mixed-methods approach was chosen because of its usefulness for describing complex phenomena (e.g., dissemination), allowing cross-case comparison, determining how Extension health educators interpret constructs (e.g., academia or dissemination tools), and providing the opportunity for data to be in unique categories of meaning created by Extension health educators (Castro, Kellison, Boyd, & Kopak, 2010; Creswell, 2013; Creswell & Clark, 2007).

Results of a number of dissemination and implementation studies suggest partnering with the intended delivery system to impact outcomes such as uptake and delivery of programming (Andrews et al., 2013; Buchanan, Miller, & Wallerstein, 2007; Foster et al., 2010; Harden et al., 2016; Israel, Eng, Schulz, & Parker, 2013; Jagosh et al., 2015; Kathol, Butler, McAlpine, & Kane, 2010; Minkler, Vásquez, Tajik, & Petersen, 2008). In previous research, this type of integrated-research practice partnership (IRPP) approach resulted in positive outcomes in a variety of settings by involving practice-based stakeholders in the adoption decision-making process (Harden et al., 2016; Harrison & Graham, 2012; Pinard et al., 2012). One of the strengths of developing an IRPP between practice-based stakeholders and researchers is that it can equally value both scientific evidence as well as the priorities of the targeted system (Harden et al., 2016). Involvement of key stakeholders (Extension educators and researchers at the land grant university) has the potential to reduce the lag time from development to scaling of evidence-based interventions and increase the buy-in of the targeted partners by addressing needs in which these partners have a demand (Glasgow, Vogt, & Boles, 1999). This

work was conducted in conjunction with an established IRPP that was founded in 2015 as part of Virginia Cooperative Extension's Physical Activity Leadership Team. This internal partnership between the state exercise specialist of Virginia Cooperative Extension (and research lab members) and community-based Extension educators exists to determine the feasibility, fit, and potential adaptations of physical activity interventions within the state system (Harden et al., 2016; Wilson, Strayer III, Davis, & Harden, 2018). As part of this study, the IRPP met regularly in order to provide input on survey design, data collection instruments, and data interpretation.

Participants - Phase I Quantitative

In order to recruit Extension health educators to participate in Phase I, Extension health state specialists (defined as those Extension professionals with a state leadership role in health promotion [e.g. nutrition, physical activity, food safety, etc.]) were asked to identify three to five community-based health educators to complete the survey (further described below). This method was chosen as no existing repository of Extension educator information exists at national level. To be eligible for this study, the participant must be employed in a role as a community-based health educator and currently be delivering health promotion programming (Harden et al., 2016; Israel, Lantz, McGranaghan, Kerr, & Guzman, 2005). Job roles were recorded through participants' survey response. No other exclusion criteria for community-based health educators were used. A sample understanding of interactions with specialists, educators, and community members can be seen in Figure 2.1.

Extension health state specialists were identified in 47 states. Three states were determined to not currently have health educators or an Extension health specialist. Specialists from the 47 identified states were contacted, and 36 health specialists (77%) responded via email communication to act as an intermediary for survey distribution. Participant accrual for this phase spanned one month, with an initial email then follow-up emails sent one week apart.

Participants - Phase II Qualitative

All participants in Phase I were asked to indicate their interest in participating in Phase II by providing contact information with their survey responses. Out of 42 participants who indicated an interest, investigators

randomly selected 20 potential participants, five from each of the four national Extension districts to ensure geographic and personnel diversity in our sample (Anney, 2014). The research team targeted 20 participants out of 42 who indicated interest because this allowed the purposive targeting of five participants from each district to contribute to the research and the larger sample size combined with district diversity increased the odds of reaching a point of data saturation (Guest, Bunce, & Johnson, 2006). Out of those twenty, 18 completed an interview. Chi-square and t-test were performed on demographic variables collected between those participating in Phase II and those who chose not to. The tests did not reveal a statically significant value ($p\text{-value}<0.05$), indicating generalizability may exist among participants in both Phase I and II.

Informed consent was obtained from all study participants at multiple points during both Phase I and II and all aspects of this study were approved by the Institutional Review Board at Virginia Tech.

Procedure – Phase I

Specialists were asked to distribute a survey link via Qualtrics (Provo, UT) to three to five Extension community-based health educators. The survey instrument was designed to elicit information sources and channels used by educators and also pertinent information on programming that facilitates adoption. For this study, the following responses on information sources and channels of educators are reported:

Which information sources or channels of communication are used to influence the intervention adoption-decision making process for Extension health educators? Which sources (e.g., journals, conferences, etc.) or communication channels (e.g., email, Internet, etc.) are most often used (1-Never; 5-Most often use) to seek intervention information? Response options were informed by information sources and previous literature on Extension (Bailey et al., 2014; Brownson et al., 2012; Kumar, Maheshwari, & Kumar, 2002; Radhakrishna & Thomson, 1996). (Appendix A)

Demographic variables were assessed based on standard variables described in highly cited research methodology texts (Kumar & Phrommathed, 2005; Orcher, 2016), and previous work (Downey, Wages, Jackson, & Estabrooks, 2012; Harden et al., 2015; Harden et al., 2016.; Zoellner et al., 2012), including collecting data on race, ethnicity, sex, state of employment, official role title within Extension, duration of employment within Extension, educational degree, and the field in which the degree was obtained.

Procedure – Phase II Qualitative

A semi-structured interview guide was developed by all members of the IRPP (Appendix B). The guide was, in part, based on principles of the DOI theory, but was developed to be more general to allow for flexibility and further insight into the communication process for Extension health educators (Drever, 1995; Longhurst, 2003). These interviews with Extension health educators were conducted. Interviews were conducted by a third year PhD student with training in conducting and analyzing interview data. All interviews were completed via phone and had an average duration of 32 (± 10) minutes. The aim was to reach data saturation (Creswell, 2013). Each interview was audio-recorded, with consent from each participant, and then transcribed by trained research assistants.

Data Analysis – Phase I Quantitative

The quantitative data analysis used the Likert scale measure aggregated to develop means for comparison (Alwin & Krosnick, 1985). Since the data were ordinal, a non-parametric Kruskal-Wallis test to detect differences between Likert scale responses was used; if significant, a Bonferroni post hoc test determined which response options differed (McKight & Najab, 2010; Hommel, 1988). Alphabetical indicators were used to identify differences in Figure 2.2. Those results with identical lettering have no significant difference but those with different lettering do have a statistical difference ($p\text{-value} < 0.05$). This conservative approach for data analyses was chosen due to the preliminary nature of this study. Statistical analyses were conducted using statistical analysis software (SPSS v. 23.0 for Windows, SPSS Inc., Chicago, Illinois).

The results of the quantitative data analysis were presented to members of the IRPP to provide insights on patterns and interpreting the results. Continuous meetings with the IRPP to discuss survey responses from health educators were crucial to ensure that interpretation and subsequent work remained informed by the target audience that would be most affected by a dissemination intervention. The IRPP met two times during survey development and once post-survey to assist with development of the semi-structured interview guide as described below.

Data Analysis – Phase II Qualitative

A conventional content analysis approach was applied to allow the data be self-explanatory, rather than fitting it within a dissemination framework (Hsieh & Shannon, 2005). Trained researchers independently separated meaning units (single-meaning phrase or sentences) (Castro et al., 2010), and then determined categories and themes from these datum (Castro et al., 2010; Creswell, 2013). For any discrepancies that could not be reconciled between independent coders, the coordinating supervisor assisted in reconciliation (Castro et al., 2010). Inter-rater reliability techniques were applied to ensure reliable analyses and all conflicts were resolved within the reviewing team. Inter-rater reliability was established by having each member of the research team independently code 25 meaning of one participant's interview and come together to compare and reconcile. The initial inter-rater reliability was greater than 75% with key areas of discrepancy being in establishing coding from the ground up following the inductive approach. Following reconciliation and clarifications, the remaining meaning units of a single interview were coded. The second round of inter-rater reliability was greater than 92%. Two of the members of the research team independently coded all remaining meaning units. The meaning units were given numerical values to aid in illustrating data saturation across participants (as conducted in previous studies) (Graneheim & Lundman, 2004; Zoellner et al., 2012). Following the data analysis of the semi-structured interviews, the results were again presented to the IRPP and discussed to ensure accurate and relevant interpretations with the targeted audiences.

Results

Phase I: Quantitative Results

The survey was distributed from February 15, 2017- March 20, 2017. One hundred thirty-six responses were received, and 121 (89%) of the responses met the eligibility criteria of being a health educator who delivered programming within a community. Participants whose responses were excluded had job roles within Extension such as administrative assistants, unit coordinators, undergraduate volunteers, and Extension state specialists. An accurate response rate using the number of all possible participants could not be calculated as specialists were asked to send the survey to three to five health educators; therefore, no absolute denominator is available. However, eligible responses were received from 33 of 36 states (i.e., 92% of engaged states and 70% of eligible states). Health educators who responded to the survey were predominantly female (91%), Caucasian

(80%), and had worked for Extension for five or more years (68%). Additionally, 71% of the educators had Master's degrees within five years of being hired. Additional information on demographic variables can be found in Table 2.1. The Kruskal-Wallis test comparing across variables for any differences within the group of variables was significant ($p < 0.05$). Therefore, a Bonferroni post-hoc test was done to determine differences in valuation between variables. Figure 2.2 demonstrates the pairwise differences within the group of variables through alphabetical indicators. The results of the survey identified both information sources, but also channels of communication. Better defined, the channels of communication used for information delivery are email, phone call, face to face interaction, etc. and the sources of intervention information are academic journal, state specialists, Extension educator colleagues, etc. Figure 2.2 shows that health educators responded that the most frequently used information channels were technology-based, such as email and Internet search tools, and the most frequently used sources of information were state specialists, colleagues, or direct supervisors. Also shown in Figure 2.2, the most commonly used information channels and sources were email and Internet along with specialists and other agents (i.e., health educator colleagues). Although participants were allowed to write-in an "other" response to capture any additional information-seeking sources or channels that were used, only two of the 121 responses reported an "other" category, and both were websites that were collapsed with the Internet source category. Through discussion with members of the IRPP, the results were confirmed to be consistent with their practices, but more importantly, the IRPP team members highlighted that there may be interplay among information categories. For example, there may be concurrent or sequential steps such as using technology (e.g., email or Internet search) before contacting a specialist or health educator. The discussion with the IRPP influenced the interview guide used in phase II.

Phase II Qualitative Results

The 18 health educators who completed an interview were similar to survey respondents: predominantly female (89%), Caucasian (77%), and had worked for Extension for five or more years (55%). Additionally, 78% of the educators had Master's degrees within five years of being hired (see Table 2.1). The two main themes determined from educator interviews were information sources and information channels (see Table 2.2). Information sources mentioned by participants are indicated as sub-themes. These included various forms of

information sources including academic journals, other states' programming, and government organization's websites (e.g., USDA). The colleagues and specialist sub-themes were mentioned by 17 of the 18 interviewees who completed an interview. The second main theme is information channels. The technological based channels included Internet searches (n=12 participants) and email (n=14 participants) usage as information channel sub-themes. However, conferences were also mentioned as an information channel not based in technology by which Extension health educators (n=13) obtain programming information.

Furthermore, Extension health educators reported actively using technology channels with peers such as state specialists or fellow educators, and to access sources of information including organization websites such as the USDA or American Cancer Society. Through the collaboration with the IRPP and conducted interviews, it was confirmed that concurrent steps are performed between sources and channels. For example, the conferences channel of communication uses both colleagues and specialists as the sources of information; therefore, multiple sources and channels could be in use in the adoption-decision making process. Additionally, specialists were considered sources of information that educators showed interest in even when the educator's perception of their specialist was negative.

“Well for instance you know if they're [state specialist] doing ... research on nutrition behavior why don't I know about that? I didn't even get an email... it doesn't [reach me], zero communication. I don't even know to go to them, to ask them...or use their research findings because I didn't know about it.” (Participant 7)

This same participant, when prompted on whether they would like for their specialist to disseminate information, responded with:

“There could be more...proactive ... sharing or even they [state specialist] could...be on top of other research that's going on and let us know about it...” (Participant 7)

This example highlights the educators' interest in having a specialist within Extension as a source of programming information and, furthermore, the survey and interview results provide additional support to the same claim.

Finally, Extension health educators were asked about their respective programming target areas, stakeholder groups, and the programs that are being currently delivered. There were 22 different health target areas reported including nutrition, obesity, physical activity and diabetes; Table 2.3 shows a list of the reported programming health target areas to show the diversity of needs health educators serve. Across interviewees, 33 different stakeholder groups (such as health care partners, church groups, and various county administration groups) were reported (see Table 2.4). In addition, 13 (72%) of the interviewees reported that they collaborated with stakeholders in their respective communities throughout the intervention delivery process (e.g., needs assessment, adoption, delivery, etc.). When asked about programs that they currently deliver, 34 different programs across nutrition, finance, physical activity, and general health promotion were reported. Some of the programs reported were Stay Strong Stay Healthy (Ball et al., 2013), Dining with Diabetes (Chapman-Novakofski & Karduck, 2005), and FitEx (Harden et al., 2016). This means that almost every state may be delivering at least one unique program. Table 2.5 reports the programs delivered by Extension health educators interviewed.

Discussion

Based on the available published evidence, this was the first study in 20 years to identify and describe the new channels and sources of information that are being used by educators nationally within Extension. This work sought to understand the new sources and channels by conducting a survey and interviews with health educators. An IRPP was used to help inform and interpret results. The survey results indicated that new technology (e.g., Internet and email), as well as conferences, served as the most prominent information channels for communication. Confirming previous findings, participants in this study also indicated that specialists and colleagues were main sources of information (Bailey et al., 2014; Mastel, 2014; Radhakrishna & Thomson, 1996). However, and not in alignment with recent calls from Extension, social media is not widely used in information seeking or sharing practices (Garcia, Dev, McGinnis, & Thomas, 2018; Gharis, Bardon, Evans, Hubbard, & Taylor, 2014; Newbury, Humphreys, & Fuess, 2014). Results of the interviews demonstrated a wide variety of programming and programming content areas being covered by Extension health educators. The

results of this study have clarified future steps to focus on targeting specialists as intermediaries to program translation within Extension nationally.

Use of an IRPP provided the opportunity to clarify research questions, improve the likelihood that data interpretation was feasible for local health educators, and inform next steps for collaboration among the community-based organization members and researchers (Estabrooks & Glasgow, 2006; Harden et al., 2016). The outcomes of this study were presented and interpreted within the IRPP composed of both Extension educators and researchers of Virginia Tech and Virginia Cooperative Extension. The IRPP was an integral part of the research design. Without the partnership in place, key results necessary to understand the networks and how information travels to educators may not have been understood as described here. For example, when survey findings were presented to the IRPP, it was shared that interplay through channels of communication and sources of information exists. That is, the methods of this study were limited to determining use of a particular source and channel but may not have captured the sequence or concurrent process for information-seeking. The survey did not capture if educators were emailing specialists or using the Internet to view academic journal articles. Therefore, the interviews were used to target the process, sources, and channels used by Extension educators.

Previous studies found that educator colleagues and Extension specialists were key informants for the adoption-decision making processes for health educators (Bailey et al., 2014; Mastel, 2014; Radhakrishna & Thomson, 1996). In this study, educators most commonly reported information sources were Extension specialists, aligning with previous research. The importance of specialists is unsurprising given that their role is to provide training, technical assistance, and support to health educators. Taking the previous literature and this study together, the process of “bringing evidence-based information from the university to the people” happens often as an exchange between state specialists and health educators with specialists serving as conduits for educators’ connection to programming information. Therefore, Extension state specialists may be important targets for future dissemination efforts within the health service system of Extension. Although this highlights the importance of understanding how specialists disseminate information to health educators, it is also pertinent to understand what sources and channels specialists use for intervention information-seeking. Thus, future

studies should focus on both information needed to facilitate programming adoption and the role of specialists' in the programming adoption process of educators.

As part of the secondary aim of this study, the 18 interviewed participants identified 34 different programs that were being delivered nationwide that targeted 24 different health promotion areas, indicating there is likely program overlap and potential issues with the successful translation of programs at the national level. Additionally, over 30 different collaborative groups and stakeholders were mentioned; see Tables 2.3-2.5. This again emphasizes that if an educator or specialist is unaware a program exists then the programming will not be translated successfully. Without successful translation, issues such as program duplication and increased cost and inefficient use of resources, such as time, may occur (Johnson, 2019; Norton & Mittman, 2010). A variety of reasons exist for the failure to translate programs, such as limited resources and training barriers, (Kahn et al., 2002) but more often, the reason is the lack of attention given to translating programming within national systems such as Extension (Aarons et al., 2017). Moreover, lack of an effective communication network for the dissemination of programming information within Extension increases the difficulty of consistent translation of programs to every state. Future work should focus on how programming is being communicated, translated, and understood at the specialist level. This future research should seek to understand if specialists are a key intermediary of information for educators, which would provide an improved understanding of specialists' adoption and dissemination process to educators. Eventually, with a better understanding of the relationship between specialists and educators, and an understanding of specialists' source and channel usage, an intervention for dissemination of programming could be developed that targets the improvement of programming translation at a national level.

It is also important to acknowledge that the successes of health promotion within Cooperative Extension are still in the early stages and ongoing research, such as this study, is being conducted to further improve Extension's health promotion and service efforts. Identification of the intermediaries within each system is critical to target and tailor dissemination interventions. For example, if the outside perception is that health educators are the intermediaries from the university to the people, but specialists are intermediaries between researchers and health educators, then a clear linear relationship of dissemination may become

apparent. In another system, however, it may be allied health professionals or public health managers who serve the intermediary role of Extension health educators (England, 2017; Gov.UK, 2017). Thus, this work of identifying information-seeking practices may be translatable to other existing international health promotion systems. However, it is also important to acknowledge that even with an understanding of the information network within a system, it is equally important to know what information must be disseminated in order to facilitate adoption and delivery of programming. Thus, future work should also determine intervention characteristics that influence the adoption-decision-making process and how to best describe them to various audiences.

This study is not without limitations. The first is that the data analysis for the survey results remained superficial as very little pre-existing data on the demographic variables of Extension health educators exists. Additionally, due to this lack of pre-existing data on Extension health educators, the sample for this study may run the risk of not being generalizable to the all Extension health educators nationwide. Also, the demographic characteristics of the sample are not very diverse, for example, most of the sample are Caucasian women. Due to the lack of pre-existing national level data on Extension educators, it is hard to determine how the lack of diversity in the sample is or is not representative of the Extension health educator profile and how that would impact results. Also, it should be noted that educators in this study represent a sample of convenience, as they were recruited through the contacting of state Extension specialists and may be representative of the most engaged health promotion educators. Although an explanatory mixed-methods approach was used to ensure the accuracy of representation of the dissemination process, our results are certainly limited by response bias related to what educators reported about information channels and sources and what they are actually doing (Furnham, 1986). Finally, this convenience sample was recruited through an intermediary (specialists) and, as such, there is a lack of information on which state specialists distributed the study invitation and how representative the chosen educators were of all educators of that state system.

Conclusion

There is a long lag in translation of health promotion interventions into practice-based program delivery settings, such as Cooperative Extension. Improving program translation at the national level could result in

better cost-effectiveness, program translation, and improved outcomes in preventive health systems. The results of this study confirmed and extended previous understanding of information seeking practices within this system. Namely, state specialists and colleagues were the primary sources of program information for educators and that these practices now include, unsurprisingly, technology like the Internet but surprisingly, not social media. This study provides support for mapping the information network through channels and sources (identifying the information source communicating with educators) as a critical first step in designing dissemination interventions. This work serves as the first part of a larger project and next steps will determine the feasibility of Extension state specialists as the targets of a dissemination intervention that could ultimately improve the translation of programming at a national level.

Declarations

Ethics approval and consent to participate

This research was approved by Virginia Polytechnic Institute and State University IRB.

Consent for Publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interest

The authors declare that they have no competing interests

Funding

No funding was used in conducting this study

Authors' Contributions

TS led all data collection and data analysis with oversight from SH. All authors interpreted qualitative data and contributed to manuscript preparation and approval. All authors read and approved the final manuscript.

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Figure 2.1 Sample Network of Interactions Among State Specialists, County-based Health Educators, and Community Members.

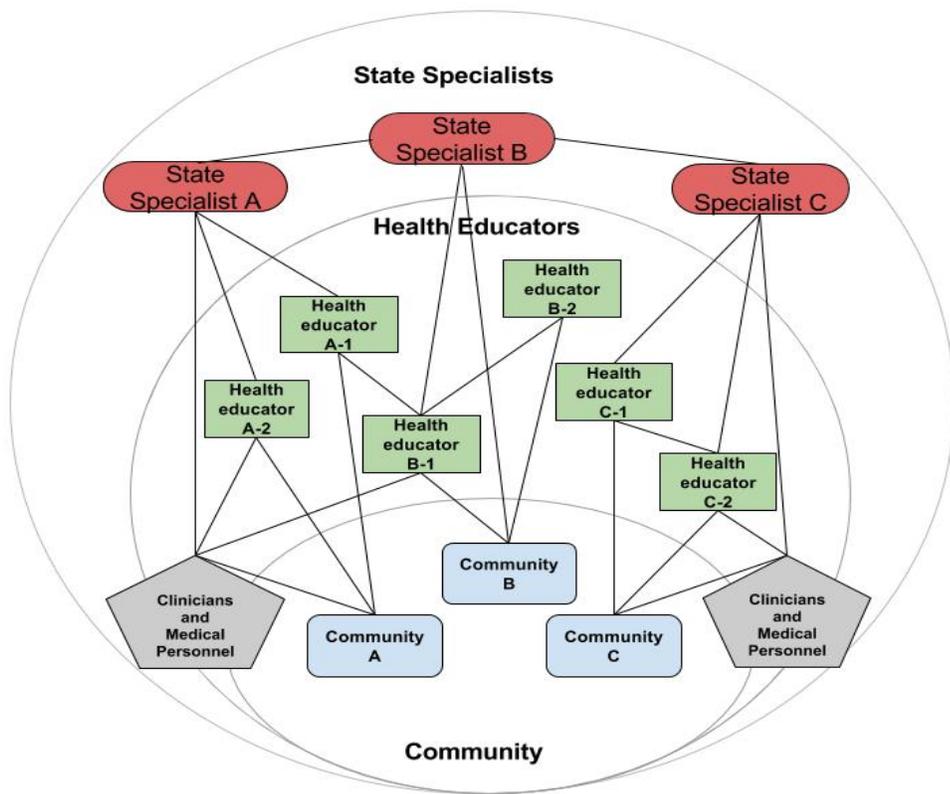


Figure 2.2 Extension Health Educator’s Information Sources and Channels

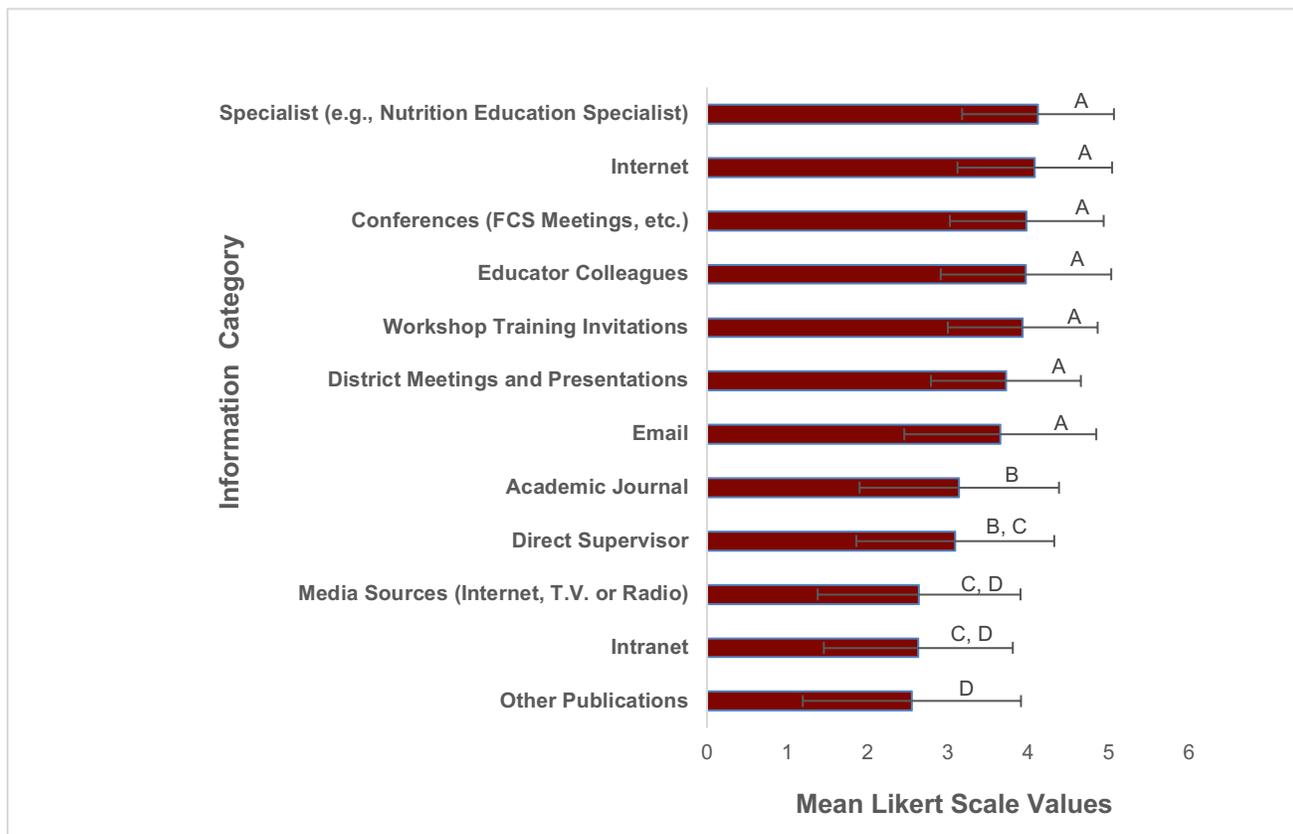


Table 2.1 Extension Educator Demographics Table

Demographics Variable	Survey Respondents (N=121)	Interview Respondents (N=18)
Gender		
Male n(%)	11 (9)	2 (11)
Female n(%)	110 (91)	16 (89)
Spanish, Hispanic, or Latino		
Yes	5 (4)	0 (0)
No	116 (96)	18 (100)
Race		
White	97 (80)	14 (77)
Black or African American	15 (12)	2 (11)
Asian	3 (3)	1 (6)
Other	6 (5)	1 (6)
Percentage of time spent with target audience (Mean Percent) (STD)		
Adults	50 (\pm 25)	52 (\pm 23)
Youth	31 (\pm 27)	29 (\pm 27)
Older Adults (65+)	24 (\pm 17)	23 (\pm 13)
Duration as an agent (educator) in Cooperative Extension n(%)		
1 Year	11 (9)	2 (11)
2 Years	9 (7)	2 (11)
3 Years	9(7)	3 (17)
4 Years	7 (6)	1 (6)
5+ Years	82 (68)	10 (55)
Highest level of Education n(%)		
Bachelor's degree	21 (17)	3 (17)
Master's degree (course option)	41 (34)	3 (17)
Master's degree (Thesis Option)	45 (37)	11 (61)
Doctoral degree	9 (7)	0 (0)
Professional degree	2 (2)	0 (0)

Table 2.2 Extension Health Educator's Information Sources and Channels

Theme (meaning unit count)	Sub-theme	Meaning Unit Count	Interviewee Count N(%)	Meaning Unit Example
Information Channel (228)	Email	43	14(78)	P12 "Um...okay so...I would definitely say we email. We have a group email list...of people who are family consumer science educators or agents and so we can email and say what have you got or you know what kind of programs have you got for this, do you have something that meets our need."
	Conferences	30	12(67)	P8 "Um...you know by going to conferences every year...um...and then you know another program that I've done...um...I learned about through going to another local conference. Um...so yeah I you know I I guess I gotta say conferences are the primary source, primary way I learn about new programs. [cross talk] extension conferences or it might be our department of health conference or...something like that."
	Internet	25	11(61)	P10 "When I'm searching for specific kinds of programs I will I actually go right to Google and I um you know look for uh things in my search bar, click site, colon, edu"
	Phone	16	6(33)	P7 "and then after I've looked at that [emailed programming information], then I would probably call them [colleagues] and talk to them in person cause you get a better feel in person than just communicating by email."
	Face-to-Face	10	6(33)	P5 "So I think face to face is important for that relationship connection"
	Meetings	10	7(39)	P12 "Um we have one annual state meeting once a year and then we have um regional meetings twice a year where...we often get the chance to showcase the programming that we're doing in our individual counties..."
	Specialist	9	3(17)	P9 "Yeah I think it it works out great knowing that we have university support from the specialist who has a specialization in our area of expertise that we're looking to build and promote our programs and having a specialist on board is very very helpful."
	Webinars	5	3(17)	P10 "We also through our national association have a a nice group of webinars that we use for professional development so through the agent association we have the webinars."
	Media	3	2(11)	P1 "Another way that I find out what people...say they want [for health promotion programming] is that I write a weekly column in our newspaper...and the circulation for that I think is 3500 or 3800 um and I do that on a weekly basis. And in there I ask 'Are you interested in this? If you are let me know.' Or 'I am offering this class call da da duh da to register' and then I, I promote classes in all...all the counties that I have."
	Social Media	3	3(17)	P10 "um I'm active on social media and so a lot of my colleagues that's where we see each other so to speak is out there sharing things, sharing tools, sharing sites and um information that way. And that helps build up who you know is is doing some wonderful things."

	Training Sessions	2	1(5)	P16 "I think our in service trainings are the most fundamental ways that I learned about new programming."
Information Source (324)	Specialist	134	18(100)	P6 "but over all they [state specialist] are um...easily the best and quickest resource. Because uh again, time is such a restraint that um...I wouldn't independently spend a bunch of time just inwardly searching for a program uh when it's their job to know about programs in their particular field."
	Colleague	84	17(94)	P12 "Okay um first of all I think I would look within my state to colleagues that are in similar positions, and what they are doing and if they have anything to paying programs or um...projects that would meet those needs. I would probably start there"
	University Resources	29	14(78)	P15 "um anything out of um the land grant university's extension um you know Penn State's one, Cornell, Ohio State, anybody that has land grants, um affiliation um...it would be what we would use."
	Extension Resources	19	8(44)	P17 "but in so in comparison or versus um if I'm looking for a specific program then I would be searching the extension resources for that program."
	Organization report	12	4(22)	P18 "Um...so what I sometimes I will reach out to research based organizations like American Cancer society...and evidence based um American Cancer Society,"
	Government Resources	11	6(33)	P2 "Um if you know primarily my area's in nutrition and health education we look to those reliable, trusted resources um such as USDA, um FDA.gov, you know Department of Health and Senior Services that we partner with quite a bit, Department of um Department of Health,"
	Academic Journal	10	2(11)	P2 "um and then in terms of physical activity we make sure that we're researching and finding those high impact journals um that uh that show the results that we're looking for."
	Community Partners	7	6(33)	P15 "well if it was up to me, I would probably have to you know you know look to surrounding look to my community uh local community if anybody had something somewhere to resolve the issue,"
	Third Party Group	6	3(17)	P17 "Um no not through like our state or anything. I'm just a part of a few different um groups or collaborations..."
	Other state programming	4	4(22)	P11 "Yeah yeah well you know adapt programs uh from other states uh extension programs or other um organ you know uh entities..."
Program Resources	4	4(22)	P10 "or um sometimes it's another call like if I see a curriculum that I like and I want to know more information about that I might specifically I might directly contact whoever wrote it or um where it's coming from and find out some more of that and even ask them "how did you find this" you know are there any national agencies you may have used to help fund this program that would love to see it replicated in another state"	

	Supervisor	4	1(5)	P4 "and what what um... what I would like to say is that... they [supervisors] always ask for our input. So if there are things out there that we [Extension health educators] hear, the things that we may learn through uh our schools or maybe their um their wellness coordinator or even their principals or whatever, if we find out information, they always welcome our feedback."
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Table 2.3 Areas of Health Promotion Targeted

Health Programming Target Area	4-H Youth
	Active Living
	Nutrition
	Chronic Disease
	Food Safety
	Specific Audiences
	Environmental Change
	Diabetes
	Family and Health
	Financial Education
	Food Access
	Food Preservation
	Food Resource Management
	Health Leadership
	Heart Health
	Infant Mortality
	Obesity
	Mental Health
	Physical Activity
	Poison Prevention
Substance Abuse	
Varying Stages of Life	

Table 2.4 Stakeholder and Collaborator Examples

Stakeholders Groups	
	Initiative Team
	Program Teams
	Economic Specialist
	Recruiting Stakeholders
	Health Coalition
	Community Partners
	Local Business
	Church Groups
	City Council
	Convention Offices
	County Commissioners
	County Executive Committee
	County Extension Council
	Day Care Providers
	Extension Advisors Committee
	Domestic Violence Group
	Extension Leadership Team
	Extension Homemakers
	Faith-based Organization
	Family Resource Center
	Food Pantries
	Government Personnel
	Health Center
	Health Department
	Hospital
	Housing Group
	Interagency Council
	Supervisor
	Parks and Recreation
Public Health Department	
Schools	
Senior Center	
Tobacco Coalition	

Table 2.5 Examples of Delivered Programming

Examples of Delivered Programming	
	Yoga for Kids
	SNAP Education
	Dining with Diabetes
	Real Food
	Strong Women Program
	Strong Women Healthy Hearts
	Active Schools
	Little Steps Big Changes
	Families Rock
	WE CAN
	Heart Truth
	Diabetes and Education
	Strong Women Strong Bones
	Health Habits a Way of Life
	Fitbit Go Healthy
	Belt Down Shape Up
	FitEx
	Poison Prevention
	Canning Class
	Missouri Move Smart Program
	Stay Strong Stay Healthy
	Chef for Kids Program
	Pick a Better Snack
	Coordinated Approach to Child Health
	Diabetes Self-Management Course
	Cooking Matters
	Serving Up My Plate
	Farm to You
	Get Real Here's the Deal Kit
Get Fit Program	
Fit in 10	
Walk with Ease	
Choose Health Food, Fitness and Fun Curriculum	
LIFT	

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CHAPTER 3

Manuscript 2: How Cooperative Extension is Getting the Word: Exploration of Health Specialists' Information Sources and Channels for Health Promotion

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Abstract

Background: In the National Cooperative Extension Service System (herein: Extension), county-based educators select and deliver health promotion programs. State-level specialists are a primary information source for county educators, serving as key intermediaries between research, educators, and the community members they serve. Little is known about how specialist use and value sources of information on evidence-based health promotion programming and channels of communicating these options with health educators.

Method: Specialists (N =94) across 47 states were identified and invited to complete a cross-sectional survey assessing demographics, perceptions of information sources, and rank-order of information channels. Sources included academic journals, out-of-state and local specialists, previously purchased curriculum, direct supervisor, and other publications. Channels included email, phone calls, online meetings, face-to-face meetings, and social media. A one-way ANOVA with Bonferroni corrections was used to detect differences between information sources and channels. Demographics were reported descriptively. Specialists who completed the survey were invited to participate in key informant interviews to augment the understanding of survey responses.

Results: A total of 47 health specialists completed the survey representing 31 eligible states (65%) and were predominately female(89%), Caucasian(70%), had a doctorate(62%), and were employed within Extension for 10.2±9.7 years. The information sources used most frequently were academic journals and other specialists (both local and out of state peer colleagues). Specialists primarily used email and online meetings to communicate programming options to county-based educators. Qualitative findings support the use of other specialists as a primary source of information and indicate specialists' desire for a national online repository of Extension programs. Additionally, specialists advised caution toward email as the primary channel for communication and information sharing due to email burden but acknowledged email as a primary channel of sharing information about training (adoption) and providing support for delivery (implementation).

Conclusion: Specialists use two main information sources including other specialists and government resources, particularly other Extension systems. Additionally, specialists are interested in having a

dissemination intervention that includes access to an information source contributed to by specialists with health promotion intervention information, such as an online repository, to facilitate dissemination on as needed basis to account for and reduce information burden on county-based educators.

Introduction

The United States' Cooperative Extension Service is a federally funded organization formed in 1914 (NIFA, 2017a; Ramussen, 2002) with the mission to “bring the university to the people.” (NIFA, 2017b; Ramussen, 2002) This community-centric system can scale evidence-based interventions both within a state as well as across the nation and to other partnering nations. At the community level, Extension health educators serve as a workforce to identify needs, match programming to meet those needs, and then adopt and deliver best-fit programs to millions of Americans nationwide (Battelle, 2015). Extension health educators facilitate knowledge transfer, acting as a bridge between academic institutions and community members, delivering health promotion interventions to the intended audiences (Brownson, Colditz, & Proctor, 2012). Extension educators have built trust in communities and are able to identify needs and deliver interventions to meet those needs (NIFA, 2017a; Ramussen, 2002). Notably, Extension health educators reported primarily receiving health promotion interventions through other peer educators and from specialists (Strayer et al., 2017). Therefore, understanding how specialists seek information is an imperative link for how to integrate evidence-based practices in this system.

Each state employs different state-level experts, but generally speaking, specialists are available for training, technical assistance, and support, and educators often have the autonomy to choose interventions to deliver to meet community needs (Powell et al., 2015). The role of Extension support may vary but a commonality between specialists' is the role as a knowledge brokers between other researchers and Extension educators (Bailey, Hill, & Arnold, 2014; Mastel, 2014; Radhakrishna & Thomson, 1996). Health specialists of this system may cover topics from opioid prevention and management to food safety to family development. These roles are determined by federal administration and policy. For example, the release of the Cooperative Extension Framework for Health and Wellness in 2014 (Braun et al., 2014), coupled with the amendments to the 2014 Farm Bill (Chite, 2014), increased health promotion efforts within this system. This was the first time Extension professionals could address health promotion in a concerted effort. To support the broad range of needs for “health,” state Extension systems were provided funding to hire Extension specialists and educators to specifically serve the health promotion needs of Americans (Braun et al., 2014). However, to date, not every state has a health promotion specialist, as states have varying demands and funding available (Braun et al.,

2014). Notably, specialists were already employed in health promotion activities such as nutrition, food safety, and other health related roles, but emphasis for new employment was created through the 2014 directive.

Taken together, the infrastructure of the system is unique and can have broad public health impacts, but the collective impact of Extension efforts is not readily communicated. This is, in part, because key principles of interventions are not readily scaled-out across multiple state systems and specialists and educators often duplicate health promotion efforts. For example, there are multiple state walking programs,(Teran & Hongu, 2012) but there is not one collective report of the impact and efforts of walking interventions within the system.

Reasons for this lack of collaboration could be attributed to system-level barriers that impact successful knowledge translation across individual state Extension systems. For example, some barriers include the time and resources to successfully disseminate evidence-based developed health promotion programs. That is, although Extension is available in every state and territory, there are no central health promotion interventions in the Extension system at a full national level because many state systems work in silos. Thus, how to connect specialists across state lines is a key dissemination research question.

For the purpose of this study, dissemination science can be considered in three constructs including: identifying the targeted audience's characteristics; identifying the sources of information; and finally identifying the channels of communication in which information can be delivered to the target audience (Brownson et al., 2012). Without an understanding of these dissemination constructs in the adoption-decision-making process for specialist, health promotion programming may suffer from a loss of effective scaling and over duplication of programming. However, other barriers also exist to dissemination including over-use of resources for dissemination campaigns, commitments of adopters, difficulty training staff, and the current lack of recommendations for health promotion in a community setting (Brownson et al., 2012; Kahn et al., 2002; Norton & Mittman, 2010). Without active information delivery, spontaneous adoption and delivery may not occur, dissemination interventions should be timely and appropriate for the organizational culture, and finally that the information conveyed in dissemination must match the stakeholders and not just the developers aims (Brownson et al., 2018; London Policy Group, 2011; Lehoux, Denis, Tailliez, & Hivon, 2005). Thus, if these conditions are not occurring at the intervention developer, specialist, or education level within Extension, then

specialists and educators are not effectively communicating leading to a lack of proper disseminating and adoption of programming and the desired result of scaling-out of evidence-based programming will not occur.

With an understanding of the information sources and channels, a delivery system may increase knowledge transfer with the potential results of reducing resource misallocation, avoid program duplication, increase amount time for program delivery, and increase the scaling of programming at a national level. The aims of the study reported here were to identify a) information sources and channels used by specialists to obtain programming information and the channel of communication used between educators and specialists; and b) Extension specialists' perceptions on an intervention to improve the dissemination of evidence-based health promotion programming to health educators.

Methods

Framework

The literature within the field of dissemination science acknowledges a barrier in choosing a framework from the over a hundred various frameworks and models that currently exist and continue to be developed (Tabak, Khoong, Chambers, & Brownson, 2012). The most prominent and well established theory is the Diffusions of Innovations (DOI) Theory (Rogers, 2010), which is currently the most utilized theory within dissemination research ("Dissemination & Implementation Models in Health Research & Practice," ; Holt & Chambers, 2017). For this study, DOI brings a necessary approach to describe the characteristics of innovations, adopting and distributing personnel, and organizations that may speed or impede translation into practice especially in national systems such as Cooperative Extension (Damschroder & Hagedorn, 2011; Rogers, 2010). The focus of this study is on the initial delivery of information for targeted audiences to learn about an evidence-based health promotion intervention. However, the DOI does not necessarily encompass the concept of how information delivery occurs and thus a gap exists in learning about the sources, channels, and the adoption and distribution of evidence-based practices used by Extension specialists. To fill the existing gap the marketing theory of Enterprise Planning has been used to augment the DOI by aiding in the identification of communication channels within organizations (Allen et al., 2013; Kumar, Maheshwari, & Kumar, 2002). Taken together, existing models and frameworks from both dissemination science (DOI) and marketing (Enterprise Planning) informed this work.

Design and Setting

A sequential explanatory mixed-methods approach (i.e., the quantitative portion occurring prior to the qualitative stage) was used for this study (Creswell, 2013). Mixed-methods research has been shown to be useful for describing complex phenomena (e.g., dissemination) which is necessary in determining how Extension health specialists interpret constructs (e.g., academia or dissemination tools), while allowing for all data to be in reported in unique categories of meaning created by specialists (Castro, Kellison, Boyd, & Kopak, 2010; Creswell, 2013; Creswell & Clark, 2007).

Participants

No federal list of Extension state specialists who support health promotion exists, but a list was constructed in previous work (Strayer et al., 2017). This list was composed from publicly available data from land-grant universities and membership data found on the National Institute of Food and Agriculture Nutrition and Health Committee for Planning and Guidance and was updated in February of 2018. Extension *health state specialists* typically have a terminal doctoral degree (e.g., DrPH, PhD, EdD) and have a role within Extension focusing on health promotion (e.g., nutrition, physical activity, food safety, etc.). However, specialists across the nation have different degrees, qualifications, responsibilities, and titles as dictated by that particular state's system (Harden et al., 2019; Harden, Gunter, & Lindsay, 2018). To be eligible for this study, the participant must have been employed in a role as a health specialist and currently be working within Cooperative Extension. Additionally, specialists were incentivized with the chance to win a \$50 gift card for participating in the survey or interview portions of this study.

Survey Instrument

The survey instrument was designed to determine the following questions (full list in Appendix A):

1. *Which information channels and sources are used to influence the intervention adoption-decision making process for Extension health specialists and channels used for educator communication? Which sources (e.g., journals, other specialists, etc.) and channels of communication (e.g., email, phone, face-to-face, etc.) are used most often (1-Never; 5-Most often use) to seek intervention information? Response options were informed by previous literature on Extension (Strayer et al., 2017; Bailey et al., 2014; Brownson et al., 2012; Kumar et al., 2002; Radhakrishna & Thomson, 1996).*

2. *Which channels communication and frequency of communication do specialist's utilize with educators?*
Which sources (e.g., journals, other specialists, etc.) and methods of communication (e.g., email, phone, face-to-face, etc.) are used most often (1=Never; 5=Most often use) to seek intervention information?
Response options were informed by information sources, channels, and previous literature on Extension (Strayer et al., 2017; Bailey et al., 2014; Brownson et al., 2012; Kumar et al., 2002; Radhakrishna & Thomson, 1996).
3. *What are the specialists' perceptions of a dissemination intervention and interest level surrounding dissemination in Extension?* This question served to determine the demand of a dissemination intervention (e.g., How useful do you believe a dissemination (the active targeting of information delivery) intervention would be that actively distributed new evidence-based practices to you, specialists, that you could use to distribute to Extension health educators? (1=Not at all Useful and 5=Extremely Useful))
4. *Demographic variables* were assessed via survey based on standard variables used from methodology literature(Kumar & Phrommathed, 2005; Orcher, 2016) and previous work(Downey, Wages, Jackson, & Estabrooks, 2012; Harden et al., 2015; Harden, Johnson, Almeida, & Estabrooks; Zoellner et al., 2012) and included race, ethnicity, sex, age, state of employment, official role title within Extension, duration of employment within Extension, educational degree, and the field in which the degree was obtained.

Survey Analysis

The survey consisted of Likert-scale and rank-ordered response. These questions were analyzed by a One-way ANOVA, and when significant were followed-up with a Bonferroni Post-hoc test. Parametric tests were performed for this analysis based on the recent push towards ordinal Likert-based responses being comparable to non-parametric measures (Sullivan & Artino Jr, 2013). Stacked bar charts were chosen to convey the samples distribution across response rankings. The analysis of the survey data was used to inform the semi-structured interviews in part two.

Semi-structured Interviews

Semi-structured interviews with specialists were conducted within two months after survey conclusion. Health specialists (N= 12) were purposively selected to participate, by the four national districts: Northeast, North Central, South, and West. However, only two specialists agreed to interview in the Northeast district and

only two were able to complete interviews in the West district, for a total of ten interviews (83% response rate). The process was identical to that used in previous work related to health educator processes (Strayer et al., 2017). The survey portion of this study included the consent to be contacted for interviews by participants voluntarily providing contact information to complete the interview. Additionally, informed consent was received at the start of the interview. Our study was determined to be Western Institutional Review Board (WIRB) exempt but we based on practices in the previous educator study's IRB guidelines (Strayer et al., 2017).

A semi-structured interview methodology has the flexibility to be interactive nature allowing for unique and impactful data to be presented and collected (Drever, 1995; Longhurst, 2003). The ability to be interactive allows for deeper insight into the flow of information and better identification of the components of the dissemination network used by Extension health specialists to distribute evidence-based programming. The main objective of the interviews was to reach a point of data saturation, or when interviews no longer yielded new information (Creswell, 2013). A trained graduate research assistant was responsible for conducting and recording all participant interviews and then these record interviews were transcribed by trained research assistants. Interviewees were de-identified using a coding system based on the order of the interview such that no identifiable information was recorded as done in previous IRB approved work (Strayer et al., 2017). All participants were informed they could choose to have their responses retracted from the study once the interview was completed at any time. At the time of submission of this manuscript, no participant has asked to have anything retracted. The semi-structured interview guide can be found at Appendix B.

Semi-structured Interview Analysis

An immersion crystallization approach was used to analyze interview data. This approach maintains the interconnectedness of information channel and sources usage by specialists to identify the process by which information travels at the specialist level in the Extension system. This process involved the researchers being immersed in the data and iteratively going through the themes and process of the information network within Extension (Borkan, 1999). This process allowed for the understanding of each participant's experience and compare cross-case to draw out the patterns and themes that were generalizable across the interviews (Davis et al., 2017). Trained researchers independently coded meaning units, and a critical friend assisted in reconciling

any coding or meaning unit discrepancies between independent coders (Castro et al., 2010; Smith & Sparkes, 2013). For this study, the senior author acted as the critical friend and inter-rater reliability techniques were applied to ensure reliable analyses and resolve conflicts. Inter-rater reliability was established by having each member of the research team (TS and NR) independently code one participant's interview and then compare and reconcile results. Inter-rater reliability was initially greater than 85%. Following reconciliation, the remaining meaning units of a single interview were coded. The second round of inter-rater reliability was 92%. The remaining meaning units were then independently coded by members of the research team. The results of the semi-structured interviews are presented in Tables 2-4.

Results

Sample

Extension health state specialists were identified in 45 states in 2018 and invited to complete a Qualtrics survey from March 26th-April 27th, 2018. Participants were sent an initial invitation email and follow-up emails sent 3 days apart for the four-week span. A total of 62 specialists started the survey, but only 47 (77%) of the responses were completed and met eligibility criteria. A response rate of 50% was achieved from the original 94 identified specialists with responses from 30 (69%) of the identified states. Table 1 gives additional demographic information about the specialist population; however, to summarize, Extension health state specialists were predominantly female (89%) and Caucasian (70%), were 46.9 ± 13.4 years of age, possessed a doctoral degree (62%), and had an average duration in Extension of 10.19 ± 9.69 . The specialists that participated in the interview portion of the study were of similar demographically to survey participants and were predominantly female (80%), Caucasian (100%), were 40.1 ± 13.4 years of age, doctoral trained (60%) and had spent 7.9 ± 9.5 years on average in Extension. Demographic data for this sample is located in Table 1.

Quantitative Results

Specialist's Information Source and Channels for Programming Information

The information sources can be seen in Figure 1. Figure 1 shows the frequency of a particular response from right to left of "not at all likely" to "extremely likely". The larger the final section of the bar for each source symbolizes greater usage of that information source being used. The sources were also ordered from top to bottom based on the mean score of the Likert responses from highest to lowest. ANOVA indicated that there

was a significant difference among the relationship of the information sources ($p < 0.05$). Using a Bonferroni post-hoc test, it was determined that the significance was between academic journals and all other information sources. The exception was that specialists use academic journals and communication with other local state specialists about the same with no statistical difference detected. Additionally, local specialists were also used more often than other publications and direct supervisors ($p = < 0.05$). The direct supervisor response was the least reported source for information about a health promotion intervention with other publications being the second lowest reported source.

The channels of information communication consisted of those responses seen in Figure 2 and the format and ordering of the information channels are the same as Figure 1. The most used channel of communication for specialists to receive information about health promotion interventions were conferences and society meetings as well as the internet. These channels were followed by workshops, trainings and email. Phone calls, district meetings and presentations, media sources and the intranet were reported as the least likely used communication channels and were statistically different from the remaining communication channels.

Specialists Communication Channels and Frequency with Educators

Twenty-seven (57%) specialists reported communicating in some way with educators 1-3 times a month or less. A majority of specialists 31(66%) reported communicating with health educators less than once a month in frequency. Figure 3 represents the communication channels ranked in order of use and presented in the same format as the questions in Figures 1 and 2. Email was the most used information channel between specialists and educators and was significantly different from all other forms of dissemination. Only two “other” categories were ranked above 6, and only one of these wrote in an “other” response which was a university specific box/canvas/basecamp program. Social media was the least likely form of communication between educators and specialists excluding the “other” category.

Qualitative Results

A total of three themes were developed. Within each theme, sub-themes were identified that elaborated further into both the components of these themes (e.g., frequency, information channel, information source feedback, etc.) and also how information channels and sources interconnect are made clear (see Table 2).

Specialist Information Sources and Channels

The first process theme related to information sources and the information channels. The key result was the way in which academic journals were being used by specialist for health promotion interventions. Specialists (80%) stated that while academic journals were trustworthy for evidence-based information they were not incredibly useful to find specific programming to adopt and deliver. For example: “...if you were wanting to find a intervention just simply through a journal, you know, what would you search for? Right?”. Additionally, while channels used to reach academic journals were not often mentioned (20% of the interviews), channels that were mentioned included the Internet such as google scholar or specific journal websites. The direction of dissemination was reported as bi-directional: Some specialists mentioned using academic journals to disseminate their work and some mentioned that journals disseminated new findings regularly via email. Finally, the use of academic journals was mostly associated with a need arising in which a specialist required evidence-based knowledge to support the local educator.

The second most prominent information source was other specialists. Specialists reported using a mixture of in- (local) and out-of-state specialists to learn about new programming information. Majority of the specialists interviewed, with the exception of one, believed that other specialists were both trust-worthy sources of programming information and sources for evidence-based health promotion interventions. The one specialist that reported a lack of trust mentioned that specialist lacked a uniformed qualification in health promotion programming such as varying degrees and specialties. The channels in which specialists communicated with other specialists included conferences, meetings, email, and through phone calls. Specialists reported both being reached out to for information and actively reaching out to specialist when a need arose that needed programming information. Conferences and meetings for specialist were the most mentioned channels for communicating with other specialists: “*When I’m at conferences and things like that, I generally lean on them [other specialists]... to hear more about the interventions that they use.*”

The third information source was the use of government sponsored organizations for programming information. These sources consisted of resources such as the CDC, Extension websites, USDA, NIH, Public Health offices, Federal Trade Commission, and Center for Training and Research Translation. Specialists reported that each organization mentioned was a trustworthy source of information and often had non-branded resources easy to integrate into Extension practice. For example, one participant stated, “*I think CDC has*

something similar [repository of programming], where they're basically putting forward material that has been developed through ...grants that they've issued or whatever, so I find that those are often... crafted... more specifically to the needs of a community and they can be maybe...um better adapted". The information channel discussed by specialists for reaching these resources were through the internet such as online repositories or Extension websites. Specialists mentioned both actively contributing to these resources and also receiving information from these sources as well, similar to that of academic journals. While these resources are considered trustworthy, it was mentioned that these resources would benefit from more frequent updating as said by one specialist, "...how often some of them are updated, you know, I mean, government resources tend to be updated about as frequently as I can update which is not very often."

The final two information sources consisted of non-profit organizations and also private organizations. These two information sources were mentioned, but no additional information was provided. The conversations did not flow toward learning more about these mentioned resources. However, it was mentioned that for the non-profit organizations consisted of the American Diabetes Association, American Heart Association, and the Dairy Council. The private organization mentioned with the Gatorade Sports Science Institute.

Specialists Communication with Educators

First, in the interviews each specialist was asked about the number of educators they serve, if a list of these educators existed (outside of a listserv) and at what frequency the specialist believed communication with educators was necessary. The number of educators in the ten states ranged from 8 to 150 educators. This difference shows the unique settings that each state faces based on geographical differences. A state such as Texas will have a different Extension structure than a state such as Vermont. Only three specialists reported having a list available of the educators working within their state. Finally, all ten specialists reported that the frequency of communication with the educators was typically on an as needed basis dependent on current state needs. However, specialists do realize the importance of having an open communication channel with educators, "*I really see my... one of my main rules in my job is to support the agents and so... in doing so you need to communicate.*"

The third theme was around the process of how specialist communicate with educators; key channels were trainings, email, phone, web-based tools, and social media. While training was not an original option in

the survey for a form of communication, specialists often mentioned that to get programming information to educators would be through training. Trainings were described as active from a specialist to educators with a preference to face-to-face communication or through webinars. The content of the trainings was for Extension approved programming to be delivered and the frequency was intervention dependent. Often, emails were mentioned in a listserv format, to reach large targeted audiences, with content being specifically focused on the community needs or a means to address a particular need including answering questions from educators. This communication channel was used daily to weekly as well as unplanned or scheduled dissemination. The third information channel mentioned by specialists was the use of phones to communicate with educators. Three specialists mentioned phone calls to be more personal and an informal means of communication that could be done as needed to answer questions pertaining a community need or intervention, *“So I think having that kinda personal... you know, being able to communicate via phone...and follow up, can really go a long way...”* The fourth information channel was web-based tools such as WebEx, Zoom, or Dropbox. These channels were mentioned as ways in which to deliver large amount of information to multiple targets quickly. Additionally, specialists reported that educators appreciated this means of communication as it was easier to facilitate meetings. Finally, when prompted to discuss social media (an option from the survey) none of the specialists reported use of social media to communicate with educators.

Initial Perceptions of a Dissemination Intervention

All specialists mentioned that they believed other specialists were the best and most reliable resource to learn about Extension programming that could be disseminated and utilized in other systems. Additionally, the interviewed specialists also mentioned the desire for state specialists to be in charge of the dissemination of programming to the educators they serve. In essence, this can be simplified by a two-level dissemination pathway: 1) specialist to specialist and then 2) specialist to educators. The information channels mentioned were email, an online repository, and one mention of phone and webinar. Email was most commonly mentioned information channel, but specialists were also the most cautious with this method particularly with email burden (e.g., *“I think that... our agents (educators) are overwhelmed with email...”*) as specialists believed that too many emails would lead to the reduced attention to the information that specialists disseminate, *“our agents are overwhelmed with email. Oh I don’t... my specialist emails would not be...business. Who wants another damn*

email?”. This caution for overburdening was further discussed in the frequency of dissemination of health promotion interventions. Specialists mentioned a variety of frequencies as to not reduce the attention given to new evidence-based information that they disseminate. In this context, the online repository may be the best channel to let specialists provide information as the need arises reducing the burden of over-information. In fact, a specialist stated, *“I think some sorta repository data base, evidence based, evidence informed system, you know, like the Stanford data base for mental health extension...could be used.”* Implying that these repositories may aid in the facilitation of programming translation at a national scale.

Discussion

This study was the first to our knowledge to identify, describe, and capture the use of information sources and channels by Extension state specialists to better learn about the way in which health promotion intervention information travels. This work aimed to gain an understanding of the information channels and sources used to by specialists to learn about health promotion information, how this information is communicated from specialists to educators, and the initial perceptions of specialists regarding a potential dissemination intervention to improve program translation in Extension nationally. Survey results indicated that specialists use academic journal and other specialists to learn about health promotion programming information. However, when that process to find this information was determined in the interviews, it was learned that academic journals are utilized mainly for generic evidence-based information and not specific health promotion programming. Through further probing in the interviews, it became clear that other specialists were key sources for programming information that were reached through conferences and meetings as the information channels. In comparison to previous literature, specialists were noted in being valuable sources of information for Extension educator along with technological means of communication being used for information channels (Bailey et al., 2014; Mastel, 2014; Radhakrishna & Thomson, 1996; Strayer et al., 2017). This study showed a similar result for the specialists’ information sources and channels network. Specialists valued the information from other specialists and especially Extension based resources typically going to websites and using email to communicate. However, conferences were the main channel that specialists used to communicate the most about programming information with other specialists. Email was the most mentioned channel for

communication from specialists to educators. This is unsurprising due to emails prevalence and ease within the workforce (Turner et al. 2010; Cameron & Webster, 2005).

With regard to frequency and channels for communicating with educators, specialists self-reported communicating with educators weekly or less. Specialists reported that their infrequency of contact was underscored by the desire to not overburden the already over-worked educators but also to meet demands of educators “as needed” (Enslie, 2005; Kutilek, Conklin, & Gunderson, 2002). This idea of “as needed” underscores the potential place for a dissemination intervention as health educators desire more information communication from specialists on on-going evidence-based health promotion interventions (Strayer et al., 2017). However, information delivered to educators may be better served as an on-demand information delivery service. From an economics perspective, demand can be thought of as function of consumers needs for a particular service (Davis and Serrano, 2016). Thus, if educators do not have a “need” for information, frequent emails (or other means of communication) from specialists may lead to educators’ desensitization to that—potentially pertinent—information. A dissemination intervention would strategically match demand and needs to specialist’s information and training supply.

One method to improve specialist and educator communication could be through an active approach of specialists reaching out through list-serve or state meetings to better inform educators of specialists’ roles and availability. Taking a more active role in this relationship will reduce spontaneous specialistXeducator interaction and instead promote common communication. With improved communication and understanding of needs between educators and specialists the next step is to have information source in which the needed information resides. To this point, specialists reported the ideal dissemination intervention would be to have information available on an as-needed basis such as a directory of specialists and their expertise as well as an on-line repository of Extension-tested interventions. Previously, repositories have been hinted as resource for use within Extension, specifically for evidence-based intervention components (Harden, Ramalingam, Breig, & Estabrooks, 2019). Additionally, further research into the way in which information appears in such a repository must match both tiers, specialists and educators, preferences to maximize the effective uptake and delivery of evidence-based health promotion programming nationally (Burkhardt, Schröter, Magura, Means, & Coryn, 2015).

The successes of this work need to be couched within its limitations. First, nationwide specialists' demographic data are not readily available and as such it is difficult to make the assumption that the data in this work are generalizable or transferable to Extension as a whole. Additionally, the sample were predominantly Caucasian females. Though again, with little data to compare, it is difficult to know if this lack of diversity is representative of specialist nationwide. The results of this study are also limited by response bias and by the limitations of a semi-structured interview (Furnham, 1986). Semi-structured interviews make each interview unique and for a variety of paths to be followed, thus the same topics were not necessarily explored in each topic. To represent this, we included sample size measures in our qualitative data table to show the representativeness of a topic reported.

Conclusion

This study continues to bridge the gap between the development of health promotion interventions and the eventual delivery of these interventions within community settings by the National Cooperative Extension Service. This study provided future direction to the development of a dissemination intervention to serve as the bridge to national knowledge translation for health promotion programming within Extension. These results supported previous work to the importance of specialist within the Extension information network from not just educators but also to other specialists. The fact that both educators and specialists value Extension specialists as key resources for health promotion programming information highlights the need of a firm understanding of how a dissemination intervention would be developed. This study continues to develop the information network with Extension and hints that the future of information dissemination might be through a specialist informed repository of online information that specialists may use to distribute health promotion intervention based on educator demand. The impact of a dissemination intervention can have on the knowledge translation process is not yet understood but the next steps of this research should inform what information is pertinent about a health promotion intervention to facilitate the adoption process for both specialists and educators. The successful development of a dissemination intervention that utilizes desired sources and channels of information can be impactful the successful program translation of evidence-based programs, reduce programming duplication, and improve outcomes for Americans nationwide in health promotion.

Declarations

Ethics approval and consent to participate

This research was approved by Virginia Polytechnic Institute and State University IRB and the Western IRB.

Consent for Publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interest

The authors declare that they have no competing interests

Funding

No funding was used in conducting this study

Authors' Contributions

TS led all data collection and data analysis with oversight from SH. NR and TS interpreted qualitative data and contributed to manuscript preparation and approval. All authors read and approved the final manuscript.

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Figure 3.1. Specialist Information Sources

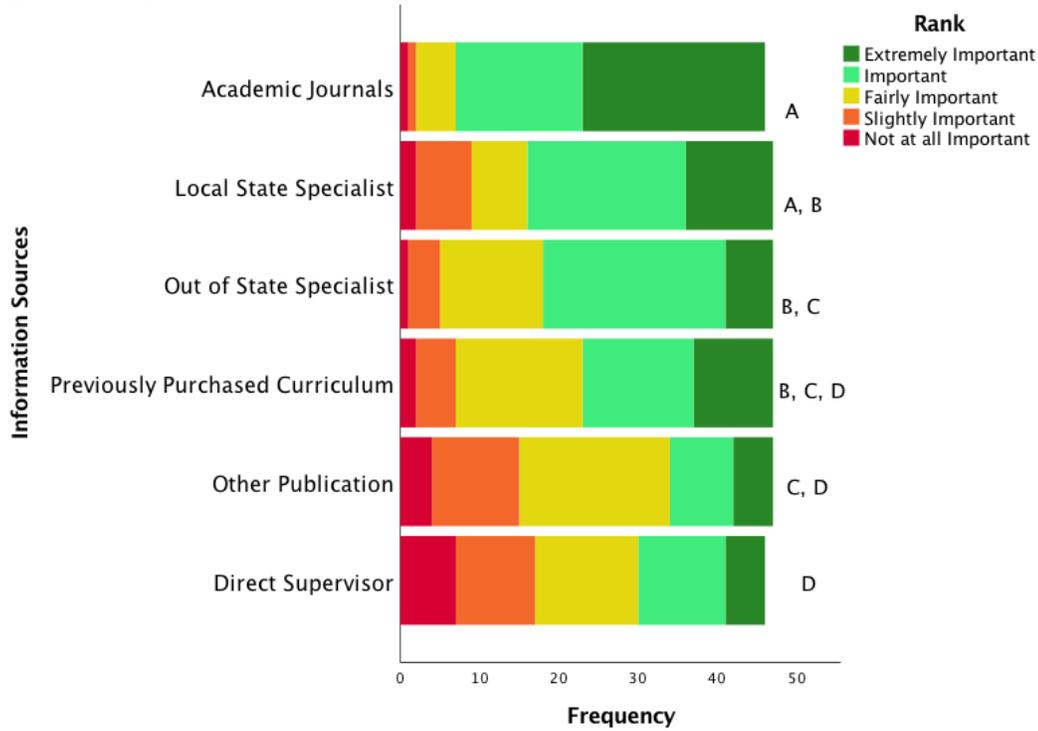


Figure 3.2. Specialists Information Channels

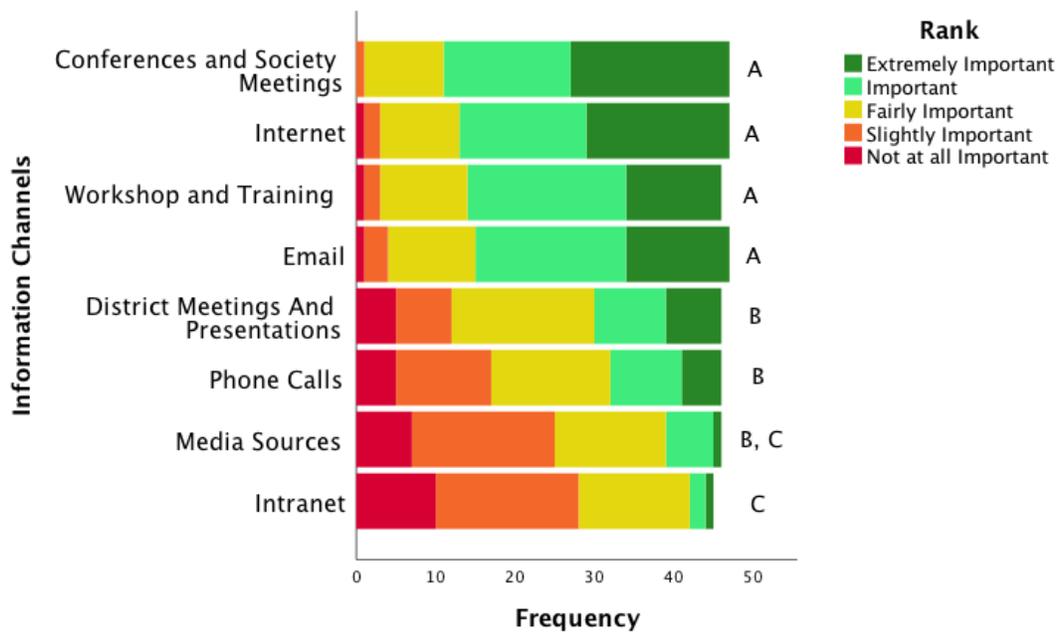


Figure 3.3. Specialists Information Channels Used for Educator Communication

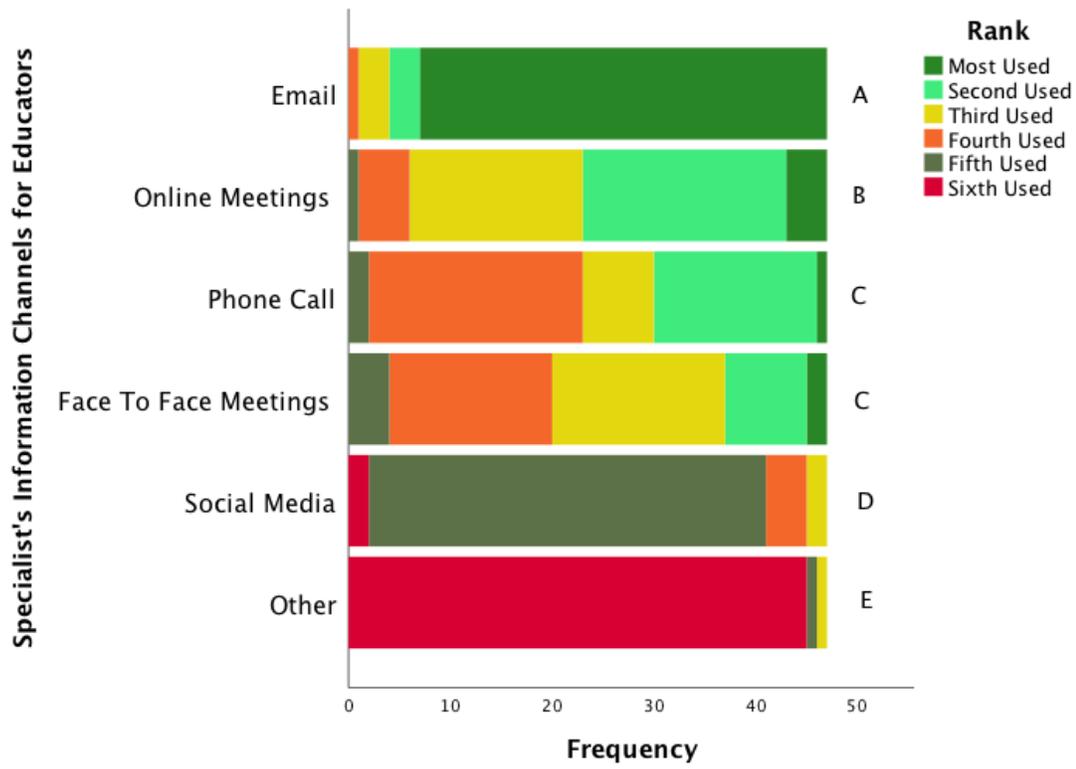


Table 3.1. Extension Specialist Demographics Table

Demographics Variable	Survey Respondents (N=47)	Interview Respondents (N=10)
Gender		
Male n(%)	4 (9)	2 (20)
Female n(%)	42 (89)	8 (80)
Other n(%)	1 (2)	0 (0)
Age Mean(STD)	46.9 (\pm 13.4)	40.1 (\pm 12.9)
Spanish, Hispanic, or Latino		
Yes	3 (7)	0 (0)
No	44 (93)	9 (90)
Race		
White or Caucasian	33 (70)	10 (100)
Black or African American	7 (15)	0 (0)
Asian	1 (2)	0 (0)
Other	5 (11)	0 (0)
Percentage of time spent (Mean Percent) (STD)		
Research	21 (\pm 19)	23 (\pm 20)
Extension	68 (\pm 30)	68 (\pm 31)
Teaching	19 (\pm 15)	21 (\pm 15)
Duration as an agent (educator) in Cooperative Extension Mean(STD)	10.19 (9.69) years	7.86 (\pm 9.5)
Highest level of Education n(%)		
Master's degree (course option)	11 (23)	3 (30)
Master's degree (Thesis Option)	6 (13)	1 (10)
Doctoral degree	29 (62)	6 (60)

Table 3.2. Specialists Interview Qualitative Results

Theme	Information Source Sub-Theme(n)	Source and Channel Information Sub-Theme Descriptions (n)
Specialist Information Sources and Channels	Academic Journals (10)	<p>Frequency: Use as Needed (8) Information Channel: Internet (Website/Google Scholar) (2) Direction of Dissemination: Bi-Directional (8) Source Feedback: Trustworthy Source of Information (9), For Evidence-based information not programming specific (8), 17 Different Journals Mentioned (8) Source Improvement: More details in intervention methodology (1), Prefer journal article be supplemental to Intervention information (1)</p>
	Specialist (10)	<p>Frequency: Use as Needed (6), Rarely or Infrequent (2) Information Channel: Conferences (7), Meetings (6), Email (3), Phone-calls (2) Direction of Dissemination: Bi-Directional (3), Actively Reaches Out (1) Source Feedback: Use In-state Specialist (6), Use Out of state Specialist (6), Trustworthy Source of Information (8), Not a Trustworthy Source of Information (1), Good information source for Programming information (6) Source Improvement: Programming can be costly coming from other specialist (1), Specialist should be more uniformed in qualifications (1)</p>
	Government Organizations (10)	<p>Frequency: Use as Needed (10) Information Channel: Internet (10) (Websites or Online Repositories) Direction of Dissemination: Bi-Directional (5) Source Feedback: Use a variety of sources such as: CDC (7), Extension (8), USDA (4), eXtesnion (3), NIH (3),Federal Trade Commission (1), Public Health Department (1), Center TRT(1), Use Trustworthy sources of Information (8), Non-branded resource (2) Source Improvement: Programming can be costly coming from other specialist (1), Specialist should be more uniformed in qualifications (1)</p>
	Non-Profit Organizations (3)	<p>Source Feedback: American Diabetes Association (2), American Heart Association (2), Dairy Council (1)</p>
	Private Organizations (1)	<p>Source Feedback: Gatorade Sports science Institute (1)</p>

Theme	Information Channel used to Communicate with Educators Sub-Theme	Channel Sub-Theme Description (n)
Specialist and Educator Information Channels for Communication	Training (8)	<p>Content: Extension Approved Programming for Delivery (8) Dose: Intervention Dependent (8) Information channel:</p> <ul style="list-style-type: none"> • In-Service Trainings/Workshop (8) <ul style="list-style-type: none"> ○ Face-to-Face (8) • Webinar Trainings (4) <p>Direction of dissemination: Specialist Training Educators (8) Rationale: Specialist believe that training improves program adoption and fidelity (1), needs a funding mechanism (1)</p>
	Email (10)	<p>Content: Emails contained information on community needs or addressing community needs (10) Frequency: Daily-Weekly (10), List-serv (as needed or scheduled updates) (7) Direction of dissemination: Bi-Directional (10) Rationale: Most common channel to communicate with multiple educators (7)</p>
	Phone (3)	<p>Content: Community Need and Intervention Information (3) Frequency: Episodic (1), As Needed (2) Direction of dissemination: Bi-Directional (3) Rationale: Informal means of communication (1)/ Can use conference calls for multiple individuals and specialist also believes talking improves personal relationships increasing intervention success (2)</p>
	Social Media (5)	<p>Content:-- Frequency:-- Direction of dissemination:-- Rationale: Specialist often states that social media was not a tool to be used to communicate with educators in its current stages (5)</p>
	Web-based Tool (WebEx/Zoom/Dropbox) (5)	<p>Content: Statewide Initiative Information/ health topics in communities/intervention information (4) Frequency: Monthly and based on health topics and Intervention needs (4) Direction of dissemination: Specialist to Educator (5)</p>

		<p>Rationale: Educators requested this channel of communication as it is convenient and easier to facilitate statewide meetings (3)</p>
	<p>Additional Communication Information (Unique Insight provided by Specialist) (5)</p>	<ul style="list-style-type: none"> • Communication may be a barrier that contributes to the underutilization of specialists (1) • Believes educators can be more productive with more contact with specialist (1) • Communication with educators is important especially to ensure educators have most up to date information on interventions (1) • Personal relationships matter in this (specialist) position as they help improve program fidelity (1) • Attention to emails is short so emphasizes not burdening educators (1) <p>Mentions that communication should be as needed with educators and that amount really isn't a measure of success (1)</p>
<p>Dissemination Intervention</p>	<p>Information Source Sub-Themes (n)</p>	<p>Dissemination Intervention Information Description(n)</p>
	<p>Specialists (10)</p>	<p>Dissemination Content: Intervention Specific Information (9), Extension Intervention Information (7)</p> <p>Frequency: As Needed for Intervention information updates, etc. (5), Monthly (1), Quarterly (2), Systematic Approach to Dissemination (1)</p> <p>Information Channel: Email (8), Online Repository of Programming (2), Phone (1), Webinar (1)</p> <p>Direction of Dissemination: Specialist to Educators (9), Specialist to Specialist then to Educators (3)</p>

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CHAPTER 4

Manuscript 3: Exploration of Intervention Characteristics that Facilitate the Adoption of Health Promotion Programming in a National Community-based System

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Abstract

Background: The National Cooperative Extension system employs county-based health educators who are at the forefront of intervention adoption and delivery. When needed, educators can seek advice and training from university-based specialists. These specialists serve as intervention developers and also provide training and support for Extension educators. This study served to bridge the gap on what intervention characteristics are considered and by both educators and specialists in order to facilitate the adoption, implementation, and translation of health promotion interventions nationwide.

Methods: Educators and specialists were recruited across 47 states to complete a mixed methods study to identify components of a health promotion intervention that facilitate the adoption process. This study consisted of a survey and semi-structured interviews to learn about pertinent components of an intervention which included the goals of program, targeted audience, cost, funding issues, etc. An ANOVA with Bonferroni corrections was used to detect differences between survey component options and conventional content analysis was used to analyze interviews.

Results: In total, 121 educators and 47 specialists completed the survey portion of the mixed-methods study from across 33 states, 18 educators and 10 specialists completed interviews. Majority of the sampled populations were Caucasian females with 5 or more years of experience serving in Extension. Educators were concerned with the community's continued need of an intervention (goals of programming align with community's need) while specialists were focused on the ability of the programming to be sustained within Extension. In interviews, the cost of time (training, implementation, etc.) of both educators and specialist were mentioned as barriers to adoption and something that should be reported by intervention developers.

Conclusion: To improve the translation efforts of health promotion interventions across Extension, intervention goals and duration, details on the time associated with training and implementation, and the necessary components to implement a program (e.g., curriculum and equipment) are all components that intervention developers must consider. An implementation framework may help Extension professionals and their partners in matching interventions with community needs.

Introduction

Chronic disease—including the obesity epidemic in the United States (U.S.)—has led to increased preventative health promotion intervention development, adoption, and implementation (Allen et al., 2013; Lim et al., 2017). Many of these health promotion interventions share similar components such as programming goals (e.g., reducing HbA1c, weight loss, increasing physical activity behaviors), evidence-based behavioral strategies, adaptability, and necessity for similar resources (e.g., equipment, time) (Chambers & Norton, 2016; Lindström et al., 2003; Proctor, Powell, & McMillen, 2013; Tate, Wing, & Winett, 2001; Zareban, Karimy, Niknami, Haidarnia, & Rakhshani, 2014). These similar components are often called evidence-based principles, core elements, or key ingredients (Bonell, Fletcher, Morton, Lorenc, & Moore, 2012; Damschroder & Hagedorn, 2011; Estabrooks, Brownson, & Pronk, 2018). These features are key in attracting potential delivery personnel (e.g., staff, health educators, volunteers) as well as ensuring that, once trained, the delivery personnel can deliver the intervention with fidelity (Wilson, Strayer III, Davis, & Harden, 2018). It is often the responsibility of a trainer (researcher, educator, or public health practitioner) to take these evidence-based interventions to delivery personnel (Wandersman, Chien, & Katz, 2012).

Delivery personnel awareness and perceptions of intervention characteristics significantly influence the adoption-decision-making process (Damschroder & Hagedorn, 2011; Kumar, Maheshwari, & Kumar, 2002; Rogers, 2010). In addition, how the intervention characteristics are shared—or disseminated—impacts the decision-making process such as what information is being disseminated (e.g., intervention attributes, role clarity), the source of information (e.g., level of enthusiasm, trust, credibility), and the means by which this information is communicated (e.g., learner-centered, online or in person) (Damschroder & Hagedorn, 2011; Kumar et al., 2002; Rogers, 2010). Based on the importance of communicating innovation characteristics to potential adopters, it is paramount to discern which of these health promotion intervention characteristics are valued and considered by potential adopters. Based on the seminal research of Roger's Diffusion of Innovations, key characteristics include the relative advantage of an intervention compared to common practice, the compatibility of programming to the system, the testability of a program, and the potential for reinvention of the program (Rogers, 2010). Similar constructs can be found in the Consolidated Framework for

Implementation Research (CFIR), and this framework expands include the intervention cost, the program's source, the design quality and packaging, and adaptability of the programming (Damschroder & Hagedorn, 2011). Matching intervention characteristics with delivery personnel values and considerations may improve initial and long-term uptake.

One target for intervention uptake is the Cooperative Extension Service (Extension) (Braun et al., 2014; Chite, 2014). Extension is housed within land-grant universities located in every state within the U.S., and its mission is to “bring the university to the people.”(NIFA, 2017; Ramussen, 2002). To target and address the health needs of Americans, Extension employs community-based health educators across the country who respond to the unique needs of that community (Franz & Townson, 2008). Educators are required to identify community needs and then search for, adopt, and implement programming to address these community needs. However, each step of this process - researching and finding programming materials, attending training on a program and understand key elements that can or cannot be adapted, and then finding resources to implement the programming in the communities – requires a significant amount of the educator's time (Strayer et al., 2017). To aid educators in meeting the unique community health needs, state-level Extension specialists serve the role of programming support and, depending on the unique roles they serve in each state, provide training and support to county-based educators (Strayer, Ramalingam, & Harden, 2018).

This infrastructure and combined expertise of specialists (providing research-based information) and health educators (addressing community needs) underscore the strength of Extension. However, the system, as a whole, remains disjointed. For example, over 20 unique walking programs(Teran & Hongu, 2012) and over 17 older adult physical activity programs exist nationally within Extension,(Balis, Strayer, Ramalingam, Wilson, & Harden, 2018) which may lead to inefficient use of resources and time (Aarons, Sklar, Mustanski, Benbow, & Brown, 2017). In these two examples, many evidence-based principles of the programs are the same (e.g., goal setting, the exercise sequences), but minor adaptations have been made (Chambers & Norton, 2016). It is not understood how specialists or health educators determine whether an existing intervention meets their need or if they need to create a new intervention. Strong implementation and dissemination practices may improve national connectivity and uptake of evidence-based principles for a public health impact.

To achieve this aim, researchers and other intervention developers need to first understand how and what information needs to be shared to positively influence the adoption-decision-making process. Therefore, the purpose of this study was to identify intervention characteristics that are valued and considered in the adoption-decision-making process for both educators and specialists across the nation.

Methods

Framework, Design, and Setting

The Diffusion of Innovation Theory (one of the most prominent frameworks in dissemination research that focuses on both the adoption-decision making process of adopters and the characteristics of the interventions themselves) and the CFIR (which focuses on similar intervention characteristics and explores organizational characteristics that may also play a role in the adopter's decision-making process) were used to develop the survey instrument (Rogers, 2010; Damschroder & Hagedorn, 2011).

This study was conducted in tandem with work on both Extension specialists' and educators' information-seeking practices (Strayer et al., 2017; Strayer et al., 2018). A sequential explanatory mixed-methods approach was used, in which surveys were followed by individual semi-structured interviews (Creswell, 2013). A mixed-methods approach was employed, allowing educators and specialists, who serve different roles, to be independent and respond based on their unique positions, categorized by unique meanings emerging from the data (Castro, Kellison, Boyd, & Kopak, 2010; Creswell, 2013; Creswell & Clark, 2007).

Participants

Participants were from two levels within the system. First, community-based health educators, who oversee programming throughout their designated communities in which they serve with support from health state specialists. Second, health state specialists who serve as intermediaries between researchers and the health educator who deliver health promotion programming. Community-based health educators of Extension are typically masters-degree trained individuals who deliver health promotion programming directly to the communities they serve. An Extension specialist is typically an individual with a terminal doctoral degree (e.g., DrPH, PhD, EdD) who has a role within Extension focusing on areas such as nutrition, physical activity,

food safety, etc (Harden, Johnson, Almeida, & Estabrooks; Israel, Lantz, McGranaghan, Kerr, & Guzman, 2005).

Sample

This study recruited 121 educators from 33 states and 47 Extension specialists participated from 31 states. Participant recruitment and strategies can be found in further detail in the previous dissemination studies on both specialists and educators nationwide (Strayer et al., 2017; Strayer et al., 2018). Briefly, specialists were identified through individual state Extension websites and educators were identified through each specialist network within each state's system. Participant accrual spanned one month, with an initial email then follow-up emails sent one week apart for a total of five emails or until a response was received. Cross-sectional surveys were distributed via Qualtrics (Provo, UT). The survey instruments can be found in Appendix E. While two survey distributions occurred, there were only minor differences between specialists and educator survey in relation to intervention attributes. Thus, one survey has been shown with differences indicated in the instrument itself. The interview guide can be found in Appendix F with minor differences shown between educator and specialists interview guides, particularly the items that were based on the differences in survey responses.

Survey Instrument

The survey instrument was designed to determine the following content:

What intervention characteristics need to be communicated with Extension health educators to facilitate the adoption-decision making process? Items related to the information that is pertinent (1-Not important; 5-Very Important) for health promotion interventions. Items were based on intervention-related such as cost factors (e.g., educator's time, cost of equipment, time to travel, etc.) as well as other intervention factors (e.g., feasibility, sustainability of the program, level of comfort delivering the program, etc.) (Barnidge et al., 2013; Damschroder & Hagedorn, 2011; Nelson et al., 2007; Rogers, 2010).

What intervention characteristics need to be communicated with Extension health specialists to facilitate the distribution of evidence-based program information? Items related to the information that is pertinent (1-Not important; 5-Very Important) for health promotion interventions. Items were based on intervention-related such as cost factors (e.g., specialist's time, educator's time, cost of equipment, etc.) as well as other intervention

factors (e.g., feasibility, sustainability of the program, level of comfort delivering the program, etc.) (Barnidge et al., 2013; Damschroder & Hagedorn, 2011; Nelson et al., 2007; Rogers, 2010).

Demographic data was collected based on standard variables described in highly cited research methodology texts (S. Kumar & Phrommathed, 2005; Orcher, 2016) and previous work, (Downey, Wages, Jackson, & Estabrooks, 2012; Harden et al., 2015; Harden et al., 2016; Zoellner et al., 2012) including race, ethnicity, sex, state of employment, official role title within Extension, duration of employment within Extension, educational degree, and the field in which the degree was obtained. There is one main difference between the educator and specialists survey for demographic variables. Responsibilities are different for educators and specialists; thus specialist were asked about their role to research, Extension, and teaching (standard academic faculty time equivalent; FTE) while educators were asked about their role to youth, adults, and older adults.

Analytical Plan

The study used ANOVA testing to analyze Likert scale measures and rank questions and presented in Likert response frequencies; see Figures 3.1-3.3 (Alwin & Krosnick, 1985). For this study, a one-way ANOVA was used in conjunction; if significant, with a Bonferroni post hoc test which determined the individual variable differences between responses (Hommel, 1988). Alphabetical indicators were used to identify differences in Figure 3.1 through Figure 3.3. This conservative approach for data analyses was chosen in accordance with previous work for purposes of replication in other systems and also consistency in the entire project (Strayer et al., 2017; Strayer et al., 2018). Statistical analyses were conducted using statistical analysis software (SPSS v. 25.0 for Windows, SPSS Inc., Chicago, Illinois).

The methods and results of this study were developed and interpreted within an Integrated Research-Practice Partnership (IRPP) at Virginia Tech (Harden et al, 2016). The IRPP provided unique insights to both the specialists' and educators' value of certain intervention characteristics. Regular meetings with the IRPP to discuss survey responses from health educators and specialists were an integral part of our interpretation. The results of these meetings with the IRPP also aided in the construction of the semi-structured interview tool.

Semi-structured interviews with Extension state specialists and educators were conducted by a trained graduate research assistant. The interactive nature of a semi-structured interview process allows for the capture of the unique perceptions that both Extension educators and Extension health specialists have about adopting health promotion interventions (Drever, 1995; Longhurst, 2003). The overall goal for the interviews was to reach a point of data saturation (Creswell, 2013). To remain consistent with previous work, semi-structured interviews were audio-recorded and then transcribed verbatim in Microsoft word by trained research assistants.

A total of 20 randomly selected educators, five from each of the four national districts (Northeast, North Central, South, and West) were chosen and 18 were interviewed in April and May of 2017. A total of 12 specialists were invited and 10 (83%) specialists were interviewed in July of 2018, two specialists did not respond to invitation to be interviewed. Specialists were nationally distributed: three each from Sothern and Northcentral Regions and two each from the Western and Northeastern regions. Informed consent for interviews was obtained from both specialists and educators at the time of the interviews. Participants were informed of their option to redact or ask for the removal of themselves from the study at any time. This option for redaction has not occurred at the time this manuscript was written. All study procedures were approved by the Institutional Review Board of Virginia Tech.

A conventional content analysis was applied to carefully analyze the data and to not constrain or forcefully interpret data based on a particular framework or theory—i.e., the data is allowed to speak for itself, and is not forcefully placed within a particular intervention adoption framework (Hsieh & Shannon, 2005). Trained qualitative researchers independently separated each interview into meaning units (interview words or phrases that represent a singular meaning and are considered units of analysis) (Castro et al., 2010), and then determined categories, sub-themes, and themes from these determined datum (Castro et al., 2010; Creswell, 2013). Discrepancies that the research team could not reconcile were referred to the coordinating supervisor, who then assisted in reconciliation (Castro et al., 2010). Inter-rater reliability techniques were applied to ensure reliable analyses and all conflicts were resolved within the reviewing team. For further information on the inter-rater reliability and methodology for coding, refer to the methods sections from the main study for this project (Strayer et al., 2017). The inter-rater reliability for the intervention interviews was greater than 90%.

Results

Phase I: Quantitative Results

Educator Quantitative Results

The educator survey was distributed in 2017. One-hundred and twenty-one (89%) of the total 136 responses met our eligibility criteria of being an educator who delivered programming within a community. These responses were received from a total of 33 of the potential 36 responding states (92% response rate). Educators who responded were predominantly female (91%), Caucasian (80%), and had worked for Extension for five or more years (68%). Additionally, 71% of the educators had Master's degrees within five years of being hired. See Table 4.1 for additional information.

Figure 4.1 represents Extension educators' preferences of the intervention characteristics important in the adoption-decision making process. There were a few statistical differences ($p < 0.05$) between characteristics. The cost of ongoing delivery (e.g., cost to sustain programming), external funding of an intervention (i.e., grant funding to implement), and the number of prior similar settings with program adoption (e.g., another educator delivering the same programming), were slightly less valued than other factors. However, it is important to note the need of an intervention (i.e., the communities need), the evidence-base, and the reach of the intervention were higher valued. Additionally, the level of comfort delivering the program and the resources needed in order to implement were also reported.

Health Specialists Quantitative Results

A total of 94 Extension health state specialists were identified in 47 states in 2018. A total response rate of 50% was achieved from the original 94 identified specialists with responses from 31 (66%) states. Forty-seven (77%) of the 61 responses were completed and met eligibility requirements. The remaining 14 responses submitted were incomplete and thus excluded. Extension health state specialists were predominantly female (89%) and Caucasian (70%), possessed a doctoral degree (62%), and 29 (62%) specialists had an average duration in Extension of 5 or more years. See Table 4.1 for additional information.

Figure 4.2 represents the value of importance provided by Extension specialists on the characteristics of an intervention that are important for the adoption-decision making process. Specialists were similar to

educators in that specialists also valued both the scientific evidence that a program is efficacious and the community's continued need for the intervention; these characteristics were both statistically different ($p < 0.05$) in importance from the last five items in Figure 4.2. The ability of the program to be sustained (i.e., the ability to integrate the program into practice within the Extension system) and the cost of ongoing delivery were the next highest reported intervention characteristics, though they were not significantly different from other characteristics with the exception of the number of settings similar to the adopters' that have delivered the program. Characteristics with lower values of importance were the number of settings similar to the adopters' that have delivered the program followed by the external funding of the intervention. The results from the quantitative portion of the survey presented in Figures 4.1 and 4.2 were used to inform the qualitative survey, see Phase II.

Phase II Qualitative Results

In total, there were three main themes from both specialists and educators (presented in Tables 4.2 and 4.3). The format of the tables are such that the themes, sub-themes, and categories each have the individual frequency of times the construct was mentioned and the number of specialists or educators who contributed to that specific theme, sub-theme, or category. These interviewee and meaning unit counts were used to show the data saturation that occurred and the meaning unit examples were used to give insight to the coding process (Graneheim & Lundman, 2004; Zoellner et al., 2012).

Educator Qualitative Results

Table 4.2 represents the themes of 1) educator adoption process, 2) educators' perception about program adoption factors, and 3) the program characteristics that have an effect on program adoption. As shown in Table 4.2, three sub-themes emerged from the overall educator adoption process theme: strategies to determine need, educators performing research, and level of autonomy to choose programming. Needs assessments, mentioned by all 18 interviewees (100%), were the most common way for an Extension educator to determine a health promotion need in the community. This was typically conducted through collaboration with both third-party groups (e.g., hospital partners, Robert Wood Johnson foundation, public health department) and community partners (e.g., community advisory board, community members, interagency council). Seven educators (39%)

reported that although a formal needs identification process was not required by supervisors, they still conducted a community needs assessment. The second sub-theme was that educators perform their own research to determine programming to meet the need of a community, for example, *“Often I’d say three to five days [I spend trying to find programming]. You know stay at home looking for a curriculum and you know comparing curriculum and then trying to determine if it’s going to be feasible um to deliver.”*

The second theme, educator perception, includes the subthemes of educators’ perceptions of funding opportunities, the perceived meaning of evidence-based interventions, and educators’ roles in Extension. The evidence behind a program was a priority for reliable programming and mentioned by all 18 interviewees. The stated definition of what constituted as evidence generally included the presence of the intervention in a peer-reviewed journal and testing of the intervention in a research setting, such as *“...our approach is uh if I think from a research standpoint means like peer reviewed you know making sure that it’s gone through several editing processes.”* They also expressed that evidence-based meant the program had been shown to be effective; however, the interviewees did not further state what constituted as *“effective.”*

The final theme, factors of program adoption, reflects factors that an Extension health educator considers when adopting a program for delivery. Subthemes were cost of programming, funding, program features, location for delivery, participants, sustainability, program creation, and educator previous experience. Educators often stated that cost of the programming was an important consideration for program adoption. Additionally, the most reported category within the cost subtheme was the educator’s time (i.e., the opportunity cost of delivering one program over another). Another highly reported category was the method by which educators determined the cost of programming. Often, educators had to determine the cost on their own with little information available from the program materials, and many costs were unique to each educator, such as *“Mostly mileage costs because that is a....we do have a travel budget...you know I taught a class, I had to drive almost two hours each way for an hour class I mean...That was not cost effective [laughter].”*

Specialist Qualitative Results

The three themes from the specialist interviews were 1) specialist perceptions, 2) factors for program adoption, and 3) system-level factors, as seen in Table 4.3. Specialist perceptions consisted of six subthemes:

educator factors, definition of an evidence-based intervention, importance of evaluation, role in Extension, purpose of Extension, and the dissemination of programming.

The educator factors for program adoption sub-theme considered by specialists consisted of the process of educators adopting programming informally, the level of comfort an educator had delivering programming, and the fact that specialists believe educators' interest inform their programming adoption process. Additionally, one specialist mentioned that a disconnect between educators and "the science" exists and two specialists (20%) also expressed concern about the educators' understanding of programming adaptation, such as, "*...it's up to... the adopters... to adapt and... my... feeling and my experiences is that... staff, personnel in Extension, do not have the... knowledge base to adapt a program that has an evidence base to the audience and to the community that they're delivering it in, so they deliver the program as its designed, but then it doesn't serve the audience or the community.*"

The second sub-theme was defining evidence-based interventions. Specialists mentioned that evidence-based means that a program has been evaluated for effectiveness, is evidence-informed, comes from a credible institution, and has been peer-reviewed. The third sub-theme was the importance of evaluation, which had categories involving the need for a program to have an evaluation component, the need for long-term outcome results, issues with evaluation complexity, need for short-term outcome results, and worries about the complexity of the process for program evaluation. All ten specialists reported that it was imperative to have evaluation. Specifically, each one mentioned the need for an intervention to come with an evaluation component.

The remaining three sub-themes for the specialist perception theme involved the role of the specialists within Extension, the purpose of Extension, and programming dissemination efforts. Specialists mentioned that their roles in program adoption were avoiding program duplication, being able to judge the adaptability of programming for their unique educators, collaborating with partner organizations, using existing programming, being technical subject matter experts, and believing that developing a program is cost-effective. Also, the sub-theme revolves around the specialists' perceived purpose of Extension. One category within this sub-theme indicated Extension's roles as an education delivery system. Three specialists indicated that Extension serves as

an educational delivery system as its main role for providing programming to communities. However, one specialist disagreed with this perception and wanted to acknowledge that Extension in fact “*contributes to the evidence base for that education (being delivered)*”, and that research within Extension is important.

The second theme identified through the specialists’ interviews was factors for program adoption with sub-themes of program features and cost of programming. Program features contained categories directly related to the information and characteristics desired by specialists for program adoption. For example, a category discussed by all specialists was for the program’s goal aligning with the need of the community to be considered for adoption. Additionally, it was mentioned that programs need to be able to be adapted to the educator’s unique environments. The need for a program to be evidenced-based and the preference for the program to be previously implemented in Extension or similar settings were important such as, “*I also... prefer programs that have been developed and implemented at other state Cooperative Extension Services.*” The second sub-theme was related to the cost of the programming, which for specialists focused on the time and cost needed for training from both the specialist and educator perspectives. Several specialists mentioned that traveling for long trainings was just not feasible in their state from a cost or time perspective. Thus, training options and time commitment were important to these specialists for program adoption.

The final theme was system-level factors related to programming adoption for specialists, which includes three sub-themes: funding, organization structure, and organizational requirements. The funding category consisted of specialists considering whether funders’ needs are met through adopted programming, that a funding source is important and available for the adoption of programming, and that the programming has some return on investment, which was described as societal returns such as reduced health care costs. The second sub-theme, organization structure, included the organization’s capacity to sustain programming implementation through support and funding and the importance of uniformity of state-wide programming. Additionally, two specialists mentioned that the educators in their states had high autonomy to choose their own programming to adopt and deliver. The final sub-theme, organizational requirements, consisted of two unique categories. The first, opportunities for scholarship, focused on the need for specialists to have opportunity for

publication program evaluation per their roles and responsibilities, which coincides with the final category, the specific needs of the organization.

Insights from Comparing Educator and Specialist Responses

Educators reported that they perform research in order to identify programming or use existing literature to create new programming, indicating that often, educators do not see current reported intervention characteristics as a complete fit with their needs. However, specialists mentioned that educators have no formal adoption process and that educators' interests inform their choices; one specialist mentioned that a disconnect between the science and educators exists. Additionally, specialists worried about educators' understanding of programming adaptation, though educators did not mention their use of adaptation in interviews.

Discrepancies between surveys and interviews.

Both survey and interview data suggest that the program's goal must align with the needs of the community. Thus, programming goals should be easily accessible for potential adopters, i.e., educators or specialists, in order to facilitate programming adoption. Additionally, both groups reported the importance of using evidence-based programming, but the meaning of evidence-based to these groups was a bit unclear. When asked, educators and specialists often described evidence-based as programming being "effective;" specialists also described Extension programming as being evidence-informed in general. Programming evaluation and the programming having been shown to be effective was mentioned by both parties as sufficing to meet the evidence-based criteria. Specialists also mentioned that evidence-based could be from credible institutions (e.g., National Institute of Health) or that the programming was from peer-reviewed resources (e.g., academic journal). Additionally, along with programming goals, the program's duration and feasibility were discussed by both parties; they mentioned the time commitments required as a barrier to program implementation. Also, the level of comfort delivering the program was not highly ranked in the survey portion of the study, but specialists often expressed the need for educator comfort to be addressed (through methods such as program trainings) to promote programming adoption and implementation.

In the survey, the number of settings that were similar to the participants and had previously implemented the potential program for adoption was ranked low by both educators and specialists in the

quantitative portion of the study. However, in interviews, one educator mentioned colleagues' experiences in implementation was important and several specialists mentioned that implementation in similar settings, such as Extension settings, would facilitate the adoption process. Also, specialists and educators were divided on the idea of avoiding program duplication and program creation. Both levels of participant had individuals who believed it necessary to continuously develop new programming, while others believed it is something to be avoided. The role of program creation versus adopting or adapting existing programs may be in the mixed perceptions that specialists and educators have about the purpose of Extension. Several educators and specialists mentioned that the primary purpose of Extension was to improve health and to function as an education delivery system. However, others from both parties mentioned the need to focus on research in Extension, and some mentioned the need to reach tenure.

Perceptions of Funding

The role of funding appeared to be of different importance between specialists and educators. The survey results showed that specialists were more concerned over the sustainability of programming than educators. In the interviews, educators mentioned the need of programming to be fee-based in order to sustain and deliver and mentioned that grant funding was important but sometimes served as barrier in the options of programming to be delivered. Specialists viewed this barrier instead as a condition to meet funder's needs with programming to ensure programming sustainment and delivery. Additionally, educators considered multiple local resources, (e.g., local department of public health, community health centers, etc.) when searching for potential programming to adopt and delivery; this was not mentioned by specialist when searching for potential programming. This distinction may be related to the location of educators within a community versus specialists often housed within university settings. Along with funding, both parties discussed the cost of programming in their considerations for programming adoption, specifically costs for training, implementation, and sustainability of adopted programming. Specifically, educators and specialists both discussed the time required for training, implementing the program (educators), and providing training for educators (specialists), along with curriculum or associated travel and/or materials cost for training. However, both groups mentioned that

learning about programming cost was done by either the educators or specialists often independent of any provided programming or intervention information.

Discussion

The work presented here did not identify a standardized process by which educators and specialists learn of intervention characteristics, but does highlight key characteristics considered, by role within Extension, when adopting an intervention. Specialists reported focusing on academic and scholarly processes along with funding requirements, while educators' focus was on individual program adoption and implementation methods needed for their unique environments. However, several intervention characteristics were deemed important by most specialists and educators, including the program goals (meeting community needs) and the duration and the cost of training (including time and training components), curriculum, and materials. Additionally, the time needed for both specialists and educators to implement programming, the evidence-base of the programming, and the evaluation tool used in order to continue showing effectiveness in new settings were also mentioned.

Additional valued characteristics mentioned by both educators and specialists relate to program translation barriers. For example, specialists and educators both mentioned the barrier of time in implementing and training of programming. The barrier of time constraints has been seen in previous research to have direct impacts to the translation of programming at a larger scale in different health promotion systems (Barnidge et al., 2013; Gravel, Légaré, & Graham, 2006; Norton & Mittman, 2010). Thus, the information that specialists and educators want to know may not be communicated within the time constraints of a training. It is also possible that researchers are not taking into account the time requirement for practitioner, (i.e., educators), into consideration when developing programming, which may lead to ineffective resource usage on programming duplication (e.g., the duplication of state-wide walking programs) (Teran & Hongu, 2012). Another important issue was the resources surrounding adoption of programming, such as curriculums, equipment, materials, funding, etc., that are needed to facilitate that adoption process which has also been previously mentioned in the literature (Kahn et al., 2002). Taken together, the results of this study highlight the need for researchers to put more emphasis on considering the characteristics of an intervention (e.g., cost, training development, adaptability, etc.) deemed important by the adopting delivery system. Delivering the information deemed

pertinent by these targeted audiences may increase the probability of program translation and reduce program duplication.

Finally, it should be mentioned that adaptations of interventions were discussed heavily by both educators and specialists in different perspectives. While educators mentioned that their communities were unique and programming had to be tailored, some specialists wondered about the capabilities of educators to make adaptations and felt their role as specialists was to provide adaptations to ensure program fidelity. Specialists' concerns may be reduced through the use of a dissemination intervention in which specialists' function as knowledge brokers between developers and educators. In fact, educators have reported in previous work,(Strayer et al., 2017) that specialists are reliable and often used sources for programming information. Considering that specialists serve the role of knowledge brokers and educators often have high autonomy to choose programming, it becomes important that the information included in potential programming for adoption aligns with desired preferences (Brownson, Colditz, & Proctor, 2012). However, it should be acknowledged that it is often challenging to articulate the exact intervention components (dose, frequency, strategies) that have been research tested within one peer reviewed journal article. Therefore, to ensure fidelity to these evidence-based principles, implementation strategies are recommended (such as technical assistance, audit, and feedback) as well as dissemination strategies (such as email, trainings (webinar or in-person)) that include the relevant information for a program to be successfully implemented as discussed in this work(Grimshaw et al., 2004; Schweier, Romppel, Richter, & Grande, 2016; Strayer et al., 2017; Strayer et al., 2018). Additionally, researchers need to consider likely adaptations at the onset of program development to be clear on the evidence based principles and what can be adapted and adopted nationally (Klesges, Estabrooks, Dzewaltowski, Bull, & Glasgow, 2005). That is, an intervention developer needs to be clear about what the key features of the intervention are and what components in the fuzzy periphery can be adapted. For example, a program was research-tested to be delivered twice a week for eight weeks. However, potential adopting educators want to reduce to meeting once a week for 16 weeks because people have timing/scheduling barriers. This changes the dose of the intervention and may require additional comparative effectiveness testing. In another example, the program was originally delivered by a research assistant with a kinesiology background and when translated to

a new audience and setting, the program will be delivered by a community-based educator with a kinesiology background. This may not detract from the key features of the program. However, if the community-based health educator does not have a background in kinesiology, fidelity may be compromised, therefore, a comparative effectiveness trial may again be necessary. Essentially, being explicit about what can and cannot be adapted is imperative to improve translation, adaptation, sustainability, and two-way trust and communication. In order to empirically test an adaptation, specific manipulations and measures may be necessary that might not be well-received by community partners. This is not to imply that controlled efficacy testing should not be done, but instead suggests that testing of how adaptations impact effect should also be completed prior to dissemination of programming at a national scale.

This work is not without limitations. First, there is limited data on Extension educators' and specialists' knowledge and preferences for health promotion intervention characteristics, thus the data collected and analyzed for this study is not readily comparable or supported to be generalizable at a national level. Additionally, the literature is not robust on specialists and educator support roles, specifically when terminal degree trained specialists provide support to master's trained educators. This study also may be affected by response bias, or the tendency for participants to answer questions untruthfully or misleadingly, even with the usage of a mixed-methods approach (Furnham, 1986). Finally, the educator portion of this study was conducted within an IRPP, which included educators as key stakeholders in the research process. This aided in interpretation and building of survey and interview tools. However, an IRPP does not currently exist for Extension specialists. In the future, an IRPP with specialists may prove to both increase participation and gain better insight for a dissemination intervention developed for use within Extension. Finally, educators in this study represent a convenience sample, as they were recruited through Extension specialists and thus may be representative of the most engaged health promotion educators or advocates of the specialists.

Conclusion

Before national health promotion interventions can be scaled across Extension, understanding the intervention characteristics that are valued and considered by educators and specialist for program adoption is necessary. The results here revealed pertinent information that developers should include to facilitate

programming adoption. These characteristics include the programming goals and duration; details on the time associated with training, time to implement, and the necessary components to implement a program (e.g., curriculum and equipment); the intervention's evidence-base and history of effectiveness; and evaluation tools needed to report impact and scholarly reports. Additionally, from other research related to specialist and educator's adoption and implementation practices,(Strayer et al., 2017; Strayer et al., 2018) it may also be in the interest of developers to consider adaptations and the impact adaptations may have on programming fidelity prior to dissemination of the programming. Additionally, intervention developers should match the time burden for training and implementation to both specialists'' and educators' expectations. In this case, if training and implementation are efficient, this would lead to less input (i.e., time to train and time to implement) for greater output (i.e., observable outcomes of the targeted audiences) of Extension work. With a better understanding of the components and adaptations necessary for program adoption as well as dissemination strategies that may be effective in Extension, future work will use feedback from members of the IRPP to develop an Extension dissemination intervention. Improving dissemination through Extension can determine whether the system can scale programming nationally rather than focusing on program adaptability and state specific programming.

Declarations

Ethics approval and consent to participate

This research was approved by Virginia Polytechnic Institute and State University IRB.

Consent for Publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interest

The authors declare that they have no competing interests

Funding

No funding was used in conducting this study

Authors' Contributions

TS and SH conceptualized the study and TS led all data collection and data analysis. All authors analyzed the qualitative data. All other authors provided input, feedback, and approval of the manuscript.

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Figure 4.1 Intervention Characteristics for Educator Adoption Graph

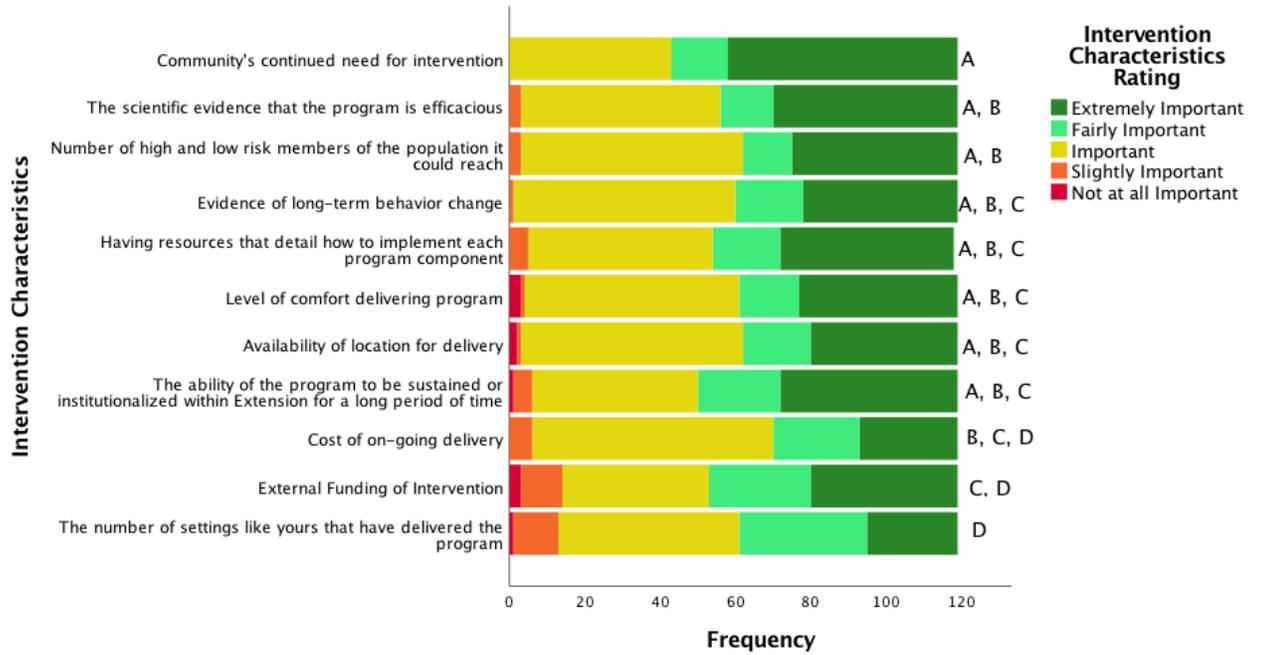


Figure 4.2 Intervention Characteristics for Specialist Adoption Graph

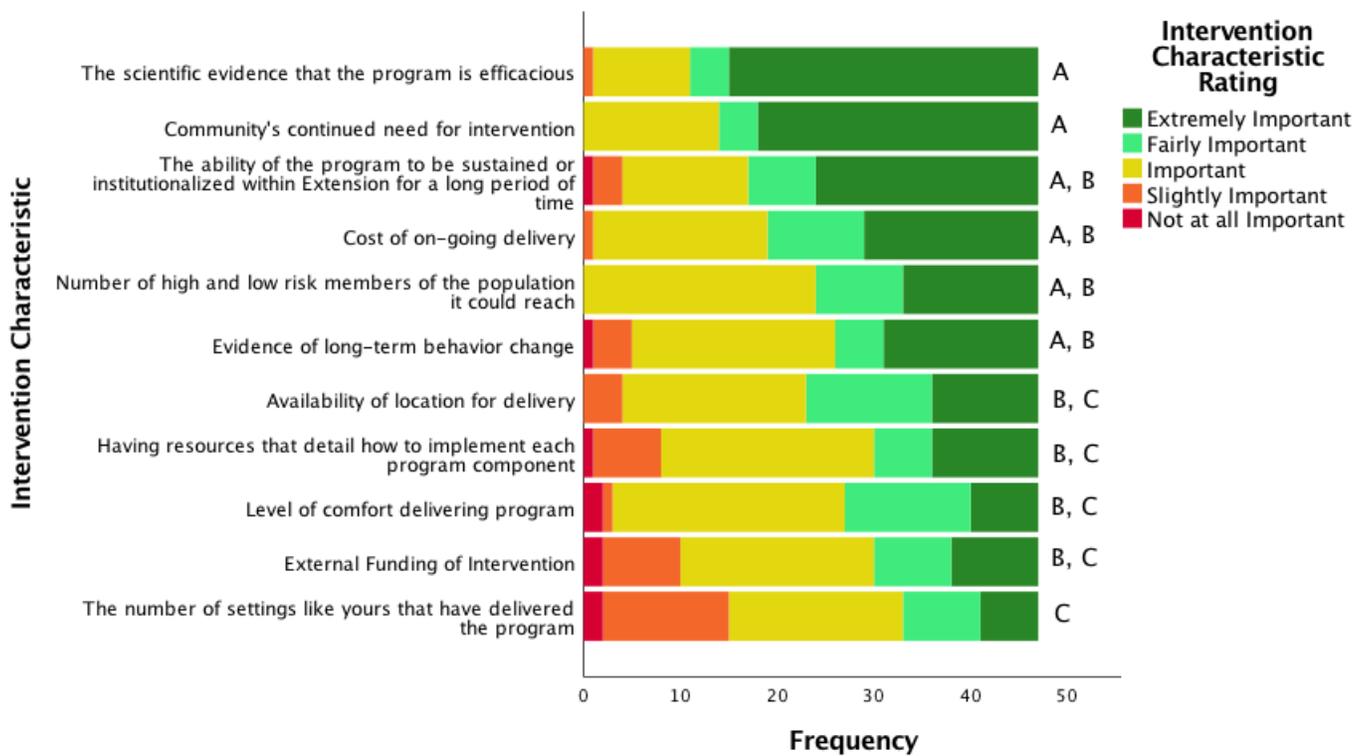


Table 4.1 Extension Educator and Specialist Demographic Variables Table

Demographic Variable	Educator Respondents (N=121)	Specialist Respondents (N=47)
Sex		
Male n(%)	11 (9)	4 (9)
Female n(%)	110 (91)	42 (89)
Other n(%)	0 (0)	1 (2)
Ethnicity: Spanish, Hispanic, or Latino		
Yes	5 (4)	3 (7)
No	116 (96)	44 (93)
Race, n(%)		
White	97 (80)	33 (70)
Black or African American	15 (12)	7 (12)
Asian	3 (3)	1 (2)
Other	6 (5)	5 (11)
Percentage of time spent with target audience (responsibilities) (Mean Percent) (STD)		
	Adult (50 (± 25))	Research (23 (± 20))
	Youth (31 (± 27))	Extension (68 (± 31))
	Older Adult (24 (± 17))	Teaching (21 (± 15))
Duration as an agent (educator) in Cooperative Extension n(%)		
1 Year	11 (9)	5 (11)
2 Years	9 (7)	3 (6)
3 Years	9 (7)	7 (15)
4 Years	7 (6)	3 (6)
5+ Years	82 (68)	29 (62)
Highest level of Education n(%)		
Bachelor's degree	21 (17)	0 (0)
Master's degree (course option)	41 (34)	11 (23)
Master's degree (Thesis Option)	45 (37)	6 (16)
Doctoral degree	9 (7)	29 (62)
Professional degree	2 (2)	0 (0)

Table 4.2 Extension Health Educator Qualitative Results

Theme (meaning unit count)	Sub-theme (meaning unit count)	Interviewee Count N(%)	Categories (meaning unit count)	Meaning Unit Example
Educator Adoption Process (191)	Strategy for Needs Assessment (159)	18(100)	Needs Assessment (65) Community Groups (54) Third Party Groups (30) No required Need Identification Process (7) Frequency of Need Identification Process (3)	P15 "Okay um the truth is I work in multiple counties and each county turns out a little different, but we do use county um we use county assessments."
	Educators Perform Research (23)	14(78)	Performs Research to Identify Program to meet Need (18) Identify Existing Programming to meet Need (3) Use Theories and Existing Evidence to Create Programming (2)	P17 "Okay then the next step would be to do some research to identify a program that could help to address that need." P13 "And if there's not research out there then you're really starting from a blank slate and just considering what general health promotion research says about program development and what things you need to consider."
	Level of Autonomy to Choose Programming (9)	6(33)	High autonomy (6) No autonomy (3)	P12 "But we are still given um a lot of autonomy to choose our own programs on how to best meet the needs of our communities. We are not...um...told what we can and can't do, which program....those are all individual choices..." P4 "Um that's [programs to be delivered] actually decided by my boss so when I actually came into the program (sneeze) it was um it wasn't something that I had a choice in, it was just something that was assigned to me."

Educators Perception (75)	Definition of an Evidence-Based Interventions (42)	18(100)	Meaning of Program Effectiveness (40) Meaning of Evidence-Based (2)	P3 "So uh...our approach is uh if I think from a research standpoint means like peer reviewed you know making sure that its gone through several editing processes."
	Role in Extension (23)	18(100)	Leadership in Extension (9) Improve Health (8) Reach Tenure (6)	P17 "I think so...um I mean I...have a job and my job is to help improve the health and well-being of community members"
	Funding (6)	4(22)	Role of Fee-based Programming (4) Benefits of Funding (2)	P14 "yeah well some people will say charge them \$5 so you get the commitment and uh first of all it can it could be more expensive managing that \$5 than it is to come up with a \$100 donation and just offer it free"
	Educator Opinion (4)	2(11)	Need to be healthy to help others (3) Lack of Similar Programming in Extension (1)	P16 "but it's what those behavior changes that are a little bit harder to get to, so we [Extension health educators] also are kind of pretty good at trying to influence people to kind of in to go toward that behavior change um"
Factors of Program Adoption (443)	Cost of Programming (137)	18(100)	Educator's Time (26) Method to Determine Cost (25) Cost important consideration for program adoption (19) Supplies and Equipment (19) Cost to Participants (16) Cost of Delivery Personnel (11) Travel Cost (10)	P15 "Um mostly mileage costs because that is a....we do have a travel budget. Um but it is also you know I would say mileage and travel costs for gas and stuff is primary to get there um...you know I taught a class, I had to drive almost two hours each way for an hour class I mean...That was not cost effective [laughter]"

			Location Cost (6)	
			Curriculum Cost (5)	
Funding (112)	18(100)		Fee-Based Programming (28) Grant Funding (27) Community Resource Awareness (20) Grant Funding Barrier (9) Funding Not Available (8) Extension Funding (7) Sustainability Barrier (6) Donations (5) Fee-based Programming Barriers (2)	<p>P6 "It's definitely easier to find other sources of funding for programs that have already been uh adopted and received well or effective so um because we have an opportunity for local funding when for when the program is initially funded for adoption, even on a trial basis or as a private um and it's received well in my county, then it's a lot easier to find additional sources of funding long term. So I could definitely see why you would have results like that. I feel like that would be I would I would agree with that in personal perspective"</p> <p>P18 "Um I have had I have run into that situation [initial funding runs out] and again it depends on the um specific population I'm going to target. If it's our low income then it's very difficult to find additional funding."</p>
Program Features (81)	18(100)		Program Effectiveness (26) Program Curriculum (17) Program Duration (9) Programming Goals (9) Dissemination Process (8) Uniformity of State-wide Programming (7) Recruitment for Programming (4)	<p>P3 "So uh...our approach is uh if I think from a research standpoint means like peer reviewed you know making sure that its gone through several editing processes"</p> <p>P14 "I would...yeah I would definitely agree 90% of it is that [state specialist supports programming] again you're apart of a larger organization, and you're part of one to be doing similar programs...yeah."</p>

			Cost-Effective (1)	
Location for Delivery (43)	18(100)		Location is a Barrier (24) Location is Not a Barrier (19)	P15 "Yes definitely [the cost of the location can be an issue]. We try to use free or very low priced places to keep the cost down. Very rarely do we pay to rent a space or room, we use a lot of community places that are very cheap or free." P3 "No, [issue finding a location to deliver programming] not really because usually our community offers up their space. So uh, sometimes it's a recreation center, sometimes it's a school, a library, space is rarely an issue."
Participants (25)	13(72)		Program Target Audience (25)	P7 "um and then how many, how many people. [Educator State] is very rural....so... it's tough for me to justify a six hour drive round trip for just five people. That's...that seems like not a good use of time. So would like depends on the number and the audience or the number of people reached..."
Sustainability (21)	10(56)		Funds for Continued Programming (20) Behavior Change (1)	P11 "yeah so I mean I I mean I just uh try avoid programs where it's just gonna last as long as the funding and then come to a grinding halt....when the funding runs out."
Program Creation (17)	10(56)		Avoid Program Duplication (9) Use Evidence-base (5) Programming Development (3)	P13 "If if not [no available programming], um then I might consider doing some of my own program development but of course um you know kind of looking into what's the evident evidence base says about um what programs on that particular topic area should include and what's been shown to be effective just based from um potential research."

	Educator Previous Experience (7)	3(17)	Personal Experience (6) Colleague's Experience (1)	P6 "um also hearing from other extension agents, their experience with the program would have bearing on my choice in whether adopting it or not."
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Table 4.3 Extension Health Specialists’ Qualitative Results

Theme (meaning unit count)	Sub-theme (meaning unit count)	Interview Count N(%)	Categories (meaning unit count)	Meaning Unit Example
Specialist Perception (142)	Educator Factors (48)	10(100)	<p>Level of Educator Comfort Important for Programming (10)</p> <p>No Formal Adoption Process (7)</p> <p>Program Duration Feasible for Educators (14)</p> <p>Educators Interests Inform Adoption Decisions (6)</p> <p>Educators Understanding of Adaptation (3)</p> <p>Specialists Learn from Educators (3)</p> <p>Educator Time Needed for Implementation (2)</p> <p>Community Buy-in (2)</p> <p>Disconnect between Educators and Science (1)</p>	<p>P4 “my goal would be... to try to focus on improving the comfort of people who deliver the program Uh to the point that they can do a good job of it...”</p> <p>P3 “Um, you know, where there’s interest in the county, it’s the faculty and then the community, it’s it’s not like, you know, we’ve noticed that this is an issue and the community is cool... to working on it, we’re still gonna go in there and try to make it work.”</p> <p>P5 “as an educator, then... they... are not part of the... science, and that creates a disconnect between the science behind what we do and our organization as a... organization to partner in the context of science, you know, that we are... the academy, and extension is just a mechanism to get the academy out into the communities. But, it operates often with a disconnect between those 2 things, in fact... way often...”</p>
	Definition of an Evidence-based Intervention? (25)	10 (100)	<p>Program Evaluated for Effectiveness (10)</p> <p>Evidence Informed Programming (9)</p> <p>Credible Institution Disseminated (3)</p> <p>Peer-Reviewed (3)</p>	<p>P2 “Evidence based means to me... that it... a program has been thoroughly evaluated...”</p> <p>P6 “but yeah so evidence informed might just be, you know, would be a less intense version of that [evidence-based].”</p>

	Importance of Evaluation (27)	10(100)	<p>Programming must have evaluation Component (12)</p> <p>Long-Term Outcomes (8)</p> <p>Evaluation Complexity (4)</p> <p>Short-term Outcomes (2)</p> <p>Process Evaluation (1)</p>	<p>P7 “Umm Sure so... Uh for me, Um I look at evidence-based programs that have been tested Um with... number one the... that that are tried and true in terms of... Umm getting the outcomes they set out to... achieve.”</p> <p>P8 “Um certainly if evaluation is a part of it, you know, how complex the evaluation is, is it simple, pre and post paper tests, or does it involve, like, other types of Um outcomes measurements, like maybe functional testing or something like that...”</p>
	Role in Extension (22)	8(80)	<p>Avoid Program Duplication (6)</p> <p>Specialist Judge Adaptability (6)</p> <p>Collaborate with Partner Organization (5)</p> <p>Prefer to Use Existing Programming (2)</p> <p>Technical Subject-Matter Expert (2)</p> <p>Developing Program is more Cost-Effective (1)</p>	<p>P7 “Um would like to do is [programming]... that is complementary and not a duplication of efforts of what’s already going on in our state.”</p> <p>P4 “And my experience has been... I much prefer to use... curriculums that has... a track record... and have been evidence based and...”</p>
	Purpose of Extension (14)	6(60)	<p>Extension as a Educational Delivery System (8)</p> <p>Programs designed in Extension are more Feasible (3)</p> <p>Extension Programs are Evidence-Informed but not Evidence-based (2)</p> <p>Importance of Research in Extension (1)</p>	<p>P5 “I think the only thing that I... I... I find... important in this context is that cooperative extension has historically, and still is, perceived as an educational delivery system”</p> <p>P5 “And unless we shift... how we... Um communicate about... extension as an organization that extends... beyond... an education delivery system and to an organization that establishes and contributes to the evidence base for that education, we’re gonna continue to be... on the fence, as to... how our personnel are perceived, how they are</p>

				<p>engaged, and how they deliver programs, because of what they... essentially feel their role is”</p> <p>P3 “Yeah, absolutely, and, you know, at the end of the day, I guess Um, you know, we’re non-clinical non-research in extension”</p> <p>P9 “Um I don’t think so. Umm (short pause) You know, I think that within extension... that if we have... we are adequately resourced for program development, and that they are they are research based, that we still have a lot of work to do in making sure that we have capacity to establish the evidence base for the things that we are doing.”</p>
	Dissemination of Programming (5)	5(50)	<p>Conferences for Trusted Programming (1)</p> <p>Open-Access Programming Materials Created by Educators and Specialists (1)</p> <p>Other Specialists Colleagues for Trusted Programming (1)</p> <p>Packaged for Delivery (1)</p> <p>Professional Organizations for Trusted Programming (1)</p>	<p>P10 “I would like to see open access, educational resources... available... to... ideally all. This is extremely valuable cause I think that’s a... a... can be a time... sync trying to find the appropriate programs that meet all of the qualifications that we have discussed for educators and specialists”</p> <p>P9 “a program that is implemented Um by extension educators or any other folks um that’s packaged for delivery.”</p>
Factors of Program Adoption (140)	Program Features (126)	10(100)	<p>Program Goal Aligns with Community Need (23)</p> <p>Program Adaptability (17)</p> <p>Program Implemented in Extension Systems (17)</p> <p>Evidence-Based Programming (12)</p> <p>Program Included Evaluation Component (11)</p>	<p>P1 “...meeting the needs of the community and certainly and kinda our criteria or template we want to choose programs Uh that led itself to collaboration at community... and county levels to address the most critical needs there, Uh we think that that’s pretty important...”</p> <p>P4 “Um however, Um if the adaptations that are made really make the curriculum more suitable for a local community, I I think that’s something that’s important to do and not just be strictly tied to the original... plan.”</p>

			<p>Program Implemented in Similar Populations (10)</p> <p>Program Feasibility (8)</p> <p>Program Curriculum Available (6)</p> <p>Certification Requirements (5)</p> <p>Delivery Model of Programming (5)</p> <p>Developed or Recommended by Credible Institution (4)</p> <p>Program Complexity (3)</p> <p>Evidence-Informed Programming (2)</p> <p>Program Compatibility (2)</p>	<p>P7 “and then I would say priority number 2 is really that scientific evidence...”</p> <p>P8 ”Um, you know, another thing that’s that’s important to me certainly is... Um whether there is already an evaluation component, or if it's acceptable for me to be able to implement an evaluation component because... design and implement an evaluation component...”</p> <p>P2 “I also... prefer programs that have been developed and implemented at other state cooperative extension services”</p> <p>P4 “most frequently for us from USDA and the cooperative extension system Uh leadership there, as well as, we definitely look to the Center for Disease Control Prevention”</p>
	Cost of Programming (14)	10(100)	<p>Time for Training (5)</p> <p>Training Cost (3)</p> <p>Curriculum Cost (3)</p> <p>Licensing Fee (2)</p> <p>Materials Cost (1)</p>	<p>P9 “Okay, well the first one [cost to be discussed] that Um that that we really need to talk about is the time for training our educators”</p> <p>P2 “Um and... what I have found is that Um many... other... Um cooperative extension units are willing to share curriculums, Um but some are not, and they are actually starting to charge for that curriculum...”</p>
System-level Factors (48)	Funding (26)	10(100)	<p>Program Meets Funder Needs (8)</p> <p>Funding is Important for Program Adoption (7)</p> <p>Funding Availability (4)</p> <p>Return on Investment (4)</p>	<p>P3 “Uh the availability of funding, I mean, sometimes we’re implementing an evidence based intervention based on, you know, the unique needs of a... a funding source”</p> <p>P10 “Yeah, so it’s Um... what I was getting at when I was saying that [return on investment] was actually</p>

			Grant Funding (3)	the cost savings in our overall, like, health care system...”
	Organization Structure (19)	7(70)	Sustainability (9) Program Support Available (5) Uniformity for State-wide Programming (3) Educators Autonomy (2)	P9 “you know, we’ve had turnover, and so... we really... to sustain a program we have to be able to conduct training Um every other year... Um so that we can keep people up to date as new people come in.” P1 “...as a health and wellness specialist, I am very familiar with that program and can provide any type of technical assistance or guidance to an educator, so it's not just that we have this program as part of our options for educators to implement, but there is ongoing support at the campus level and expertise to Uh assist them at any time.”
	Organizational Requirements (5)	3 (30)	Opportunities for Scholarship (3) Organizational needs are Met (2)	P8 “or opportunities to publish or present based on, you know, what we... Um the... any data that we collect.”

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CHAPTER 5: CONCLUSIONS

The translational lag time from development to implementation of new evidence-based programming is still a challenge in community-based work. One important part of this translational process is the initial dissemination, or information delivery, of intervention information to the targeted practitioner audience. A recent publication brought to light the synthesis of other works regarding the spread of information to allow for successful adoption by these practitioners. One of the highlights of this work was that passive communication does not lead to the spontaneous uptake of interventions (Brownson, Eyster, Harris, Moore, & Tabak, 2018). Thus, having an understanding of an intervention delivery system's information sharing, network, and is a necessary component to facilitating intervention translation and adoption.

This dissertation determines the way in which information travels within the Cooperative Extension Service, a national health promotion system, and contributes to the understanding of its process for intervention information delivery and uptake. Namely, this work contributes to better informing Extension educators, specialists, and intervention developers about the intervention adoption and implementation process through: 1) identifying information sources and channels used by Extension educators; 2) identifying information sources and channels used by Extension health specialists; and 3) identifying intervention information that serves to facilitate the adoption and translation of evidence-based programming at two individual levels: specialists and educators. This collection of studies ultimately serves to bridge the gap in understanding where and how information regarding evidence-based interventions are sought by both Extension health educators and specialists.

In Manuscript 1, a nationally representative sample of health educators participated in a sequential explanatory mixed methods study in order to identify the information sources and channels that were used to learn about new health promotion interventions to adopt and deliver. The outcomes highlighted the use of technological channels such as the Internet and email serving as key facilitators for information communication. In terms of information sources, educators highlighted the use of other peer-educators but also noted Extension health specialists which aligned with previous work (Radhakrishna & Thomson, 1996). The concept of specialists being information sources is unsurprising as most specialists serve both as intervention developers and support for Extension educators. Therefore, with educators pointing toward technology related information

channels and specialists as reliable information sources, the next step was to determine the information channels and sources used by Extension specialists and early perceptions of a dissemination intervention.

Manuscript 2 determined the information channels and sources used by Extension health specialists through a survey and follow-up semi-structured interviews. This study determined Extension specialists' preference to use other specialist as information sources. It also identified conferences as a key information channel, along with email and Internet, that specialists used to communicate. Specialists indicated that they did not use academic journals for finding specific interventions but did use them for learning of the evidence-based surrounding how to address a unique need of a community. Specialists also reported the frequency of communication with educators being on a "as needed" basis with the most commonly used channel being email. This concept of information access "as needed" was mentioned by both specialists and educators and aligns with economic principles that demand for an intervention is a precursor for seeking out information. When prompted further on this, specialists indicated a desire for a dissemination intervention to aid in intervention distribution. Specialists also reported the use of an online repository to allow for a tailored response and dissemination of evidence-based interventions as needed by educators. In combination, specialists expressed a desire for a resource to use "as needed" to distribute to educators on a "as needed" basis. One potential solution for this as needed information exchange is to update relevant information via an online repository: Educators and specialists can access and engage whenever needed.

With an understanding of the sources and channels used to obtain information on evidence-based health promotion interventions, the third study aimed to evaluate the intervention characteristics that facilitate intervention uptake and implementation. Manuscript 3 examined the preferences of both Extension educators and specialists regarding health promotion intervention characteristics. The results showed that educators and specialists both desired to learn about the evidence-based research and the cost and time associated with implementing an intervention. Additionally, both educators and specialists desired interventions to be adaptable to fit within the unique communities across the nation. Specialists highlighted the need for more information to be provided on training requirements to assist in implementing an intervention.

Overall Message and Future Directions

Overall, this collection of studies provides information to inform a dissemination intervention that may facilitate the translation and uptake of health promotion evidence-based interventions at a nation level within the Cooperative Extension Service. This work identified Extension health specialists as key intermediaries between Extension educators and intervention developers. Furthermore, this work identified technological means of communication, such as email and Internet, as key information channels used within the Extension system. Specialists reported the desire for a dissemination intervention in the form of an online repository that allows access to evidence-based health promotion interventions that could be disseminated based on the unique demands of each unique community. Considering their “as needed” approach to assisting educators, specialists hypothesize that a repository would avoid email burden and speed readily available intervention characteristics that matter most the potential adopting personnel. Finally, the most important intervention characteristics to disseminate is time (to train, implement, program duration) as well as programming adaptability. Future work should focus on developing the concept of an online repository to be used by Extension specialists nationwide. The overall format, design, accessibility, and key features of an online repository should be informed by a combination of social marketing, human-computer interaction, and Extension-specific information seeking and sharing. A repository could serve to reduce program duplication while simultaneously improving programming translation by providing direct access to desired information about evidence based interventions in a centralized location and by providing assistance in adaptation allowing programming to be delivered and used by both educators and specialists nationwide. Ideally, a dissemination intervention would be put in place to provide a “supply” of programming information that meets the “demands” of the Extension professionals. Thus, creating a dissemination intervention that utilizes the requested sources and channels used within a system, in combination with highlighting that said intervention has the desired characteristics, may effectively allocate and promote the dissemination of health promotion programming nationally.

Finally, another purpose of this work was to highlight a methodology that could be translated to other health promotion systems for learning how programming information is delivered/communicated. This work demonstrates a means of identifying the intervention information process from finding key intermediaries to the eventual programming adoption and implementation. In this work, the main information source was the

intermediary specialist role that communicates through email and whom desire an online repository of health promotion interventions. However, that may not be the case for another system. Thus, by performing a similar study, as done here, would allow for other health promotion systems to more efficiently translate, implement, and be impactful with their unique targeted audiences. This work also poses the challenge to intervention developers of thinking broadly of the impact and the adaptability of health promotion interventions. In times of funding insecurity, it becomes more important to have a lasting impact than just an impact at all. Therefore, it is a necessity that intervention developers consider aspects of the intervention from both and adaptability and fidelity perspective.

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Appendices

Appendix A

Educator Survey for Manuscript 1

Thank you for your willingness to take the following survey on the process by which you, as an extension professional, gather information about interventions for adoption.

All of the information that you provide will be kept confidential. We will not share your name or personal information with anyone outside of our evaluation group. The evaluation group includes Virginia Tech faculty as well as IRB certified graduate students.

However, some of the information you provide could be used for research purposes such as academic publications and presentations. Again, the data used for investigation will not include your name or any other identifying information. The decision to participate is voluntary and should take less than 20 minutes. The decision to participate or not will not have an effect on your employment with extension services or Virginia Tech.

By clicking continue below I consent to participate in this research study.

1. First 3 letters of your first name: ___ ___ ___
2. First 3 letters of your last name: ___ ___ ___
3. Month and day of Birth: Month (01 for January Etc):___ ___
4. What is your sex ? Male Female Other
5. Are you Spanish, Hispanic, Latino or none of these? Yes None of these Unsure
6. Choose one or more races that you consider yourself to be: (check all that apply):
 - 1 White
 - 2 Black or African American
 - 3 Asian
 - 4 American Indian/Alaskan Native
 - 5 Native Hawaiian or Other Pacific Islander
 - 6 Not sure
 - 7 Other: _____
7. What state do you serve?
8. What is your official role title in extension?
9. What percentage (%) of your time do you spend with:
 - a. Adults ()
 - b. Youth ()
 - c. Older Adults 65+ ()
10. Duration as an agent (educator) in Cooperative Extension:
 - 1 year
 - 2 years
 - 3 years
 - 4 years

5+ years

11. What is the highest level of school you have completed or the highest degree you have received?

Bachelor's degree in college (4-year)

Master's degree (Course Option)

Master's degree (Thesis Option)

Doctoral degree

Professional degree (JD, MD)

12. Please provide the department from which you obtained your Graduate Degree? (e.g., Department of Agriculture Education)

13. Below are some ways that health educators learn about programs. Please indicate which means you are most likely to use. (1=Not at all Likely and 5=Extremely Likely)

E-mail

Publications of Interventions (Academic Journals)

District Meetings and Presentations

Conferences (Society Meetings, FCS Meetings, etc.)

Previously Purchased Curriculum

Workshop Training Invitations

Direct supervisor

Other Agent

Specialist (E.g., Nutrition education specialist, Exercise specialist)

Media Sources (Internet, T.V. or Radio)

Intranet

Internet

Other publications (i.e., not academic)

Other ()

Final Question

Are you interested in sharing more about these topics?

We are inviting county-based health educators to participate in a phone interview.

The phone interview is confidential in that we will ask for your name and the type of programming you deliver (ex: nutrition education, physical activity, etc.). However, all data responses will be de-identified when analyzed.

The phone interview and the contact information survey are voluntary and the decision to participate or not will not influence your employment with extension services or your institution.

The phone interview will be audio-recorded and about 30 minutes long.

Are you interested in contributing to a phone interview?

Yes → Goes to new link

No → Thank you for participating

Appendix B

Semi-structured Interview Guide for Manuscript 1

Adoption-Decision-Making (*not read*)

1. **How do you determine health promotion needs in your community?**
 - a. **Probes:** needs assessment, county strategic plan, conversations with community members, hosting community forums, personal experience?
 - b. **Probes:** Which of these are you required to complete? Who makes this requirements?
2. **In the areas you serve, what areas of health promotion do your adopted programs typically target?**
 - a. **Probes:** What types of health behaviors are you targeting?
 - b. **Prompts:** physical activity promotion, healthy dietary promotion, policy/system/environmental changes? Obesity rates
3. **What is most important when choosing to adopt an intervention?**
 - a. **Probe:** goals of program, audience, difficulty, cost, funding issues, difficulty to deliver, previous effects, relative advantage of the proposed program when compared to other programs we deliver, Curriculum available, specialist support

For the next few questions, let's assume the areas you serve request a new health promotion intervention.

Dissemination (*not read*)

4. **Please outline your steps to meeting this community need.**
 - a. **Prompt:** What would you do first to see if a program already existed? Would you make a new program? How would you decide?
5. **What is the most common way you learn or find a new intervention to adopt?**
 - a. **Probes:** Email, Internet, Publications, etc. informed from survey, specialist
 - b. **Let's talk more about ____.**
 - i. Why is that important?
 - ii. What works well about this "tool" (say the tool they mention)?
 - iii. What improvements are needed for this tool?

Our nationwide survey showed that Extension educators most commonly use the following methods to learn about interventions:

Specialist, Other community-based health educators (often called agents), Conferences, Internet, Email

6. **What are your thoughts about these methods?**
 - a. Which of these do you use most often?
 - b. Which do you use least often?
7. **Please describe your sequence for using these methods when learning about an health promotion program.**
 - a. Do you email a specialist? Do you search for a program and then ask a colleague about their experience with the program?

Appendix C

Specialist Survey for Manuscript 2

Thank you for your willingness to take the following survey on the process by which you, as an extension specialist, gather information about interventions for adoption.

The following questions serve to support the representativeness of our study. All of the information that you provide will be kept confidential and all data will be made de-identifiable. We will not share your name or personal information with anyone outside of our evaluation group. The evaluation group includes Virginia Tech faculty as well as IRB certified graduate students.

However, some of the information you provide could be used for research purposes such as academic publications and presentations. Again, the data used for investigation will not include your name or any other identifying information. The decision to participate is voluntary and should take less than 20 minutes. The decision to participate or not will not have an effect on your employment with Extension.

By clicking continue below I consent to participate in this research study.

14. First 3 letters of your first name: ___ ___ ___

15. First 3 letters of your last name: ___ ___ ___

16. Month and day of Birth: Month (01 for January Etc): ___ ___

17. What is your age in years? Fill in the Blank

18. What is your sex ? Male Female Other

19. Are you Hispanic, Latino/a, or Spanish origin? If yes, one or more categories may be selected below:

1 Mexican, Mexican American, Chicano/a

2 Puerto Rican

3 Cuban

4 Another Hispanic, Latino/a, or Spanish origin

20. Choose one or more races that you consider yourself to be: (check all that apply):

1 White

2 Black or African American

3 Asian

4 American Indian/Alaskan Native

5 Native Hawaiian or Other Pacific Islander

6 Not sure

7 Other: _____

21. What state do you serve?

22. What is your official role title in extension?

23. What percentage (%) of your time do you spend with: (Fill in the Blank)

a. Research ___

b. Extension ___

- c. Teaching __
- d. Other _____

24. Duration as an specialist in Cooperative Extension: Fill in the Blank

25. What is your highest degree that you received?

- Master's degree (Course Option)
- Master's degree (Thesis Option)
- Doctoral degree (Ph.D)
- Juris Doctorate (J.D.)
- Medical Doctor (M.D.)

26. Please provide the department from which you obtained your Graduate Degree? (e.g., Department of Agriculture Education)

27. Below are some sources that **specialists** may use to learn about interventions. Please indicate which means you are most likely to use. (1=Not at all Likely and 5=Extremely Likely)

- Publications of Interventions (Academic Journals)
- Previously Purchased Curriculum
- Direct supervisor
- Out of State Specialists
- Local State Specialists
- Other publications (i.e., not academic)
- Other ()

28. Below are some communication channels **specialists** may use to learn about interventions. Please indicate which means you are most likely to use. (1=Not at all Likely and 5=Extremely Likely)

- E-mail
- Phone calls
- District Meetings and Presentations
- Conferences (Society Meetings, FCS Meetings, etc.)
- Workshop Training Invitations
- Media Sources (Internet, T.V. or Radio)
- Intranet
- Internet
- Other ()

29. How frequently do you communicate with Extension health educators regarding health promotion intervention information?

- Every day
- Several times a week
- Once a week
- 1-3 times a month
- Less than once a month
- Other_____
- Never

30. How often do you distribute new evidence-based interventions to Extension health educators?

- Every day
- Several times a week
- Once a week
- 1-3 times a month
- Less than once a month
- Other _____
- Never

31. When you communicate with Extension health educators, what is the primary way in which you communicate? (Rank from 1-most used to 5-least used)

- Email (listserv included)
- Phone Calls
- Online Meetings (Zoom, WebEx, Skype, etc.)
- Face-to-Face Meetings
- Social Media (Facebook, Twitter, Google Group, Etc.)

32. How useful do you believe a dissemination (the active targeting of information delivery) intervention would be that actively distributed new evidence-based practices to you, specialists, that you could use to distribute to Extension health educators? (1=Not at all Useful and 5=Extremely Useful)

33. In the previous question, what are your initial thoughts on a dissemination intervention for Extension specialists designed to disseminate to Extension health educators?

34. Do you wish to be entered in the chance to win a \$50 dollar gift card for your participation in this survey? Please enter your name and email below. Should you be selected we will reach out to obtain further information.

Name _____
 Email _____

Final Question

Are you interested in sharing more about these topics?

A main focus of this study is to determine the feasibility of a dissemination intervention using Extension health state specialists to aid in the distribution of health promotion intervention to Extension health educators.

We are inviting Extension state specialists to participate in a phone interview to further delve into the previous questions along with addressing your perceptions on the potential of a dissemination intervention used by specialists.

The phone interview is confidential in that we will ask for your name and how you disseminate programming information (ex: email, phone, etc.). However, all data responses will be de-identified when analyzed.

The phone interview and the contact information survey are voluntary and the decision to participate or not will not influence your employment with extension services or your institution.

The phone interview will be audio-recorded and about 30 minutes long.

Are you interested in contributing to a phone interview?

Yes → Goes to new link

No → Thank you for participating

Appendix D

Specialist Interview Guide for Manuscript 2

Dissemination Semi-Structured Interviews

Thank you for speaking with me today to participate in this key informant interview. The purpose of this key informant interview is to collect information from Extension specialists who have first-hand knowledge about deciding on health promotion interventions to disseminate to Extension health educators. Today we want to discuss in more detail how Cooperative Extension specialists learn about interventions and what information is key in the adoption of new intervention. We also want to gain feedback on the potential for a dissemination intervention within Extension.

I am _____, and I am part of the research team. We will start by talking about your role as a participant in this study. Then, I will start asking questions from my interview guide. My role as an interviewer is to present the topic areas, probe for any follow-up details we may need related to a specific response, and to keep track of time.

There are no right or wrong answers, so please share your experience and thoughts as we continue.

I will begin recording now.

What does your state call county-bases health educators (agents, educators, etc)? *Call them that throughout the interview).

Please state your role in Cooperative Extension, the state you are employed in, and your participant ID (FOLLOW SURVEY HERE) (Example SAM0701)

(Allow interviewee to read their assigned participant number to both test for volume and ‘record’ voice recognition)

Thank you.

Survey established do they interact, how are they interacting, sources used, willing to disseminate

Adoption-Decision-Making (not read)

Can you please describe your roles and responsibilities within Extension?

- b. **Probe** specifically about their responses. *Predicted responses around “health educator engagement.”*

For the next few questions, we will talk about your interactions with ____ (HE, agents).

1. How do you determine programming needs of local health educators?

- a. **Probes:** Educator’s community needs, local needs assessment, monthly educator meetings, personal experience?

b. What sources are valuable to you?

- i. **Probes:** conversation with other specialists? Conferences? Internet? Academic journals

c. Let’s talk more about ____.

- i. Why is that important?
- ii. What works well about this “tool” (say the tool they mention)?
- iii. What improvements are needed for this tool?

For the next few questions, let’s assume you want health educators in your state delivering a health promotion intervention.

Dissemination (not read)

1. **What would you do first?**
2. **Please describe your next steps.**
 - a. **Probes:** If they talk about trainings, get info about trainings, etc.
3. **What information about the health promotion program is most important to convey?**
 - a. How do you communicate that to HE?

Our nationwide survey showed that Extension specialists speak with educators at this (SURVEY RESPONSE FREQUENCY):

4. **What are your thoughts about that frequency?**
 - a. How does this reflect the frequency of contact you have with specialists?
 - b. Should specialists contact HE more or less often or about the same?
5. **Specialist responded with communicating with educators via (SURVEY RESPONSE) method the most.**
6. **Additionally, Specialists also reported the usefulness of an dissemination intervention as (SURVEY RESPONSE).**
7. **How do you think an dissemination intervention for specialist to target educators would be using the above communication method?**
 - a. How often do you think this should occur? (Frequency of intervention)

Wrap-Up (Remaining Time)

Is there anything else you would like to share with the research team at this time?

I am going to stop recording now.

Thank you for your participation in this key informant interview. Members of the research team will transcribe these sessions verbatim. We will then interpret the findings in order to improve the adoption process inside Cooperative Extension. If at any time during this process you wish to retract all or part of your statements, you may do so.

[Salutations]

Appendix E

Educator and Specialist Survey Template Manuscript 3

Thank you for your willingness to take the following survey on the process by which you, as an extension (position), gather information about interventions for adoption.

The following questions serve to support the representativeness of our study. All of the information that you provide will be kept confidential and all data will be made de-identifiable. We will not share your name or personal information with anyone outside of our evaluation group. The evaluation group includes Virginia Tech faculty as well as IRB certified graduate students.

However, some of the information you provide could be used for research purposes such as academic publications and presentations. Again, the data used for investigation will not include your name or any other identifying information. The decision to participate is voluntary and should take less than 20 minutes. The decision to participate or not will not have an effect on your employment with Extension.

By clicking continue below I consent to participate in this research study.

1. First 3 letters of your first name: ___ ___ ___
2. First 3 letters of your last name: ___ ___ ___
3. Month and day of Birth: Month (01 for January Etc):___ ___
4. What is your sex ? Male Female Other
5. Are you Hispanic, Latino/a, or Spanish origin? If yes, one or more categories may be selected below:
 - 1 Mexican, Mexican American, Chicano/a
 - 2 Puerto Rican
 - 3 Cuban
 - 4 Another Hispanic, Latino/a, or Spanish origin
6. Choose one or more races that you consider yourself to be: (check all that apply):
 - 1 White
 - 2 Black or African American
 - 3 Asian
 - 4 American Indian/Alaskan Native
 - 5 Native Hawaiian or Other Pacific Islander
 - 6 Not sure
 - 7 Other: _____
7. What state do you serve?
8. What is your official role title in extension?
9. What percentage (%) of your time do you spend with: (Fill in the Blank)(Educator Only)
 - a. Adults ()
 - b. Youth ()
 - c. Older Adults 65+ ()

10. What percentage (%) of your time do you spend with: (Fill in the Blank)(Specialist Only)

- a. Research __
- b. Extension __
- c. Teaching __
- d. Other _____

11. Duration as an agent or specialists in Cooperative Extension?

12. What is your highest degree that you received? (Bachelor Degree Option for Educator)

- Bachelor Degree
- Master's degree (Course Option)
- Master's degree (Thesis Option)
- Doctoral degree (Ph.D)
- Juris Doctorate (J.D.)
- Medical Doctor (M.D.)

13. Please provide the department from which you obtained your Graduate Degree? (e.g., Department of Agriculture Education)

14. What factors do you consider important when adopting a health promotion program? (Rank each item from 1-5 (1=Not at all Important and 5=Extremely Important)

External funding of intervention (Non-profit, Academic, etc.)

The number of high and low risk members of the population it could reach

The scientific evidence that the program is efficacious (i.e. peer-reviewed journal publications).

The number of settings like yours that have delivered the program.

Having resources that detail how to implement each program component.

Evidence of long-term behavior change (maintenance)

The ability of the program to be sustained or institutionalized within Extension for a long period of time.

Level of comfort with delivering program

Cost of on-going delivery

Ease of Integration into the community

Availability of location for delivery

Community's continued need for the intervention

Other()

Appendix F

Semi-Structured Interview Guide for Educator and Specialist Manuscript 3

Thank you for speaking with me today to participate in this key informant interview. The purpose of this key informant interview is to collect information from Extension specialists who have first-hand knowledge about deciding on health promotion interventions to disseminate to Extension health educators. Today we want to discuss in more detail how Cooperative Extension specialists learn about interventions and what information is key in the adoption of new intervention. We also want to gain feedback on the potential for a dissemination intervention within Extension.

I am _____, and I am part of the research team. We will start by talking about your role as a participant in this study. Then, I will start asking questions from my interview guide. My role as an interviewer is to present the topic areas, probe for any follow-up details we may need related to a specific response, and to keep track of time.

There are no right or wrong answers, so please share your experience and thoughts as we continue.

I will begin recording now.

What does your state call county-bases health educators (agents, educators, etc)? *Call them that throughout the interview).

Please state your role in Cooperative Extension, the state you are employed in, and your participant ID (FOLLOW SURVEY HERE) (Example SAM0701)

(Allow interviewee to read their assigned participant number to both test for volume and 'record' voice recognition)

Thank you.

Educator Guide Questions

1. What is most important when choosing to adopt an intervention?

- a. **Probe:** goals of program, audience, difficulty, cost, funding issues, difficulty to deliver, previous effects, relative advantage of the proposed program when compared to other programs we deliver, Curriculum available, specialist support
- b. **Our survey showed that Extension educators most value if an intervention was previously effective. For example, the program improved dietary or physical activity behaviors. Can you expand on what would make you consider a program effective?**
 - i. **Probes:** scientific evidence, Internet, conference, conversations, personal experience, participant sharing feedback on success (anecdotal)
 1. **In our survey, respondents said that continued funding to support the program was less important when considering program adoption. What are your thoughts about continued funding?**
 1. **Probe:** internal funds needed after external funding ended was a primary cost concern
 2. **Prompt:** Describe how you consider funding in your adoption decision.
 - ii. **What costs do you consider when adopting a program**
 1. My time as an agent (Including preparation, delivery, and post-program work), Cost of equipment, Cost of a location, Internal funds needed once external funding ends, Cost to participants

Specialist Guide Questions

1. What is most important when choosing to adopt an intervention to disseminate to educators?

- a. **Probe:** goals of program, audience, difficulty, cost, funding issues, difficulty to deliver, previous effects, relative advantage of the proposed program when compared to other programs we deliver, Curriculum available, specialist support
- b. **If they say costs**
 - iv. **Probe:** My Time as a Specialist, educator's time (Including preparation, delivery, and post-program work), Cost of equipment, Cost of a location, Internal funds needed once external funding ends, Cost to participants
 - v. **Align with Survey responses?** scientific evidence, Internet, conference, conversations, personal experience, participant sharing feedback on success (anecdotal)
 1. **Example:** I heard you say ___ that was not one of the reasons in our survey, can you expand on that for me? Or I heard you say ___, most of our survey respondents said the same thing. Can you expand on that for me?

Appendix G
IRB Memorandum Manuscript 1 and 3



Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732 Fax 540/231-0959
email irb@vt.edu
website <http://www.irb.vt.edu>

MEMORANDUM

DATE: January 31, 2019
TO: Samantha Marie Harden, Thomas Edward Strayer III, NithyaPriya Shivanthi Ramalingam, Laura Elizabeth Balis, Meghan Wilson, Lauren Elaine Kennedy
FROM: Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE: Dissemination: How do Cooperative Extension Professionals learn about Health Promotion Interventions
IRB NUMBER: 16-994

Effective January 31, 2019, the Virginia Tech Institution Review Board (IRB) approved the Continuing Review request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<https://secure.research.vt.edu/external/irb/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 5,6,7**
Protocol Approval Date: **February 13, 2019**
Protocol Expiration Date: **February 12, 2020**
Continuing Review Due Date*: **January 29, 2020**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Appendix H

IRB Memorandum Manuscript 2 and 3



Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732 Fax 540/231-0959
email irb@vt.edu
website <http://www.irb.vt.edu>

MEMORANDUM

DATE: March 28, 2018
TO: Samantha Marie Harden, Thomas Edward Strayer III, Stephanie Ann Breig
FROM: Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE: Dissemination: How do Cooperative Extension Health Promotion Specialists learn about Health Promotion Interventions
IRB NUMBER: 18-065

The Virginia Tech Institutional Review Board (IRB), acknowledges the Amendment request for the above-mentioned research protocol.

This acknowledgement recognizes the item(s) identified in the Special Instructions section.

NOTE: Please ensure that required Amendments are submitted to WIRB for review and approval. WIRB guidance is provided on page 49 of the Guide for Researchers. The section is titled Changes to Research / Additional Document Submissions. The document is located at:
<http://wirb.com/Documents/Guide%20for%20Researchers.pdf#page=2>

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March 13, 2018

Samantha M. Harden, PhD
Virginia Tech
1981 Kraft Dr., Room 1032
Blacksburg, Virginia 24060

Dear Dr. Harden:

SUBJECT: REGULATORY OPINION—IRB EXEMPTION
Protocol Title: Dissemination: How do Cooperative Extension
Professionals learn about Health Promotion Interventions
Investigator: Samantha Harden Ph.D

This letter is in response to your request to Western Institutional Review Board (WIRB) for an exemption determination for the above-referenced research project. WIRB's IRB Affairs Department reviewed the exemption criteria under 45 CFR §46.101(b)(2):

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
 - (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
 - (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

We believe that the research fits the above exemption criteria. The data will be collected in a way so that the subjects can be identified, directly or through identifiers linked to the participants. However, any disclosure of the human subjects' responses outside the research will not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. You have also confirmed that the results of this study will not be submitted to the Food and Drug Administration (FDA) for marketing approval.

This exemption determination can apply to multiple sites, but it does not apply to any institution that has an institutional policy of requiring an entity other than WIRB (such as an internal IRB) to make exemption determinations. WIRB cannot provide an

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Office: (360) 252-2500 | Fax: (360) 252-2498 | www.wirb.com

exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions. You are responsible for ensuring that each site to which this exemption applies can and will accept WIRB's exemption decision.

Please note that any future changes to the project may affect its exempt status, and you may want to contact WIRB about the effect these changes may have on the exemption status before implementing them. WIRB does not impose an expiration date on its IRB exemption determinations.

If you have any questions, or if we can be of further assistance, please contact R. Bert Wilkins, J.D., M.H.A., C.I.P., at 360-252-2852, or e-mail RegulatoryAffairs@wirb.com.

RBW:tb

B2-Exemption-Harden (03-13-2018)

cc: Jennifer Farmer, Virginia Tech
Thomas Edward Strayer, Virginia Tech
WIRB Accounting
WIRB Work Order # 1-1069349-1