Title
Implementation Leadership in School Nutrition: A Qualitative Study

Journal
Journal of Nutrition Education and Behavior, 54(1)

ISSN
1499-4046

Authors
Machado, Stephanie S
Brewster, Amanda L
Shapiro, Valerie B
et al.

Publication Date
2022

DOI
10.1016/j.jneb.2021.08.011

Peer reviewed

Implementation Leadership in School Nutrition: A Qualitative Study

Machado, S. S., Brewster, A. L., Shapiro, V. B., Ritchie, L. D., Magee, K. S., & Madsen, K. A. (2022). Implementation leadership in school nutrition: A qualitative study. *Journal of Nutrition Education and Behavior*, *54*(1), 56–64.

Abstract:

Objective: This paper identifies implementation leadership characteristics in the school nutrition setting and places findings in the context of implementation leadership literature.

Methods: Fourteen interviews were conducted with school district leadership/staff in an urban school district. Modified grounded theory was employed.

Results: Four themes emerged: (1) understanding of technical/operational intervention details; (2) ability to proactively develop and communicate plans; (3) supervisory oversight; and (4) intervention framing. Themes were consistent with 4 of the 5 dimensions comprising the Implementation Leadership Scale: knowledgeable, proactive, perseverant, and distributed leadership. The supportive domain was not a major finding. An additional domain, how leaders message the intervention to staff, was identified.

Conclusions and Implications: Implementation leadership in school nutrition appears similar, but not identical, to leader behaviors present in the Implementation Leadership Scale. School nutrition leaders might consider involving staff early in implementation planning, incorporating technical expertise, and clearly communicating the intervention purpose to support successful implementation. Future research might explore the interplay between leadership and implementation outcomes.

URL: https://doi.org/10.1016/j.jneb.2021.08.011

INTRODUCTION

School meals are usually the healthiest lunch option for students. Thus, considerable effort has gone into developing and testing new strategies to promote school lunch participation and increase consumption of the fruits and vegetables offered in the program. However, students continue to participate at low rates and eat poorly despite these efforts. Although there is a need for innovative strategies to improve student nutrition outcomes, in large, public sector contexts such as schools, limited financial resources and large organizational structures make it challenging to create and sustain change.

A heightened focus on how an intervention is implemented (i.e., put into place) may help schools achieve better student nutritional outcomes. Public health interventions often fall short of their potential because of a failure to attend to the contexts in which they are delivered or the processes through which they are implemented. The interdisciplinary field of implementation science (IS) has emerged to guide systematic study into factors (ie, the intervention itself, the intervention dose, who implements it, the context in which it is implemented, and the approach to implementation) that shape implementation success. Swindle et al highlights the potential utility of IS to improve intervention delivery in public health nutrition. They underscore a need for a nuanced understanding of the successes and failures of implementing nutrition-related interventions.

Furthermore, they note the need to understand which IS insights, often developed in clinical settings, are relevant and translatable to nutrition interventions. Some nutrition studies have taken on these tasks. For example, Whiteside-Mansell et al conducted a thorough examination of the factors impacting the implementation of a school-based obesity prevention curriculum. McKay et al explored the relevance of existing implementation theories in the nutrition and physical activity context. Less attention to public health nutrition has been paid to the role of leadership in implementation.

Leadership is one of the many factors that influence implementation. The Consolidated Framework for Implementation Research, a framework developed for health services research but known in the nutrition field, highlights that leadership engagement within the inner setting (ie, the implementing organization) is an indicator of organizational commitment to implementation. Little implementation research about the role of leadership has been published within the school nutrition setting. Qualitative school nutrition studies, using an inductive approach, have found themes of leadership in their exploration of implementation. Although these studies provide valuable insight, integration of IS theories could provide greater opportunity to identify specific leadership functions or steps leaders could take to positively influence implementation. There is a growing body of work from implementation scientists on how leadership style and leadership behaviors support the implementation of interventions in clinical settings. For example, the implementation leadership scale (ILS) a measure of strategic leadership for implementation, suggests that effective leaders of implementation are

knowledgeable, proactive, perseverant and supportive, and distribute leadership responsibilities. It remains unclear if frameworks such as the ILS translate to a school nutrition context.

This study offers insight into how leaders might leverage their role to improve the implementation of school nutrition innovations through a qualitative exploration of the challenges in the implementation of a multifaceted school meal promotion intervention in one school district in California. This paper has 2 purposes: (1) to identify critical aspects of implementation leadership in the context of a school nutrition intervention; and (2) to contextualize study findings in the existing implementation leadership literature.

METHODS

Study Design and Setting

The present qualitative study was part of a larger 3-year project examining the impact of an intervention to increase school lunch participation and reduce plate waste by middle and high school students in an urban California school district. The intervention consisted of (1) teacher outreach about school lunch, (2) cafeteria redesign, and (3) the sale of school lunch through vending machines and mobile carts. An application to provide nutrition education and allow students to preorder lunch was part of the intervention plan but was not implemented because of technical challenges. The study was approved by the University of California, Berkeley Committee for Protection of Human Subjects.

Data Collection

Using purposive sampling, a district staff member who worked closely with the research team identified all district-level staff members involved in managing, planning, and/or leading the implementation of the intervention. All potential subjects were interviewed. Interviews were conducted the summer following the end of the 3-year intervention period by the first author (S.S.M.), a public health researcher with previous qualitative research experience. Participants gave informed consent and were not compensated for their participation. The semi-structured interview protocol focused broadly on policies, structures, procedures, and culture of the organization related to intervention implementation. The interview guide can be found with the Supplementary Data. The interviews, lasting approximately 30–60 minutes each, were audio-recorded, transcribed by research assistants, and uploaded to QDA Miner Lite (version 2.06, Provalis, 2012) for data management and coding.

Analysis

Modified grounded theory (ie an integrated approach) was employed in the coding and analysis of the data. Analysis was focused on the intersection of implementation fidelity (ie, the extent to which the intervention was delivered as intended) and leadership. Deductive codes were based on 2 aspects of fidelity: adherence to intervention protocol (ie, how well the intervention content was delivered as intended) and dosage (ie, how much of the intervention was delivered).

As little is known about the role and functions of implementation leadership in school nutrition contexts, inductive coding was chosen to ground leadership codes in the experience of participants. Leadership codes that co-occurred with, or were connected to, fidelity codes were the focus of the analysis.

An investigator (S.S.M.) conducted line-by-line coding of all transcripts, using both descriptive and evaluative codes. In alignment with grounded theory, a constant comparison was used; the investigator refined the coding schema throughout the process. Furthermore, the coding structure iterated with a review of relevant literature on implementation leadership. As all potential subjects were interviewed, a decision about saturation was not relevant to this study. After coding training by an investigator, a second coder with experience in public health nutrition (K.S.M.) used the codebook to independently code all 14 transcripts, and the 2 coders (S.S.M. and K.S.M.) discussed codes and came to a consensus on salient themes. Themes were then compared with existing concepts in the literature, and as the ILS was most relevant to the data, the ILS domains were compared with emergent themes. One interview participant from the leadership team reviewed the preliminary findings.

RESULTS

Sample Characteristics

Management staff (leadership team) who planned and oversaw implementation accounted for half of the interviewees. Leaders participating in this study consisted of midlevel staff in the food service department (n = 3), hired specifically to implement school meal innovations, their supervisors (n = 3), and a director of another district-level department (n = 1). The other half of the interviewees were implementation staff (ie, mid-level and lower-level staff involved in school meal operations) (n = 3), as well as information technology and administration staff (n = 4). All implementation staff worked in or directly supported the food service department. Few interviewees were involved in the project or employed by the school district during the entire study period. One interviewee was only involved after the study period (ie, the sustainability phase of the intervention). Of the 14 interviewees, 9 were women.

Characteristics of Leadership in Implementation

Four major themes emerged reflecting how participants perceived that leadership characteristics shaped implementation success: the leader's (1) understanding of the technical and operational details of the intervention, (2) ability to proactively develop and communicate intervention plans, (3) supervisory oversight over implementation staff and contractors, and (4) acknowledgment that intervention messaging (ie, how leaders message the intervention to staff) can influence staff acceptance and support. Illustrative quotes from these themes can be found in the Table. Results indicate that leader's access to technical and operations expertise influences

their ability to develop useful implementation plans. Furthermore, a leader's ability to proactively develop and clearly communicate plans to staff impacts intervention fidelity. Results also point to the importance of leaders' supervisory oversight in successful implementations; leadership functions are perceived to be more successfully performed when leaders have appropriate authority in the organization. Finally, leaders framing the intervention as innovative and temporary have had some negative implications for staff collaboration and implementation success.

Table. Implementation Leadership Themes and Illustrative Quotes

Quotes
Technical and Operations Experience
"You cannot put.. .me working in NASA, because I don't have the experiences... and, that was the whole thing... Just because you worked with one kitchen, it does not qualify you to do a skill this big: implementation." (Participant 1, implementation staff)
"I think there is a real hole, a real void to fill between the ideas and what implementing at the district level actually looks like." (Participant 4, leadership team)
"[The intervention] fell short in that [the leadership team] perhaps didn't have an operations background. For example, the original vision of the mobile cart [didn't] pass food safety guidelines, and I don't know [how that was missed]. But most people that have worked in food service operations would have seen that right away and had a red flag." (Participant 4, leadership team)
"So, you can be the best business person in the world, set up the most beautiful contracts, arrange the top end of this flawlessly. But if it doesn't work, you wouldn't know where to go." (Participant 2, leadership team)
"Like I remember sitting in a meeting with [the e-application vendor] and being like, 'Cool, so how is that pre-order going to work?... we were trying to work in pre-order, and all of a sudden we're like, we don't even know what that could look like, I mean, we have no clue.. .how that would ever even be possible.'" (Participant 6, leadership team)
"I mean it's IT, it's electrical. But then, electrical is like going through facilities to do the contract which then means you have to go to the bidding process, which is another department. ..... as soon as you hit one button, then all of a sudden 15 others showed up, and that process alone, just to purchase [vending machines] was like a 6-month process. .... And that wasn't built in our timelines." (Participant 5, leadership team)
"[Vending machine issues]was a big challenge and I think [the leadership team] spent a lot of time running in circles because there was a little bit of, you know, 'I believe it's that component causing the problem,' and the other one saying, 'it's that component causing the problem.' What we found was a mixed bag. The solutions came from different arrangements according to which machine and what schools we were talking about. So it wasn't one correction fit all." (Participant 2, leadership team)
"You had a dedicated kind of management person who was there to support this program .....and do a lot of the research and do a lot of the supporting activity which [they] spent so many hours at, and working with the staff, and working with the technology, and making sure that we were doing the best that we could with what we had." (Participant 7, implementation staff)
"As 1 participant said, I would say first of all the [leader] needs to have a lot of resources, knowing who to reach out to and, and be able to [be] self-sufficient in finding the resources." (Participant 1, implementation staff)
"So somebody needs to be the responsible person and then know where to go if something isn't correct. If those resources aren't there, you will struggle." (Participant 2, leadership team)
"I would make sure that [leadership] have everyone at the table in the planning process. Their Buildings and Grounds equivalents, if they have an IT team, have them at the table. Just so everybody fully understands everything that goes into it....and [is involved] in the planning process." (Participant 4, leadership team)

(continued)

Table. (*Continued*)

Quotes
Planning
"[Leadership]... had kind of a grand plan for how everything should work. But also at the same time, I don't think they really knew what they wanted or what they want to get out of the app." (Participant 3, implementation staff)
"I would say a lot of it was just lack of communications.. .and lack of clarity.. .causing me, or my supervisors, or the entire staff team [to ask] 'Where are we going, what are we doing? Why are we changing a few times a week?' Nobody has any idea what needs to be done." (Participant 1, implementation staff)
"It goes back to how do you create the team, and the messaging, and the communications to the team. So it's clear what the roles are, and why each person has the role they have." (Participant 8, leadership team)
"We had timelines.. . and I don't think we gave ourselves the freedom and flexibility that we needed." (Participant 6, leadership team)
Supervisory Oversight
"I think there has to be strong leadership leading the way and getting the team reunited because it is an operational shift... There has to be someone who can mandate that as part of people's job responsibilities and I didn't have that ability." (Participant 5, leadership team)
"We were without a director for a really long time... But in that time, we're trying to launch all these things.. .but then we didn't have someone who can mandate [the intervention] has to happen." (Participant 5, leadership team)
"In the absence of leadership, there's no one to do the negotiations." (Participant 4, leadership team)
"[High level leaders aren't] necessarily part of the team." (Participant 5, implementation staff).
"[A high level leader] could mandate things but.. .wasn't there to see it day to day. You need someone who's going to [oversee] day-to-day operations." (Participant 5, leadership team)
Intervention Messaging
"[The intervention] was looked at as something new as opposed to how we could coordinate and streamline it with the...programs that we already had going on." (Participant 8, leadership team)
"A lot of thought was already put into breakfast grab and go lines. So how do we repurpose those lines to also be used at lunchtime because it's the same concept... It's just now lunch versus breakfast. I think that's one of the biggest things [that would have improved implementation success]. Instead of creating something new, extending [existing processes]." (Participant 8, leadership team)
"I don't know that there was a lot of connection with the planning process between the [implementation staff]." (Participant 8, leadership team)
"I think a lot of the [implementation staff] sees.. .the work that [the leadership team does] as very separate, when the work that we need to do needs to be much more tied." (Participant 6, leadership team)
"I think the hardest part was that [the intervention] was seen as a separate, temporary project - it was a pilot. But, that doesn't mean that pilots just end, right? It's the point of a pilot is to see how it could live on. But that wasn't [communicated] as successful[ly]." (Participant 9, implementation staff)
"I don't think it's been really well explained.. .this idea of innovation.. .for some reason it seems like that message isn't [getting through to staff]." (Participant 5, leadership team)
"I think it was a loss in translation of why we're doing this." (Participant 6, leadership team)
"We hadn't built a case as to why this [intervention] was necessary for our [students]." (Participant 5, leadership team)

Note: Quotes, organized by qualitative theme, from interviews (n = 14) with leaders and staff regarding a school nutrition intervention.

Technical and Operations Experience

Technical knowledge and operations experience were the primary factors attributed to intervention fidelity. Critical to success, when these were absent, implementation proved difficult. Two aspects of the intervention (the additional points of sale, for which the roll-out was delayed but ultimately successful, and the application, which was not successful) required significant technical knowledge in the areas of the leadership team had an interesting overarching vision but not a clear, detailed plan for how to realize it. Others noted that even a good, high-level plan could be difficult to adapt without the requisite technical knowledge. Because of food safety regulations, the final mobile cart model included coolers and warmers and needed an

electrical source, rendering the mobile carts heavy and cumbersome to move and suitably locate. Similarly, for the vending machines, leadership that lacked technical knowledge and operational experience inadvertently called for the wrong electrical setup, did not build maintenance into the vending machine contract, and initially selected machine locations that violated the fire code. As a result, the vending machine rollout was delayed, and the majority of the machines were placed in inconvenient locations.

Interviewees talked about the importance of technical and operations expertise in solving problems that were encountered during implementation. Interviewees emphasized that the issues they had to navigate in implementing the school nutrition intervention were complex. For example, with the vending machine, issues with the power sources, software, and hardware arose. Staff noted that bringing in those with technical experience helped with implementation. One staff noted that implementation was more successful when, about halfway into the implementation process, a leadership team member with school meal operations experience was hired.

Furthermore, staff noted that soliciting help from a director of another district department with construction and maintenance expertise led to the resolution of many of the vending machine issues. This director located and resolved a problem with the electrical circuits and worked with the appropriate vendors and district staff to identify and resolve connectivity problems. Despite multiple project setbacks with many of the intervention components, the team continued to try different strategies to resolve the issues they experienced and were ultimately able to roll out all components aside from the e-application. Interviewees suggested that if those in leadership roles did not have the necessary expertise, then they need to bring in those with the expertise in the early planning phase and continue to draw on their support throughout implementation.

Planning

Dimensions of planning not connected with technical and operations experience also emerged as important. Participants highlighted how leaders created and communicated plans affected intervention fidelity. Participants emphasized how leaders must clearly communicate implementation plans to staff, especially with a complex project. For example, a lack of clear communication and roles led to staff confusion about the next steps for implementation. Furthermore, lack of time to adequately plan for implementation contributed to intervention fidelity. Some participants emphasized that 1 of the reasons why the selected mobile cart model was less functional than envisioned was because the leadership team purchased carts quickly, without gathering detail about how the carts would work in the schools. The leadership team members talked about how tight grant timelines forced them to make implementation decisions quickly and move forward with existing implementation plans, even when these plans did not appear to maximize intervention fidelity.

Supervisory Oversight

Leadership team members mentioned that those in implementation leadership roles need to have the ability to mandate staff participation and negotiate with other departments and external contractors. The mid-level staff in the foodservice department on the leadership team were charged with overseeing the day-to-day implementation. However, these staff did not explicitly supervise the implementation staff and had no control over their work priorities. Instead, these leadership team members and the implementation staff were in similar positions within the overall hierarchy. Leadership talked about how mandating staff participation cannot come from either the bottom or the very top of the organizational hierarchy. One leadership team member mentioned that they were responsible for encouraging the implementation staff to participate but did not have the power or status to successfully convince staff. This particular participant was not hierarchically positioned above the staff performing implementation activities.

Contributing to hierarchical challenges, the top leaders also may not have been able to effectively mandate participation because, although highly supportive of the project, they were not a part of the department and were not there to oversee daily operations. Furthermore, leadership team members noted that the director of the food service department did not have a leadership role in the project, with position turnover and vacancy contributing to lack of participation. The director position was vacant for approximately half of the intervention. Thus, without this role filled, there was little power within the foodservice department to influence other departments.

The leadership team was able to access the power they needed to resolve vending machine problems by connecting with the director of another department. This person was successful in convincing the maintenance contractors to re-do their electrical work at no additional cost because the contractors had previously worked with this person and knew that future contracting decisions would also be made by this person.

Intervention Messaging

Messaging the intervention as innovative appeared to have implications for implementation success and influence how leaders made decisions. The framing of the intervention as innovative and new seems to have prompted leaders to develop new processes instead of building from existing equipment and processes. For example, the new mobile cart created specifically for the intervention was less mobile and more complicated than the existing, approved grab-and-go breakfast carts. One participant observed that implementation might have worked better if the intervention had built on the existing breakfast carts. Furthermore, because the project was managed as an innovation, a new team within the food service department (i.e., the mid- level staff on the leadership team), distinct from the rest of the staff teams, was created to lead implementation without including other food service staff (ie, the implementation staff) members as leadership on the project. Implementation staff helped with implementation but were not intimately involved in leading or planning for implementation.

Implementation staff and leadership alike noted that having both the leadership and implementation staff working together on the project from the beginning would have improved intervention fidelity. However, the focus on innovation created a dynamic in which the 2 teams had difficulty collaborating. Some leaders highlighted that reframing the project as something that extended existing programs or utilized staff with knowledge of those programs would have helped improve collaboration between the 2 teams. Implementation staff noted that another way to improve collaboration between teams would be to invite all staff to give feedback on implementation plan development. This would help staff feel like their perspective was valued and could increase staff buy-in and collaboration around implementation.

Furthermore, it appeared that there was a discrepancy in how the intervention was framed at the top of the leadership chain compared with how it was viewed by the implementation staff. Although the intervention may have been thought of as innovative and a step toward a permanent redesign of the school meal landscape at the top of the leadership chain, it was messaged as temporary to these implementation staff. Finally, it was unclear to implementation staff why this particular intervention was selected. This lack of clarity, coupled with the temporary messaging, may have influenced staff ownership of the project.

DISCUSSION

This study provides a detailed description of leadership characteristics that can support the implementation of school-based nutrition intervention and provides key takeaways for those interested in implementation leadership in the realm of school nutrition. Dimensions of leadership emerged as important in this study align well with the constructs measured by the ILS. The original scale was developed in mental health settings, and only 4 prior studies have used the ILS to consider implementation leadership in an educational setting. Results illustrate how these manifest in the context of school nutrition. The original scale includes 4 domains: leaders being knowledgeable, proactive, perseverant, and supportive. Locke et al explored the ILS in a school context, identifying the additional dimension of distributed leadership.

The themes from this study align with 4 of the 5 ILS domains: knowledgeable, proactive, perseverant, and distributed leadership. Perseverant leadership is clear (for overcoming obstacles) but not as readily evident in the interviews. A leader's access to technical and operations knowledge aligns with knowledgeable leadership (ie, being knowledgeable and able to answer questions about the intervention and implementation) from the ILS. This present study adds specificity to the areas of knowledge needed for implementing technology-based innovations in a school nutrition context: namely, how the intervention relates to school operations and technology. This study suggests that leaders must build a network of experts to fill in knowledge gaps or know where to find knowledge and assistance when needed.

The need for leaders to take a proactive approach to implementation planning, demonstrated in the present study, fits with the ILS concept of proactive leadership (ie,

establishing clear standards for implementation, developing a plan to facilitate implementation, and removing obstacles to implementation). This domain is particularly key to intervention dose in a school setting. Study findings, in a school nutrition context, suggest that an additional component of proactive leadership includes clear communication of plans to staff. School nutrition studies cataloging lessons learned have also identified communication with implementers as key to implementation success. Furthermore, the finding that leaders did not always have ample time to make strategic implementation decisions is similar to the study by Hamdi et al of a school nutrition intervention that found resource and time constraints impeded implementation. More lead-time to be proactive may allow for higher-quality implementation.

Results highlight the need for more nuance in ILS' distributed leadership, the leadership of many individuals across teams and hierarchical levels, in a school nutrition context. This study suggests that leveraging influence and relationships to accomplish goals is most effective when performed by staff with appropriate authority, whereas encouraging staff participation is best performed by staff with appropriate authority and who oversee day-to-day operations. This is corroborated by Birken's theory of middle management which posits that middle managers (ie, those positioned between high-level leaders and on- the-ground staff) are hierarchically poised to most effectively sell the value of the intervention to staff.

Supportive leadership (ie, supporting employee efforts to learn about and use intervention and recognizing employees for these efforts) was not a predominant theme in the present study. Shapiro et al found reduced perceptions in supportive leadership over time throughout the implementation of a school-based mental health intervention, unique among the ILS constructs. Therefore, supportive leadership may not have emerged as a theme because of when study data were collected relative to intervention initiation.

This study identified 1 leadership domain not included in the ILS: leader messaging (ie, how the intervention is messaged to staff by leaders). Results indicate that intervention messaging by leaders influenced staff participation and leaderships' implementation strategy. The messaging of the intervention as temporary indicates that sustainability was not planned for, which decreases the likelihood that an intervention is sustained. Furthermore, participants noted a gap in explaining to staff why the intervention was important to implement. Findings from another school nutrition environment intervention demonstrate that perceived appropriateness of the intervention by implementation staff may be a contributor to implementation fidelity. The present study highlights the influence that leaders may have in addressing staff perceptions and sustainability through intervention messaging. An adapted conceptual model of implementation leadership is presented in the Figure that describes how study findings com pare to the ILS.

There are limitations to this study. Interviews were primarily based on perceptions of the leadership functions that could have improved implementation and not solely on those that did promote successful implementation. Interviewees likely focused on implementation barriers because more questions were asked about barriers than facilitators. Furthermore, the study was a retrospective exploration of leadership functions, was conducted in 1 school district only, and

had a small sample size. The leadership characteristics identified in our study may not generalize to less com plex and technical school nutrition program implementation efforts, although the themes that emerged as prominent in our context largely correspond to the ILS domains developed and applied in other settings. The study intended to understand leadership, but it is important to note that leadership is one of many factors that influence implementation. Finally, the ILS was designed to assess leadership in putting evidence-based practice in place. Although the ILS constructs mapped well, the intervention was an innovation that may explain differences in the leadership themes that emerged.

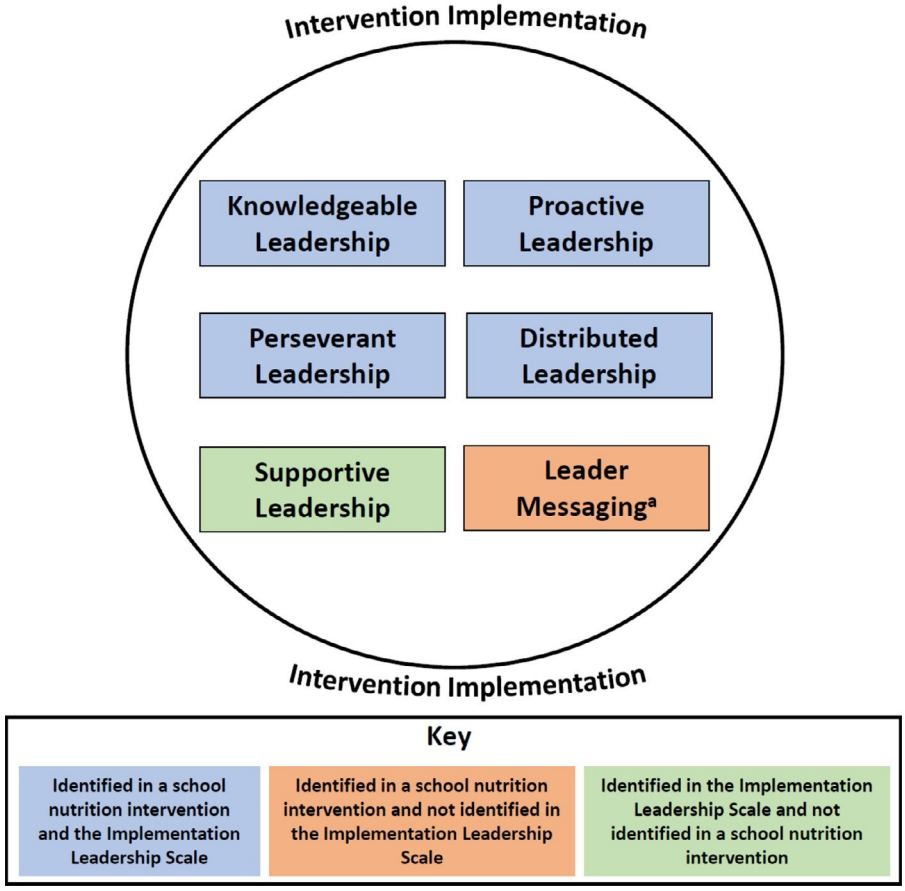

Figure. Leader behaviors that support the implementation of a school nutrition intervention. Leader behaviors that support the implementation of interventions, as identified as a finding in a school nutrition intervention and the implementation leadership scale (ILS),18 include knowledgeable, proactive, perseverant, and distributed leadership. Supportive leadership, a domain in the ILS, is not a major finding in a school nutrition intervention. Leader Messaging is a finding in a school nutrition intervention but not in the ILS. How an intervention is messaged to staff by leaders.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Study findings offer practical considerations for school nutrition leaders. First, ensuring leader access to technical and operations experts is key when implementing technology-based innovations, strategies that require significant acquisitions, or interventions that modify the environment. Leaders might consider technical assistance (or, in IS terms, facilitation), a method used to support implementation in school health interventions or including implementation staff in early planning, as their involvement improves project ownership. Leaders could also use an evidence-based quality improvement strategy to further engage staff in addressing potential barriers to implementation. Furthermore, attention should be paid to how leaders message the intervention purpose to their staff. Without clear and convincing communication about the intervention's purpose, it may be difficult to mobilize staff. Finally, within large organizations, in which changing existing systems is difficult, it may be necessary to garner support from the existing systems and staff early in the conceptualization and planning phases. An innovation lens may inhibit this support.

Findings support the potential utility of an adapted ILS framework for school nutrition interventions. Further considerations of adapting the ILS to this context will require the examination of other interventions and the inclusion of multiple schools. Future work might explore the interplay between the implementation determinant, leadership, and implementation outcomes such as intervention acceptability or appropriateness. This study highlights the need to explore how leaders can perform their roles to improve the implementation of nutrition interventions in school settings.

ACKNOWLEDGMENTS

This research was supported by the US Department of Agriculture, National Institute of Food and Agriculture: Technology and Design Innovation to Support 21st Century Nutrition (Grant ID: 2015 68001 23236).

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jneb.2021.08.011.

REFERENCES

Liu J, Micha R, Li Y, Mozaffarian D. Trends in food sources and diet quality among US children and adults, 2003−2018. JAMA Netw Open. 2021;4: e215262.

Forrestal S, Potamites E, Guthrie J, Paxton N. Associations among food security, school meal participation, and students' diet quality in the first school nutrition and meal cost study. Nutrients. 2021;13:307.

Vaudrin N, Lloyd K, Yedidia MJ, Todd M, Ohri-Vachaspati P. Impact of the 2010 US Healthy, Hunger-Free Kids Act on school breakfast and lunch participation rates between 2008 and 2015. Am J Public Health. 2018;108:84–

Cohen JFW, Richardson S, Parker E, Catalano PJ, Rimm EB. Impact of the new U.S. Department of Agriculture school meal standards on food selection, consumption, and waste. Am J Prev Med. 2014;46:388–394.

Forman SG, Olin SS, Hoagwood KE, Crowe M, Saka N. Evidence-based interventions in schools: developers' views of implementation barriers and facilitators. Sch Ment Health. 2008;1:26.

Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. Milbank Q. 2004;82:581–629.Cohen BJ. Fostering innovation in a large human services bureaucracy. Ad- min Soc Work. 1999;23:47–59.

Frieden TR. Six components necessary for effective public health program implementation. Am J Public Health. 2014;104:17–22.

Swindle T, Curran GM, Johnson SL. Implementation science and nutrition education and behavior: opportunities for integration. J Nutr Educ Behav. 2019;51:763–774.e1.

Whiteside-Mansell L, Swindle T, Selig JP. Together, We Inspire Smart Eating (WISE): an examination of implementation of a WISE curriculum for obesity prevention in children 3 to 7 years. Glob Pediatr Health. 2019;6:2333794X19869811.

McKay H, Naylor P-J, Lau E, et al. Implementation and scale-up of physical activity and behavioural nutrition interventions: an evaluation roadmap. Int J Behav Nutr Phys Act. 2019;16:102.

Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci IS. 2009;4:50.

Greaney ML, Hardwick CK, Spadano-Gasbarro JL, et al. Implementing a multi- component school-based obesity prevention intervention: a qualitative study. J Nutr Educ Behav. 2014;46:576–582.

Cho H, Nadow MZ. Understanding barriers to implementing quality lunch and nutrition education. J Commun Health. 2004;29:421–435.

Storey KE, Montemurro G, Flynn J, et al. Essential conditions for the implementation of comprehensive school health to achieve changes in school culture and improvements in health behaviours of students. BMC Public Health. 2016;16:1133.

Roberts E, McLeod N, Montemurro G, Veugelers PJ, Gleddie D, Storey KE. Implementing Comprehensive School Health in Alberta, Canada: the principal's role. Health Promot Int. 2016;31:915–924.

Aarons GA. Transformational and transactional leadership: association with attitudes toward evidence-based practice. Psychiatr Serv. 2006;57:1162–1169.

Aarons GA, Ehrhart MG, Farahnak LR. The implementation leadership scale (ILS): development of a brief measure of unit level implementation leadership. Implement Sci. 2014;9:1–10.

Locke J, Lee K, Cook CR, et al. Understanding the organizational implementation context of schools: A qualitative study of school district administrators, principals, and teachers. Sch Ment Health. 2019;11:379–399.

Aarons GA, Ehrhart MG, Farahnak LR, Sklar M. Aligning leadership across systems and organizations to develop a strategic climate for evidence-based practice implementation. Annu Rev Public Health. 2014;35:255–274.

Machado S, Ritchie L, Thompson H, et al. Multi-pronged intervention to increase secondary student participation in school lunch: design and rationale. Contemp Clin Trials. 2019;78:133–139.

Bradley EH, Curry LA, Devers KJ. Qualitative data analysis for health serv- ices research: developing taxonomy, themes, and theory. Health Serv Res. 2007;42:1758-1772.

Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. Implement Sci IS. 2007;2:40.

Miles MB, Huberman AM, Saldana J. Qualitative Data Analysis: A Methods Sourcebook. 3rd ed. Sage Publications Ltd; 2014.

Kelly M. The role of theory in qualitative health research. Fam Pract. 2010;27:285–290.

Lee J, Shapiro VB, Kim BKE, Yoo JP. Multilevel structural equation modeling for social work researchers: an intro- duction and application to healthy youth development. J Soc Soc Work Res. 2018;9:689–719.

Shapiro VB, Ziemer KL, Accomazzo S, Kim BKE. Teachers' Assessment of "Implementation Leadership" during a new Social Emotional Learning Initiative. Contemp Sch Psychol. 2020;24:174–180.

Lyon AR, Cook CR, Brown EC, et al. Assessing organizational implementation context in the education sector: confirmatory factor analysis of measures of implementation leadership, climate, and citizenship. Implement Sci IS. 2018;13:5.

Langford R, Bonell C, Jones H, Camp-bell R. Obesity prevention and the Health promoting Schools framework: essential components and barriers to success. Int J Behav Nutr Phys Act. 2015;12:15.

Hamdi N, Ellison B, McCaffrey J, et al. Implementation of a multi-component school lunch environmental change intervention to improve child fruit and vegetable intake: a mixed-methods study. Int J Environ Res Public Health. 2020;17:3971.

Birken SA, Lee S-YD, Weiner BJ. Un- covering middle managers' role in healthcare innovation implementation. Implement Sci IS. 2012;7:28.

Cooper BR, Bumbarger BK, Moore JE. Sustaining evidence-based preven- tion programs: correlates in a large- scale dissemination initiative. Prev Sci. 2015;16:145–157.

Cradock AL, Barrett JL, Carnoske C, et al. Roles and strategies of state organizations related to school-based physical education and physical activity policies. J Public Health Manag Pract. 2013;19(3 suppl 1):S34–S40.

Hager ER, Rubio DS, Eidel GS, et al. Implementation of local wellness policies in schools: role of school systems, school health councils, and health dis- parities. J Sch Health. 2016;86:742–750.

Pronovost PJ, Berenholtz SM, Need-ham DM. Translating evidence into practice: a model for large scale knowledge translation. BMJ. 2008;337:a1714.

ORCIDs

Stephanie S. Machado: http://orcid. org/0000-0002-2520-8313

Amanda L. Brewster: http://orcid. org/0000-0003-4024-5830

Valerie B. Shapiro: http://orcid.org/ 0000-0003-4493-8829

Lorrene D. Ritchie: http://orcid.org/ 0000-0002-8038-1821

Kristine A. Madsen: http://orcid.org/ 0000-0002-1880-5363