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## Coordinated Approach: Comprehensive Policy and Action Planning

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### Abstract

**Background:** Schools play a vital role in student health, and a collaborative approach may affect health factors such as physical activity (PA) and nutrition. There is a lack of recent literature synthesizing collaborative approaches in K-12 settings. We present updated evidence about interventions that used a coordinated school health approach to support K-12 student PA and nutrition in the United States.

**Methods:** A 2-phase literature review search included a search of systematic reviews for individual qualifying studies (2010-2018), followed by a search for individual articles (2010-2020) that evaluated a coordinated approach or use of school wellness councils, committees, or teams to address PA and/or nutrition.

**Results:** We identified 35 articles describing 30 studies and grouped them by intervention type. Interventions demonstrated promising findings for environmental changes and student dietary and PA behaviors.

**Implications:** Coordinated and multicomponent interventions demonstrated significant improvements or null results, indicating that implementation of programs and/or policies to promote healthier eating and PA practices may support and do not appear to hinder environmental or behavioral outcomes.

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**Disclaimer:** The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

#### HUMAN SUBJECTS APPROVAL STATEMENT

Preparation of this paper did not involve primary research or data collection involving human subjects, and therefore, no institutional review board examination or approval was required.

#### CONFLICT OF INTEREST DISCLOSURE STATEMENT:

The authors have no conflict of interest to declare.

**Conclusions:** Schools can use a coordinated approach to implement opportunities for PA and nutrition; this may influence students' PA and dietary behaviors.

### Keywords

coordinated approach; school health; nutrition; physical activity

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The Whole School, Whole Community, Whole Child (WSCC) framework emphasizes the importance of engaging families, school staff, students, and community members in establishing and coordinating policies, practices, and programs to improve learning and health; the WSCC framework emphasizes that each component plays a role toward creating a healthy and safe school that supports the health and academic achievement of students.<sup>1</sup> Educational attainment is a social determinant of health; people with more education tend to have better health than those who have less education.<sup>2-4</sup> School health programs can have positive health effects on academic outcomes as well as health behaviors and health outcomes.<sup>5</sup>

Applying the WSCC framework involves establishing infrastructure (eg, school health councils and coordinators) within school district and school levels; conducting a needs assessment of health policies, practices, programs; creating or revising policies, practices, and programs; and coordinating school health strategies and activities across the multiple components, including policy adoption.<sup>6,7</sup> Creating infrastructure for school health through school health advisory councils (SHACs) or school health councils (SHCs) and coordinators helps establish and maintain policies and practices.<sup>8</sup> Council representatives should bring in a variety of perspectives to ensure inclusion of all aspects of the WSCC framework.<sup>6</sup> Teachers; school counselors; school nutrition professionals, physical education and health education staff; school nurses and other health, mental health, and social services staff members; school administrators; student and parent groups; and community organizations bring distinct perspectives to SHACs/SHCs and can work together to identify and prioritize healthy eating and PA opportunities for students throughout the school environment. Working as a team, these constituents can conduct a school health assessment and develop a plan to make improvements in policies, practices, and programs. School health coordinators lead the efforts of the SHACs/SHCs and can engage school administrators and others who might not be on the council.<sup>8</sup> Nine states require that a WSCC or wellness council be created at the district level, and 3 states require that a WSCC or wellness council be created at the school level.<sup>9,10</sup>

School health coordination can occur at different levels, including within and across classrooms, school departments, and/or with engagement from all other school staff. Bringing together multiple components of the whole school may impact environmental outcomes and individual behaviors which can lead to health and academic results that would not be achieved otherwise.<sup>11</sup> There is currently a dearth of literature synthesizing recent coordinated school health approaches to impact dietary behaviors and PA in K-12 settings. This systematic review aims to assess the impact of coordinated approaches for school nutrition and PA opportunities, including school health assessments, policies, and multicomponent changes, on the school environment and student behaviors.

## METHODS

The articles in this review come from a larger 2-phase systematic review that began with a review of review articles (ie, systematic reviews or meta-analyses for 2010–2018, Phase 1).<sup>12</sup> Research librarians advised us that some of the same keywords can be used to find articles about coordinated approaches to improving PA and dietary outcomes among K-12 students and articles about school nutrition and PA interventions.<sup>13,14</sup> We therefore cross-referenced the search results from other topics to identify reviews about coordinated or multicomponent interventions rather than running a separate search. We also searched the Guide to Community Preventive Services website to identify Community Preventive Services Taskforce (CPSTF) systematic reviews and conclusions (2010–2021) that aligned with the priority research question related to nutrition and PA in school settings: What changes in the school setting (e.g., policies, programs, instructional practices, physical modifications, infrastructure) lead to improvements in diet quality and PA levels? In that search we found 4 conclusions that partially aligned, 2 recommendations for multicomponent school meal or fruit and vegetable interventions with PA (2016, 2018),<sup>15,16</sup> and 2 conclusions of insufficient evidence for multicomponent interventions involving competitive foods (e.g. foods sold during school hours a la carte, or through vending machines, fundraisers, or school stores) served or sold during school and PA (both 2018).<sup>17,18</sup> All 4 CPSTF recommendations involved specific combinations of components. To allow a more flexible definition of a multicomponent intervention we included multicomponent interventions that involved > 2 components of the WSCC framework to address PA and/or nutrition outcomes.

In Phase 2, research librarians developed searches for individual articles (published 2010–2020) addressing topics for which a sufficiently relevant and recent (2017 or newer) review was not identified. All searches queried Medline (OVID), PsycInfo (OVID), CINAHL (EBSCO), Scopus, ERIC (ProQuest), Education Database, and Sociological Abstracts. Table 1 presents the Medline search queries used and search dates.

To be eligible for consideration, review articles and individual articles had to: (1) be published between 2010 and 2020; (2) be available as a full-text article in English; (3) come from a peer-reviewed publication; (4) discuss studies that took place in the United States; (5) use an appropriate study design (ie, systematic review for Phase 1; suitable for evaluating effectiveness for Phase 2); (6) describe coordinated approaches and/or multicomponent interventions; (7) describe school-based interventions (policy, program, systems change, environmental change); (8) align with a relevant research question related to improving PA and nutrition among school-aged youth; and (9) include relevant outcomes. Although many of the included studies measured body mass index (BMI) as their primary outcome, the primary outcomes for our synthesis were PA and nutrition knowledge, attitudes, perceptions, and behaviors, and environmental outcomes. We categorized BMI, sedentary behavior, and fitness as secondary outcomes. Additional details about the abstract and full-text screening process can be found in the introduction and methods article at the start of this special issue.<sup>12</sup>

We collected and managed standardized information about each included article using REDCap electronic data capture tools hosted at the Centers for Disease Control and Prevention.<sup>19,20</sup> Paired reviewers completed practice extractions in REDCap and met as a team to reach consensus. Details about the extraction can be found in the introduction and methods paper of this special issue.<sup>12</sup> Reviewer pairs met to reconcile any differences in extraction and reached 100% agreement.

Figure 1 depicts the article selection process. In Phase 1, we identified 4 anchor systematic review articles addressing multicomponent interventions within the context of obesity prevention from the original search of articles, and 39 individual qualifying articles for data extraction, 5 of which were excluded. Additionally, subject matter experts (SMEs) identified 13 qualifying articles during abstract screening that had an intervention with > 2 WSCC components which were tagged as “multicomponent interventions” from anchor reviews that were identified in the original search of articles but addressed other topics. To ensure reliability, a second reviewer scanned the full text articles to confirm if the tagged articles were indeed multicomponent. A total of 47 qualifying articles were identified and extracted. Articles tagged as multicomponent were grouped for potential inclusion in our review during the data extraction phase. SMEs reviewed these articles again during this phase to determine whether they illustrated a coordinated or multicomponent approach or were better suited for another article within this special issue because the interventions reflected 2 WSCC components (N = 21). We included 26 qualifying articles from Phase 1 that described multicomponent interventions.

We did not identify any reviews addressing interventions to improve coordinated school health infrastructure such as implementing local school wellness policies (LWPs) and/or SHACs/SHCs; therefore, we worked with research librarians to develop a tailored search in Phase 2 (Table 1). In Phase 2, we included a total of 121 articles, as described in Figure 3 of the introduction and methods paper.<sup>12</sup> Of these, 7 were coded during the initial search as having coordinated policy interventions as a main intervention strategy, and 4 were identified during data extraction as having a coordinated component. One was excluded due to redundancy with Phase 1, and another was moved to another manuscript in this special issue. We included 9 articles from Phase 2.

## RESULTS

The 35 articles described 30 unique studies (10 randomized control trials or controlled clinical trials [RCT/CCT], 20 quasi-experimental design [QED]) including 34 interventions—described in aggregate in Table 2 and individually within the Supplemental Table, including intervention components and characteristics, population demographics, and risk of bias assessments. Interventions are categorized by intervention type and strategy employed.

### Use of an Assessment Tool

Two studies (1 RCT/CCT, 1 QED) focused on use of a school health assessment tool.<sup>21,22</sup> Hoelscher and colleagues used Centers for Disease Control and Prevention’s (CDC) School Health Index (SHI) to identify priority areas for action and observed a significant improvement in PA and dietary behaviors.<sup>22</sup> Belansky et al. compared the SHI approach

to an adapted intervention mapping approach which included involvement of a full-time external facilitator and principal and found a significant increase in the number of healthy eating and PA policies developed for the adapted intervention mapping approach arm.<sup>21</sup> Belansky's article received a quality assessment rating of good, and Hoelscher's received a rating of poor.

### **Implementation of a Wellness Policy**

Seven studies (2 RCT/CCT, 5 QED) with 8 interventions focused on the creation or change and implementation of a district or school wellness policy to promote healthy eating and physical activity.<sup>23-30</sup> Five studies evaluated the impact of wellness policies on the school environment or student behavior, and 2 looked at interventions to support policy development and adoption, including partner engagement and technical assistance. All 4 interventions that measured environmental outcomes documented a significant improvement in at least 1 outcome; all 4 also documented a non-significant change in at least 1 environmental outcome.<sup>24,25,27,28</sup> One intervention measured dietary intake, reporting an overall significant increase in fruit and vegetable consumption but a significant increase in soda intake for boys and no change in soda intake for girls.<sup>30</sup> The one intervention that assessed PA outcomes and the 3 that evaluated BMI found non-significant changes.<sup>23,29,30</sup> Gollub and colleagues reported that 25 of the 27 involved districts developed comprehensive school wellness policies and adopted environmental changes.<sup>26</sup> Three articles received a quality assessment of fair,<sup>24,25,30</sup> 4 articles received a poor quality assessment rating<sup>23,26-28</sup>; 1 did not receive an overall assessment, but its noted weaknesses included lack of blinding and inappropriate data analysis.<sup>29</sup>

### **Coordinated Multicomponent Physical Activity and/or Nutrition Interventions**

Overall, 21 unique multicomponent PA and/or nutrition studies (7 RCT/CCT, 14 QED) described 24 interventions (25 articles).<sup>31-55</sup> The WSCC components addressed through these interventions included changes to the nutrition environment, PA/physical education, parent engagement, community engagement, and health education via curricular components addressing PA and/or nutrition. Nutrition intervention strategies included offering healthier options during the school day, encouraging participants to drink water instead of sugary beverages, and taste test activities. Physical education and PA changes included new equipment for recess along with cards with recess activity ideas, scheduled walking time during school hours, incentive programs in which students tracked PA, classroom PA resources/trainings, and walk to school programs. Communication interventions reinforced activities and encouraged participants to choose more nutritious foods and be more active; approaches included social media and in-house broadcast system reminders, posters, and signage. Families and parents were engaged through activities including family education programs, family nights, volunteer opportunities, tailored communications (eg, newsletters, recipe cards), and encouragement calls. Changes were introduced simultaneously in some interventions but not in others; 1 study described an incremental, layered approach implemented over 6 years.<sup>40</sup> Five articles investigated the HEALTHY study,<sup>33-37</sup> a comprehensive program that included changes to the school food environment, physical education curriculum and equipment, a social marketing campaign, and classroom-based education that incorporated behavior change activities.

Although all multicomponent studies employed health-promoting strategies in their intervention approaches, not all measured both dietary and PA behavioral outcomes. Findings were mixed within and across the studies. Among the 16 interventions that evaluated both PA and nutrition outcomes,<sup>32-39,41,44,47,49,52,54,55</sup> 8 found significant changes in the expected direction for both PA and nutrition,<sup>32-39,41,44,49,52,54</sup> 1 intervention reported a significant increase in PA but no significant change for dietary behaviors,<sup>55</sup> and 2 interventions reported a significant change for dietary behaviors but no significant PA change.<sup>53,54</sup> One article measured only dietary behaviors and reported a significant improvement,<sup>51</sup> and another measured only PA and documented a significant increase.<sup>48</sup> Overall, 11 of the 17 studies that assessed dietary behaviors and 10 of the 17 studies that assessed PA reported a significant change in at least one outcome. Lewis and colleagues did not conduct statistical tests but reported an increase in percentage of students consuming fruits and vegetables and a decrease in percentage of students achieving 60 minutes of PA per day.<sup>46</sup>

Sixteen interventions (14 studies) measured BMI outcomes with findings mixed across and within studies. Fourteen reported null findings, and of the 8 interventions that reported significant improvements in student BMI,<sup>31,34,40-43,45,53,54</sup> 4 found that outcomes varied by timepoint,<sup>42,43</sup> choice of measure,<sup>34</sup> or BMI classification.<sup>45,53</sup> One study evaluated the impact of a multicomponent intervention that used de-identified school-based BMI measurement data of an entire school district for grades K-8 to analyze longitudinal trends in school prevalence of overweight and obesity and found no effect,<sup>50</sup> in contrast with a prior evaluation of this intervention that focused on consented participants in grades 5-7 and reported a significantly lower average BMI score in students receiving the intervention.<sup>34</sup>

## DISCUSSION

Many interventions included in this systematic review demonstrated some evidence of effectiveness at improving school-level policy and environmental changes as well as student behaviors and outcomes, and many were implemented with diverse populations. The variation in intervention strategies affords school administrators, teachers, and other constituents the flexibility to choose approaches that are best for their school. Coordination of policies and practices across WSCC components to support student PA and nutrition quality can be challenging but is important to support policy implementation; establish active school and healthy nutrition environments; and ensure consistent messaging about PA and nutrition.<sup>6,7,11</sup> To help prioritize which interventions to put into place, practitioners and researchers alike need quality assessment tools that can be used to review existing policies and practices, guide action planning, and evaluate the adoption of coordinated approaches in schools.

Of the 2 studies examining an assessment tool, 1 found an improvement in PA and in nutrition intake and eating behaviors,<sup>22</sup> and the other found increases in the number of nutrition and PA policies developed.<sup>21</sup> Tools such as CDC's SHI and Wellness Policy in Action Tool (WPAT) can be used to help districts and schools assess the presence and strength of school health policies and practices, identify gaps, and prioritize steps to improve them. The CDC's SHI enables schools to assess the presence and implementation level of

policies and practices for all WSCC components. Many SHACs/SHCs and coordinators have used SHI results to establish, strengthen, and adopt policies, including those specific to PA and nutrition.<sup>56-59</sup> Results from 1 study suggest that having monthly meetings, a dedicated coordinator, and principal involvement may lead to a greater policy adoption than a less intensive assessment process.<sup>21</sup> Using assessments such as these can create connections across WSCC components and assist districts and schools with prioritization of school health needs.<sup>56,58,60,61</sup>

Implementation of a district or school wellness policy can affect the healthy eating and PA environment, but it is not clear if it can affect student behavior. Only 2 of the 7 policy implementation studies measured student behavior outcomes, but 1 found a significant increase in fruit and vegetable consumption for girls.<sup>30</sup> More research is needed, particularly with a longer follow-up time, to understand the relationship between wellness policy change and student behaviors. Additionally, understanding the strength of the policy language and the fidelity of implementation is important when considering the effect of policy change on individual behavior. Research documenting the impact of wellness policies is mixed,<sup>65</sup> as a majority contain weak and vague language.<sup>62-65</sup> Policies written with strong and clear language are more likely to be fully implemented than if they are written with weak and vague language.<sup>66</sup> Previous research demonstrates legislative mandates, such as the Healthy, Hunger-Free Kids Act, led to more comprehensive school health policies.<sup>67,68</sup> Four of the 7 studies in this group had high risk of bias, owing to weaknesses including data collection tools shown to be neither valid nor reliable, blinding not described, and controlling for less than 60% of relevant confounders.

Of all categories of coordinated approaches documented in this review, those targeting both PA and nutrition were most common. CPSTF recommends school meal or fruit and vegetable snack interventions combined with PA for grades K-6,<sup>15</sup> but found mixed results among interventions addressing competitive foods and PA components with or without school meal or fruit or vegetable snack interventions.<sup>69-71</sup> Among the studies that assessed PA and/or dietary outcomes, most had mixed results with some positive findings for PA and dietary outcomes. Folta et al. reported on the PA and nutrition impacts of Shape Up Somerville and found several changes in the expected direction—reduced sugar-sweetened beverage consumption and screen time, increased PA and organized sports participation—but no significant effect on fruit and vegetable consumption.<sup>39</sup> Other evaluations, outside the scope of this review, have found Shape up Somerville to be an effective childhood obesity prevention intervention with a positive return on investment.<sup>72,73</sup>

Several interventions successfully leveraged community assets, such as community food banks, female community health workers (promotoras), and local restaurants in their program design.<sup>32,39,51,54</sup> Fifteen total interventions used community engagement in their intervention approach, and 3 of the 15 compared the addition of community engagement components to existing interventions using approaches such as community workshops, 1-on-1 coaching from health sciences graduate students, and community park updates.<sup>32,41,54</sup> Two interventions within the same article engaged nursing school students in delivering health coaching as part of an elementary school intervention that included parent engagement in addition to classroom curricular components.<sup>54</sup> The results varied

by implementation model; children receiving the intervention at 1 school received highly variable instruction whereas intervention students at the other had weekly onsite sessions with student nurses, which was associated with greater improvements in PA than curricular content (control group) alone.<sup>54</sup> Higher levels of engagement with behavior change techniques such as motivational interviewing, accountability measures like self-monitoring, peer recruitment, or public commitments was associated with individual behavior change within 3 multicomponent interventions.<sup>48,54</sup> Investigators found more positive dietary and PA behaviors in students experiencing the additional community engagement than their counterparts who did not.<sup>41,54</sup> Another paper in this special issue examines approaches to engage the community in school-based efforts to improve student PA and nutrition outcomes.<sup>74</sup>

It is unclear from our synthesis which multicomponent intervention approaches are most effective; many studies reported mixed results and featured a high risk of bias. This is similar to previous CPSTF conclusions of insufficient evidence for multicomponent school-based intervention approaches that combine dietary interventions with PA interventions, due to mixed results.<sup>15,17</sup> We did not search for multicomponent obesity prevention interventions in Phase 2, given our identification of recent and relevant reviews on the topic (Phase 1) and our focus on PA and nutrition outcomes. Nevertheless, it is worth noting that an update of a Cochrane review of obesity prevention RCTs among school-aged children (6-18 years old) found moderate certainty evidence that school-based interventions can lead to small improvements in BMI with low likelihood of causing harm.<sup>75</sup>

This review uncovered some gaps in the literature. As has been noted in existing Cochrane and other reviews on childhood obesity prevention, there is an evidence gap for multicomponent PA and nutrition interventions for grades 7–12.<sup>76,77</sup> Further research is needed for these grade levels, as interventions that work for elementary school students may not be readily transferable to adolescents. An in-progress Cochrane review may help to narrow this gap by examining combined and separate dietary and PA interventions to prevent obesity in children aged 12–18 years and evaluating the comparative effectiveness of these approaches.<sup>78</sup> Importantly, the review protocol used by the authors of this Cochrane Review explicitly considers intervention implications for health equity.<sup>78</sup>

## Limitations

The introduction and methods article notes some limitations of this systematic review's overall methodology, including the potential for social desirability bias.<sup>12</sup> We note some additional limitations specific to this systematic review. The included studies feature multiple components, often implemented in tandem, and the analyses largely preclude our ability to evaluate how discrete elements contribute to the observed outcomes. It is worth noting that many school wellness interventions have multiple components, so the included interventions are representative of what a school or district may carry out. We did not conduct a specific search for coordinated approach, and we could have missed some review articles; however, SMEs verified that highly cited/relevant reviews were included (e.g., Cochrane, Wang/AHRQ). Most studies received a quality assessment rating of “poor.” Studies with more rigorous study designs (RCT/CCT) and higher-quality execution are



needed to evaluate the use of an assessment tool and implementation of local wellness policies. Finally, several studies did not clarify where the intervention occurred and to whom it was delivered. This limits our understanding of how transferrable these approaches may be to different settings and populations.

## IMPLICATIONS FOR SCHOOL HEALTH POLICY, PRACTICE, AND EQUITY

Districts and schools may have more direct influence over policy and environmental change strategies (e.g., nutrition policies, implementing wellness councils) than individual student health behaviors (e.g., PA, dietary intake). Moreover, environmental changes may eventually lead to healthy behavior changes. Assessment tools are one way that schools and districts can review, consider, and prioritize policy changes. We found that using assessment tools was associated with favorable policy changes and some evidence of environmental changes, which is consistent with previous literature documenting outcomes of using the SHI.<sup>57</sup> The majority of US school systems have written LWPs in place, but the strength of these policies varies, and more work focused on implementation and evaluation is needed.<sup>79-82</sup> School districts that participate in a US Department of Agriculture child nutrition program (e.g., National School Lunch Program) are required to have an LWP, which must include, at a minimum, goals for nutrition education and promotion, goals for PA, and nutrition standards for all foods sold and served to students.<sup>83,84</sup> The LWP presents districts with a roadmap for improving the overall nutrition and PA environment in schools. Communication about policies through the SHAC/SHC, coordinator, and school administrators helps ensure consistency in how practices are implemented across the school. Nearly 81% of secondary schools reported recently reviewing their written wellness policy; however, only 49.4% have developed an action plan to meet these goals.<sup>85</sup> The WPAT can be used to assess how well schools are aligning their school nutrition and PA practices with their district's local school wellness policy, which is part of the required triennial assessment for LWPs.

A community-based participatory approach can be helpful in authentically engaging partners, establishing mutual trust, and encouraging community involvement.<sup>86,87</sup> This strategy may encourage greater participation as students, parents, teachers, and others invested in school health are involved in every step of the process. Researchers can work with schools and students to frame community school health questions, implement studies, and provide results. Health practitioners can work directly with schools and health departments to promote healthy eating and PA behaviors. Involving parents in school health programming can lead to greater community buy-in.

## CONCLUSIONS

Most coordinated and multicomponent approaches resulted in positive or null findings, indicating that implementation of programs and/or policies to promote healthier eating and PA practices do not appear to hinder environmental or behavioral outcomes. For behaviors known to decline around adolescence such as PA,<sup>88</sup> interventions that showed that individual behaviors remained steady or improved can be viewed as a success as secular trends indicate significant declines in the prevalence of youth meeting PA guidelines.<sup>89</sup>

District and school leaders and partners can use assessment tools (SHI, WPAT, etc.) to identify school health needs and improve the implementation of wellness policies.<sup>88,89</sup> Implementing district and school wellness policies has promising impacts on the nutrition and PA environment, but more research is needed to assess impacts on student behaviors. Districts and schools can consider wording, as policies written with strong and clear language are predictive of higher implementation than those with weak language.<sup>66</sup> Districts participating in federal child nutrition programs are required to assess their school wellness policies triennially; districts and schools can use the WPAT to meet this requirement and to guide their action planning.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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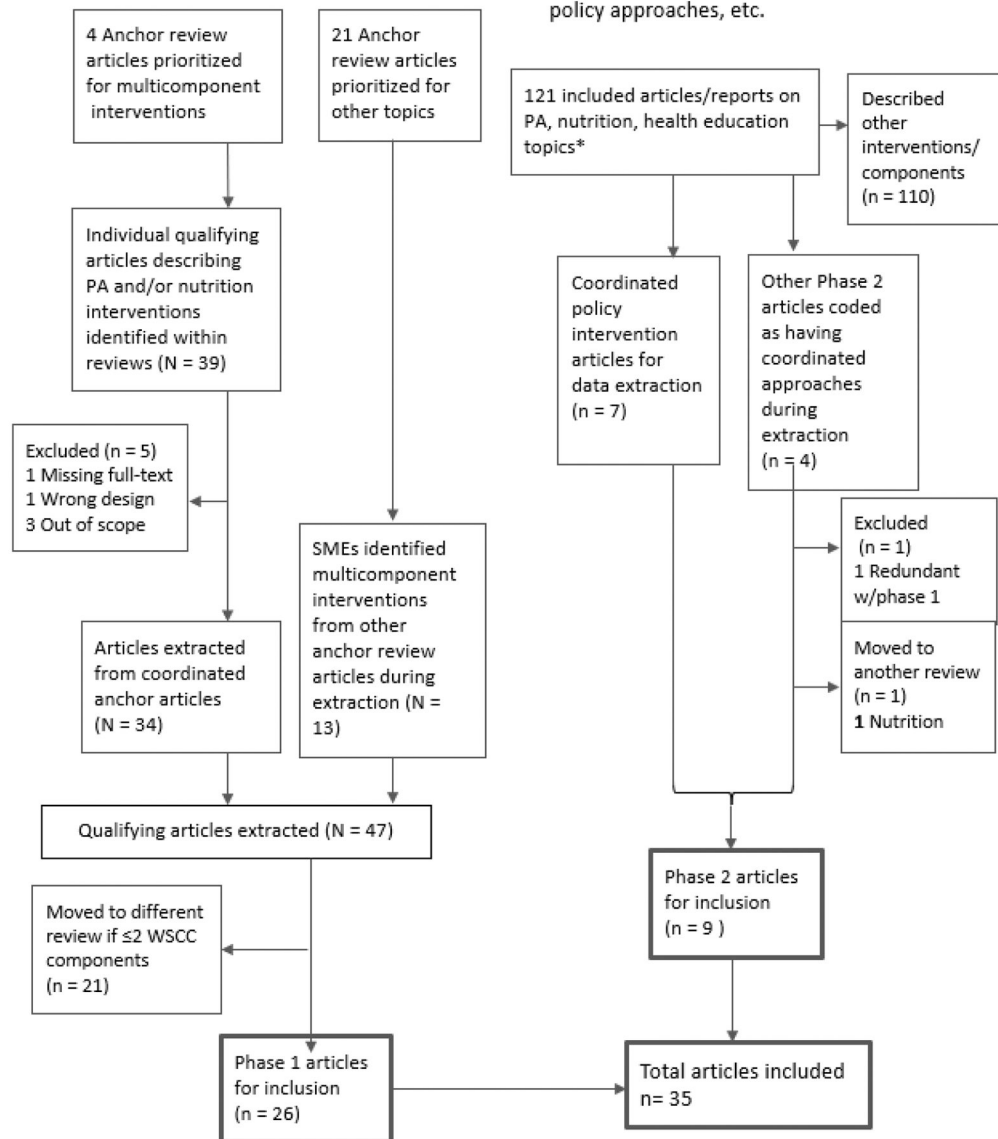
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**Phase 1: Individual studies identified from systematic reviews\***

**Phase 2: Individual articles about local wellness policies, school health councils, coordinated policy approaches, etc.**



**Figure 1:** Identifying articles to include from systematic reviews (Phase 1) and individual searches (Phase 2)

Abbreviations: PA, physical activity; SME, subject matter expert.

\*See introduction and methods paper at the start of this special issue for full project flow chart.<sup>12</sup>

\*\*Out of scope: Wrong outcomes, process data only, single point in time cross-sectional, wrong date, or wrong topic. For example, in Phase 2 multicomponent obesity prevention interventions were considered out of scope.



**Table 1:**

Search strategy used to identify peer-reviewed publications about coordinated school health approaches

Topic	Medline Strategy <sup>a</sup>
Phase 1: N/A	None. For this cross-cutting topic, the research librarian recommended we review the results of the other searches developed in Phase 1 for PA/NUTR topics
Phase 2: Coordinated approach to supporting wellness, PA, nutrition  3/10/2020	(school* ADJ5 wellness ADJ5 committee*) OR (school* ADJ5 wellness ADJ5 coordinat*) OR (school* ADJ5 wellness ADJ5 mentor*) OR (school* ADJ5 wellness ADJ5 collaborat*) OR (school* ADJ5 wellness ADJ5 council*) OR (school* ADJ5 wellness ADJ5 team*) OR (parent* ADJ5 wellness ADJ5 school*) OR (communit* ADJ5 involvement ADJ5 school*) OR (PTA* ADJ5 wellness) OR (parent teacher association* ADJ5 wellness) OR (district* ADJ5 wellness ADJ5 polic*) OR (wellness ADJ5 champion* ADJ5 school*) OR (district support AND wellness AND school*) OR ((obesity OR weight control OR nutrition OR physical activit* OR wellness) ADJ5 (team* OR collaborat* OR coordinat* OR committee* OR council* OR association* OR communit* OR district* OR leader* OR mentor*) ADJ5 school*) AND Physical activit* OR physical education OR exercis* OR running OR walking OR biking OR body mass index OR BMI OR weight OR obesity OR diet* OR nutrition OR lunch* OR breakfast* OR meal* OR snack* AND Journal article.pt OR review.pt Limit English; 2010-

Abbreviations: NUTR, nutrition; PA, physical activity.

<sup>a</sup>We ran the Medline search strategy first. It yielded the largest number of independent citations; we then modified it for subsequent database queries in the other databases: PsycInfo (OVID), CINAHL (EBSCO), Scopus, ERIC (ProQuest), Education Database, and Sociological Abstracts.

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**Table 2:** Aggregated Description of Coordinated Study Characteristics and Outcomes by Intervention Type

Intervention <sup>b</sup> N = 34	Articles N = 35	Study design <sup>c</sup> N = 30	Study Participant Characteristics					Intervention Outcomes (significant) <sup>d</sup>			
			School Level	Locale	Race/Ethnicity <sup>d</sup>	PA and Nutrition KAP <sup>e</sup>	Environ-mental Outcomes <sup>e</sup>	Dietary Outcomes <sup>e</sup>	PA Outcomes <sup>e</sup>	BMI <i>e f</i>	
<b>Use of an assessment tool</b> (N = 2)	(N = 2)	RCT/ CCT: 1 QED: 1	Elementary (n = 0) Middle (n = 0) High (n = 0) Multiple (n = 1) Not reported (n = 1)	Urban (n = 0) Rural (n = 1) Suburban (n = 0) Not reported (n = 1)	Majority White (n = 1) Majority Black (n = 0) Majority Hispanic or Latino (n = 1) Majority racial and ethnic minority groups (n = 0) Not reported (n = 0)	Total (n = 0) + : 0 = : 0 - : 0	Total (n = 1) + : 1 = : 0 - : 0	Total (n = 1) + : 1 = : 0 - : 0	Total (n = 1) + : 1 = : 0 - : 0	Total (n = 0) + : 0 = : 0 - : 0	
<b>Implementation of a wellness policy</b> (N = 8)	(N = 8)	RCT/ CCT: 2 QED: 5	Elementary (n = 1) Middle (n = 0) High (n = 2) Multiple (n = 4) Not reported (n = 0)	Urban (n = 1) Rural (n = 2) Suburban (n = 0) Not reported (n = 2) Nationally representative (n = 1) State representative (n = 1)	Majority White (n = 1) Majority Black (n = 0) Majority Hispanic or Latino (n = 0) Majority racial and ethnic minority groups (n = 2) Not reported (n = 4)	Total (n = 0) + : 0 = : 0 - : 0	Total (n = 4) + : 4 = : 4 - : 0	Total (n = 1) + : 1 = : 1 - : 1	Total (n = 1) + : 0 = : 1 - : 0	Total (n = 3) + : 0 = : 3 - : 0	
<b>Coordinated multicomponent physical activity and nutrition</b> (N = 24)	(N = 21)	RCT/ CCT: 7 QED: 14	Elementary (n = 12) Middle (n = 2) High (n = 0) Multiple (n = 5) Not reported (n = 2)	Urban (n = 7) Rural (n = 4) Suburban (n = 0) Not reported (n = 10)	Majority White (n = 5) Majority Black (n = 4) Majority Hispanic or Latino (n = 6) Majority racial and ethnic minority groups (n = 4) Not reported (n = 2)	Total (n = 4) + : 2 = : 3 - : 0	Total (n = 1) + : 0 = : 1 - : 0	Total (n = 17) + : 11 = : 11 - : 0	Total (n = 17) + : 10 = : 11 - : 0	Total (n = 16) + : 8 = : 14 - : 2	

Abbreviations: BMI, body mass index; KAP, knowledge, attitudes, and perceptions; N/A, not applicable; PA, physical activity; QED, quasi-experimental design; RCT/CCT, randomized control trial or controlled clinical trial.

<sup>a</sup> Examples of outcomes that support hypothesis and would be coded (+): increased nutrition knowledge, increased physical activity, decreased sugar-sweetened beverage intake, and decreased BMI.

<sup>b</sup> Interventions refers to the set of practices, policies, or approaches tested within a study. If a research study included multiple intervention arms, each arm counted as a separate intervention for a given outcome in this table.

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<sup>e</sup> QED could be 2-group cohort, including regression discontinuity; 1-group cohort; interrupted time series; repeat cross-sectional. Studies refers to interventions within the same population/sample, following the same protocol or trial registration. Multiple citations may reference the same study. Tucker (2010) is a single citation that describes 2 different studies.

<sup>d</sup> Majority defined as >50% of participants/study population.

<sup>e</sup> Totals for measured outcomes may exceed the number of interventions evaluating a given outcome because a single intervention may be counted more than once if it reports mixed findings; for example, an intervention that reported increased consumption of fruits but not vegetables would count as both a (+) and (=) for dietary intake.

<sup>f</sup> Studies included in this review reported on BMI scores, BMI percentiles, and prevalence and incidence of those with overweight and obesity.