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THEORETICAL ARTICLE

The Future of School Health Education in the United States: An Ontology

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ABSTRACT

BACKGROUND: As summarized in this article, the widespread implementation of modern school health education (SHE) could become one of the most effective means available to improve the well-being of people in the United States and in other nations. However, the development and evolution of SHE largely remains unorganized, underdeveloped, and neglected by health and education agencies, policymakers, and the public.

METHODS: Essential to the development of any scientific discipline, scientists today use the word ontology to refer to efforts to organize knowledge in particular domains. A useful working definition of a scientific ontology is an explicit, formal specification of a shared conceptualization—a systematic set of shared terms and an explication of their interrelationships. Nine interdependent questions are outlined to help guide the development of an initial, broad, and actionable scientific ontology for SHE.

RESULTS: Whether and how we respond to these questions arguably will determine the future of SHE research, policy, practice, and equity in the United States.

CONCLUSIONS: An initial ontology might help conceptualize, inform, and facilitate more systematic and strategic local, state, national, and international deliberations and actions to improve SHE.

Keywords: systems analysis and systems change; college and university activities; health educators; professional preparation of school health personnel; school health instruction; health literacy.

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''Nothing is so practical as a good theory.''—Kurt Lewin[1](p18)

''The best way to understand something is to try to change it.''—Kurt Lewin[1](p18)

Human societies have learned much that individuals could use to protect, maintain, and improve their health; and we rapidly will learn much more in years to come.[2,3] But we have not yet learned how to effectively share these learnings within our societies. As summarized in the following article, the widespread implementation of modern school health education (SHE) could become one of the most effective means available to improve the well-being of people in the United States and in other nations. However, the development and evolution of SHE remain largely unorganized, underdeveloped, and neglected by health and education agencies, policymakers, and the public.[4-10]

PRESENTATION OF THE THEORY

The purpose of this article is to briefly outline an initial, broad, and actionable scientific ontology for

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SHE. In 2022, the National Academy of Sciences, Engineering, and Medicine suggested that essential to the development of any scientific discipline, ''*Scientists today use the word ontology to refer to efforts to organize knowledge in particular domains. Although there is no universal definition of a scientific ontology, a valuable working definition is an explicit, formal specification of a shared conceptualization—a systematic set of shared terms and an explication of their interrelationships (Gruber, 1995).*''[11(pp11-12)] To guide the development of an actionable ontology, 9 essential and interdependent questions briefly are outlined. The answers to these questions arguably will determine the future of SHE research, policy, practice, and equity in the United States. Given space limitations, this article focuses most on the first foundational question and less on each of the other 8 questions that briefly are outlined. A thorough analysis of all 9 questions would render this overview article too long. These 9 questions include: Why is SHE vital to the nation? What is SHE? What should be taught? Who should teach it? What should be the role of colleges and universities? How should we measure its effectiveness and implementation? What are major challenges to improving it? Which organizations could do most to improve it? What should we do to most improve it?

Question 1: Why Is SHE Vital to the Nation?

How do we explain to educators, health workers, policymakers, parents, students, and the public why SHE is vital to the nation? Each of these stakeholders has different objectives and follows different media. One way to address their common interests might be to recognize that because our nation's 120,000 schools materially influence both the education and health of 50 million students every school day, they also substantially determine the economic productivity and future well-being of our people.[12]

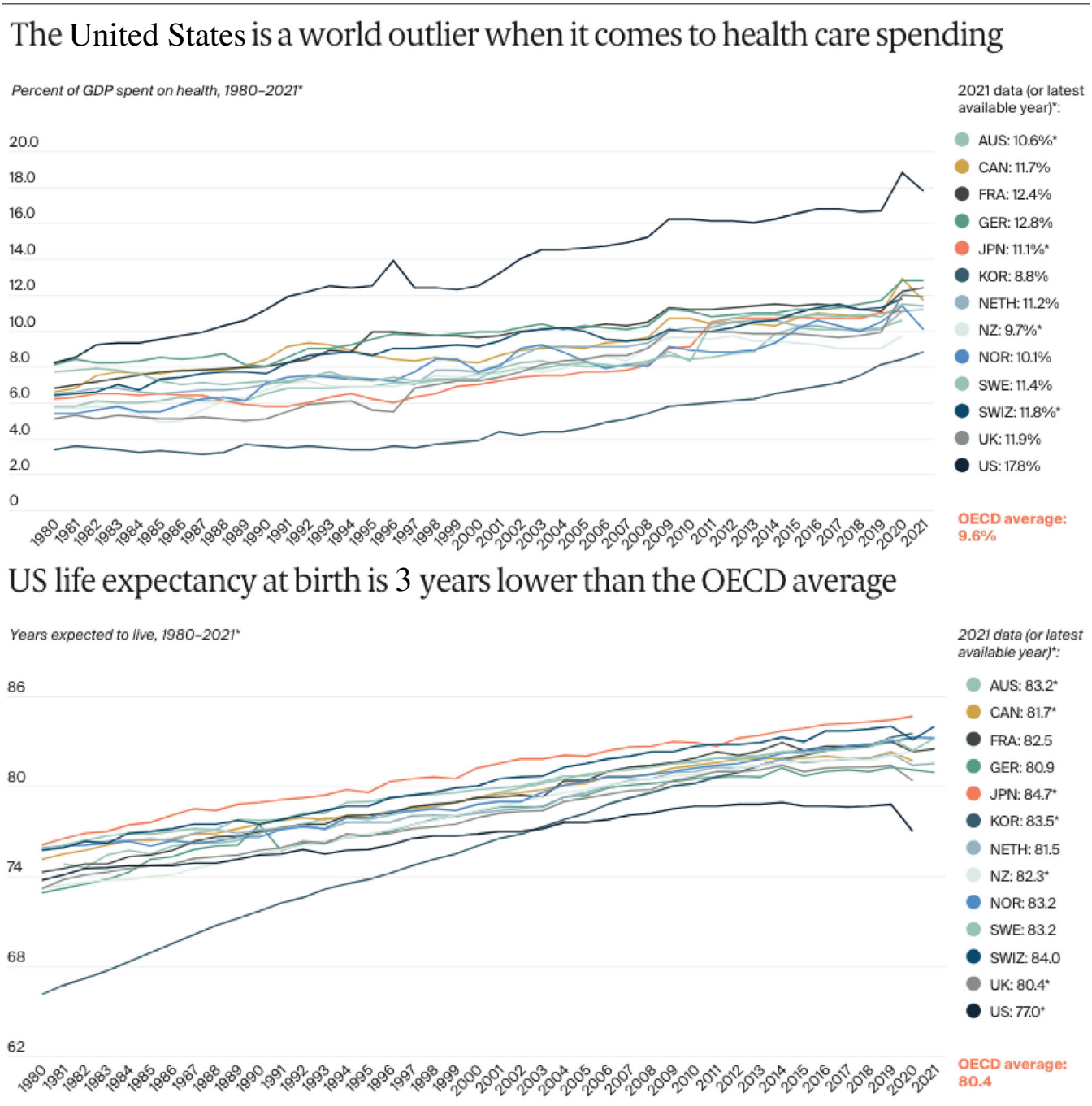
Illustratively, the United Nations (UN) Human Development Index (HDI) suggests the well-being of any nation can be reflected by 3 interdependent indicators.[13] First, *having a long and healthy life* is measured by *average life expectancy at birth*. The UN estimated that the average life expectancy in the United States in 2021 was 77.2 years, which was less than in 43 other nations. Second, *being knowledgeable* is measured by (a) *mean years of schooling for adults ≥ 25 years* and (b) *expected years of schooling for children of school entering age*. The average US adult achieved 13.7 years of schooling, less than in 4 other nations; and US children on average were expected to achieve 16.3 years of schooling, less than in 28 other nations. Third, having *a decent standard of living* is measured by *gross national income per capita*, which at $64,765 in the United States, was less than in 5 other nations. As a statistical composite of these indicators, the US HDI in 2021 was .921, which was lower than 20 other nations.[14] HDI scores within the United States in 2021 varied markedly by state, ranging from a high of .949 in Massachusetts to a low of .846 in Mississippi.[15]

As depicted in Figure 1 by the top line in the upper graph, during the past 40 years the United States increasingly has been spending much more of its gross domestic product (GDP) on health care than have similar Organization for Economic Cooperation and Development (OECD) nations.[16] By 2021, the United States had spent 17.8% of its GDP on health; while these other high-income nations spent, on average, 9.6% of their respective GDPs. Further, by 2031 the United States is expected to spend fully 19.6% of its GDP on health.[17] However, as depicted in Figure 1 by the bottom line on the lower graph, during the past 40 years the United States increasingly has lost pace with increases in life expectancy achieved by these other nations. By 2021, life expectancy in the United States was more than 3 years lower than in the average OECD nation.

Final 2019 and 2021 US mortality reports suggest that between 2019 and 2021 US life expectancy declined by 2.4 years—from 78.8 years in 2019, to 77.0 years in 2020, to 76.4 years in 2021—largely because of increases in mortality due to COVID-19, unintentional injuries, chronic liver disease and cirrhosis, suicide, and homicide.[18,19] During these years, US life expectancy declined inequitably by 6.6 years among American Indians and Alaskan Natives, 4.2 years among Hispanics, 4.0 years among Blacks, 2.4 years among whites, and 2.1 years among Asians.[20] Further, in 2021 the US maternal mortality rate of 32.9 deaths/100,000 live births was more than 10 times higher than the estimated rates in other high-income countries like Australia, Israel, and Spain; the rate among US black women was 69.9 deaths/100,000.[21] And in 2021 the average life expectancy at age 25 among Americans who did not have a 4-year college degree was roughly 8.5 years shorter than those who did have such a degree.[22,23] By far, the leading causes of US deaths in 2021 among all age groups combined included heart diseases (at 173.8 deaths/100,000); cancer (146.6); COVID-19 (104.1); and unintentional injuries, including drug overdose deaths (64.7).[19]

During the 1990s, death rates among working-age adults ages 25-64 began to increase from drug and alcohol causes, suicide, and cardiometabolic diseases.[24] Ominously, between 2013 and 2016, the death rate among 10- to-19-year-olds from all causes increased 12%. Injuries caused 70% of these deaths. The death rate from all injuries combined increased 18%, from unintentional injuries increased 13%, from suicide increased 56%, and from homicide increased 27%. By 2018, compared with 16 other

Figure 1. **Health Care Spending and Life Expectancy among High-Income Nations, 1980-2021**[16]



high-income peer nations the United States had the highest age-specific mortality rate for every age group under age 25.[25] Between 2019 and 2020, the death rate for children and adolescents ages 1-19 again increased by 10.7%, and increased by another 8.3% between 2020 and 2021.[26] During the past decade, childhood emotional, behavioral, and neurological disabilities have increased and have become more prevalent than physical impairments.[27] The COVID pandemic further exacerbated poor mental health among young people: mental health emergency room visits surged among 5 to 17-year-olds,[28] 44.2% of 9th to 12th grade students experienced persistent feelings of sadness or hopelessness, 19.9% seriously had considered attempting suicide, and 66% found it more difficult to complete their schoolwork.[29,30] In addition, both pervasive use of social media and an increase in loneliness among children and adolescents

may affect their mental health in ways we do not yet understand.[31,32] Poor mental health among young people is associated with impaired cognition, academic performance, quality of life, interpersonal functioning, employment, and physical health; can increase risks for experiencing later psychopathology; and can disrupt financial support and stability for affected individuals and families.[33] As one example of declining educational performance, in 2022 our nation's 13-year-old students on average scored 7 points lower in reading, and 14 points lower in mathematics, than their same-age peers a decade earlier.[34] In response to worsening trends, national pediatric organizations[35] and the US Surgeon General[36] declared a national emergency to address the mental health of our youth.

Many analyses[37-41] have suggested the root causes of excessive illnesses, injuries, deaths, and economic costs in the United States include: (1) education and income inequities, (2) inequitable preventive and health care services, (3) unhealthy physical and social environments, and (4) unhealthy behaviors. Table 1 lists 6 categories of unhealthy behaviors often established during youth that contribute to the leading causes of morbidity and mortality in our nation.[42] The estimated economic costs of racial and ethnic health inequities in 2018 ranged from $421 to 451 billion and the estimated costs of education-related health inequities ranged from $940 to 978 billion.[43,44] As reflected by the ''health in all policies approach,''[45] these 4 root causes of poor health largely are determined by policies, including health, education, economic, and environmental policies which vary among states.[37-41,46-48] For example, in the education sector, SHE policies can predispose students to establish lifelong healthy dietary and physical activity behaviors that will influence their risks for heart disease and cancer as adults. But school food service policies and school physical activity policies will determine whether young people are enabled and reinforced to actually engage in these behaviors every school day.[49,50]

Table 1. **Six Categories of Risk Behaviors, with Examples, among US High School Students, 2021**[42]

1. Behaviors that result in unintentional injuries and violence: 10% attempted suicide at least once during past 12 months
2. Alcohol and other drug use: 23% currently drank alcohol
3. Sexual behaviors that result in pregnancies and STDs: 21% were currently sexually active
4. Tobacco use: 18% currently used electronic vapor products
5. Unhealthy dietary behaviors: 15% drank a can, bottle or glass of soda or pop one or more times/day
6. Inadequate physical activity: 76% spent 3 or more hours/day on screen time (not counting doing schoolwork)

Relevant to Categories 5 and 6 above: 16% were overweight, another 16% had obesity

Health, education, and economic productivity are interdependent.[51-53] Research confirms that children learn better if they are not hungry, anxious, depressed, abusing alcohol, pregnant, sick, needing medication, or consequently dropping out. Conversely, research also confirms that adults with less education are more likely to develop unhealthy lifestyles, have less healthy children, generate more medical care costs, be less productive at work, earn less, live sicker, and die younger.[12]

Importantly, recent evidence also confirms that well-designed, multicomponent school health programs could do much to improve both health outcomes and education outcomes—including cognitive abilities, academic behaviors, and academic achievement.[12,54-58] In 2015, the US Centers for Disease Control and Prevention (CDC) and ASCD operationally characterized such multicomponent programs with the Whole School, Whole Community, Whole Child (WSCC) Framework that includes the 10 components listed on the left in Table 2.[59-61] In 2021, WHO and UNESCO operationally characterized multidimensional school health programs with the Health Promoting Schools (HPS) Framework that includes the 8 standards listed in Table 2 on the right.[62] As indicated by WSCC Component #1 and HPS Standard #5, the SHE curriculum is an essential part of the multicomponent school health program. These components and standards can help chart the scientific discipline, profession, and practice of school health.[63] And this SHE component/standard could provide an essential means by which nations could enable their people to make increasingly complex decisions about behaviors, services, and policies that fundamentally will determine their individual and collective health, education, and economic productivity.

Question 2: What Is SHE?

SHE may be described as that component of the multicomponent school health program that is the ''process'' for teaching health. It can be implemented through *categorical SHE* about a specific topic—such as education about drugs, sex, HIV, nutrition, climate change, or social and emotional learning. Those who advocate for education about categorical topics often compete with each other for scarce curriculum time. Many believe SHE instead should be implemented—like education about language, science, and mathematics—through a more organized approach called *comprehensive SHE* that purposefully integrates education about multiple important topics at appropriate ages. Comprehensive SHE has continued to evolve over time and might be described as: part of the multicomponent school health program; that incorporates multiple priority categorical health topics; into a planned, sequential curriculum; taught

Table 2. **Modern, Multicomponent School Health Program Frameworks—WSCC[59] and HPS[62]**

Whole School, Whole Community, Whole Child Framework (WSCC), CDC/ASCD, 2015	Health Promoting Schools Framework (HPS), WHO/UNESCO, 2021
1. **Health education**	1. Government policies and resources
2. Physical education and physical activity	2. School policies and resources
3. Nutrition environment and services	3. School governance and leadership
4. Health services	4. School and community partnerships
5. Counseling, psychological, and social services	5. **School curriculum**
6. Social and emotional climate	6. School social-emotional environment
7. Physical environment	7. School physical environment
8. Employee wellness	8. School health services
9. Family engagement	
10. Community involvement	

Note: Bold text indicated by WSCC Component #1 and HPS Standard #5, the SHE curriculum is an essential part of the multicomponent school health program.

from pre-K through grade 12; by teachers specifically trained; to help students progressively acquire the essential cognitive, emotional, social, and physical health literacy skills they need to make and implement health-related decisions; throughout their lifetimes; about critical health behaviors, services, and policies; that will determine their own health, the health of families for which they will become responsible, and the health of local, national, and global communities within which they and their children will live.[64-68]

Health literacy, in contrast, may be described as an ''outcome'' of SHE which reflects the extent to which students consequently have developed the essential skills they need to make good decisions at appropriate ages about critical behaviors, services, and policies that will affect their health. Critical health behaviors also are important SHE ''outcomes.''[49,66] Some have called for rebranding SHE as ''education for health literacy.''[69,70] The National Health Education Standards list important health literacy skills for students to develop by the end of Grade 2, 5, 8, and 12, respectively.[71,72]

National reports published in 1997,[73] 2004,[74] and 2010[75] called for US schools to improve health education and health literacy for K-12 students. In 2015, the US Congress passed the *Every Student Succeeds Act*[76] which designated that ''health''—along with no less than 17 other subjects—*could* be part of a well-rounded education. In 2020, Healthy People 2030 (HP 2030) called for the nation to increase the proportion of secondary schools that require students to take at least 2 health education courses between grades 6 and 12.[77] Indeed, HP 2030 made improving health literacy a central focus for the nation and defined 2 types of health literacy: *personal health literacy* as the degree to which individuals have the ability to make health-related decisions and actions for themselves and others; and *organizational health literacy* as the degree to which organizations enable individuals to improve personal health literacy.[78,79] But HP 2030 includes neither an objective for students to increase *personal health literacy*, nor an *organizational health literacy* objective for schools to help students increase personal health literacy

Numerous state, district, and local school policies also address SHE.[80-84] Illustratively, the National Association of State Boards of Education maintains an ongoing State Policy Database on School Health that is searchable by state and by each of the 10 WSCC components, including health education.[80] One analysis of the 2017-2018 database,[81] for example, found that 25 states had policies that addressed the National Health Education Standards[71,72] and 15 states had policies that addressed professional development for health education. The extent to which schools comply with various component policies is not clear.[85]

Question 3: What Should Be Taught?

Some nations develop national curricula; but in the United States, final decisions about what should be taught about any subject rest with respective state and local education agencies. What might be most important for schools to teach about health; why; and how do we decide at a national level what state and local education agencies might consider? National Health Education Standards[71,72] iteratively published in 1995, 2007, and 2022 invaluably have enabled education agencies to focus on helping students develop the health literacy skills they will need largely to reduce those 6 categories of *behaviors* listed in Table 1[42] that contribute to the leading causes of morbidity and mortality in the United States. But there has been little organized effort to help students develop the health literacy skills they equally will need as citizens in a democracy to collectively make decisions about *policies* that profoundly will influence their own health and the health of the communities, nation, and world in which they will live.[46-50,86-90] Such policies determine, as examples, social[91-93] and commercial[94,95] determinants of health, health inequities,[43,44,96] healing effects of social connections and community,[32] environmental health,[97] climate change,[98-101] emerging and zoonotic infectious diseases,[102] vaccination rates,[103] and antimicrobial resistance.[104]

Question 4: Who Should Teach It?

To effectively teach today's complex *Comprehensive School Health Education Program*, as outlined above, requires considerable professional preparation and time for teachers to effectively develop and implement the program[105-109] and to address National Health Education Standards.[71,72] To effectively teach

today's equally complex *Comprehensive School Physical Activity Program*[110] also requires substantial professional preparation and time for teachers to: provide physical activity before, during, and after school; teach physical education (PE); engage school staff, families, and communities; and to address National Physical Education Standards.[111] School physical educators often also manage and coach school sports teams and work to achieve National Standards for Sports Coaches.[112] Most agree the elementary school teacher might serve to provide both PE and health education for elementary students. However, many believe secondary students would be better served by teachers who specifically are prepared and have the time needed to teach either PE or health education, not both.[113,114] However, school administrators are inclined to hire teachers to effectively teach both, to achieve both PE and health education standards, and to coach sports teams and achieve sports coaching standards—an enormously demanding set of expectations. One study[115] conducted in 2019-2020 found 31 states required secondary school teachers to be certified in health education (HE) only, 15 states and DC required certification in combined health and physical education (HPE), and 4 states enabled those certified in PE only to teach health education. Related, another study[116] conducted in 2020 found the proportion of lead SHE teachers employed by the nation's secondary schools were prepared by university programs that focused on a wide range of disciplines: 47% focused on combined HPE; 18% focused on education, nursing, counseling, or other discipline; 14% on PE only; 12% on kinesiology or other science; and 10% on HE only. School health educators, school physical educators, and other education leaders—with their professional associations—should work collaboratively to address this dilemma.

Question 5: What Should Be the Role of Colleges and Universities?

During roughly the last quarter of the 20th century, many academic departments in colleges and universities offered bachelor's and master's degrees in HPE combined, and many offered bachelor's and master's degrees in HE only. Some departments also offered a doctoral degree that focused on HE only. Academic departments that offered such undergraduate and graduate degrees often were located within colleges of education. With the rapid evolution of public health training during the first quarter of the 21st Century, many of these academic departments migrated from colleges of education to colleges of health science and many lost their close connections with their college of education teacher training programs. More importantly, the recent decline in college enrollment[117]—especially in colleges of education[118]—coupled with the inclination of school administrators to hire teachers to teach both PE and health education and to coach sports teams, has led to a great reduction in the number of academic departments that are able to focus only on SHE training, research, and service. Consequently, few academic departments now are able to focus on providing doctoral training in SHE and the multicomponent school health program.

Table 3. **Important Actions Universities Could Take to Improve SHE**

- **Recruit, develop, and support well-trained school health education faculty**
- Provide high-quality School Health Educator Preparation Programs
- Conduct useful SHE research and development
- Provide local, state, and national leadership for effective SHE
- Develop a course to help school administrators implement the broader WSCC Program
- Provide high-quality health education courses for university students
- Work with interested colleagues within their own and other universities
- Work with CDC, SHAPE, SOPHE, and other interested national organizations

Note: The most important action universities can take to sustain and improve SHE is to recruit, develop, and support well-trained SHE faculty to conduct other actions listed in Table 3.

In essence, the future of SHE in the United States will be determined largely by the quality of SHE faculty in our nation's universities, especially faculty trained and experienced in working with both the public health system and the education system.[12] The most important action universities can take to sustain and improve SHE is to recruit, develop, and support well-trained SHE faculty to conduct other actions listed in Table 3.

With CDC support, from 2021 to 2023 SOPHE and CDC jointly helped faculty from 32 universities across 19 states to substantially improve their respective SHE teacher preparation programs.[119] Some examples of continuously evolving national resources that university faculty and others can use to improve SHE are listed in Table 4.

Question 6: How Should We Measure Its Effectiveness and Implementation?

Much has been written recently about developing means to measure child and adolescent health literacy;[66,128,129] though there have been few efforts to measure health literacy among US students. CDC's Youth Risk Behavior Survey (YRBS)[130] provides essential data about important risk behaviors among high school students in each state and many large urban school districts. Although SHE is essential to help students develop the health literacy/decision-making skills they need to make good decisions about these behaviors, we do not expect SHE alone to determine these behaviors.[49,50] CDC's School Health

Table 4. **Some Examples of Continuously Evolving National Resources to Improve SHE**

- CDC—Characteristics of an Effective Health Education Curriculum (Website)[67]
- CDC—Health Education Curriculum Analysis Tool (Website)[120]
- CDC—Health Education Tools and Trainings (Website)[121]
- CDC—Health Education Teacher Instructional Competency Framework (Journal Article)[105]
- CDC—Healthy Schools Partner Toolkit[122]
- Human Kinetics—The Essentials of Teaching Health Education (Textbook)[123]
- McGraw Hill—Health Education: Elementary and Middle School Applications (Textbook)[124]
- NCSHE—National Health Education Standards (Website)[71]
- SHAPE—National Health Education Standards (Website)[72]
- SHAPE—Leading Healthy Schools[125]
- SHAPE—School Health Education Teacher Preparation and SPA Standards (Website)[108]
- SOPHE—School Health Education Teacher Preparation and SPA Standards (Website)[109]
- SOPHE—Model Toolkit for School Health Educators (Website)[126]
- SOPHE—School Health Education Teacher Preparation Model Guidance (Website)[127]

Profiles (SHP)[84] provides crucial data about important secondary school policies and practices for each of the 10 school health components—including SHE—in each state and many large urban districts. SHP measures, for example, the extent to which schools require health education, the type of professional preparation health education teachers have, and the extent to which they are certified to teach health education.

Question 7: What Are Major Challenges to Improving It?

In 2019, a special issue of 1 journal published a collection of 4 articles[114,131-133] that identified 12 challenges to improving SHE and 27 recommendations to address these challenges. One example of these recommendations is to create means to help coordinate efforts of government and nongovernment organizations to improve SHE. Other challenges might include the current crisis in our education system;[134,135] the complexity of education system reform;[136] the politicization of education,[137] public health,[138] and science;[139] the lack of administrative commitment for SHE;[140] and little funding to improve SHE research and development.

Question 8: Which Organizations Could Do Most to Improve It?

No single organization can be effective by itself; multiple organizations need to work together. Each can be more effective if it collaborates—instead of competes—with other organizations that have similar interests. Among various categories of national organizations, more than 100 have worked to improve school health programs, including the SHE component.[141] Examples of organizations that can be instrumental include education organizations, like the National Association of State Directors of Teacher Education and Certification; health organizations, like the Association of State and Territorial Health Officials; organizations that focus on the multicomponent school health program, like the American School Health Association (ASHA), CDC's School Health Branch, CDC's Division of Adolescent and School Health, the Society of Health and Physical Educators (SHAPE) America, the Society for Public Health Education (SOPHE), and the Society Of State Leaders of Health and Physical Education; higher education organizations, like the American Association of Colleges of Teacher Education; international organizations, like the World Health Organization and other nations from, and with, whom we might learn.[142]

Question 9: What Should We Do to Most Improve It?

We cannot do everything plausible to improve SHE. Without an analytic framework, rationale, and commitment, we may remain perpetually unfocused, indecisive, and inert. Based on the 8 questions above combined, what national actions should be priorities for the future? Importantly, we've made some important strides to address this question during the past several decades. As a few examples, in the 1960s various philanthropies funded the SHE Study which progressively laid the modern foundations for SHE;[143,144] in the 1980s, CDC established[145] a continuously active Division of Adolescent and School Health[146] and a School Health Branch;[147] in the 1990s the American Cancer Society helped organize a National Action Plan for Comprehensive SHE,[148] from which evolved National Health Education Standards;[71,72] and ASHA, CDC, SHAPE, SOPHE, and other committed organizations continuously have provided national leadership. Our nation is indebted to the many individuals and organizations that have provided leadership to improve SHE in the past. What actions should be priorities for the future? Why? Who should help decide? How? And, most importantly, when? What might we learn from analogous efforts, especially recent efforts of national organizations that are collaborating to improve science education in the United States;[149-153] including the development of state science standards, instructional materials, instruction, assessment and accountability policies, professional learning, and preservice teacher preparation?

IMPLICATIONS FOR SCHOOL HEALTH EDUCATION RESEARCH, POLICY, PRACTICE, AND EQUITY

The 9 interdependent questions briefly outlined above might help guide the development of an initial,

broad, and actionable scientific ontology for SHE. Each question could be addressed more fully in subsequent publications. Whether and how we address these questions arguably will determine the future of SHE research, policy, practice, and equity in the United States.

Conclusions

The United States has built no systematic means to educate its people about their health. Schools could provide an essential means. An initial ontology might help conceptualize, inform, and facilitate more systematic and strategic local, state, national, and international deliberations and actions to improve SHE. Indeed, we should not expect to significantly improve the interdependent health, education, and economic well-being of our nation unless we more systematically educate our people about decisions they individually and collectively will make about critical behaviors and policies that determine their health. Will we summon the will and the leadership to build the kind of SHE system our nation needs to secure its future?

Human Subjects Approval Statement

This analysis did not involve human subjects.

Conflict of Interest

The author declared no conflict of interest.

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