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School Health: Analysis of Collaboration between the Medical and Educational Fields

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Abstract:
Children's health and education depend on a variety of social determinants, and their disparities are prevalent in the U.S. Given such a link between children's health and education, and because children spend half of their days at schools, schools have been attempting to comprehensively meet children's health needs through school health services. But these programs are not implemented in every school, and when implemented, they do not always lead to the desired outcomes. While scholars have attributed these school health shortcomings to a shortage of funding, to limited school staff capacity, to challenges of increasing buy-in, and to inadequate evaluation of programs, they have paid little attention to the lack of proper collaboration between medical and educational professionals. This capstone aims to illuminate the nature of proper collaboration between physicians and educational professionals for the creation and implementation of successful school health initiatives in the current era. To do so, this capstone analyzes primary and secondary sources to first establish the nature and significance of this gap. It then examines case studies of combating obesity, in particular nutrition and physical activity, to analyze modes of collaboration between physicians and educational professionals in school health services. Based on the analysis of twenty-eight cases, the capstone recommends a collaboration model for more efficacious efforts between medical and educational professionals that can contribute to more successful school health programs.

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School Health:
Analysis of Collaboration between the Medical and Educational Fields

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ABSTRACT

Children's health and education depend on a variety of social determinants, and their disparities are prevalent in the U.S. Given such a link between children's health and education, and because children spend half of their days at schools, schools have been attempting to comprehensively meet children's health needs through school health services. But these programs are not implemented in every school, and when implemented, they do not always lead to the desired outcomes. While scholars have attributed these school health shortcomings to a shortage of funding, to limited school staff capacity, to challenges of increasing buy-in, and to inadequate evaluation of programs, they have paid little attention to the lack of proper collaboration between medical and educational professionals. This capstone aims to illuminate the nature of proper collaboration between physicians and educational professionals for the creation and implementation of successful school health initiatives in the current era. To do so, this capstone analyzes primary and secondary sources to first establish the nature and significance of this gap. It then examines case studies of combating obesity, in particular nutrition and physical activity, to analyze modes of collaboration between physicians and educational professionals in school health services. Based on the analysis of twenty-eight cases, the capstone recommends a collaboration model for more efficacious efforts between medical and educational professionals that can contribute to more successful school health programs.

Keywords: physicians, school health, obesity and schools, nutrition and schools, physical activity and schools, collaboration in school health, healthcare in schools

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INTRODUCTION

Children's Health and Educational Disparities in the U.S.

With the COVID-19 pandemic, revived attention has been brought to children's health and educational disparities in the U.S. A study by Goyal et al. in *Pediatrics,* the journal of American Academy of Pediatrics, showed that compared to non-Hispanic White children, minority children have a much higher rate of infection (with non-Hispanic White at 7.3%, non-Hispanic Black at 30.0%, and Hispanic at 46.4%), and the same holds true for the children in the families with highest to the lowest income status (highest mean family income quartile at 8.7% and lowest mean family income quartile at 37.7%) (Goyal et al., 2020). Moreover, school closures and online instruction as the result of the COVID-19 pandemic are predicted to exacerbate the existing achievement gap by 15 to 20% (Dorn et al., 2020). Such data are merely recent evidence of the long-lasting children's health and educational disparities in the U.S. and of their common underlying determinants. Children's health and educational disparities exist across factors such as gender, sexual orientation and identity (*Why Education Matters to Health: Exploring the Causes*, 2020), socioeconomic status (Basch, 2011a; Basch, 2011b; Mohai et al., 2011; Sirin, 2005; van Zon et al. 2015; *Why Education Matters to Health: Exploring the Causes*, 2020), ethnicity and race (Basch, 2011b; Sirin, 2005), disability status (*Why Education Matters to Health: Exploring the Causes*, 2020), and geographical location (*Why Education Matters to Health: Exploring the Causes*, 2020). For example, the Center for Society and Health at the Virginia Commonwealth University has found that a large body of research shows that children from low-socioeconomic and minority backgrounds are at a higher risk of experiencing adverse childhood experiences. These experiences, such as trauma, home instability, social exclusion, and persistent poverty, change these children's developing brains in a way that their cognition, behavioral regulation, and executive functions are negatively affected. These outcomes can then impact the children's long-term education and health outcomes (*Why Education Matters to Health: Exploring the Causes*, 2020). With strong common predictors of health and education, it is not surprising that abundant research shows the bidirectional relationship between health and education (Symons et al., 1997).

The Link Between Children's Health and Education

Focusing on the link between children's health and education alone, we can find three main themes: 1) healthy children are better learners, 2) unhealthy children show lower academic achievement, and 3) good education creates opportunities for better health. Scholars have found that healthy children have higher mathematics, reading, and vocabulary scores, lower absenteeism and tardiness, better problem-solving skills, less disruptive behavior, and improved attention (Allison et al., 2019; Mann & Lohrmann, 2019; Rosas et al., 2009). Similarly, it has been shown that children with poor health, such as children suffering from poor nutrition, substance abuse, obesity, smoking, sleep disorders, mental health disorders, poor vision, and inattention and hyperactivity disorders, experience lower motivation, poor academic achievement, and educational attainment (Eide et al., 2010; Basch, 2011b; Hunt et al., 2015; *Why Education Matters to Health: Exploring the Causes*, 2020). Lastly, children with high academic achievement can have better health outcomes. First, they are more knowledgeable about health-related literacy and skills (van Zon et al., 2015). Second, they will have more access to occupational opportunities with high incomes that would enable them to live in healthy neighborhoods, form strong social networks, and access high-quality healthcare (van Zon et al., 2015; *Why Education Matters to Health: Exploring the Causes*, 2020). Given this strong link between health and education, poor health can compound poor learning for disadvantaged children, resulting in long-lasting effects. It is therefore crucial that children's health and wellness needs be met.

Schools and Children's Health

Since children spend half of their days in school, schools have become ideal places to provide the necessary health-related services for their students' health and educational well-being (Basch, 2011b; Eide et al., 2010). The field that encompasses such work is the field of school health. School health services include, but are not limited, to immunizations as well as the diagnosis and treatment of vision, hearing, speech impairments, asthma, obesity, and mental health disorders (Eide et al., 2010; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). While school health services have generally seen an upward positive trend over the past few decades, many of them have not been universally implemented or as successful as envisioned when implemented (Brener et al., 2013; "Results from the School

Health Policies and Practices Study 2016," 2016). Based on the latest School Health Policies and Practices Study, a national survey periodically conducted by the Centers for Disease Control and Prevention (CDC) to assess school health policies and practices at various levels, not all school health services have seen an increasing trend as desired. For example, from 2000 to 2016, while the percentage of districts that required schools to follow any national, state, or district health education standards rose from 68.8% to 81.7%, the percentage of districts that provided funding to schools to establish a school health council, committee or team decreased from 42.7% to 30.7% ("Results from the School Health Policies and Practices Study 2016," 2016). In response to these positive and negative trends across school health areas and to the lack of complete implementation of school health services at all schools, scholars have attempted to explore the reasons behind such school health shortcomings.

Causes of School Health Shortcomings

Scholars have typically attributed the cause of school health shortcomings to **a shortage of funding** (Agron et al., 2010; Basch, 2011a; Deschesnes et al., 2003; Hunt et al., 2015; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Lear, 2017; Rosas et al., 2009; Wyatt & Novak, 2000), **limited school staff capacity** (Basch, 2011a; Basch, 2011b; Deschesnes et al., 2003; Hunt et al., 2015; Mann & Lohrmann, 2019; Rosas et al., 2009; Young et al., 2012), **challenges of increasing buy-in**, and **inadequate evaluation of programs** (Basch, 2011a; Brener et al., 2014; Deschesnes et al., 2003; Hunt et al., 2015; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Lear, 2017; Mann & Lohrmann, 2019; Healthy Schools Campaign, 2017; Young et al., 2012).

Some scholars have argued that the **lack of proper collaboration** between health and educational professionals — the two main stakeholders in the development of school health — could be a leading cause of poor implementation and failure of programs (Lear, 2017; Mann & Lohrmann, 2019; Mitchell et al., 2005; Washburn, 2018). But these scholars merely suggest a multidisciplinary collaboration and its advantages, failing to elaborate a suggested structure for successful multidisciplinary collaboration (Marshall & Wuori, 1985). Investigating the nature of the variables necessary for successful collaboration is crucial since productive collaboration

between these two fields can result in more funding opportunities, help from the health field in providing staff to school health services, and design of multidimensional evaluations capable of accurately measuring the effect of school health policies (Mann & Lohrmann, 2019). With such improvements, better-managed and better-implemented data-driven school health programs can result in more buy-in from schools and higher advocacy power at the policy level. For a more complete discussion of this section, please see Appendix 1: Literature Review (Appendices).

RESEARCH QUESTIONS

This capstone asks: In the current era, what is the nature of proper collaboration between medical and educational fields for the creation and implementation of successful school health policies and programs? Given the breadth of this question and the limited space of this capstone, the current era is defined as 2013-2020, the medical field is defined as physicians with an MD degree (referred to as physicians throughout the paper), and school health policies and programs are defined as school health initiatives against obesity, namely nutrition and physical activity initiatives. More specifically, therefore, this capstone asks: Since 2013, what is the nature of proper collaboration between physicians and educational professionals in the case studies of nutrition and physical education initiatives?

Further, it explores 1) Why should we care about school health in the first place? To answer this, I discuss the Introduction section. 2) How do we know whether there is a lack of collaboration between health and educational professionals in the field of school health? To answer this, I discuss the Physicians and Historical Development of the Field of School Health in Situating Capstone's Aim section and Appendix 1: Literature Review section. 3) Why are school health initiatives combating obesity good examples to draw generalizations from for the field of school health? To answer this, I discuss the Value of School Health Initiatives Combating Obesity in Situating Capstone's Aim section. 4) In the case studies of initiatives, are there general trends in collaboration models that lead to proper design and implementation of the programs? To answer this, I discuss the Results and Results in Action sections and offer the capstone's proposed collaboration model in the Capstone Recommendations section.

SITUATING CAPSTONE'S AIM

This capstone aims to explore the nature of documented successful collaborations in school health between medical and educational fields. In these collaborations, I focus specifically on the role of physicians in the medical field, and anti-obesity initiatives as representatives of school health programs. In this section, I present a discussion of these two points. Specifically, first, I discuss the role of physicians in the historical development of the field of school health to illuminate the trends in collaboration between physicians and schools. These trends depict how the current collaboration came to be and why we should look at the collaboration between physicians and educational professionals in the field of school health. Second, I provide background on the school health initiatives combating obesity, in particular nutrition and physical activity initiatives. I additionally discuss how the narrow case studies of these initiatives can yield general recommendations for more successful collaboration between physicians and educational professionals in the field of school health.

Physicians and Historical Development of the Field of School Health

The discussion of health entered schools in the mid-1800s, with Rhode Island passing the first legislation to make health education mandatory in 1840 (Programs et al., 1995). From the mid-1800s to the late 1800s, the health services at schools were sparse, until an attempt to control the outbreak of infectious diseases such as diphtheria and scarlet fever led to an era of communicable disease control in the late 1800s (Sellery, 1952). During this era, physicians attended schools to screen students and helped teachers to identify sick children (Sellery, 1952). In addition to physicians linking schools and health, ideas about hygiene, such as sanitation and disease control, entered the curriculum of every public school in the 1880s and 1890s (Petrina, 2006). The late 1800s marked the start of the medicalization of education and integration of health into schools' everyday practices (Petrina, 2006).

Physicians' involvement at school sites continued to increase throughout the 1900s and 1910s in the medical inspection era. The vast inspection practices were shaped in response to urbanization, immigration, and the start of World War I, and the practices aimed to keep all children healthy (Buser, 1980; Sellery, 1952). It resulted in the landmark 1913 Medical Inspection Law, sponsored by both the Department of Health and the Department of Education,

which required the medical inspection of all students for a variety of diseases and authorized the schools to employ nurses (Buser, 1980). The ever-increasing hands-on role of doctors in schools during this era can also be seen in Clark University President G. Stanley Hall's 1908 remark that "the doctor now follows the child into the school" (Petrina, 2006), as well as in reports that show the employment of 1194 school doctors in the U.S. by 1910 (Sellery, 1952).

Throughout the 1920s through the 1940s, physician's involvement at schools expanded to include policymaking and programming. The continuation of their hands-on role at schools can be seen through the physical examination and health educator eras of the 1930s when the school physicians conducted physical examinations of all students and provided educational talks to both students and parents on attitudes toward healthy living (Sellery, 1952). Physicians' expanding role in policymaking can be seen in the creation of national organizations on school health. The most influential group in school health policies and practices was created in the 1920s through the collaboration of the American Medical Association (AMA) and the National Education Association (NEA) (Programs et al., 1995). The Joint Committee on Health Problems and Education conducted national surveys and published materials on school health practices. For example, their 1927 paper on Health Supervision and Medical Inspection of Schools promoted the concept of coordination between multidisciplinary groups at schools (Programs et al., 1995). Another group, American School Health Association, which still exists today, began in 1927 (*About | ASHA*, n.d.). This group was initially founded by 325 physicians as the American Association of School Physicians. In 1936, it ultimately changed its name and opened its membership to all professionals interested in promoting school health (*About | ASHA*, n.d.). Through such organizations, physicians started to gain more voice in the design of the field of school health (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997).

The large shift towards physicians focusing on off-site school health work can be seen throughout the 1950s through the 1990s. The shift began during World War II, where the shortage of physicians led to physicians entering a medical advising era. During this period, school nurses became the main health staff at school sites while physicians continued their contributions to the field through individual consultations, supervision of school health

programs, and policymaking. After the war, perhaps due to veterans of World War II prompting a large discussion and advocacy towards disabilities and post-traumatic stress disorder (PTSD) in the U.S., physicians entered a medical educational consultant era (Sellery, 1952). During this time, physicians focused on research topics of mental health, psychology, psychiatry, and children with disabilities to inform school health practices (Petrina, 2006; Sellery, 1952).

The boundaries between the private work of physicians and the public-school health programs significantly disappeared after the Education of Handicapped Children Act of 1975, which further pushed physicians into their off-site school health roles (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). With the passage of this Act, now called the Individuals with Disabilities Education Act (IDEA), physicians had to change their role from focusing on diagnosis and treatment to working with school programs to design appropriate services for students with disabilities (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). This responsibility was further encouraged by the administration of school nurses. In a national survey of school health supervisors, at least 40% of the supervisors indicated feelings that they had no clinical preparation in the delivery of the health services that the children needed (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). In the late 1980s, physicians added the discussion of chronic illnesses to their school health policymaker roles as a nationwide investigation of school health showed the need for chronic illness management services, such as administration of medication (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). In 1994, during the Health Security Act debate, policymakers began serious discussions about the role of school health in the larger healthcare system (Lear, 2017). By the early 21st century, with an increase in the complexity of school health needs, its related laws, and regulatory bodies, physicians became heavily involved as school health advocates to serve more than 50 million students in the U.S. (Buser, 1980; Lear, 2017).

Currently, physicians appear to be working at multiple positions in school health, focusing both on individual students' needs and the public health of the school community. Their services include consultation on health policy and health curricula, evaluation of programs and services,

direct consultation regarding individual patients or groups of patients, and participation in the provision of health services at the school site (DiLaura Devore & Wheeler, 2013; Lear, 2017). In many of these positions, physicians as representatives of the medical field must collaborate with educational experts on the design and implementation of successful programs. Yet there is evidence as noted below that underlying conflicts prevent a successful collaboration from occurring. This lack of proper collaboration as discussed above has been cited as one of the reasons for the shortcomings of school health initiatives.

The conflicts between physicians and educational professionals in the researchers' analysis of the field of school health are well documented and are reasonable and important enough for us to claim once again that a true lack of productive collaboration between medical and educational fields currently exists, and that recommendations for their collaboration are needed. For example, healthcare is still predominately private, while most schools are public (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Lear, 2017; Programs et al., 1995). This leads to a fundamental conflict when schools have to rely on using their limited budgets to fund their school health programs, leading some schools to cut the budget for nurses; meanwhile, the American Academy of Pediatrics suggests schools hire physicians in addition to nurses (DiLaura Devore & Wheeler, 2013; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). For another example, the healthcare field often prioritizes urgent diagnosis and treatment of children in controlled clinical environments, while the educational field often prioritizes gradual improvement in groups of children in classrooms (Marshall & Wuori, 1985). The physicians are further distanced from the realities of schools when there is not a discussion of school health in their medical and residency education (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). The various priorities and realities of each field, combined with the history of school health putting physicians on a trend toward "off-site" school health services, has contributed to a lack of needed collaboration between medical and educational fields noted in the current era. Overall, the offered historical discussion then supports the necessity of addressing the capstone's aim of providing recommendations for collaboration between physicians and educational professionals.

Value of School Health Initiatives Combating Obesity

For exploring the nature of a proper collaboration between medical and educational fields, this capstone uses school health services targeted at combating obesity for two main reasons. First, obesity is an epidemic that impacts both the health and education of children. Second, nutrition and physical activity services as school health initiatives that combat obesity have involved the contribution of both medical and educational experts. Nutrition initiatives have generally been more successful than physical activity initiatives however case studies of both initiatives are individually analyzed to inform this capstone's recommended collaboration model.

Obesity is defined as a body mass index (BMI) at or above the 95th percentile of the CDC growth chart (*Childhood Obesity Facts | Overweight & Obesity | CDC,* 2019). As of the 21st century, obesity has become an epidemic due to its high prevalence. Over the past 30 years, the rate of obesity in the U.S. has doubled in children and tripled in adolescents, reaching a total of 13.9% among 2 to 5-year-olds, 18.4% among 6 to 11-year-olds, and 20.6% among 12 to 19-year-olds in 2019 (*Childhood Obesity,* 2018; *Childhood Obesity Facts | Overweight & Obesity | CDC*, 2019; Xanthopoulos & Tapia, 2017). Obesity is directly linked to a high risk of adverse physical health outcomes such as high blood pressure, high cholesterol, type 2 diabetes, respiratory problems, joint problems, and fatty liver disease; and psychological problems such as anxiety, depression, and low self-esteem (CDC, 2020; Christopher et al., 2020; Greenwood, 2018; Schwimmer et al., 2003). Scholars have also cited the relationship between obesity and adverse educational outcomes. For example, obese children have shown domain-specific working memory deficits, lower reading scores, more detentions, lower school attendance, more frequent tardiness, and higher dropout rates (Lanza & Huang, 2015; Rouse et al., 2010; Shore et al., 2008; Wu et al., 2017). While it might appear that the link between obesity and education is direct, obesity is an example of poor health and shares underlying predictors with poor education. Structural racism, poverty, and community context shape children's access to healthy food, physical activity, education, jobs, and financial security, which systematically affect their health and weight (Christopher et al., 2020). It is thus no surprise that children from low-socioeconomic and minority backgrounds are at a higher risk of suffering from obesity. For example, the prevalence of obesity in children in the lowest income group is almost two times higher than among those in the highest income group (*Childhood Obesity Facts | Overweight & Obesity |*

CDC, 2019; Christopher et al., 2020) and is almost 1.5 times higher among Hispanic and non-Hispanic Black children than among their White peers (Rendall et al., 2012; Rouse et al., 2019; Xanthopoulos & Tapia, 2017).

With obesity showing the links between children's health and education and significantly affecting many children, schools have universally taken steps to mitigate it through their school health services (*Childhood Obesity*, 2018; Christopher et al., 2020; Lear, 2017; Story et al., 2009). These widespread school health services can be put into two categories: nutrition initiatives and physical activity initiatives. For this project, nutrition and physical activity initiatives serve as cases demonstrating various ways of collaboration between medical and educational fields. Below a general discussion of each field including their relevant policies is offered to provide context before offering an analysis of the relevant cases. While these section's relevant policies are general, a detailed list of all relevant state laws on nutrition and physical activity can be found on the National Association of State Boards of Education Healthy Schools Database https://statepolicies.nasbe.org/ (Committee on Physical Activity and Physical Education in the School Environment & Food and Nutrition Board, 2013).

Nutrition Initiatives

Nutrition initiatives at schools include both nutrition at schools and nutrition education classes. Nutrition at schools is often federally regulated by the United States Department of Agriculture, includes schools' available meals and snacks, and impacts children's academic and social success (American Federation of Teachers, 2015). School nutrition comprises two main programs: the National School Lunch Program and the School Breakfast Program (American Federation of Teachers, 2015). The National School Lunch Program (NSLP) is a federally assisted meal program that provides low-cost or no-cost lunches to children on school days (United States Department of Agriculture, 2017a). The program was established in 1946 and as of 2016, it serves 30.4 million children (United States Department of Agriculture, 2017a). The School Breakfast Program (SBP) is a federally assisted meal program that provides low-cost or no-cost breakfast to children on school days (United States Department of Agriculture, 2017b). The SBP started as a pilot project in 1966, was made a permanent program by Congress in 1975, and as of 2016, serves 14.57 million children (United States Department of Agriculture, 2017b).

The combined taxpayer investment in these two programs was $16.9 billion in the 2015 fiscal year (Schwartz & Wootan, 2019). Both the SBP and NSLP have been crucial for feeding millions of children. The COVID-19 pandemic especially has been underscoring their importance as seen by the impact of school closures on the rise of children's food insecurity in the U.S. (Kinsey et al., 2020). Pre-2010, most of the meals served by such programs were filled with high calorie, low nutritious meals, contributing significantly to high obesity rates. After 20 years of advocacy, the Healthy, Hunger-Free Kids Act of 2010 (HHFKA) was established to combat these rates (Schwartz & Wootan, 2019). The HHFKA increased school meal access in high poverty schools, expanded the after-school meal program, and enhanced the nutrition standards for school meals; now 98% of school districts serve meals with more whole grains, fruits, and vegetables and less salt and trans-fat (McLoughlin et al., 2020; Schwartz & Wootan, 2019). Since 2016, the federal regulations have required schools' snacks and beverages to have limited fat, sugar, sodium, and calorie content, following Smart Snacks in School Standards (McLoughlin et al., 2020).

In addition to nutrition at schools, nutrition education influences children's nutritional behaviors by teaching them healthy eating habits (American Federation of Teachers, 2015; CDC, 2021). Nutrition education can be incorporated throughout the school day in various locations, such as classrooms, school gardens, and cafeterias (CDC, 2021). Currently, students on average receive less than 8 hours of nutrition education each year, compared to the 40-50 suggested hours for affecting behavior change (Center for Disease Control and Prevention, 2021). From 2000 to 2014, the percentage of schools providing required nutrition education decreased from 84.6% to 74.1% (CDC, 2021).

Overall, nutrition initiatives at school are often applauded for their success and are one of the main focuses of both medical and educational fields because of their importance to children's well-being and development.

Physical Activity Initiatives

Physical activity initiatives at schools include both recess or physical education classes, with the classes being defined as academic subjects having a planned, sequential, K-12 curriculum

(Christopher et al.; Committee on Physical Activity and Physical Education in the School Environment & Food and Nutrition Board, 2013; Michael et al., 2019). Evidence suggests that physical activity is related to academic performance; higher physical fitness enhances basic cognitive functions, such as attention and memory formation, and higher performing cognitive functions lead to higher academic performance (Committee on Physical Activity and Physical Education in the School Environment & Food and Nutrition Board, 2013; Seth, 2014). In agreement with such research, primary care physicians have recently started to prescribe exercise and free play time outside of school to help students stay healthy and remain engaged in classrooms (Seth, 2014). Advocacy for school-aged children's physical activity can also be seen by the guidelines such as those issued by the 2018 Physical Activity Guidelines Advisory Committee, providing recommendations to the federal government on physical activity (U.S. Department of Health & Health Services (DHHS), 2018).

Nevertheless, physical education has not been a focus of many schools. The most commonly cited reason for this shortcoming is the mandated academic achievement testing that requires schools to constantly improve their students' standardized test scores in reading and math (Moore, 2016). For example, the Center on Education Policy found that many schools in response to the No Child Left Behind Act of 2002, decided to increase their students' test scores by sacrificing physical activity time and increasing English and math instruction times (Whitehouse & Shafer, 2017). The result has been vaguely-worded school physical activity policies, improperly implemented physical activity initiatives, and locally-controlled policies and initiatives (Christopher et al., 2016; Committee on Physical Activity and Physical Education in the School Environment & Food and Nutrition Board, 2013; Michael et al., 2019; Whitehouse & Shafer, 2017). For example, while the national guidelines recommend at least one hour of moderate to intense daily physical activity, a 2017 study found that only 39 states have laws requiring physical education in elementary schools, and of those 39, only 19 states specify time limits for students' participation in the physical education classes (Christopher et al., 2016; Whitehouse & Shafer, 2017). A study comparing physical education policies across states from 2000 to 2014 found a lack of improvement in all physical education policies, except for increases in the percentage of middle and high schools requiring certification, licensure, or endorsement for physical education teachers (Michael et al., 2019). In another example, based on the CDC

National School Health Policies and Practices Study of 2016, the percentages of districts adopting some policy stating that the schools will teach physical education have been 92.6% for elementary schools, 89.7% for middle schools, and 92.9% for high schools (Results from the School Health Policies and Practices Study 2016," 2016). But looking at the breakdown for recommended vs. required physical activity, most of these districts' policies are solely "recommended" and therefore rarely implemented and followed (Christopher et al., 2016).

Physical activity at schools thus remains an area of school health with a wide variety of regulations, few mandates, and low accountability, and suffers from negligence and improper implementation despite its significant correlation to better health and educational achievement (Christopher et al., 2016; Committee on Physical Activity and Physical Education in the School Environment & Food and Nutrition Board, 2013; Michael et al., 2019).

By analyzing the collaboration models from the case studies of nutrition and physical activity initiatives, this capstone draws general recommendations to inform the nature of a successful and sustainable collaboration between medical and educational professionals in the field of school health.

METHODOLOGY

Methodology

The methodology for this capstone can be divided into three parts: Part I: introduction and background information, Part II: nutrition and physical activity case studies search and analysis, and Part III: general recommendations and proper collaboration structure.

Part I Methodology

In Part I, I first outline the context of my proposed problem: lack of recommendations and guidelines addressing the current lack of proper collaboration between the medical and educational fields in school health. I do so by asking the following questions: 1) How are the health and education of children related? 2) In brief, what school health services do schools currently provide? 3) Why am I claiming they have shortcomings? 4) What have other scholars said about these shortcomings? 5) What, in brief, is the history of the field of school health, especially in regards to the role of physicians in its development? Then, given the vast field of school health services, I ask the following questions to address the value of using school health initiatives that combat obesity and provide a general background on its related initiatives: 1) Why do I believe obesity initiatives are a good choice as a representative of collaboration in the school health field? 2) What have been the main policies and trends in nutrition and physical activity initiatives from 2013 to 2020? 3) What is the current state of nutrition and physical activity fields in terms of its main stakeholders, the number of children they serve, and the breakdown of their recommended versus required policies?

For answering Part I questions, I use primary and secondary sources. I mainly conduct my searches on Articles+, Google Scholar, JSTOR, and PubMed for their large collection of peer-reviewed articles, and publications of pioneering journals and organizations in the field of school health, such as American Academy of Pediatrics, Journal of School Health, American School Health Association, and Trust for America's Health. For secondary sources, I additionally draw from credible news articles that cite other research papers or interviews. For national data on various aspects of my capstone, I use original reports and analysis of CDC's School Health Profiles, a system of surveys assessing school health policies and practices in states, large urban

school districts, territories, and tribal governments; and School Health Policies and Practices Study, a national survey conducted at the state, district, school, and classroom levels. Some of the key search terms that I use are *school health policies, school health services, nutrition services and schools, physical education and schools, school physicians,* and *healthcare in schools*.

Part II Methodology

In Part II, I use a systematic literature review process to choose my case studies in nutrition and physical activity initiatives, collect their relevant data, and analyze the overall data to inform my work in Part III.

In choosing the case studies, I proceed in four steps (Figure 1). In step 1, I do a broad search of nutrition and physical activity initiatives involving school-aged children and collaboration with the health field by searching on PubMed and ERIC. PubMed and ERIC were chosen since together, they comprehensively cover articles published by both medical and educational experts. Step 1 resulted in 1287 articles after duplication erasing. In step 2, articles' titles and abstracts were skimmed, and articles that included the following criteria were kept: measurable data, focus on nutrition and/or physical activity interventions in K-12 schools, location of study within the U.S., and publication date from 1/1/2013 to 1/1/2021. At the end of step 2, 121 articles remained. In step 3, articles' full texts were skimmed to include a relation to physician involvement. At the end of step 3, 52 articles remained. In step 4, articles were all read closely to ensure they are appropriate for the capstone. At the end of step 4, 28 articles remained. For a comprehensive explanation of these four steps, see Appendix 2: Methodology of Choosing Case Studies (Appendices).

The 28 articles' data were collected by asking the following questions:1) What type of initiative — nutrition, physical activity, or both — does the article address? 2) Which site does the study focus on? 3) What was the duration of the study, including the follow-up? 4) What was the general objective of the study? 5) What were the general roles led by the medical professionals? 5) What were the general roles led by the educational professionals? 6) What were the general roles led collaboratively by both the medical and educational professionals? 7) Were there any

other main collaborators in the project? If yes, who were they? 8) What was the collaboration evaluation? 9) What were the relevant takeaways? The data collection terms are explained below in the Data Collection Terms section. For a list of articles' information and collected data see Appendix 3: Data Table (Appendices).

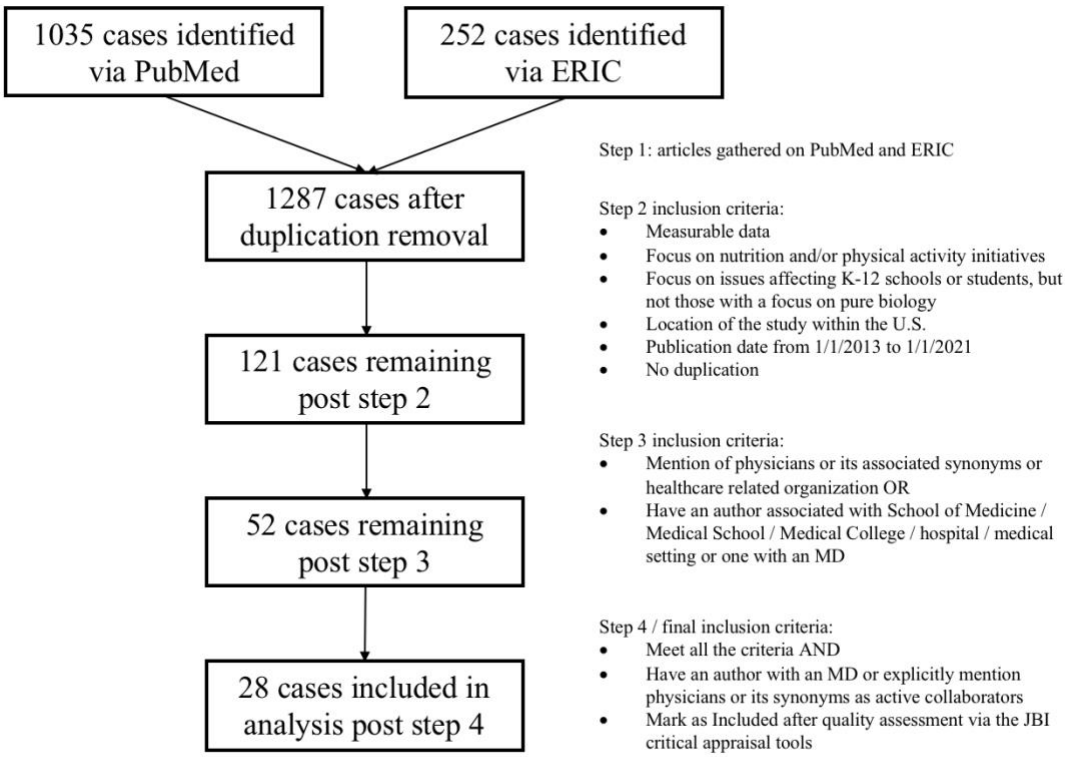


Figure 1. Methodology of Choosing Case Studies. For a detailed explanation of the steps, see Appendix 2: Methodology of Choosing Case Studies.

Part III Methodology

In Part III, the recorded data in Appendix 3: Data Table is used for analysis, production of trends, and construction of a recommended model of collaboration consistent with this capstone's aim. I consequently ask: 1) What are the general structures and trends in collaborations in successful programs? 2) What are the general structures and trends in collaboration in unsuccessful programs? 3) How can such trends be used to recommend a general structure of collaboration that allows the fields to start and sustain their generally successful work? Based on these

questions, the Results and Results in Action sections are generated. The data is presented in histograms and icon arrays in the Results section (Figures 2-7). A close reading of three case studies and a discussion of community-based participatory research are presented in the Results in Action section.

Using the Results and Results in Action sections, the capstone recommends its model of collaboration between medical and educational fields for more successful initiatives in the field of school health. The Capstone Recommendations section asks: 1) How is the capstone's recommended model constructed? 2) What are its limitations and its recommendations to address these limitations? 3) What are the next steps? These questions are answered through the Results section, the Results in Action section, and primary and secondary articles found similarly using Part I Methodology.

Data Collection Terms

This section serves to elaborate on key data collection terms that are commonly used in the Results and Results in Action sections for the construction of the capstone's recommended collaboration model. For each articles' information and data, see Appendix 3: Data Table (Appendices).

Study Duration: The duration of the studies includes the follow-up time, and the school year was counted as 10 months.

Studied Site: Medical setting refers to places such as school-based health centers or clinics. Classroom refers to interventions on the classroom level only, such as a change in curriculum in one subject. Whole school refers to multiple interventions across the school, such as changes in the cafeteria, advertisement, and classroom curricula. Community refers to interventions or active participation across the community, such as through community recreation centers or community program leaders.

Field Led Roles: The three related categories are medical field-led roles, educational field-led roles, and collaboratively led roles. Medical field-led roles included roles that were mainly led by

the medical professionals: either the research team of the study had at least one researcher with an MD degree or the medical team was explicitly mentioned in the article. Educational field-led roles included roles that were mainly led by the educational professionals, meaning here any personnel involved at schools or school districts, such as principals and teachers. Collaboratively led roles included roles that were collaboratively carried by both medical and educational professionals. Across the cases analyzed, six roles were commonly observed: observer, designer, data collector, data analyzer, result interpreter, and implementer. The observer role involves observing the initiatives for tasks such as data collection without interference in the intervention. The designer role involves designing the study or intervention. The data collector role involves identifying relevant measurement categories and taking such measurements. The data analyzer role involves analyzing the data for analysis of programs. The result interpreter role involves translating the data analysis for the target audience and inferring the program's state based on the data analysis. The implementer role involves implementing the initiatives and leading their execution at the designated setting and level.

Collaboration Evaluation: The collaboration evaluation is subdivided into three categories: 1) successful collaboration, 2) more collaboration, and 3) no collaboration. No collaboration was chosen if the medical field did not collaborate directly and extensively with the educational field for the purposes of its study. More collaboration, short for more collaboration needed to be identified as successful collaboration, was chosen if the medical field directly collaborated with the educational field but mentioned lack of collaboration or the mode of collaboration as an area of limitation or concern and encouraged more comprehensive collaborations in the future. Successful collaboration was chosen when the author highly recommends its mode of collaboration or expresses satisfaction with their collaboration, or attributes the success of the study to their collaborations.

Relevant Takeaways: The relevant takeaways focus mainly on other items, rather than the collaboration between health and educational fields, that were important in the study and authors' notes in the discussion and conclusion sections. The articles and their associated recorded data and analysis are in Appendix 3: Data Table (Appendices).

Research Limitations

The scope of the capstone is limited in multiple ways. As mentioned previously, this capstone limits its analysis of the medical field to the role of physicians with an MD degree and its analysis of school health initiatives to those concerning obesity prevention. It assumes that these physicians are practicing physicians and contributed to all stages of the research. Due to the methodology of choosing cases, physicians are likely overrepresented in the data analyzer and result interpreter roles since all the cases had at least one author with an MD degree and the authors wrote the results and discussion sections. The capstone also counts the educational field as any study participant who is part of the educational system. Many other parts of the data collection were done by my judgment alone. My interpretations of Figures 2-7 may also not reflect the reality of the best possible model of collaboration as no statistical analysis was done and sample sizes were small. Therefore, the capstone is limited in objectively and comprehensively capturing all the diverse viewpoints of healthcare and educational professionals across all school health fields and offering the most productive collaboration model.

Since the many parts of the data collection included my judgment, my own possible biases impose a limitation. I aspire to become a physician with an MD degree, therefore I might be viewing physicians and their contributions more favorably than the educational professionals. I am also neither a medical nor an educational expert. Therefore, despite the research, I may be still unaware of the needs, barriers, and current collaboration models between the medical and educational fields in the field of school health.

RESULTS

Twenty-eight final cases were analyzed carefully (as described in the Methodology section), and the resulting data along with case information was recorded (Appendix 3: Data Table, Appendices). To determine the proper collaboration model between the medical and educational professionals in the field of school health, Figures 2-7 were generated.

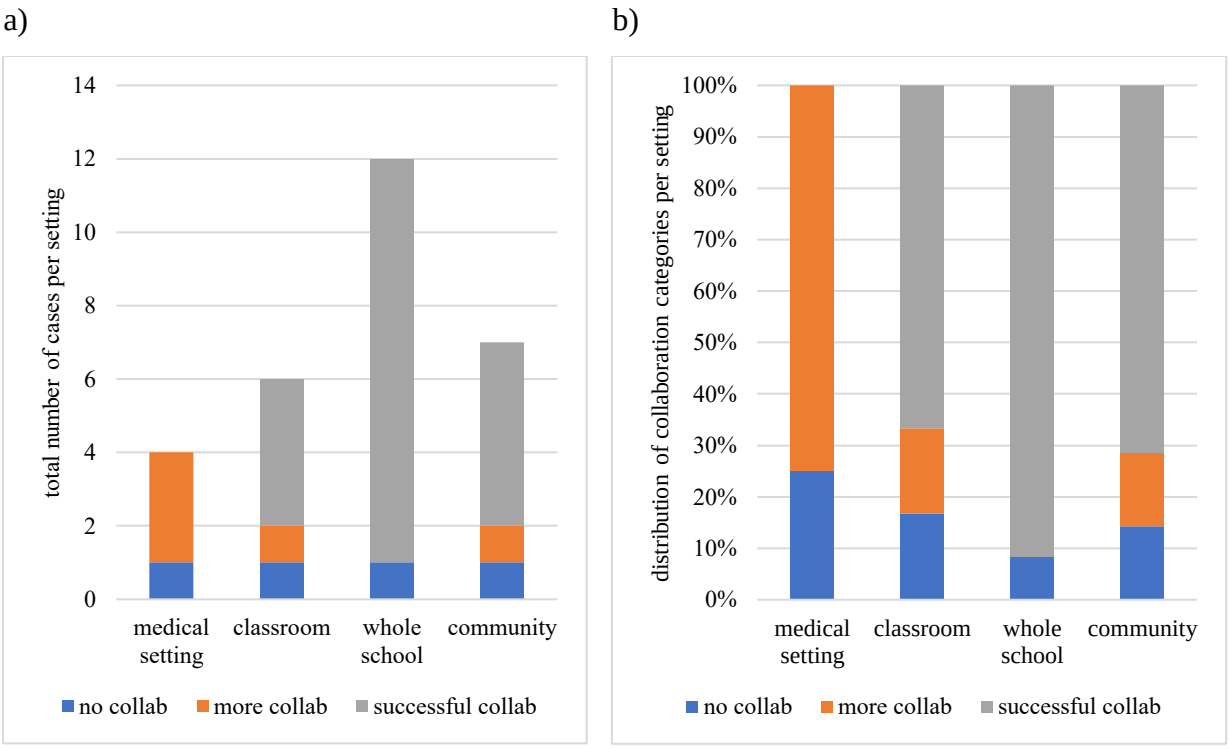


Figure 2. Study Setting vs. Collaboration Evaluation. a) Total number of cases per setting, color-coded by their degree collaboration categories (no collaboration, more collaboration, and successful collaboration) are depicted. b) Distribution of collaboration categories in each setting is depicted as a percentage of the total number of cases in that setting. Description of settings is provided in the Data Collection Term section.

Based on Figure 2a, whole school initiatives involving changes at multiple locations and levels at schools are the most common settings for nutrition and physical activity initiatives. In Figure 2b, it appears that whole school initiatives tend to be most successful compared to other settings by having the highest percentage of cases with successful collaboration. From this data, I conclude

that whole school initiatives are proper starting places for school health initiatives with the highest chance of successful collaboration between medical and educational fields.

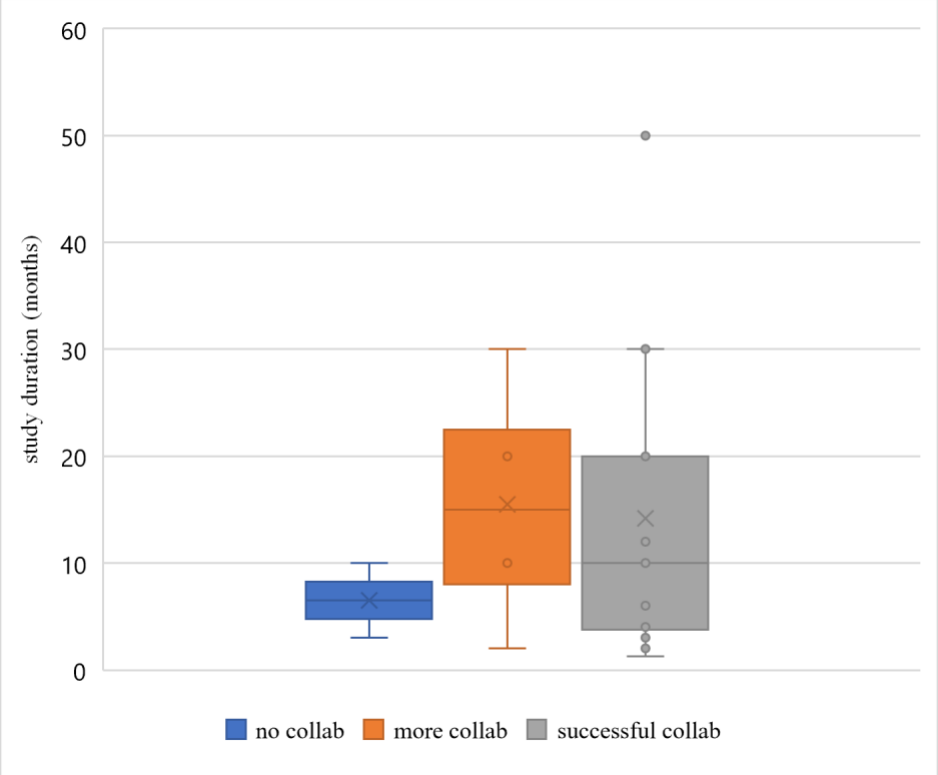
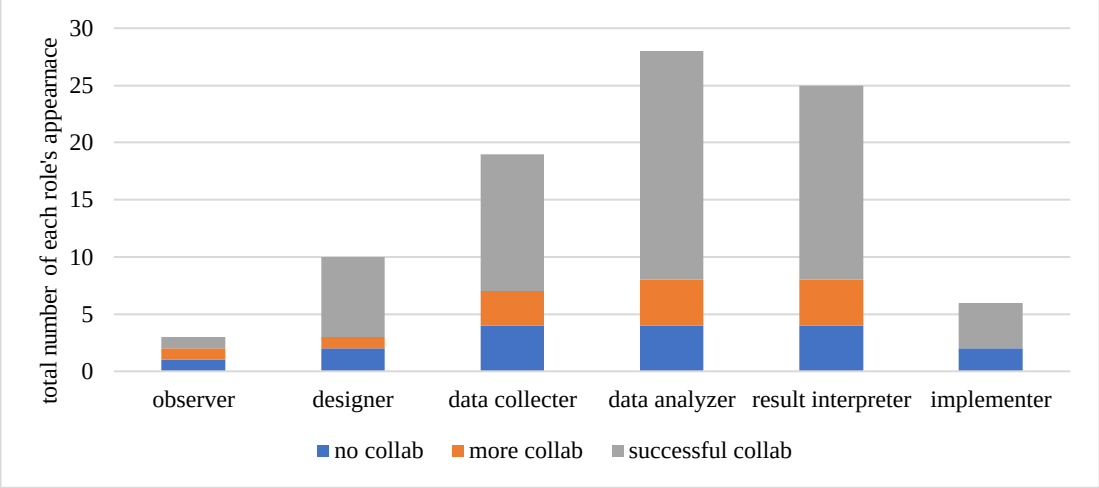


Figure 3. Study Duration vs. Collaboration Evaluation. For each collaboration category (no collaboration, more collaboration, and successful collaboration), the duration of the studies belonging to that collaboration category along with the means ("X"), quartiles (horizontal lines), and outliers are depicted. The duration of the studies included the follow-up time, and the school year was counted as 10 months.

Based on Figure 3, case studies identified as part of the more collaboration or successful collaboration categories have a higher duration (15.5 and 14.9 months, respectively), compared to cases that are part of the no collaboration category (6.5 months). Since I counted a school year as 10 months, cases with successful or more collaboration are averaging for approximately 1.5 school years. From this data, I conclude that school health initiatives running an average of 1.5 school years are correlated with successful collaboration between the medical and educational fields in the field of school health.

a)



b)

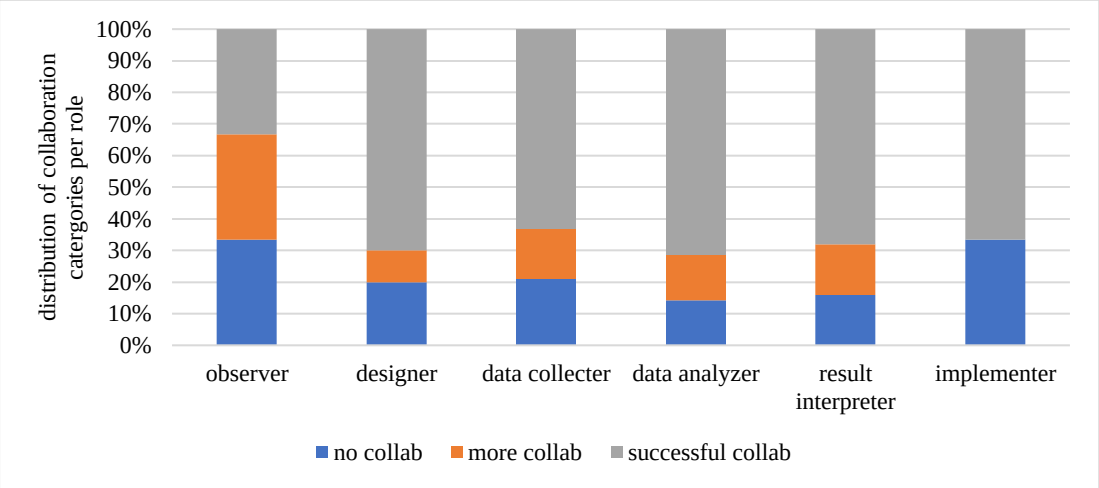
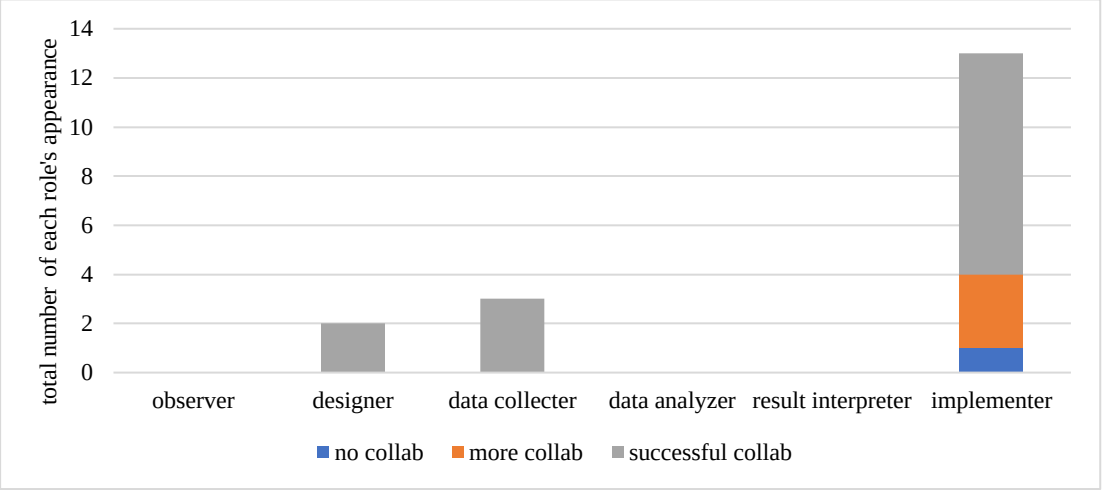


Figure 4. Medical Field-Led Roles. a) The horizontal axis depicts the main roles observed in all cases. The vertical axis depicts the number of those total cases where the corresponding role was led by the medical field. Within each role, the frequency of collaboration categories is shown and is color-coded. The collaboration categories are no collaboration, more collaboration, and successful collaboration. b) Distribution of collaboration categories in each role when led by the medical field is depicted as a percentage of the total number of cases in which the role is led by the medical field.

Based on Figure 4a, the most common medical field-led roles are the data collector, data analyzer, and result interpreter roles. As previously discussed, these roles might be more common as the result of the methodology of case selection. Based on Figure 4b, collaborations

are more frequently successful when the medical field-led roles are the designer, data collector, data analyzer, and result interpreter roles.

a)

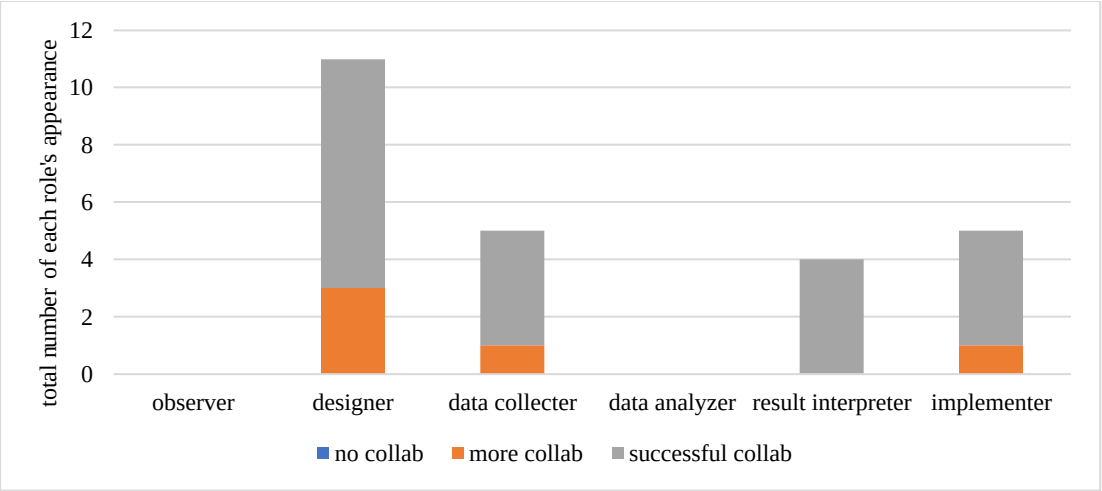


b)

Figure 5. Educational Field- Led Roles. a) The horizontal axis depicts the main roles observed in all cases. The vertical axis depicts the number of those total cases when the corresponding role was led by the educational field. Within each role, the frequency of collaboration categories is shown and is color-coded. The collaboration categories are no collaboration, more collaboration, and successful collaboration. b) Distribution of collaboration categories in each role when led by the educational field is depicted as a percentage of the total number of cases in which the role is led by the educational field.

Based on Figure 5a, the most common educational field-led role is the implementer role. Based on Figure 5b, collaborations are usually successful when the educational field leads this role. While the data collector and designer roles have a 100% rate of successful collaboration, due to the small sample size of 2 and 4, they are not a reliable indicator of the proper educational field-led roles.

a)



b)

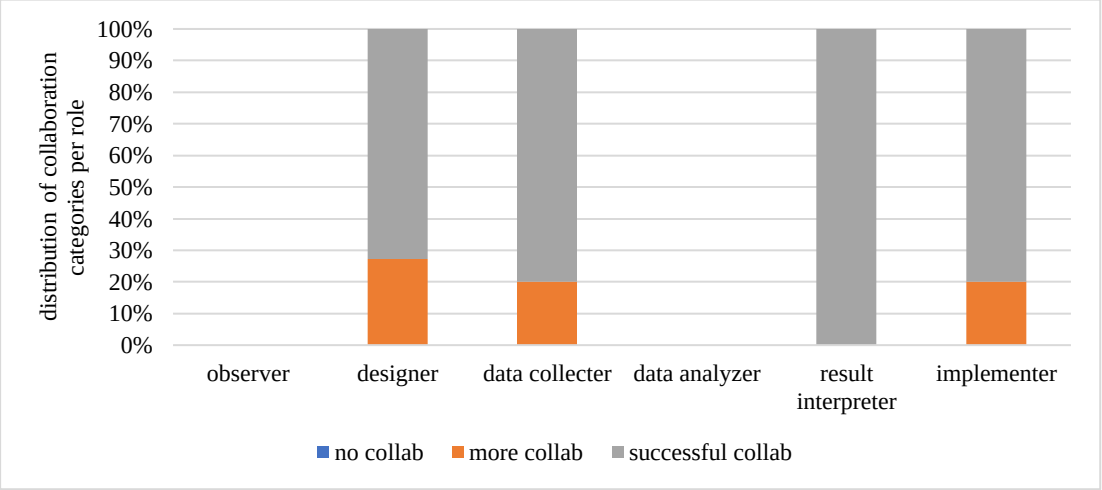


Figure 6. Medical and Educational Fields' Collaboratively Led Roles. a) The horizontal axis depicts the main roles observed in all cases. The vertical axis depicts the number of those total cases when the corresponding role was collaboratively led by the medical and educational fields. Within each role, the frequency of collaboration categories is shown and is color-coded. The

collaboration categories are no collaboration, more collaboration, and successful collaboration. b) Distribution of collaboration categories in each role when collaboratively led is depicted as a percentage of the total number of cases in which the role is collaboratively led.

Based on Figure 6a, the design role is the most common role that is collaboratively led by the medical and educational fields. Based on Figure 6b, collaborations are usually successful when the medical and educational fields collaboratively lead the designer role. While data collector, result interpreter, and implementer roles also have high rates of successful collaboration when collaboratively led (Figure 6b), their sample sizes are small (Figure 6a).

So far based on Figures 4-6 only, because only the medical professionals lead the roles of observer and data analyzer, and because medical professionals also compromise the significant majority of the result interpreters often with a high rate of successful collaboration, I suggest that medical field-led roles for this capstone's collaboration model include the observer, data analyzer, and result interpreter roles.

For the designer, data collector, and implementer roles, based on Figures 4-6, no conclusions could be made because they are roles led by the medical field, educational field, or collaboratively led, and are moderately correlated with successful collaboration in each leadership structure. Therefore, for a better depiction of the distribution of successful collaboration and leadership structure in each role for the capstone's recommended collaboration model, icon arrays are done (Figure 7).

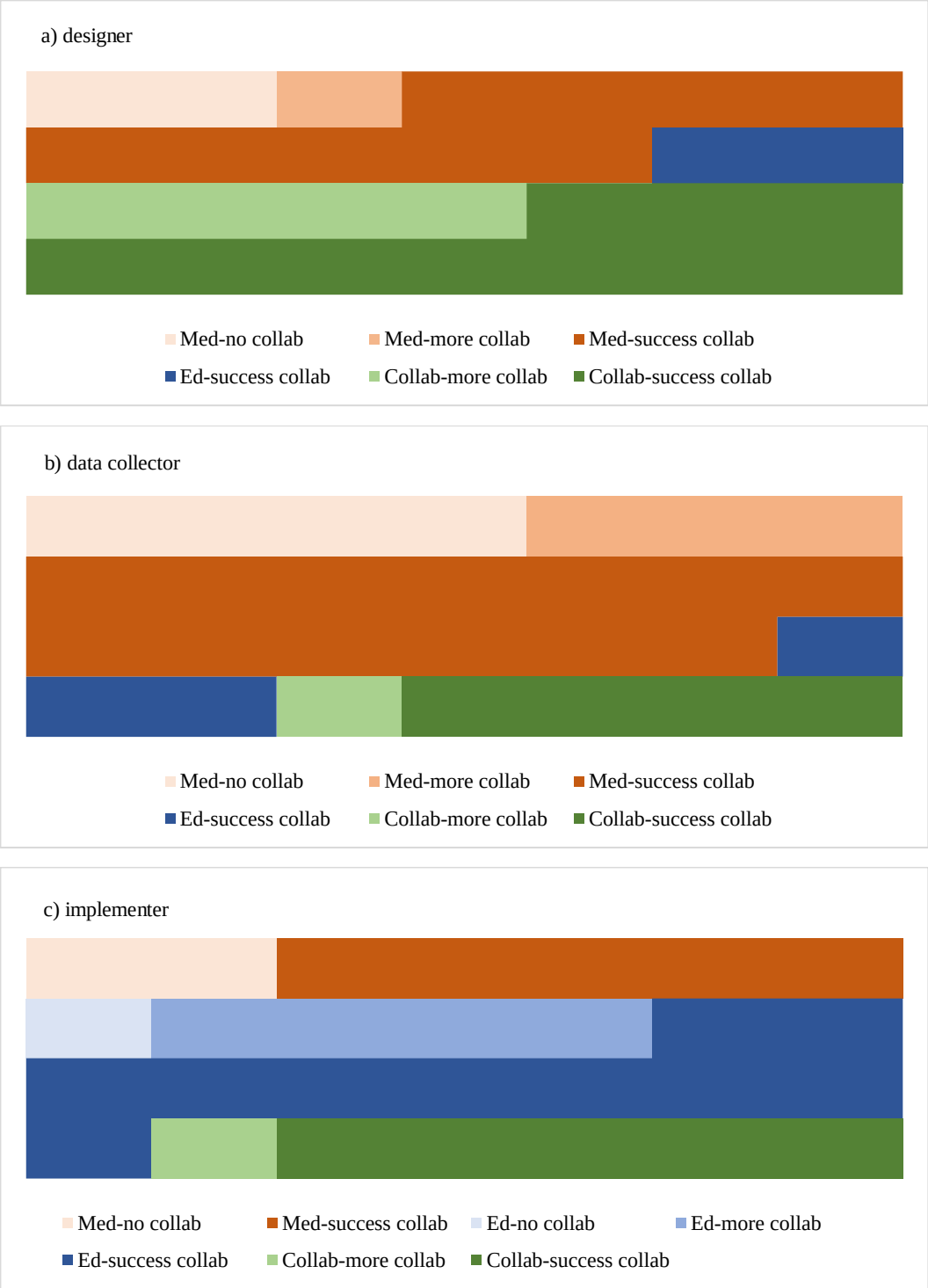


Figure 7. Icon Arrays of roles. a) designer role, b) data collector role, c) implementer role. Within each role, the distribution of cases with respect to their leader field and collaboration category is color-coded and depicted. The leader field categories are Med (medical field-led,

orange), Ed (educational field-led, blue), and Collab (medical and educational fields collaboratively led, green). The collaboration categories are no collaboration (light shade), more collaboration (medium shade), and successful collaboration (dark shade).

In Figure 7a, half of the icons are green, and there are more dark green icons than dark orange icons, showing that when medical and educational professionals collaboratively lead the designer role, the collaboration often tends to be successful. In Figure 7b, almost a third of the icons are orange, with almost half of the icons being dark orange, showing that when the medical professionals lead the data collector role, the collaboration often tends to be successful. In Figure 7c, more than half of the icons are blue, with more than half of those being dark blue, showing that when the educational professionals lead the implementer role, the collaboration often tends to be successful. Therefore, in my capstone's recommended collaboration model, the designer role will be collaboratively led by medical and educational professionals, the data collector role will be led by medical professionals, and the implementer role will be led by educational professionals.

Conclusion of the Results

For having the highest chance of successful collaboration, the capstone recommends that the initiatives be implemented at the school-wide level, with an average study duration of 15 months. For the capstone's recommended collaboration model, based on the Results section only, the medical field should lead the observer, data collector, data analyzer, and result interpreter roles. The educational field should lead the implementer role. The designer role can be collaboratively led by the medical and educational fields.

RESULTS IN ACTION

Analysis of the Three Cases

Summaries of three connected case studies are offered as examples of how the collaboration between medical and educational fields occurred in the analyzed studies. This summary complements the data-driven Results section by painting a more comprehensive picture of collaboration in action.

All three studies are of the Students for Nutrition and eXercise (SNaX) program. SNaX offers "5-week middle-school based obesity-prevention interventions combining school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education" (Bogart et al., 2014, in footnotes: for more details on the nature of the intervention, see study 2). The first case is a randomized controlled trial of the program published in 2014 and belongs to this capstone's "successful collaboration" category (Bogart et al., 2014). The second case is a two-year follow-up of the program published in 2016 and belongs to this capstone's "successful collaboration" category (Bogart et al., 2016). The third case is an evaluation of the dissemination of the program published in 2018 and belongs to this capstone's "more collaboration" category (Bogart et al., 2018).

In the first case study, five intervention and five control schools were randomly selected from the Los Angeles Unified School District to participate (Bogart et al., 2014). The program was conducted under the community-based participatory research principles, where the school district administrators were equal partners with the research team on program design, intervention testing, result interpretation, dissemination, and data collection. For example, for data collection, schools provided records on the number of fruits and vegetables served, while the researchers gathered pre- and post-program surveys assessing psychosocial variables. The researchers also formed a community advisory board to get input for the direction and design of their program. The community advisory board was composed of the local community and academic experts in adolescent obesity prevention, such as those in parent groups, youth-serving organizations, and Los Angeles County's health department. The program's intervention included other partners, such as bachelor's-level facilitators who led the peer-leader sessions and a PhD-level clinical

psychologist who conducted the motivational interviewing training. The only section of the program that was led by either medical or educational professionals was the data analyzer role, led by the research team as representatives of the medical field. The case's results showed that the program was effective and generally resulted in changes in cafeteria and school store outcomes that were 10%-15% in magnitude above what would be expected in the absence of the program. The researchers claim that their use of community-based participatory research throughout all stages of the research led to their success. They believe this research's methods led to community investment in the program to the extent that a community advisory board member used the program's findings to help draft legislation relating to the availability of drinking water at California schools. In summary, they claim, their "research shows that rigorous intervention evaluations tested in real-world contexts that involve strong community partnerships can have both program and policy outcomes."

In the second case study, the researchers examined the long-term effects of the program implemented in the first case study with a two-year follow-up (Bogart et al., 2016). The educational field led the data collection, with school staff measuring the height and weight of the students, and the medical field led evaluations of the program, with researchers analyzing and interpreting the data. The study showed that even though the program lasted only five weeks, it had long-term effects because it taught the students skills that could be generalized and sustained across contexts such as schools and homes. The researchers claim that SNaX can have a larger impact if it is implemented throughout the school year into schools' existing clubs and extracurricular activities.

In the third case study, using community-based participatory research principles, the program was expanded to another school district and its dissemination was evaluated (Bogart et al., 2018). Prior to the expansion, the research team revised the program's design with the community advisory board for greater sustainability of the program. The expansion of the program took place largely with the effort of a district "champion," who was a teacher selected as a full-time district SNaX coordinator to provide teacher training and technical assistance. The schools in collaboration with the district "champion" led the implementation, and the research team evaluated the program after a year for insights about ways to implement and disseminate obesity

prevention programs. Their results showed that adapted programs were not always effective. Local resources constrained most of the activities, and some principals and cafeteria managers believed they received less comprehensive training than the teachers. Researchers hypothesize that the program's effectiveness can be improved by highlighting its main components and providing technical assistance to community stakeholders and school administrators. That way, they can tailor the program to their individual settings while maintaining the program's crucial components for effective results. Many schools felt that because the district supported the program and the program aligned with districts' wellness policies, the program's successful implementation in their schools was a possibility.

Relevant Take-Aways

As seen in Appendix 3: Data Table (Appendices), many obesity prevention initiatives include contributors beyond physicians and educational professionals whose collaboration this capstone focused on. Notably, many of these contributors are parents, student advocates, community volunteers, and school nurses. The significance of having such community collaborators is a major universal theme throughout the analysis of the majority of the 28 cases. Many researchers believed that their collaboration with the community and the educational professionals led to the understanding of the community's structural barriers, needs, and priorities, which contributed to community investment and ownership of the programs, authentic partnerships, culturally appropriate materials, and multi-sector and multi-level environmental changes. Many case studies identified schools as trustworthy, easily accessible places for communities and suggested that programs are successful when implemented within a school's existing structures. Given each community's unique needs and resources, programs that are adaptable and can be integrated into a school's infrastructure, such as a certain curriculum, produce the best results by requiring less from the already limited school resources and burdened staff. Overall, the theme of researchers valuing community as an equal partner was highlighted throughout the detailed case analysis.

In addition to the repeated mention of community collaboration, "community-based participatory research" frequently appeared in the case analysis as well. Community-Based Participatory Research (CBPR) is a research approach where community members, practitioners, and academic researchers are equal partners in all aspects of the research process, contributing their

expertise and sharing the responsibility equally (Israel et al., 2010; Wallerstein & Duran, 2010). CBPR has a multitude of benefits, such as greater cultural centeredness of programs, appropriate recruitment and retention strategies, democratizing science by valuing communities as equal partners, building on communities' strengths, addressing community's needs and priorities, engaging community members for policy advocacy, and balancing research and action for researchers' and communities' mutual benefit (Israel et al., 2010; Wallerstein & Duran, 2010). CBPR has been used for addressing health concerns and disparities, especially among low-income and minority communities (Health Outreach Partners, 2011; Wallerstein & Duran, 2010). Some key principles of CBPR include facilitating a collaborative, equitable partnership in all phases of research, fostering co-learning and capacity building among all parties, involving systems development using an iterative process, and involving a long-term process and commitment to sustainable research projects (Health Outreach Partners, 2011). Given the significance of collaborative work with communities and its many benefits, this capstone draws on this section in the construction of its recommended collaboration model.

CAPSTONE RECOMMENDATIONS

Capstone's Recommended Collaboration Model

In summary, through the Results section, the observer, data collector, data analyzer, and result interpreter roles were assigned to be led by the medical field, the implementer role was assigned to be led by the educational field, and the designer role was assigned to be collaboratively led for the highest chance of successful collaboration outcomes. The Results section also suggests that school-wide initiatives with an average study duration of 15 months are highly correlated to successful collaborations. The Results in Action section discussed the importance of working collaboratively with the community as an equal partner and partnering with other key community stakeholders and members in such interventions. While all the results were obtained through initiatives against obesity, as outlined in the Value of School Health Initiatives Combating Obesity section, such initiatives are representative of school health initiatives that can inform collaboration between medical and educational professionals in the field of school health. Therefore, based on these two sections, this capstone recommends the collaboration model for the medical and educational fields for the creation and implementation of successful school health programs as outlined in Figure 8.

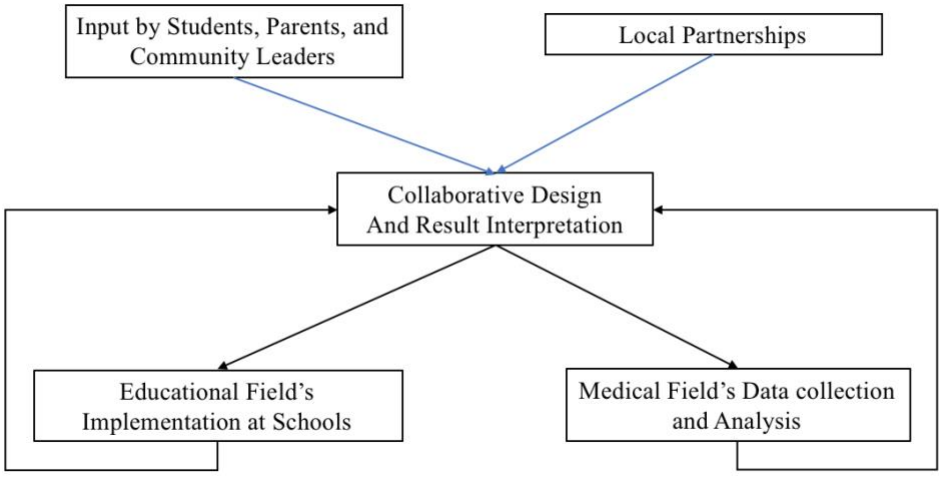


Figure 8. Capstone's Recommended Collaboration Model Between Medical and Educational Fields. The collaboration model was constructed based on the Results section and the Results in Action section. The collaboration model, along with its limitations, is discussed in the Recommendation section.

Under this capstone's recommended model, the medical and educational fields come together to collaboratively design the program. By doing so, physicians can bring their expertise on how to best address health-related issues, while the educational professionals can bring their expertise on schools' needs, priorities, and available resources. Their collaboration in the design stage can also allow educational professionals to adapt the program to their current systems without requiring extra staff capacity in the long-term, while medical professionals help keep the core program components leading to its effectiveness in place. Collaboration at the design stage is a system that was highlighted as important in the Results in Action section. After the proper design of the program, the educational professionals take the lead role in implementing programs since they are familiar with the structure at the schools. At the same time, physicians take the lead role in data collection and data analysis, since they can gather relevant data and do a proper analysis of such data to help track the progress of the initiatives in the most accurate way. Doing so will address the problem of lack of evaluation and buy-in addressed in the literature review through more accurate data collection and analysis of programs' progress. Since the observer merely observes the initiatives without modifying them, in this capstone, this role is included in the data collection and data analysis stages and is led by the medical professionals.

After some duration of the intervention when the first round of data collation and analysis is done, medical and educational professionals can come together once again to collaboratively interpret the result and modify existing programs or design new ones for continuous improvement. Although the Results section led to assigning the results interpreter role to the physicians, this role is assigned to be collaboratively led in this capstone's recommended model for two reasons. First, the CBPR emphasizes collaborative result interpretation. Second, due to the limitations of the methodology, a majority of the papers were expected to have the result interpreter role led by the medical field; the medical field was identified as authors with an MD degree, who wrote these cases and interpreted the results in the analyzed research papers. Therefore, the result interpreter role is assigned based on the Results in Action section, rather than the Result section, to be collaboratively led. Once programs start, the results interpreter role goes hand-in-hand with the designer role, and medical and educational experts can collaboratively work to continuously improve school health services.

Lastly, the suggested collaboration model includes continuous collaboration between the fields in agreement with the Results section, which depicted the correlation of studies that have an average duration of 15 months study and successful collaboration between the fields (Figure 3). A model of continuous collaboration between physicians and educational professionals ensures that all projects and initiatives will receive a proper length of implementation and follow-up time to allow for success and improvement.

In addition to the collaboration between medical and educational fields in the field of school health, this capstone emphasizes receiving community input from important stakeholders, especially students, parents, and community leaders, as found beneficial in the Results in Action section. Given the complexity of working with all community leaders at all stages, the capstone recommends that their input be at the design stage and/or result interpretation stage for ensuring that programs are culturally appropriate and are supported throughout the community for maximal impact. Engaging important community stakeholders can also take the form of local partnerships, which increases available resources, community engagement, and possible policy advocacy and outcomes.

Overall, this capstone's collaboration model aims to provide a groundwork for successful collaboration between physicians and educational professionals in the field of school health so that services can continuously improve and lead to improvement of academic outcomes and wellbeing of children.

Capstone Model's Limitations

Despite the capstone's model of collaboration's advantages and comprehensive construction, the model has three major limitations on the scope of the recommendations. First, due to the process of case selection in methodology, the analyzed cases are at the local level. The recommended model is therefore appropriate for local initiatives, such as those at district levels, rather than federal initiatives. But since each community's needs are unique and programs are often designed at the local level while funded at the federal level, providing a collaboration model at the local level is perhaps more appropriate than one at the federal level.

Second, communities and physicians might not always be willing to work with one another. Both physicians and educational professionals have many responsibilities and experience burnout. For example, a study that evaluated the prevalence of burnout in a sample of 6880 physicians in 2014 found that more than half of US physicians experience professional burnout (Shanafelt et al., 2015). Similarly, it is estimated that 19 to 30% of new teachers experience burnout within their first five years of teaching (School of Education, 2019). Additionally, communities, especially minority communities, often mistrust physicians. For example, Black communities have not only faced historical medical traumas, as in the Tuskegee study, but still face everyday racism in the healthcare system (Bajaj & Stanford, 2021). So, while this capstone offers a collaboration model, it does not offer ways for initiation of collaboration between physicians, educational experts, and communities who are not interested in engaging with one another.

Finally, the main issue of funding still remains. While paying a collaborating physician can help with improvements in academic and health outcomes of children and possibly bring in funding from the medical field, this payment can pose a significant challenge for schools that are operating on already limited budgets. While it is beyond the scope of this capstone, below are two recommendations that may address the funding issue. The recommendations ask for the help of medical school students and public health experts in the field of school health.

Medical school students serve as valuable resources as they are often enthusiastic to volunteer in helping their neighboring communities. For example, in one of the analyzed cases, a team of medical school students who were trained by pediatricians and pediatric resident leaders in current school health policies volunteered as mentors for the children in school settings (Narayanan et al., 2019). To have medical students replace physicians in collaborating with schools without decreasing the quality of expertise they bring, the volunteer medical students can attend regular meetings with a lead physician throughout the year to ensure that they are helping their schools in the best and most accurate way. As a medical school applicant in the 2020 cycle, I found that many medical schools offer opportunities for medical students to collaborate with K-12 schools in a variety of ways. For example, one of the Johns Hopkins School of Medicine's community service groups, Community Adolescent Sex Education, brings medical school students to local Baltimore middle schools to teach sex education. Therefore, with a model that

includes medical school students, physicians would only need to volunteer a limited portion of their time, or schools would need to dedicate less budget for hiring such lead physicians.

Like the medical school students, public health experts can also complement physicians at schools. Public health experts can include public health workers, community health workers, and public or community health students, and they are an important part of healthcare teams. Public health experts focus on protecting the health of populations and have been involved in vaccination programs, in educational programs such as those in reducing obesity, and in school nutrition programs (American Public Health Association, n.d.a). Similarly, community health workers are trusted members of a community and have a close understanding of the community's needs (Malcarney et al., 2017). Community health workers have been recognized for their role in addressing health disparities by improving chronic disease management, promoting positive lifestyle behavior changes, and reducing unnecessary use of health services (Malcarney et al., 2017). Public health professionals are experts in public health policies, data collection, and data analysis, while physicians, depending on their specialty, are less fluent in such work and instead are experts in diagnosis and treatment of diseases (American Public Health Association, n.d.b). Therefore, public health experts can lead the data collector and data analyzer roles and can work alongside physicians and educational experts in the designer and implementer roles. With this working model, hiring physicians will cost less; in addition, physicians are more likely to volunteer due to less time commitment. More importantly, this model may lead to a more comprehensive design and evaluation of more effective school health initiatives.

Next Steps

This capstone's work of offering a collaboration model for physicians and educational professionals provides only a small glimpse of the complex collaborations that go into school health. In the future, mechanisms of collaboration in the field of school health between educational professionals and non-physician healthcare professionals, such as public health workers and school nurses, need to be studied. Since this capstone made its conclusions based on school health initiatives against obesity, future studies need to examine physicians' collaboration with schools in other areas of school health to modify, validate, or refute the capstone's recommended model. The capstone's model can also be compared with other available models of

collaboration surrounding health and educational disparities within communities in the U.S. or other countries for finding the most appropriate model. Lastly, the capstone's plausibility needs to be examined through interviews with stakeholders in the field of school health. The capstone's collaboration model was constructed based on a review of 28 case studies, and interviews with stakeholders in the field of school health can offer insights that were not included in the studies.

CONCLUSION

School health services can help many children and offset some of the effects of children's health and educational disparities in the U.S. Both health and educational professionals contribute to school health, yet their lack of productive collaboration has been repeatedly cited as a reason behind the shortcomings of school health services. It is thus important for us to further study the way that collaboration has or has not worked in these initiatives. This paper explores the nature of a proper collaboration between medical and educational professionals for successful school health policies and programs, and recommends its collaboration model. As an aspiring physician interested in pediatrics and school health policy myself, I believe that exploring this topic is important to show *how* collaboration between the fields should happen, rather than only saying that it *should* happen. Through my recommended model, I hope that some educational and healthcare professionals find strategies that could help them to feel more confident in building and sustaining successful collaborations in the field of school health in order to support our children more holistically throughout their K-12 education.

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APPENDICES

Appendix 1: Literature Review

Children's health and education depend on a variety of social determinants and their disparities are prevalent in the U.S. Given such a link between children's health and education and children spending half of their days at schools, schools have been attempting to meet children's health needs through school health services. But these programs are not implemented in every school, and when implemented, they do not always lead to the desired outcomes. Scholars have typically attributed the cause of school health shortcomings to a shortage of funding, limited school staff capacity, challenges of increasing buy-in, and inadequate evaluation of programs. With the health and educational fields being the two main stakeholders in the development of school health, some scholars have argued that their lack of collaboration could be one of the leading causes of poor implementation and failure of programs. But these scholars merely suggest a multidisciplinary collaboration; failing to suggest what a successful collaboration entails.

In this literature review, I discuss the literature within the three suggested causes of school health shortcomings: 1) shortage of funding and limited school staff capacity, 2) challenges of increasing buy-in and inadequate evaluation of programs, 3) lack of proper collaboration between health and educational fields. Discussion of these areas situates my capstone's aim of exploring the nature of a successful collaboration between medical and educational fields in the field of school health.

Shortage of Funding and Limited School Staff Capacity

Shortage of funding for school health programs impacts their success in two ways: not meeting the programs' necessary resources and not having the needed school staff capacity to properly execute the programs. In this section, I first begin a discussion of the healthcare system for children in the U.S. to acknowledge its limitations. Next, I illuminate the current system of funding for school health programs available at schools. I then explain the scholars' work on funding and school staff capacity in the field of school health.

Healthcare systems for children in the U.S.

The health care system in the U.S. still struggles to meet every child's health needs. Children often obtain their health insurance through a parent's private plan, Medicaid, or the Children's Health Insurance Program (Berchick & Mykyta, 2019). While there has been tremendous progress in recent decades in terms of children's access to health insurance, not all children are currently insured (Leininger & Levy, 2015). Based on the 2018 U.S. Census Bureau's annual health insurance coverage in the U.S. report, about 4.3 million children did not have any health insurance coverage (Berchick & Mykyta, 2019). This number equivalents to 5.5% of all children in the U.S. under the age of 19 not meeting their health needs as properly as they should (Berchick & Mykyta, 2019). But access to insurance alone does not guarantee access to quality health care either (Leininger & Levy, 2015). For example, insured children may not receive health care due to high out-of-pocket expenses (Berchick & Mykyta, 2019). Insured children might be in families where due to concerns with transportation, cultural sensitivity, and parent's approach to the healthcare system, they might not access health care services (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Therefore, outside of school health, there is still a lot of progress to be done in this field of health care to ensure all children's health needs are met (Leininger & Levy, 2015). There are many key players and complex systems that influence this goal and schools cannot ensure meeting all children's health needs alone.

Funding for school health programs

Generally, funding for school health services is limited to education budgets, which come from federal, state, local, or private funds (Basch, 2011a; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Lear, 2017). Federally, schools can benefit from congress authorized funds for health services and/or be reimbursed for their services for eligible children living in poverty through Title XIX: Medicaid's Early and Periodic Screening, Diagnostic, and Treatment Program (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Additionally, they can get funded for specific categories of services such as, but not limited to, maternal and child health services through Title V, healthcare services of educationally disadvantaged children through Title I of the Elementary and Secondary Education Act, and services to prevent Human

Immunodeficiency Virus (HIV) infections and hepatitis B infections through the Centers for Disease Control and Prevention of the U.S. Department of Health and Human Services (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). At the state level, state tax funds might be added to the federal funds or be distributed for other health services and initiatives. For example, some states have funds for specialized initiatives and/or finance schools for healthcare services for children living in poverty, health screening, or tobacco use prevention programs (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). At the local level, the local tax contributes to the education budget, which includes school health services (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Locally, in addition to taxes, services clubs, volunteer health organizations, or private providers of healthcare may also contribute to school health services (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). In addition to these three funds, private foundations often offer grants as well. But these grants are transient, categorical, population or problem-specific, and are often for research or political purposes (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). For example, they can be for studying specific health problems of the school-age population or they can be supported by a political party and be aimed at family planning (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). While multiple avenues of funding exist for school health programs, they are still limited and are often cited as causes of school health shortcomings.

Shortage of funding for school health services has been cited by numerous scholars as a cause of school health shortcomings (Agron et al., 2010; Basch, 2011a; Deschesnes et al., 2003; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Lear, 2017; Rosas et al., 2009; Washburn, 2018). Funds only coming from school and educational budgets limit school health services tremendously, as these sources are already limited and need to meet various other academic needs (Deschesnes et al., 2003; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). The funds are also limited given the severity and magnitude of children's health needs that currently exist (Basch, 2011a). Even when these funds are sufficient, the lack of their proper and

comprehensive implementation prevents the programs from impacting the students as much as intended (Deschesnes et al., 2003). For example, to explore the lack of funding, Dr. Randall Reback of Columbia University found that by increasing the budget for California public schools by 1%, enough counselors can be hired to provide basic mental health services at all K-12 schools and mobile health clinic coverage can be expanded to schools that currently do not have existing health care programs (Washburn, 2018). In another study in 2006, a survey of 2900 individuals representing 1296 school districts across the U.S. indicated that adequate funding was the number one reason districts cited as the barrier to effective design, implementation, and monitoring their school health policy and programs (Agron et al., 2010).

Funding and school staff capacity for school health programs

In addition to funding for programs, funding poses another barrier to school health programs through school staff capacity (Hunt et al., 2015; Rosas et al., 2009). Due to insufficient funds, school health programs are often undermanaged, often leaving school board members or school leadership members in charge of the programs (Agron et al., 2010; Lear, 2017). The previously mentioned 2006 study indicated a lack of time as the second barrier to the success of school health, as rated by school board members and state association leaders (Agron et al., 2010). Superintendents and principals are often concerned about spending a day on their school health programs, as this will take away from their attention to academic areas and can put districts in a position of being portrayed poorly (Young et al., 2012). Therefore, additional funds are needed for establishing school health boards with their own designated personnel.

Challenges of Increasing Buy-In and Inadequate Evaluation of Programs

Some scholars have attributed the shortcomings of the school health programs to challenges of increasing buy-in and inadequate evaluation of programs. In this section, I first discuss the current systems available for tracking school health programs' success. Next, I discuss the reasons that scholars have explored to be the cause of the lack of proper evaluative measures in the field of school health. Lastly, I discuss the close relationship between evaluation and data acquisition, buy-in from schools and stakeholders, and funding for school health, especially in regards to the current merit-based system in place for schools.

Current evaluation systems for school health programs

Information about the status of school health services is gathered at two levels: by the Centers for Disease Control and Prevention (CDC) or by schools and/or district themselves. CDC conducts two surveillance systems to understand the extent to which school health policies and services are being implemented in schools: School Health Policies and Practices Study (SHPPS) and School Health Profiles (Brener et al., 2013; Brener et al., 2014). SHPPS is a national survey that is conducted periodically to assess the practices and policies at the classroom, school, district, and state levels (Brener et al., 2013; Brener et al., 2014). School Health Profiles includes a system of surveys that similarly monitors practices and policies in states, large urban school districts, territories, and tribal government (Brener et al., 2013; Brener et al., 2014). At the school level, surveys are often categorized as process evaluation where the evaluation explores whether the proven intervention is properly implemented and what variables might have contributed to the outcome. Schools and districts may conduct these evaluations as they wish (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997).

Although such evaluation practices exist, they do not necessarily lead to or facilitate the improvement of school health services. In regards to the CDC's surveillance systems, the resulting data are large aggregates of generalized information, and schools cannot use such data to improve their specific school health services to meet their specific student needs (Brener et al., 2014). Such surveys also cannot gather all the information about schools' situations and their data might be skewed by the school, district, or state staff providing socially desirable responses (4). At the school level, evaluation is often not done or is poorly done (Deschesnes et al., 2003; Healthy Schools Campaign, 2017; Hunt et al., 2015; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). With this limited research and data on how various programs are doing, schools thus continue to implement programs that have never been tested or do not produce any positive results (Basch, 2011a; Basch, 2011b; Deschesnes et al., 2003; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Young et al., 2012). Scholars have offered multiple reasons for this lack of proper evaluation of school health services. We can put these reasons into four general categories: staff capacity, the definition of an effective school health program, measurement validity, and biases.

Inadequate evaluation: reason 1 – staff capacity

In regards to staff capacity, evaluation is often not done as it requires time and expertise that school personnel often do not possess (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Young et al., 2012). The evaluations needed to properly assess school health services are designed by doctoral-level professionals from universities and research centers, which are often out of the expertise of the school staff (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Hiring such professionals is also not an option since they will pose a huge financial burden on the school (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997).

Inadequate evaluation: reason 2 – definition of effective program

In addition to limited staff capacity, lack of a definition of what an effective school health program imposes another barrier to evaluation. These programs are designed to influence the health status of children, but the health of children depends on a variety of factors that is out of the school's control. So, evaluation of school health programs cannot focus on the end goal of healthy children as a true measure of their effect (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). The evaluations should instead focus on factors including but not limited to, education (improved attendance and graduation rates), personal health (improved biological measures), mental health (less depression, stress, and violence), and healthy behaviors (improved healthy and health-literacy related knowledge, attitudes, and skills) (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). With such a vast array of factors to analyze, it is then challenging to decide which ones should be measured as the true indicator of the success of school health programs (Agron et al., 2010; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Therefore, the nature of what constitutes a successful school health program causes challenges in its evaluation (Darlington et al., 2018).

Inadequate evaluation: reason 3 – measurement validity

Relating to the complex nature of school health services, the third category of challenges in evaluation is measurement validity. School health services often have multiple components, and depend on a variety of factors for their success. For example, the same school health service might produce drastically different results in another region due to its school's resources, school's leadership, school culture, the family beliefs, community interventions, and children's initial needs (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). The complex interaction between all these factors makes valid measurement of school health services challenging even if the data on all these factors is present (Agron et al., 2010; Darlington et al., 2018; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997).

Inadequate evaluation: reason 4 – bias

Lastly, like any other statistical test, evaluation of school programs can include biases and flaws inherent to statistical studies. Some of these flaws include self-reporting bias (providing socially desirable answers), reporting biases (only reporting positive findings in the literature), Hawthorne effect (observing positive outcomes due to being part of the investigation rather than the nature of the investigation), the vague conceptualization of study variables, and small sample size (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Murray et al., 2007). Therefore, all these barriers to evaluation, result in a lack of data for school health services.

Link between evaluation and buy-in and funding

Due to the accountability systems, evaluation of school health programs is closely linked to buy-in from key stakeholders and funding for school health programs. With the merit-based systems currently in place, such as those as the result of the No Child Left Behind, schools are under pressure to maintain their students' academic achievements above certain levels and show continued improvement (Mann & Lohrmann, 2019). The consequences of not meeting these demands are often decreasing or losing funding (Mann & Lohrmann, 2019). Schools are thus less likely to spend their funds in programs, such as school health services, if these programs do not directly contribute to their students' academic performance (Basch, 2011a; Mann & Lohrmann,

2019; Mitchell et al., 2005). Advocates for school health programs emphasize the link between health and education to convince schools and other stakeholders that these programs improve students' academic improvement, their future employability, and decrease healthcare expenditures (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). But without the necessary evaluation and data, these claims are not enough to bring the necessary buy-in and financial support. For example, educational leaders are more likely to support school health programs if they are made aware of their immediate benefits related to student academic achievement (Basch, 2011b; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Mann & Lohrmann, 2019). But as discussed, doing so for school health programs is challenging due to their complex nature. Even worse is when school health programs are implemented but because they are implemented improperly or inefficiently or wrong evaluation technique is used, their results show limited gains, resulting in harsh criticism and a decrease in buy-in and investment (Deschesnes et al., 2003; Rosas et al., 2009). The negative result might also lead to the discontinuation of a good program whose results were not optimal because of other negative conditions that outweighed its benefits or limited funding for its successful implementation (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Proper evaluation of school health programs, whether to better demonstrate its direct or indirect impact on academic achievement, is then crucial for showing the importance of school health services, bringing more funding and buy-in from schools and other stakeholders (Basch, 2011a; Basch, 2011b; Deschesnes et al., 2003; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Mann & Lohrmann, 2019; Murray et al., 2007; Wyatt & Novak, 2000). It is important to note that besides increasing support, proper evaluations are also necessary for continuous improvement of school health programs (Deschesnes et al., 2003).

Lack of Proper Multidisciplinary Collaboration

Some researchers note effective collaboration of health and educational fields as an essential part of the school health success (Agron et al., 2010; Deschesnes et al., 2003; Freudenberg & Ruglis, 2007; Hunt et al., 2015; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Mann & Lohrmann, 2019; Novello et al., 1992; Washburn, 2018; Wyatt & Novak, 2000). Both health and educational fields have the goal of promoting

children's wellbeing and see value in their collaboration (Lear, 2017; Marshall & Wuori, 1985). Yet, their executive boards are not inclusive of experts in the other field and there are no centralized organizations where the fields come together (Lear, 2017; Mann & Lohrmann, 2019; Marshall & Wuori, 1985). For example, the last nation-wide collaboration between them occurred in 1992, where 125 experts from 40 national education, health, and social service organizations came together to produce a national action plan for comprehensive school health education (Mann & Lohrmann, 2019). The literature suggests that this lack of extensive collaboration stems from their differences in priorities and realities. For example, physicians often focus on training in acute illnesses, while educational professionals value gradual change (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Marshall & Wuori, 1985). Or schools are often public systems while health care is often a private system (Lear, 2017). Healthcare experts often decide what are school health needs that the focus needs to be on, while schools might have their own needs that are more urgent than the health service-identified ones (Mitchell et al., 2005; Taras, 2003). Public health experts rarely make reducing the drop-out rates a priority, even though it is widely understood that one's education is inextricably linked to their future health (Freudenberg & Ruglis, 2007). So, when these fields come together, there are always discussions around who will be in charge, whose methods will apply, who will provide funding, and how it will impact the community's relation to the school because of the programs' possible stance on controversial health topics (Lear, 2017). While there are many scholarly works that offer this lack of collaboration as one of the reasons behind the shortcomings of school health programs, I have found that they fail to provide any frameworks and suggestions on what effective collaboration looks like (Lear, 2017). Therefore, health and educational fields are told to work with one another, but there are no centralized well-established guidelines to encourage their initial steps of collaboration. This capstone aims to provide such a framework on effective collaboration, and potentially help with reducing the other mentioned causes behind school health shortcomings: a shortage of funding, limited school staff capacity, challenges of buy-in, and inadequate evaluation of programs.

Effective collaboration and funding and school staff capacity

Health and educational fields' effective collaboration can bring more funding and staff to the school health programs. Healthcare organizations, such as the American Medical Association or

the American Academic of Pediatrics, can help the educational field with funding by sharing the costs of school health programs (Freudenberg & Ruglis, 2007; Mann & Lohrmann, 2019; Wyatt & Novak, 2000) and identifying the most cost-effective school health programs that bring the most positive impact on students' well-being given a school's limited funds (Taras, 2003). Additionally, health experts contribute to rising the school staff capacity. For example, they can work with the teachers to identify students' medical needs and ensure the students would receive the necessary follow-up care for preventing future complications (Basch, 2011a). Healthcare workers can also reach students in medically underserved areas by establishing school-based health centers or telehealth appointments (Healthy Schools Campaign, 2017; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Their expertise may additionally help relieve administrators' anxiety by helping in planning and implementation of clinical services at schools (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). Therefore, with proper collaboration, we reasonably expect to see a decrease in funding and school staff capacity issues that school health programs often face.

Effective collaboration and buy-in and adequate evaluation

Their effective collaboration may also help with the appropriate evaluation of school health services, thus leading to higher buy-in and funding. Healthcare professionals are capable of helping with designing basic and outcome evaluations that lie outside of the expertise of educational experts, who often design process evaluations (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). With basic and outcome evaluations, respectively, experts are able to identify the fundamental determinants of behavior change and empirically examine the interventions on targeted outcomes (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). The healthcare staff can continuously evaluate and monitor the programs, areas of improvement, and the overall state of children's health in communities (Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997; Mann & Lohrmann, 2019; Novello et al., 1992; Taras, 2003; Wyatt & Novak, 2000). By collaborating with one another, the experts would be able to design evaluations that show the link between education and health, thus school health's contribution to education (Freudenberg & Ruglis, 2007; Institute of

Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997). This way, they can advocate for school health programs stronger at the policy level and increase buy-in (Freudenberg & Ruglis, 2007; Institute of Medicine (US) Committee on Comprehensive School Health Programs in Grades K-12, 1997).

Overall, the collaboration between health and educational fields is crucial for the success of school health, and since frameworks on how it should happen are limited, this capstone suggests a collaboration model that can lead to more successful collaborations.

Appendix 2: Methodology of Choosing Cases Studies

This section comprehensively explains Figure 1 and the Methodology section in choosing case studies in nutrition and/or physical activity initiatives. In choosing the articles, I go through four steps. In step 1, I do a broad search of nutrition or physical education initiatives involving school-aged children and collaboration with the health field by searching on PubMed and ERIC. PubMed was chosen to represent articles published by the medical community, and contains the articles from the top 10 journals in the intended fields of study. The journals were identified by searching the two following bullet points in the Web of Science Core Collection and analyzing the reports for the top journals in the field. The inclusion of these journals by PubMed was checked on the NML catalog for journals currently indexed for MEDLINE. Search terms on Web of Science and top 10 journals associated with them through the analysis report are:

- (TI=(school* or student*) AND TS=(obes* OR overweight) AND TS=(nutrition OR physical education OR physical activity)) AND LANGUAGE: (English)
    - Journals: BMC Public Health, Journal of School Health, International Journal of Environmental Research and Public Health, Public Health nutrition, PLOS one, Journal of Physical Activity Health, International Journal of Behavioral Nutrition and Physical Activity, Journal of Nutrition Education and Behavior, Nutrients, Preventative Medicine
- TS=(school* or student*) AND TS=(obes* OR overweight) AND TS=(nutrition OR physical education OR physical activity)) AND LANGUAGE: (English)
    - Journals: BMC public health, International Journal of Environmental Research and Public Health, Public Health Nutrition, Journal of School Health, Journal of

Physical Activity Health, PLOS One, Nutrients, Preventive Medicine, International Journal of Behavioral Nutrition and Physical Activity, Journal of Nutrition Education and Behavior

ERIC database was chosen as the database representing the education field. The following terms were searched on PubMed and ERIC. The numbers of articles found on PubMed and ERIC were 1035 and 252, respectively.

- PubMed:
    - (school*[ti] or student*[ti]) AND (obes* OR overweight) AND (nutrition OR physical education OR physical activity) AND (physician* OR doctor* OR MD OR health center* OR health organization* OR healthcare* OR hospital* OR clinic* OR health care* OR pediatric*) AND (intervention OR program OR trial OR pilot*)
    - Filter: free full text, journal article, meta-analysis, randomized controlled trial, review, English, From 1/1/2013– 1/1/2021
- ERIC:
    - (title: school OR student) AND (obes OR obesity OR overweight) AND (nutrition OR physical education OR physical activity) AND (physician OR doctor OR MD OR health center OR health organization OR healthcare OR hospital OR clinician OR clinic OR health care OR pediatric OR pediatrician) AND (intervention OR program OR trial OR pilot)
    - Filter: full text

The articles were exported to Zotero — a reference management software program — and after duplication erasing, 1287 total articles remained. In step 2, articles' titles and abstracts were skimmed, and articles that included the following criteria were kept:

- Measurable data and not that of providing reviews or meta-analysis of other studies
- Focus on nutrition, nutrition education, or physical education interventions
- Focus on interventions or issues affecting K-12 schools or students, but not those with a focus on pure biology, such as the elucidation of genes or signaling pathways
- Location of the study within the U.S.
- Publication date from 1/1/2013– 1/1/2021

At the end of step 2, 121 articles remained. For step 3, the articles' abstracts and full texts were skimmed to include a loose relation to physician involvement. The inclusion criteria were:

- Mention of physicians or of associated synonyms (such as clinician, doctor, healthcare provider, surgeon) or healthcare-related organization in the full text OR
- Having an author associated with School of Medicine / Medical School / Medical College / hospital / medical setting or one with an MD degree

At the end of step 3, 52 articles remained. For step 4, a careful reading of articles' full text was done to ensure they meet all the criteria mentioned in steps 1, 2, and 3 and have the following criteria:

- Have an author with an MD degree or explicitly mention physicians or words synonymous with physicians as active participants of the study
- Are judged as "Include[d]" during quality assessment via the critical appraisal tools of JBI (Joanna Briggs Institute)

The JBI critical appraisal tools are well-known checklists that help assess the validity and reliability of a study based on the type of article (Karolina, 2015). I judged the type of article based on my knowledge of study types, and then use the relevant appraisal tool for quality assessment of the article. The inclusion or exclusion of the study after doing the checklist was made qualitatively based on my judgment using the tool (Karolina, 2015). My judgment mainly relied on the study having a clear objective, a clear and relevant methodology, clear results with proper analysis for answering the objective, and relevance to the purposes of this paper's research aim. At the end of step 4, 28 articles remained. These articles were analyzed carefully for the proposed model of collaboration between physicians and educational experts in the field of school health. Their recorded data are in Appendix 3: Data Table.

Appendix 3: Data Table

The data collected from the 28 cases are attached in the excel sheet and the google sheet linked below. The key data terms are explained in the Data Collection Terms section.

Excel Sheet: Ava_Niknahad_FinalCapstone.xlsx

Google Sheets: Ava_Niknahad_FinalCapstone