WATER SAFETY EDUCATION IN MICHIGAN: TEACHERS AS NAVIGATORS TOWARDS WATER SAFETY FOR CHILDREN AND YOUTH

By

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ABSTRACT

Drowning is the leading cause death for children ages 1-4, and second only to motor vehicle crashes for children and youth ages 5-14 (CDC, 2012; 2016). Protecting children and youth from drowning requires a set of water competencies, including, but not limited to, self-rescue, the safe rescue others, and effective prevention (Cummings, Mueller & Quan, 2011; Salomez & Vincent, 2004; Stallman et al., 2017; Thompson & Rivara, 1998;). There is evidence that water safety education can help build the water safety knowledge and skills to bolster these competencies among children and youth (Solomon et al., 2013; Petrass and Blitvich, 2014; Wilks et al., 2015; Turgut, 2016). In Michigan little is known about the water safety education efforts of schools, the water safety knowledge levels of teachers, and teachers' willingness to participate in future water safety education.

This study aims to, identify the current water safety education and swimming efforts of Michigan K-12 teachers and their schools, identify the water safety knowledge levels of K-12 grade Michigan teachers, and explore the influence of teachers' background factors, water safety knowledge, risk perceptions, past behavior, attitudes (ATT), subjective norms (SN), and perceived behavioral control (PBC), on intentions (INT) to teach three 30-minute water safety lessons through an extended model of the Theory of Planned Behavior (TPB).

To achieve the purposes of this study an online survey was sent at random to over 200 public, private, and charter schools across Michigan resulting in 238 teacher participating in the surveys. Correlations were run between background factors, water safety knowledge and water safety education efforts of teachers and their schools. Teachers' experiences with drowning and rescue, along with their perceptions of Michigan's beach safety flags were explored using content analysis. Finally, a path analysis was utilized to analyze the influence of ATT, SN, and

PBC on INT to teach water safety.

The final sample of 184 teachers represented over 80 schools, and closely matched the greater population of Michigan teachers. Results revealed that opportunities for students to participate in water safety education and swimming in Michigan schools are extremely limited. Only 13% of schools provide swim lessons, 11% provide water safety education in the classroom, and 3.4% of teachers teach water safety education lessons in the classroom. Although teachers accurately identified effective prevention efforts and drowning risk, they averaged just 50% correct on water safety knowledge questions and had incorrect perceptions of Michigan's beach flags. Teachers had favorable attitudes toward water safety education, yet low INT to teach water safety. The path model based on TPB exhibited excellent fit (RSMEA .000, CFI = 1.000, TLI = 1.000 and SRMR = .000), and SN was found to be the sole predictor of teacher intentions (B .486 $p < .001$).

There are very few opportunities for students to participate in water safety education and swimming in Michigan schools, and the water safety knowledge of Michigan K-12 teachers was generally low. Teachers value water safety education and believe it can be an effective way to help keep students safe in and around the water. However, teachers do not feel that teaching water safety education is a responsibility of their job or an expectation from school leadership. Subjective norms were found to be the sole predictor of teacher's intentions, highlighting the important influence of the social and cultural factors, cultivated by important referents, on teacher's intentions to adopt new curriculum like water safety education. Teachers value the expectations of their principals more than any other referent, and curricular expectations are ultimately shaped by standards set at the state level. Therefore, policy may be a key factor in the cultivation of teacher's normative beliefs.

PUBLIC ABSTRACT

Children and youth participating in aquatic activity are at a high risk of drowning. However, participating in aquatic activity can provide many physical and psychological benefits that can aid in their overall development. Therefore, there is great importance in finding ways to effectively keep children and youth safe while participating in activities in and around the water. Many effective drowning prevention measures are already known, barriers around water, the use of lifejackets on watercraft, supervision, and building the knowledge and skills (water competencies) to keep them safe. Water safety education has been found to bolster the water competencies of children and youth in many contexts, including in schools. However, in the state of Michigan, a state surrounded by water, little is known about the water safety education efforts of teachers and their schools. Therefore, the purpose of this study was to identify the current water safety education and swimming efforts of Michigan K-12 teachers and their schools, to identify the water safety knowledge levels of K-12 Michigan teachers and explore teachers' willingness (intentions) to teach water safety education to their students.

184 teachers from nearly 100 schools completed an online survey that help provided the information needed to accomplish all three purposes. Results provided evidence that Michigan K-12 students have very few opportunities to participate in water safety education or swimming, that teachers had limited water safety knowledge, and that they had little intention to teach water safety education to their students. Although intentions were low, teachers had very positive attitudes towards the importance and effectiveness of water safety education for their students, believing it could help save lives and keep their students safe. Intentions appeared to be influenced primarily by teacher's beliefs about the expectations they felt from important others, like principals and fellow teachers. Additionally, teachers valued the expectations of their

principal more than anyone else. These expectations are most likely shaped by standards set at the state level, and therefore policy change may be a key factor in changing teacher's beliefs about teaching water safety. Beyond policy change, there are several other potential paths forward for Michigan schools identified, paths that could enhance opportunities for students in Michigan to develop the water competencies needed to better protect them from drowning.

This research is dedicated first and foremost to everyone who has lost someone to the tragedy of drowning. I hope that our efforts in research help cultivate greater opportunities for the development of the water competencies needed to protect from drowning. Second, this study is dedicated to finding ways to generate the momentum, motivation, and political will to better engage schools in water safety efforts that can help protect children and youth from drowning so we can prevent these tragedies in the future. Third, this study is dedicated to those who share my love for the water, may you stay safe as you partake in the joy of aquatic activity, and be dedicated to keeping others safe along the way. Fourth, this study is dedicated to my Grandma Field, who shared in much of my PhD journey with me but was unable to be with me at journeys end. I love you Grandma; I'll send a copy to heaven.

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CHAPTER 1: INTRODUCTION

Drowning is a global health concern, sadly claiming the lives of an estimated 236,000 people every year, and negatively impacting families and communities around the world far too often (WHO, 2021). In the past decade, global drowning rates have reached as high as an estimated 372,000 people annually (WHO, 2014). Drowning is the world's third leading cause of accidental death, representing 7% of all injury related deaths worldwide, and experts claim that global statistics may even underestimate the true scope of drowning. (WHO, 2014; WHO, 2021). Near drownings are of additional health concern and can cause injury as well as require emergency care, occurring at rates far greater than fatal drowning incidents (Moran, 2010; Katchmarchi, 2017). For example, in the U.S., a survey by the fAmerican Red Cross found that nearly half of participating adults (n=1,000) reported what is identified as a life-threatening submersion event (LTSE), or a near drowning. Additionally, an exploration by McCool et al. (2008) provided evidence that just under one third (30%) of participating adult beachgoers (n=3,371) from New Zealand said they had experienced a LTSE. Combined, the risk of fatal and non-fatal drowning is substantial for all those participating in activities in and around the water.

The issue of drowning goes far beyond prevalence, as drowning is a tragedy that has many costs. These costs not only include the social and emotional costs felt by families, friends, and communities after experiencing a drowning, but also a variety of financial costs. The resources needed for the initial response and rescue, for the long-term recovery of near drowning patients, and the performance of searches for missing drowning victims all have financial costs associated with them that quickly add up. In 2010, drowning costs in the U.S. mounted to just over 6 billion dollars, with coastal drowning alone costing $273 million (CDC, 2013; WHO, 2020). Total drowning injury costs in Australia have been reported around $85.5 million, and, in

Canada, injury costs have reached around $173 million (WHO, 2020). Recently, Houser, Arbex and Trudeau (2021) reported that the economic burden of drowning on the Great Lakes is over 100 million dollars, an amount that far outweighs the cost of employing seasonal lifeguards. Finally, the Australian Water Safety Council urges the consideration of the full burden of drowning, including the lasting social and economic impacts of drowning incidents as well (AWSC, 2016). Each of these burdens, however, are avoidable, because drowning is a tragedy that is ultimately preventable (Bierens, 2006). Therefore, the investment in efforts to protect individuals, families, and communities drowning "is not only worthwhile, but essential." (Moran et al., 2017).

The first step in protecting individuals from the tragedy of drowning is understanding factors that may influence drowning risk. There are a number of well-established risks found within the water safety and drowning prevention literature, including a variety of personal characteristics and environmental factors. Unfortunately, across an entire lifespan, children and youth are consistently at the highest risk of drowning. Worldwide, drowning is the third leading cause of death for youth 5-14 years old, and about 60% of all drownings occur among those under 30 years of age (WHO, 2020). In the U.S. drowning is the leading cause of unintentional death in children 1-4 years, and second only to car accidents in youth 5-14 years (CDC, 2016). Starting at the age of one year, and for every year after, global drowning rates are significantly higher among males, drowning at rates twice as high as females (WHO, 2008). These rates are even more pronounced in the U.S., from 2005-2009 males drowned at rates almost four times higher than females, and males make up 80% of drowning incidents (CDC, 2016; Drowning, 2012; WHO, 2020).

Drowning trends also provide evidence that those of racial or ethnic minority (Strubi et al, 2006; Peden & Franklin, 2012; Golob, Giles & Rich, 2013; Katchmarchi, 2018), tourists (Stallman et al., 2017; Morgan, Ozanne-Smith, & Triggs, 2008), those in remote areas (Moran et al., 2017), and those of lower socioeconomic and educational status (ILSF, 2003; Irwin, 2009b; USA Swimming, 2017; Irwin et al., 2018) are at higher risk of drowning. These trends may be due to unfamiliarity with local aquatic environments and their hazards, limited opportunities to learn about water safety and to gain important skills, the lack of access to safe water ways, and,/or resources to aid in drowning prevention (Wiltse, 2007; Irwin et al.,2018; Stallman et al., 2017; Morgan, Ozanne-Smith, & Triggs, 2008, Moran et al., 2017). Additional populations at higher risk of drowning include persons of disability, those with preexisting medical conditions, and those with higher access to water (Lhatoo & Sander, 2005; Peden and Wilcox-Pigeon, 2020; WHO, 2020; CDC, n.d.). Finally, the use of alcohol impairs balance, coordination, judgment, and reaction time, which in combination can increase drowning risk (Driscoll, Harrison & Steenkamp, 2004; Quan, Pilkey, Gomez & Bennett, 2011). There are a wide variety of personal factors that can influence drowning risk for individuals, many of which are mentioned above, and focusing prevention efforts on those at highest risk is of great important moving forward.

The community or environment individuals live within can also impact drowning risk. For example, the majority of drownings occur (90%) in low- or middle-income countries that lack the infrastructure or resources to effectively protect their communities (WHO, 2020). In Bangladesh drowning rates have reached as high as 42% of all deaths among children 1-4 years of age, while in Vietnam drowning has been found to occur at rates of 16.57 and 13.10 per 100,000 among children 0 to 4 and 5-14 respectively (National Institute of Population Research and Training, 2012; Vietnam Health Environment Management Agency, 2010). Other

environmental risks include access to water, with those of higher access typically at higher risk, natural disasters, and the unique hazards of the aquatic environment itself (WHO, 2014). Albeit to a lesser extent, drowning is a health and life safety concern for high income, developed nations as well. In the U.S. an average of around 4,000 people will drown every year, a rate of 10 drownings a day, 800 of which are children (CDC, 2014, 2016; Safer Kids World Wide, 2016). There are also areas within the U.S. that present unique water safety challenges and are in need of a more intentional, focused drowning prevention approach.

The Great Lakes, for example, are a set of lakes which host many of the same characteristics, and subsequent risks, as oceanic coastal environments. Since 2010, there have been over 1,000 total drownings on the Great Lakes, 110 occurring in 2020 and 57 of these on Lake Michigan (Great Lakes Surf Rescue Project, n.d.). The issue of Great Lakes drowning is amplified when comparing rates to other coastlines. In the 2017-2018 season, there were 46 drownings across all of Australia's beaches, while the Great Lakes saw 117 drowning incidents in 2018 alone (GLSRP, n.d.; Royal Lifesaving, 2018). Indeed, the Great Lakes had 100 more drownings than all United States Lifesaving Association (USLA) guarded beaches across the US in the 2017 season (USLA, 2017). Generally, the Great Lakes region lacks the proper prevention, response, and rescue efforts needed to best protect their communities from drowning, despite the region arguably having the available resources and capacity to do so.

The "Great Lakes State" of Michigan hosts more shoreline than the East or West coast of the United States and has more shoreline than any other state in the U.S. outside of Alaska (U.S. Department of Commerce, 1975). However, unlike other U.S. coastal cities and state parks, the vast majority Michigan's Great Lakes shoreline is not protected by lifeguards (Pratt, B. Personal Communication). The lack of swift response and rescue by professional lifeguards on beaches

across the Great Lakes may be a driving factor in high Great Lakes drowning rates. Communities that are not situated on Michigan's shoreline also have high access to water, further increasing the risk of drowning. In fact, while in Michigan, individuals will never be more than 6 miles from an inland lake (Michigan Economic Development Corporation, n.d). Drowning risks are compounded by uncertainty as to whether or not there are ample water safety education efforts in Michigan schools. Water safety standards are situated in the physical education curriculum, however, physical education classes across the state have seen recent decline (Michigan Department of Education, 2017) and, in some cases, when offered, do not teach the required water safety curriculum. Water safety standards are not only situated in a content area seeing significant reduction, but they are also rarely, if ever, assessed or evaluated. Indeed, water safety standard adherence in physical education is not tracked in any way by the state (M. Teachout, Personal Communication, December 11, 2017).

Although there are several known drowning risk factors, drowning remains a dynamic issue, reflecting the complex, and great variety of ways in which individuals interact with the water (Moran, 2006). In a review of over 3,000 media and official reports, Connelly (2014) found that many drowning incidents were also coupled with hazardous environmental and, or, personal factors, like moving water, cold water, entrapment, exhaustion, and being unable to hold onto the water's edge. The water safety issues on the majority of Great Lakes shorelines are an excellent example of this complexity. The combination of high access to the water, lack of professional prevention, supervision, and rescue efforts by lifeguards in open water ways, and uncertainty in water safety education efforts, coupled with the lack of knowledge and skills of the individuals engaging with the water may ultimately create an environment increases drowning risks.

However, for all the risks that water presents to those participating in activities in and around the water, there are also a wide range of benefits to being active in the water, especially for children and youth. Aquatic activity like swimming can significantly reduce the risk of mortality, chronic illnesses, heart disease, and diabetes (United States Department of Health and Human Services, 2008; Chase et al., 2008). Additionally, aquatic exercise and swimming has been found to provide better sleep for those with mild sleep disorders, arrest chronic kidney disease progression, and bolster both the metabolic profile and the cardiovascular system for men with type 2 diabetes mellitus (Chen et al., 2016; Cugusi et al., 2015; Pechter, Raag & Its-Rosenberg, 2014). Participating in early years swimming can aid in the early achievement of cognitive, physical and linguistic milestones in young children, when controlling for both social background and gender (Jorgensen, 2013). An ocean-based adaptive surfing program provided an environment for the improvement of a wide variety of physical fitness outcomes, as well as a setting that helped enhance the social development and self-confidence of children (Clapham, Armitano, Lamont & Audette, 2014). Increasing regular physical activity through swimming and other aquatic activity can aid youth in their optimal growth, development, and learning (Janssen & LeBlanc, 2010; U. S. Department of Health and Human Services, 2008; Strong et al., 2005). Finally, as youth learn how to be safe in and around the water, they would have opportunities to help others learn how to be safe and even prevent drowning as a layperson or using their water safety knowledge and skills in careers like lifeguarding or swim instructing. This will allow youth to reinvest in and serve their community in a meaningful way which can enhance their trajectory towards positive development (Perkins, Borden, and Villarruel, 2001).

Aquatic activity provides a wide array of important physical and psychological benefits, while simultaneously presenting several hazards to those participating. There is great

importance, then, in finding ways to increase participation in aquatic activity, while simultaneously reducing the risks of drowning. Fortunately, there are many well-known practices that can help protect individuals from drowning, keeping themselves and others safe while in and around the water. Safe participation in aquatic activity requires a set of competencies that includes the knowledge, skills, behaviors, and attitudes that are vital to keeping self and others safe while engaged with the water (Moran, 2013). Water competence includes, but is not limited to, knowing, and performing safe entry into and exit from the water, effectively being able to float and gain orientation, propulsion, knowledge of local water ways and their risks, and even positive attitudes towards water safety (Stallman et al., 2008: Stallman et al., 2017). Generally, water safety literature provides evidence that attaining the knowledge and skills to perform safe self-rescue, to safely rescue others, and to engage in effective preventative behaviors that protect from drowning in the first place reduces the risk of drowning.

Safely managing access to water using barriers is one of the first steps towards drowning prevention. The placement of barriers around the water can drastically reduce drowning incidents, especially four-sided, isolated barriers that completely surround the water (Thompson & Rivara, 1998; WHO, 2020). Vigilant supervision of others is the next important step towards preventing drowning, especially for children and youth. Salomez & Vincent (2004) provide evidence that the most common factor in drowning among children 1-4 is the lack of proper adult supervision. Querioga and Peden (2013a) discovered high rates of drowning among youth 5-19 years when away from the supervision of parents or lifeguards in Australia. The appropriate use of personal floatation devices is the final major step in the direction of drowning prevention, especially for the non, or inexperienced swimmer, and for those participating in activities like boating (U.S. Coast Guard, 2011; U.S. Coast Guard, 2019; Cummings, Mueller & Quan, 2011).

Once entering the water, it is important for individuals to have the knowledge and skills to be able to save themselves if in trouble in the water. This can be done by taking a deep breath, rolling onto your back, and attempting to float while calmly assessing the best path to safety (GLSRP, n.d.). Finally, if others are in trouble in the water, it is important to know how to respond and rescue them safely. This can be done by first properly identifying drowning, providing floatation, and performing CPR with breaths, and first aid if needed (Szpilman et al., 2014),. Ultimately, discovering ways to build a robust set of water competencies among individuals can help create safer communities in and around the water. Fortunately, there is evidence that water safety and drowning prevention interventions can help enhance the knowledge, skills, and attitudes of individuals to do so.

Water safety interventions have been found effective among individuals of all ages, with a wide range of ability levels, in several contexts, diverse settings, and communities all around the world (Asher et al., 1995; Moran, 2011b; Hatfield et al., 2012; Sandomierski, Morrongiello & Colwell, 2019). Research supports that interventions situated within schools have been particularly beneficial for children and youth of all ages, from early elementary to college students (Solomon et al., 2013; Petrass and Blitvich, 2014; Wilks et al., 2015; Turgut, 2016). Although there is evidence for the positive impact of these interventions, water safety intervention work frequently lacks consistent, long-term evaluations, the use of guiding theory, and formative evaluations (Leavy et al., 2015a; Leavy et al., 2015b). Additionally, school-based water safety education and drowning prevention interventions are typically done in partnership with water safety experts or organizations, and, although there is great value in doing so, rarely include teachers in the process of development, delivery and evaluation of these programs (Lynch 2012).

Teachers hold the potential to be valuable assets in not only the development of water safety education, but also its delivery and evaluation in schools. Their professional skill set and experiences can bring important guidance in water safety education curriculum development, recommendations in best practices in delivering water safety messages, as well as consistent and effective evaluation. High quality teachers have also established positive relationships with their students, are familiar with their students' interests and how they best learn, and are connected to families and the greater community, all of incredible benefit in creating a water safety education program. Teachers may be more aware of their local aquatic environments and their hazards and more readily able to address local risks and prevention considerations in the water safety curriculum development process. Finally, school-based water safety education programs could offer equitable, consistent, and long-term drowning prevention efforts that are situated in educational/behavioral theory and evaluated over the course of many years, all of which have been identified as important gaps in water safety and drowning prevention literature (Moran 2008; Lynch, 2012; Petrass and Blitvich, 2014; Leavy, 2015b).

Although the inclusion of teachers in the process of water safety education curriculum development, delivery and evaluation is essential, there are several important formative questions that should be explored prior to inviting teachers into this process. The first set of questions surround the current water safety competency levels of teachers. What do teachers currently know about water safety and drowning prevention? Are teachers familiar with drowning risks, efficacious preventative measures, and how to safely rescue themselves and others? Further, what water safety skill sets do teachers currently possess? This could include swimming ability, expertise in aquatic activities, or even lifeguard training/experience? Finally, are teachers familiar with the risk of drowning, especially for children and youth? The second

important question has to do with the current water safety education practices of teachers and their schools. Are teachers delivering a water safety curriculum in any capacity, or participating in drowning prevention efforts as part of their local schools? Third, and finally, it is important to consider if teachers are willing and motivated to participate in water safety education efforts in their schools. In other words, what future intentions do teachers have, if any, to teach water safety messages to their students?

Gaining an understanding of the water safety competencies, the current water safety education efforts, and the future water safety intentions of teachers is an essential first step in the development of successful school-based water safety education programs. Knowing the current water safety knowledge and skills of teachers can help identify gaps and inform necessary teacher education and training. Professional educators who are more competent in water safety content could be more motivated and successful in the task of teaching water safety messages (Deci & Ryan, 2000; Fauth et al., 2019). In addition, the current water safety education and drowning prevention efforts of teachers and schools in Michigan is widely unknown. In order to enhance future water safety education efforts it is important to understand if students are learning water safety skills or being taught about drowning prevention, by whom, and to what extent. Finally, discovering teachers' intentions to participate in water safety education efforts can provide useful insight to whether or not teachers plan on teaching water safety in the future.

According to the Theory of Planned Behavior (TPB) three major beliefs determine the trajectory of human behavior: beliefs about the outcomes of behavior, beliefs about the expectations of others (normative expectations), and beliefs about an individual's ability to control the behavior itself (Ajzen, 1991; Ajzen, 2013). Additionally, TPB states that, in the context of the behavior, these beliefs will yield positive or negative attitudes, perceived social

influences (subjective norms), and perceptions of behavioral control respectively (Ajzen, 1991; Ajzen, 2013). In totality, attitudes, subjective norms, and perceived behavioral control will cultivate an individual's intentions toward the behavior, and these intentions may, or may not, be carried out, dependent on the actual control an individual has over the behavior. In their meta-analysis, Conner and Sparks (2015) find medium (~.3) to large (~.5) relationships between the proposed determinants (attitudes, subjective norms and perceived behavioral control) and behavioral intentions in health behaviors. The authors also provide evidence that attitudes, subjective norms and perceived behavioral control are significant predictors of intentions, explaining 32.3% of variance. Finally, both perceived behavioral control and intention are significant predictors of behavior, together explaining 18.8% of variance. Differences in beliefs and changes in intentions between assessment and time to act on the behavior, as well as unexpected obstacles, may explain why intentions and perceived behavioral control are less predictive of actual behavior (Fishbein and Ajzen, 2010).

The TPB (Ajzen, 1991) was developed by adding PBC as a predictor of both intention and behavior to the original Theory of Reasoned Action (Ajzen, 1991). Since its inception, several researchers have explored the impact of introducing a variety of new variables into the model. These practices are encouraged by Ajzen (2020), as long as they are done with thoughtful theoretical consideration and draw on past empirical evidence. Further, a good deal of research has evaluated the influence of background variables on the direct antecedents of both intentions and behavior. Research on the background variables in the TPB typically examines the effect of context specific factors on ATT, SN, and PBC, providing some evidence of significant influence (Lee et al., 2018; Bornschlegl, Townshend & Caltabiano, 2021). Further, there is a robust volume of research on the inclusion of additional direct predictors of intentions

and behavior in the TPB model. Knowledge, past behavior, and risk perceptions are a few, not all, of the variables more frequently introduced as direct predictors. Knowledge has been found to have significant direct and indirect effects (Guerin and Toland, 2020; Mohajeri et al., 2021), as well as moderating effects (Wang et al., 2020; Rahmafitria et al., 2021; Mohajeri et al., 2021) on intentions. Similar results have been found in regards to risk perceptions (Ferrer & Klein, 2016; Adiyoso and Wilopo, 2021; Seong and Hong, 2021; Zhang, Wu & Rasheed, 2019) and past behavior (Hashim et al., 2014; Fu, 2020; Huang, Antoonides and Nie, 2020).

Using the TPB as a guide to explore teachers' intentions to teach water safety education could bring to light valuable information about teachers' attitudes, social influences, and perceived control in regard to water safety education. The addition of important background factors in the context of both education and water safety can help further explain what impacts antecedents of teachers' intentions to teach water safety. Additionally, investigating knowledge, past behavior and risk awareness as additional, direct predictors of intentions may also help increase the explanatory power of the TPB model (Cheng, 2015). Gathering information on teachers' intentions to teach water safety education, water safety competencies, and the current water safety education efforts of teachers and their schools can help map out the relatively unknown "landscape" of drowning prevention in Michigan k-12 schools. Finally, understanding these components can provide the building blocks needed to construct a strong foundation for future school-based water safety and drowning prevention efforts.

Building this foundation may be of particular importance for children and youth in Michigan, which, as previously noted, is a state with vast shoreline and inland waterways, primarily unprotected by lifeguards, and with great uncertainty in water safety education efforts in schools. While it is tempting to immediately step into water safety curriculum development, or

dive into the development of a teacher-based intervention, doing so may be premature as the current water safety knowledge and skills of teachers, the current water safety education efforts of teachers and their schools, and the future intentions of teachers to provide water safety education is greatly unknown. For this reason, it would be judicious to survey teachers and learn more about these important components prior to water safety curriculum development and the implementation of teacher-based water safety interventions in Michigan schools.

Given the above, this dissertation will involve surveying Michigan K-12 teachers and has three purposes. These include to:

(1) identify the current water safety competency levels of k-12 teachers in Michigan;

(2) identify the current water safety education efforts of Michigan K-12 teachers and their schools;

(3) explore the influence of teacher background/demographic factors, water safety knowledge, drowning risk awareness, past behavior in teaching water safety, ATT, SN, and PBC on teacher intentions to teach three, 30-minute water safety lessons to their students.

Purposes 1 and 2 are descriptive in nature, while Purpose 3 will be examined using a structural equation model (SEM) in an extended TPB model (Figure 1). The extended TPB model generates several predicting paths with associated hypotheses:

H1: Males will have lower perceived drowning risk, and less favorable attitudes towards water safety education.

H2: Minorities will have higher perceived drowning risk than white individuals and more favorible attitudes towards water safety education.

H3 – H8: Access, participation, school participation, swim ability, lifeguard experience, experience with rescue and experience with drowning will positively predict perceived

risk (H3), attitudes (H4), subjective norms (H5), past behavior (H6), perceived behavioral control (H7), and knowledge (H8) related to water safety education

H9: Perceived risk will significantly, positively predict attitudes towards teaching three, 30-minute water safety lessons.

H10: Past behavior will positively predict subjective norms towards teaching three 30-minute water safety lessons.

H11: Water safety knowledge will positively predict perceived behavioral control towards intentions to teach three 30-minute water safety lessons

H12 – H17: Perceived risk (H12), attitude (H13), subjective norms (H14), past behavior (H15), perceived behavioral control (H16), and water safety knowledge (H17) will positively predict intentions to teach three, 30-minute water safety lessons.

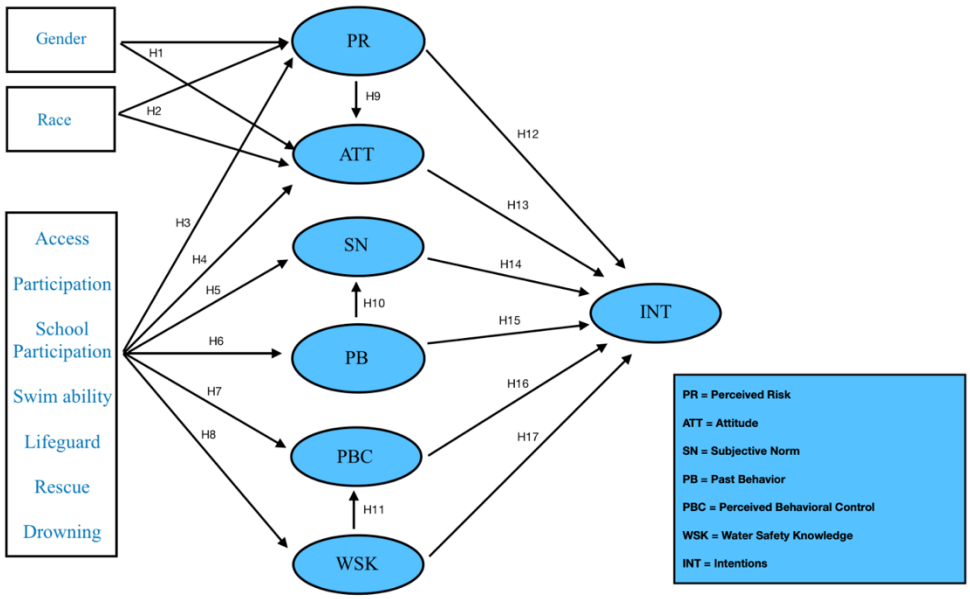


Figure 1

WSEGLS Extended Theory of Planned Behavior Model with Associated Hypotheses

CHAPTER 2: REVIEW OF THE LITERATURE

Given the focus of this investigation is on assessing K-12 teachers' views on water safety education in Michigan it is important that the literature on water safety issues is understood. For this reason, the present review begins with an examination of risk factors associated with drowning including age, gender, minority status, socioeconomic status, preexisting conditions, differed abilities and alcohol, water entry and exit practices, access and geographic locations and water entry. After examining risk factors for drowning the topic of drowning prevention will be discussed including factors of influence including supervision, barriers, personal flotation, self-rescues, safe rescue of others and the important role of lifeguards, water competencies and community engagement. This will be followed by a discussion of key water safety knowledge and competencies, water safety and drowning prevention interventions and school-based water safety intervention programs. Lastly, water safety education in Michigan is discussed including interventions, the case for water safety education in schools, the benefits of teacher participation in water safety education and the essential role teachers play in water safety curriculum development.

Drowning Risk Factors

Age

Water safety and drowning prevention literature provides several well-established drowning risk factors. Among these, age has been found to be one of the most prominent predictors of drowning risk, with younger age groups being at higher risk of drowning than older age groups, and, sadly, the youngest at highest risk (Barker, Sprinks, Hockey & Pitt, 2003; Blum & Shield, 2000). For children ages 1 to 3 living in Australia, and for those 1 to14 living in China, drowning is the leading cause of unintentional injury death (WHO, 2020). Bangladesh claims

some of the highest drowning rates in the world, where drowning tragically causes 43% of all deaths among children ages 1- 4 (WHO, 2020). In the U.S., drowning is the leading cause of unintentional death in children ages 1- 4, the second only to car accidents in youth ages 5 -14, and one third of death due to unintentional injury for children ages 1- 4 can be attributed to drowning (CDC, 2012, 2016).

There are many potential reasons for these age-related findings. First, at early ages, children are less protected from injury as they frequently lack the ability to recognize dangerous behaviors that may put them at risk of drowning and lack basic knowledge about safety to help them avoid these risks (Gresham et al., 2001). Additionally, Ross and colleagues (2003) believe this trend may occur due to the combination of newly found mobility and high curiosity, compounded by a number of other physiological disadvantages among very young children. Evidence from recent drowning statistics in the U.S. (2017) reinforce these trends, drowning mortality rates increase from 1.1 per 100,000 for those ages 0 - 1 to a rate of 2.7 per 100,000 for those ages 1- 4 (Kochanek, Murphy, Xu, & Arias, 2019). Age also appears to be correlated with drowning location among children and youth. For example, infants are at highest risk of drowning in tubs, while toddlers are most at risk of accidental falls into bodies of water around the home (Brenner, 2002; Byard & Lipsett, 1999; Nixon, Pearn, Wilkey & Corcoran, 1986). Children and youth ages 5 to 17 will however be at highest risk of drowning in natural bodies of water (American Red Cross, n.d.). Global drowning rates have been consistently highest among this age group as well. Data from 1980-2017 show average rates of 8.79 per 100,000 for under five years of age, while rates between 5 to 69 years old hover between 2.54 - 3.83 per 100,000 (Institute for Health Metrics and Evaluation, 2018).

Older age groups are also at higher risk, with individuals 70 years of age and older

experiencing global drowning rates of 8.69 per 100,000. These rates are higher than for those 50 - 69 years of age (3.71) and those 15-49 years of age (2.54) (Institute for Health Metrics and Evaluation, 2018). Additionally, the National Vitality Statistic Reports claim that for those 50 and older, rates per 100,000 are higher than the average across lifespan (Kochanek, Murphy, Xu, & Arias, 2019). Pre-existing medical conditions, decreasing levels of fitness, and dampened aquatic skills and abilities could all play a role in drowning incidents for those 65 and older (Queiroga & Peden, 2013). For older populations, health systems, from physicians to fitness classes, could help raise awareness of the risks of drowning and provide education on how to stay safe while participating in aquatic activity at an older age. (Queiroga & Peden, 2013).

Gender

Beginning at the age of one males are more likely to drown than females during childhood (WHO, 2008). Globally males drown at a rate twice as high as females, while in the U.S., males make up 80% of drowning incidents, a disparity so vast in drowning statistics that from 2005-2009 males drown at a rate almost four times greater than females (CDC, 2016; Drowning, 2012; WHO, 2020). Males are additionally overrepresented in drowning statistics in New Zealand, where less than half the population is male, yet 80% of drowning incidences occur among males (Water Safety New Zealand [WSNZ], 2016). Even at young ages, males 0-4 have been found to drown at rates 70% higher than females, possibly due to males being more interested in exploration than females (Australian Bureau of Statistics, 2000; Blum & Shield, 2000).

Higher drowning rates among males may be further explained by males typically underestimating risks to drowning while simultaneously overestimating their abilities and participating in higher risk activities in and around the water (McCool et al. 2008; Moran,

2011a). There is ample evidence in the literature that risk perceptions can drive behavior, and that young men and women perceive risk differently than one another (Lapinksi & Viken, 2014). Additionally, water safety literature provides robust examples of behaviors and beliefs among males that place them at higher risk in and around the water (Moran, 2011). A trend seen in the over-representation of males in both rescue and drowning incidents (Moran 2011). Moran (2011) presents White and Young's (1997) conceptualization of a "culture of masculinism" in discussion of the overrepresentation of males in drowning rates.

According to White and Young (1997) males typically engage within a cultural context that typically applauds risk taking while simultaneously discouraging safe practices, a "culture of masculinism", and the large imbalance between males and females in drowning statistics reinforces this concept. There is great importance in pushing back on these traditional codes of masculinity in the aquatic environment to protect males from drowning, especially during early years of life, as they will often correlate with high-risk behaviors in and around the water (Moran, 2011). As an example, Moran (2006), found that among a large sample of high school age youth (n = 2,202) close to twice as many males (40%) believed being stuck in a rip current at a beach without lifeguards would be a slight/no risk situation than females (24%). In addition, males identified being swept off rocks while fishing as a slight/no risk more than females (23% males, 12% females). Among adult beachgoers in New Zealand (n = 3,371) males, as well as younger adults, had lower drowning risk perceptions, higher occurrence of risky aquatic behavior, and more frequently reported stronger perceived swim ability (McCool et al., 2009).

McCool and authors highlight the importance of addressing the dangers of overestimating swim ability and underestimating drowning risk, especially with young men. Significantly more male parents believed that open water environments were safe/very safe than female parents, as

well as significantly more male parents believing open water environments were safe/very safe for their children (Stanely & Moran, 2017). At New Zealand beaches parents and caregivers (n = 796) participated in a questionnaire in which over twice as many male participants (37%) perceived that there was no to low risk for their 5–9-year-old child to drown than female participants (18%). Additionally, males were more confident in their own ability to swim and float in open water, less likely to be anxious about performing these tasks, and more confident in their rescue capabilities, despite not having any more lifesaving experience than participating females (Moran, 2009). Finally, male parents/caregivers more consistently identified their child as strong swimmers than females. Significantly more males than females identified that they would jump in to make a rescue if someone was drowning in a New Zealand based survey (n = 415) performed by Moran & Stanely (2013), while Morgan and authors (2008) provide evidence that males are more apt to swim in deeper waters, use surfing equipment, and will spend more time in the water overall than females.

Interviewing males living along Great Lakes shoreline, Lapinski and Vikin (2014) suggest that males do not feel that they are invulnerable to drowning risk, just less vulnerable than other populations of people. The authors also found that activities like alcohol consumption and cliff jumping were reported consistently among males, along with reports of being motivated to swim during red flag conditions, as well as jumping/diving off piers into the water, all high-risk activities on Great Lakes coastline. In their review, Stallman and authors (2017) summarize that the drowning prevention literature indicating that males may be more likely to drown than females due to an underestimation of risk, in tandem with an overestimation of ability levels, while in and around the water.

Understanding the primary influencers of water safety knowledge, attitudes, behaviors,

and beliefs among males may help explain the trend of significantly higher drowning rates among males. Moran (2009) found that males identified their peers as the primary water safety knowledge source, doing so at rates 10 times that of their female counterparts, among year 11 youth (n = 2,202) from New Zealand. Females, however, identified their main water safety knowledge sources as parents and schools. Interestingly, socio-economic status was not a factor that influenced the formative water safety knowledge sources of participating youth. Considering that males have also been reported to participate in higher amounts of unsafe practices when with their peers, these results are concerning, and focusing on ways to engage males in learning water safety from consistent, professional water safety sources is of great importance (Moran, 2009). Lapinski and Vikin (2014) report that males from Great Lakes shoreline communities are very often encouraged by their peers to participate in risk taking behavior in and around the water at the beach.

Further, the authors also found that males are highly influenced by their peers when making decisions on whether to go to the beach in the first place. Because most males will navigate through decisions about behavior in the water with their peers, overestimate their ability levels, draw upon inconsistent, potentially inaccurate water safety knowledge sources, in a "culture of masculinism" (White and Young's, 1997), it clear to see why males may be less protected from drowning than females. Discovering ways to overcome the cultural and social factors causing the swell in drowning rates however will take significant effort, as stated in Australia's 2016-2020 Water Safety Strategy, "The resistant male, set in his ways and sure of his ability to overcome all obstacles, is a challenge for any public safety advocate." (Australian Water Safety Strategy, 2016). These challenges are however worth every effort, as seeing a significant decrease in drowning among the males could drastically decrease overall drowning

rates.

Minorities

The majority of drowning prevention and water safety literature agrees, those at highest risk of drowning include both minorities and immigrants (Katchmarchi, 2018). Interestingly, although there is ample evidence to back these claims, many countries do not have available data to help support these findings, as the conceptualization of "minorities" is a phenomenon of Western culture (Golob, Giles & Rich, 2013). In their review of racial and ethnic minorities and drowning rates, Golob and colleagues (2013) discovered only New Zealand, Australia, the US and the Netherlands track racial and/or ethnic drowning statistics. Additionally, countries with higher immigration levels, like Canada, for example, do not track citizenship, nationality, or birthplace mortality statistics (Golob, Giles & Rich, 2013). For countries that do track these statistics there are trends worth exploring and addressing in drowning prevention efforts.

In the Netherlands, Strubi et al. (2006) analyzed the injury related mortality rates across the country from 1995 to 2000, finding that ethnic minorities were at higher Relative Risk of drowning (RR=2.58) than those native to the Netherlands. Additional epidemiological work provides evidence that Pacific, Asian and Maori people living in New Zealand drown at greater incidence than the majority European New Zealand population (Water Safety New Zealand, 2011). Peden & Franklin (2012) found that Indigenous children and children born outside of Australia were less likely to achieve swimming and water safety benchmarks. The Lifesaving Society of Canada (2010) reported that individuals immigrating to Canada from Asian countries were deficient in both water safety skills and swim ability at a rate four times higher than native born Canadians.

Even the journey by migrants can be a risk for drowning, as these ventures will often take

place on overcrowded boats that lack safety equipment, without properly trained personnel, and are generally unsafe (WHO, 2020). Upon arrival to their new home, lack of localized knowledge about water safety could drive the increased drowning rate seen in migrant families (Pearn, 1986). Additionally, larger family size has been reported as a drowning antecedent specifically for children (Pearn, 1986). Therefore, if a migrant family is larger than average, this may only compound the drowning risk for children in the family, making drowning intervention and education work even more important for migrant families.

Robust examples of the relationship between minorities and drowning risk are provided in literature out of the U.S., where findings support that minorities are generally more at risk than other populations. For example, African Americans have been found to drown at rates 5.5 times higher than whites in swimming pools, with this disparity being greatest during the ages of 10 to 11, where rates are 10 times that of their Caucasian peers (Gilchrist & Parker, 2014). From 1999-2010 African Americans had significantly higher drowning rates than whites in the U.S., across all age groups (Gilchrist & Parker, 2014). Additionally, Gilchrist & Parker found, American Indians and Native Alaskans had the highest cumulative drowning rate in all settings, with drowning rates twice that of whites (2.57 verses 1.32 per 100,000). It is thought that these rates would be even more pronounced if they were based on participation in aquatic activity, not on population-based data (Branche et al., 2004). In an analysis of youth <21 years of age in the National Impatient Sample, and the Nationwide Emergency Department Sample databases (n=19,403), Felton, Myers, Lie, et al. (2015) found that minority youth saw highest rates of non-fatal drownings as well. By age group however, the majority of non-fatal drownings between ages 0 to 4 actually occurred among Caucasian children in pools, while the majority of non-fatal drownings for minorities occurred in natural water ways.

More recent work done by the University of Memphis, the University of Las Vegas Nevada, and in partnership with USA Swimming, found that 64% of African American children, and 45% of Hispanic children have no/low swim ability (USA Swimming, n.d.). A high percent (76%) of parents also identified that their children would be more apt to swim if they were to see a skilled swimmer that looked like them, and a large amount of African American children (65%) said they would like to participate in the activity of swimming more than they are able to currently. In partnership with the Young Men's Christian Association (YMCA), Irwin, Irwin, Ryan and Drayer (2009) conducted a large survey with parents of children 4-11 years old, and adolescents 12-17 years old, from six major cities across the U.S. (n=1,680). The authors found that 57.5% of parents of African American children and 56.2% of parents of Hispanic/Latino children identified their child as "at-risk" (unable to swim or being uncomfortable in the deep end of pools). This perception was found to a far lesser extent among parents of Caucasian and Asian children, who reported their child being of high risk in the water only 30.9% and 28.6% of the time respectively.

Interestingly, although those of Hispanic and Asian descent are also considered minorities in the US, drowning risks are considerably, and consistently higher for Black Americans. These trends can be explained by events early on in America's history, when slave owners began to not allow African American slaves to learn how to swim, because they viewed their water competencies as a way to effectively escape (Burzillo, 2014). Swimming and aquatic activity, once a rich cultural competence for African Americans, sadly began to fade away. Unequal access to swimming pools for African Americans could be another major factor in the disparities in drowning and swimming ability seen among Black communities in the US to date (Wiltse, 2007). Swimming at public swimming pools mounted in popularity across U.S. culture

from the 1920s - 1930s, and again from the 1950s to the 1960s (Wiltse, 2007). During both these periods of popularity, white Americans had the ability to access pools with ease, while Black Americans were often denied access due to unfair discrimination (Wiltse, 2007). Therefore, swimming was never fully embraced into the sport and recreational culture of Black Americans' communities (Wiltse, 2007).

Recent evidence suggests that, although minorities may have more access today than earlier in America's history, participation and swim ability disparities still exist across the U.S. Irwin, Irwin et al. (2009) reported that, as of 2008, 92.5% of all USA swim club members were Caucasian, 4.2% were Hispanic, 1.7% were African American, 1.1% Asian/ Pacific Islander, and finally 0.5% were Native American (J. Cruzat, personal communication, 29 August 2008). More recently, Irwin et al. (2018) surveyed youth from multiple cities across the U.S. (n = 1,373) and found that among all races, African American youth reported no/low swim ability higher than any other race (66%), while white youth in the sample reported no/low swim ability 35.8% of the time. The authors highlight the importance of continued intervention work and encourage the continued engagement from parents and communities of minority youth to aid in drowning prevention efforts.

In an exploration of racial disparities in drowning from 1970-2015 in Florida, Gorsuch and authors found that racial disparities have greatly vanished since 1970. In the state racial drowning disparities diminished slowly from 1970 to 1990, and by 2005, they had all but vanished. Among those 10-34 drowning, however, there remains a difference, but the gap is much smaller than it once was. The convergence of disparities in racial drowning rates may be due in part to efforts made by the international swimming hall of fame, who have become major stakeholders in efforts to protect minority communities from drowning across the entire state.

Additionally, the authors report four of the five counties with highest rates of drowning among minority groups have made intentional efforts to provide equitable drowning prevention including swim schools intentionally encouraging the participation of black children, building swim teams with black participants, and free lessons for low-income children.

Florida provides an example of how long term, community wide intervention efforts, working on a broad scale to protect those at high risk from drowning, can be effective in reversing negative trends over time. In future enhancement of water safety education among ethnic and racial minorities Golob, Giles and Rich (2013) recommend four potential best practices. First, prior to building water safety education programs, gain an understanding of the cultural beliefs and norms of minority groups. Second, to provide opportunities for minorities to have an integral role in the cultivation of water safety programs. Third, offer ample opportunities to learn about popular aquatic activities and essential water safety knowledge. Fourth, and finally, to discover ways to increase the number of racial and ethnic minority members as swim instructors, lifeguards, and administration.

Socioeconomic Status

Worldwide, mortality statistics support that those of lower SES, are at higher risk of death from non-communicable diseases in general (Tobias, 2017; Stringini et al., 2017). Specific to drowning prevention, Irwin and authors (2009b) found a correlation between parental education status and those receiving free or reduced lunch, where lower education status and those receiving reduced lunch were found to have lower swimming ability. According to the International Life Saving Federation, low education status of mothers in Bangladesh are inversely related to drowning risk among their child(ren) (ILSF, 2003) Additionally, in their Global Report on Drowning, the World Health Organization reports that the poorest and least

educated in any country are at higher risk of drowning, regardless of the country's economic status (WHO, 2014). Self-reported data of U.S. adults provided evidence that lower SES is associated with lower swimming levels, lower physical activity levels, and lower swim team participation (Gilchrist, Sacks & Branche, 2000). Children of families with total household incomes of less than $50,000 were found to have no/low swimming ability at higher rates than families of higher income status (79%), as well as children qualifying for free or reduced lunch (62.7%) (USA Swimming, 2017; Irwin et al., 2018).

The educational background of fathers, monthly income and residential agglomeration of families was positively correlated with self-reported swimming ability (distance they could swim non-stop/ability to perform different swim strokes) and rescue skills in 19–20-year-old males (n = 521) from Poland (Moran et al. 2017). Additionally, rescue ability increased with monthly budgets, residential agglomeration, and the parents' educational background. Curious, that residential community size was positively correlated with swim and rescue ability, which Moran and authors (2017) suggest may be due to the lack of opportunities to learn water safety competencies in rural settings with small populations, verse larger cities that have more facilities and learn to swim/water safety education programs. Overall, SES and lack of resources in communities were found to mediate opportunities for individuals to gain water competencies and experiences in the water. Therefore, those of lower SES, and those with less resources will typically have fewer experiences in the water, as well as fewer opportunities to gain important water safety competencies (Moran et al., 2017).

Interestingly, Silva and authors (1998) revealed results that may challenge the established trends in SES and drowning. In the authors review of childhood of mortality statistics in the Northern Territory of Australia showed that from 1985-1994, 41% of childhood drownings (1-4

years of age) occurred at home pools. These findings seem a bit conflicting as pool owners would be assumed to typically be of higher SES than non-pool owners. The vast majority of drownings occurred in pools that had no fencing or did not meet the standards for pool fencing laws in Australia. Additionally, lack of proper supervision was noted in several of the cases. These two components, lack of barriers and supervision, along with increased access due to pool waters increase drowning risk substantially. It appears that the high rate of drownings may be more a failure to protect children with proper barriers issue, which was highlighted specific to the Northern Territory during this time, and not tied necessarily to social class. In Grosuch and colleagues previously mentioned work, the authors report finding little change in economic disparities in the state of Florida over the same period that drowning rates among minorities shifted. This could suggest that economic status may not be entirely related to drowning rates on a broader scale within the state. In totality, however, results across water safety and drowning prevention literature generally support that socioeconomic status is another important drowning risk factor, inversely related to both drowning rates and water safety competencies like swimming and rescue ability.

Beyond the economic status of the individual, the economic, or developmental status of the country an individual lives within has been found as a risk factor for drowning. Low- and middle-income countries have been found to have regional drowning rates as high as 3.4 times greater than high-income countries, and 90% of unintentional drowning deaths occur in low to middle income countries (WHO, 2014; WHO, 2020). This is due in part to the unique way in which those from low income and middle-income countries engage with the water, commonly working and living around water lacking adequate barriers and flood disaster protection (WHO, 2014). In a devastating example, 43% of all deaths in children ages 1 to 4 are due to drowning in

the low to middle income country of Bangladesh (WHO, 2014; World Bank, n.d.). According to WHO's Global Drowning Report (2014) high income countries are making progress in the reduction of drownings. However, from 2000 to 2010, the U.S. moved form 1.24 per 100,000 to only 1.22 per 100,000 (CDC, 2013). In fact, after significant reductions in drownings for decades in the U.S., drowning rates have fluctuated between 1.1 and 1.2 per 100,000 for nearly the last 20 years (Statistica, n.d.). As Katchmarchi (2017) states, high income countries seemed to a "hit a wall" in their "race" towards significantly reducing the number of unintentional drowning deaths in their communities.

Other At-Risk Populations

Additional populations known to be at higher risk of drowning include persons with disabilities, those with preexisting medical conditions, and those under the influence of alcohol. For example, drowning incidents have been found more prevalently among children and youth with Autistic Spectrum Disorder (ASD) than their peers. Analysis of 1,367 deaths reported in the National Vital Statistics System, from 1999 to 2014 in the U.S., Guan and Guohua (2017) discover that children with ASD had a drowning PMR of 39.89. In more recent work, Peden and Wilcox-Pigeon (2020) found that children and youth (n=667) with ASD are at significantly higher risk of drowning than peers with known medical conditions. Other medical conditions, however, can also increase the risk of drowning. Drowning is the leading cause of death due to unintentional injury for those with seizure disorders, and for these individuals, the bathtub is the place of highest risk for these individuals (CDC, n.d.; Lhatoo & Sander, 2005). Alcohol consumption in and around the water is another key risk factor negatively influencing drowning rates (CDC, 2016; WHO, 2014).

It is known that alcohol can negatively impact balance and coordination, impair

judgment, and delay reaction time, impairing a number of key skills needed to stay safe in and around the water (Driscoll, Harrison & Steenkamp, 2004; Quan, Pilkey, Gomez & Bennett, 2011). Additionally, these negative impacts are only enhanced by heat and sun exposure during aquatic activity (Driscoll, Harrison & Steenkamp, 2004). In their review of alcohols role in drowning, across all English language literature up to 2003, Driscoll and authors (2004) found that anywhere from 30%, to upwards of 70% of drowning incidents occurring among those with detectable blood alcohol levels, that alcohol played a role in 10% to 30% of drowning deaths, and that blood alcohol concentration positively correlated with drowning risk. More recently, there is evidence that alcohol played a role in 37% of drownings in creeks, rivers and streams in Australia (Peden & Queiroga, 2014). In order to combat these findings, the AWSC recommends providing consistent messages highlighting the risks of alcohol consumption in and around the water, along with creating meaningful partnerships across aquatic recreation organizations, substance abuse advocacy groups, and governmental agencies.

Water Entry and Exit Practices

One issue with alcohol consumption in and around the water is that it could cause unintentional falls into the water and further increase the risk of drowning (Pajunen, et al., 2017). Knowing how to safely enter and respond during such falls would not only include what to do upon entry, but also how to safely exit the water. In fact, there is support in the literature that safe entry and exit practices are also important in protecting individuals from drowning, and risk factors include unsafe unintentional falls into the water, dangerous intentional water entry, and the inability to exit the water. From 2008-2012, unintentional falls into the water made up a quarter of drowning fatalities in New Zealand (Water Safety New Zealand, 2013). Further, in 2013, more drownings occurred due to falls into the water (18%) than swimming for recreation

(16%) (Royal Life Saving Society Australia, 2013). Earlier exploration in the UK provided evidence that over a quarter of drownings included accidental entry into the water, and just over half of which were due to falls (Royal Society for the Prevention of Accidents, 2005). In open water environments, falling unintentionally, while fully clothed, is a common cause of drowning (Stallman et al., 2017). The International Life Saving Federation states that the great majority of drowning incidents will occur in circumstances where victims have no intention of going into the water. (ILSF, n.d.). When water entry is intentional, dangerous water entry practices create a risk of both drowning and severe water related injury as well. Of the approximate 3,000 people paralyzed annually due to neck breaks, the majority are due to diving into shallow water (ILSF, n.d.). These diving injuries have been found to occur more often among males ages 15-29 when drinking alcohol (Aito, D'Andrea, & Werhagen, 2005; Blitvich, Mc Elroy, Blanksby, & Douglas, 1999; Herman & Sonntag, 1991). Other risks include being in open water environments, headfirst entry, diving from a dock or pier, not checking the depth of the water, and unfamiliarity with the local aquatic environment (Branche, Sniezek, Sattin, & Mirkin, 1991).

There is some evidence that drowning may occur due to victims being unable to exit the water upon reaching the water's edge (Moran, 2014b). The International Life Saving federation states that about 40% of drownings occur within 2 meters of safety, implying that many drowning incidents may be due to the inability to exit the water (ILSF, n.d.). However, not much is known about the actual or perceived extrication abilities of individuals from the water in case of emergency (Stallman et al., 2017). Moran (2014a) provides one of the few studies on exit competencies from the water with young adults (n = 37) in the pool. A number of youth could not exit deep water with a 410 mm ledge in clothing (35%), or wearing a life jacket (49%), regardless of swim ability. Although more males were able to exit the water without perceived

difficulty, they under-estimated the demands of performing a deep-water exit. Lifejackets are an important safety measure for youth, especially the non-swimmer (U.S. Coast Guard, 2011), but exiting the water is of great importance as well. Results from this study provide evidence that one safety measure appears to be impeding another. Finding ways to either help individuals learn techniques that could help them exit the water while wearing a lifejacket, or, designing lifejackets that are less bulky and help make water exit less challenging, are important considerations. Water exit techniques that could help individuals exit the water more efficiently, especially when tired or lacking the strength to pull themselves out, already exist. The "elbow, elbow, tummy, knee" technique created by Goldfish Swim School is taught to young children to aid in water exit (Goldfish Swim School, n.d.). This technique can also be helpful for older youth, or adults when they lack the strength to effectively exit the water.

Access and Geographic Location

Those living in environments with greater access to water increase their chances for incidents like unintentional falls and diving injury and are inherently at higher risk of drowning. These risks are especially high for children living around open water, which commonly lacks proper barriers (WHO, 2020). In the U.S. the majority of drownings among infants occur at home, with 87% of drownings among toddlers occur in private pools or hot tubs, and youth 5-17 are more likely to drown in natural bodies of water (American Red Cross, n.d.). In fact, over half fatal and nonfatal drownings occur in open, natural bodies of water for those 15 and older. (American Red Cross, n.d.; CDC, 2016). According to a report by Safe Kids Worldwide, teenagers drown in natural water ways at rates three times that of children ages 5-9 and twice as much as those under (McKay et al., 2016).

For adults, occupations like fishing, or the navigation small boats in lower income

countries, will increase drowning risk in open water environments (WHO, 2020). According to Australia's 2019/2020 drowning report (July 1st to June 30th) over 80% of drownings occur in open water environments, including beaches, oceans/harbors, lakes, rivers and creeks, dams, and off of rocks, each environment having their own unique risks (Royal Life Saving Society - Australia, 2020). The Australian Water Safety Council (2016) recommended performing risk assessments across geographical regions in order to identify high risk locations. This process is critical in bolstering location specific efforts and interventions to protect communities from drowning. What is gathered about specific geographical risks can then be combined with best practices in mitigating those risks and helps move communities towards safer aquatic participation. (Australian Water Safety Council, 2016).

Drowning is the cause of 75% of deaths during flooding disasters, with increasing risk for low- and middle-income countries that have communities living along water ways that experience frequent flooding without the proper protection, warning systems, and evacuation plans (WHO, 2020). Protecting communities from flooding risk is of great value, and requires swift and effective warning systems, well planned evacuation routes, safe havens, strengthening structural components, targeted intervention, and greater awareness (Di Mauro & Meloni, 2012).

Interestingly, different geographic locations and aquatic environments will not only present unique risks but may also influence the outcomes of drowning or near drowning incidents. Drowning incident outcomes have been found to be best in cold water, followed by backyard locations, and finally open water environments (Salomez & Vincent, 2004; Weiss, 2010). Improved outcomes in cold water are thought to be due to the preservation effect of the rapid cooling of extremely cold water, and subsequent hypothermia, on brain function prior to the impact of hypoxia (Salomez & Vincent, 2004). On the other extreme, higher drowning rates

have been reported in hotter climates, like in Australia, where drownings have been significantly higher in the Northern Territory compared to the rest of the nation (Edmond, Attia, Deste & Condon, 2001; Silva, Ruben, Wronski, Stronach & Woods, 1998).

Climate is only one of the many differences each aquatic environment hosts, indeed, every river, lake, sea, etc. has many overlapping structural and environmental elements, however, not one is exactly the same. An example, the Great Lakes shorelines, compared to coastal shorelines on the ocean, look very similar at points and have many similar features. Yet, the Great Lakes are vastly different in many ways. The Great Lakes and ocean beaches host a range of unique differences, different structures, wind and wave conditions, bottom contours and elements, water temperature differences, dynamic currents, and beyond (Stallman, et al., 2017). Therefore, without proper knowledge of local water ways and their unique risks, an individual will naturally be at higher risk of drowning, independent of physical ability or swimming skills. Langendorfer (2015) draws on both the dynamical (Newell, 1986) and constructivist approaches and highlighting the importance understanding that an individual's competencies may not carry from one aquatic environment to the next. Water safety goes beyond the individual's swim skills and abilities, it includes their experiences in and around the water, the particular aquatic activity they are engaging in, and the characteristics of that specific aquatic environment (Langendorfer, 2015). In totality, all of these components will determine how safe, or in turn, how unsafe, someone will be as they engage with the water. Therefore, an elite swimmer, with only experience swimming in a pool, may not be nearly as competent, and hence nearly as safe, in the conditions delivered by open, coastal waters, on a day with high swell and high wind.

Water Temperature

When water temperature changes frequently, drowning risks can rise substantially,

especially when temperatures drop drastically. Entry into cold water causes physiologically responses that are unsafe in the water, especially when cold water is unexpected, presenting many challenges for even the most competent of swimmers. The first few seconds of cold-water immersion (CWI), as an individual attempts to resurface, can induce what is known as a cold shock response (CSR), an immediately life-threatening condition associated with respiratory impairment (Golden & Tipton, 2002). Onset of CSR can elevate respiratory frequency, followed by possible hyperventilation, each dangerous physiological responses while in the water (Golden & Tipton, 2002; Barwood, Corbett, Green, Smith, Tomlin, Wier-Blankenstein, & Tipton, 2013). Early work from the UK showed that most drownings were occurring 3-4 m from safety (Home Office, 1977), causing experts to consider CSR, not hypothermia, to be the main cause of these drownings (Tipton, 1989; Tipton, 2003; Tipton, et el., 1999). Indeed, it appears that the CSR during CWI is most likely the driving factor to drowning incidents associated with extremely cold water.

Great Lakes waters are not only cold (spending the majority of the year well under 70 degrees F), but their temperatures can shift dramatically, especially in the summer months, when upwelling due to offshore winds can cause local shoreline temperatures to plummet (National Oceanic and Atmospheric Administration, 2020a; 2020b). In fact, changes in water temperature can occur quite rapidly, dropping 20, even 30 degrees overnight (Jones, 2020). When water temperatures change so drastically swimmers are often caught off guard when entering the water, and jumping off a pier, dock, or boat into deep water when temperatures go from 72 to 49 degrees can cause CWS and be life threatening. In fact, across the Great Lakes, CWI consistently causes several the drownings seen throughout the year (Great Lakes Surf Rescue Project, 2020).

The Great Lakes shorelines in many ways look much like being along the East or West

coast beaches in the U.S., or other ocean coastlines. Beachgoers who have lived or visited the ocean, and are familiar with beaches along the coastline, could be especially caught off guard by such drastic water temperature changes, as these temperature changes are far less common along ocean shorelines. There are other drowning risks, beyond cold water and the drowning risks reviewed above. Many of the primary risks of drowning have been highlighted in this review. A singular risk however is not typically to “blame" for any drowning incident, indeed many risk factors will typically be at fault. For example, a drowning caused primarily due to CWI may have been a life saved if the individual was wearing floatation, was being closely supervised, and, or, rescued swiftly once in trouble in the water. Risk factors then are dynamic and complex, building off one another to further complexity. It is of great importance then to understand drowning risk factors in this dynamic way, and to create interventions that are equally dynamic to protect people from drowning.

Drowning Prevention

Participation in aquatic activity can positively impact the lives of individuals, enhancing development and increasing capacity in a number of important areas of life. There is great value then in protecting people from the many risks of being in and around the water and providing safety while engaging in aquatic activity. This allows for individuals and communities to gain from the many benefits of participation in aquatic activity, and ultimately prevents the tragedy of drowning. Lifesaving prevention efforts provide individuals the opportunity to attain essential water safety knowledge and acquire a set of effective water safety competencies to protect against drowning. There are a number of important water competencies (Stallman et al., 2017), aquatic skills (Stallman, 2008), and knowledge (Katmarchi, 2018) important in protecting against drowning presented in water safety literature. Water safety can be broken down into three key

components. First, drowning prevention through practices like providing supervision, installing barriers around the water, and the use of personal floatation devices (PFDs). Second, knowing how to safely response and rescue when someone else is in trouble in the water. Third, self-safety, through the development of important self-rescue skills and water competencies.

Supervision

When it comes to prevention efforts, the water safety literature paints a clear picture, one of the most effective drowning prevention measures is vigilant supervision. Conceptually, supervision is more than a lifeguard watching over a pool or beach, or an adult watching over younger children, supervision is provided anytime anyone watches out for someone else in and around the water. Practices like always swimming with a "buddy", never swimming alone, having a spotter while participating in activities behind a boat, are all forms of supervision. However, supervision should be provided by individuals who are at an age and ability level capable to respond/rescue safely. Among children 0-4 years of age, the most common factor in drowning is the lack of proper adult supervision (Salomez & Vincent, 2004). In a 10 year analysis of drowning rates in Australia, Querioga and Peden (2013a) discovered that among youth (ages 5-19) a high volume of drownings occur away from the supervision of parents or lifeguards. The authors also note that drowning seems to occur frequently while participating in aquatic activity with peers rather than in the supervision of family members during late adolescents and early adulthood. Blitivich et al. (2012) showed that among swim instructors (n=133) in Australia, 84% felt that parent supervision is the most important aspect of child safety around the water, providing pushback on the beliefs of many parents, that a child is "drown proof" after swimming lessons, as this is not the case.

Katchmarchi (2018) identifies parents and guardians as the "first line of defense" in

drowning prevention, while Ramos and associates (2015) highlight the importance of close supervision of children by parents or guardians as an essential part of drowning prevention. The International Life Saving Federation notes that most drownings occur during aquatic activity in settings unsupervised by lifeguards (ILSF, n.d.). Effective supervision is active in nature, in close proximity to those being cared for, with continuity of watchfulness, while diligently paying close attention to what is going on in and around the water (Saluja et al., 2004). Adults providing active supervision can help prevent drowning incidents, however, there are still questions insofar as the ability of older siblings to adequately supervise without getting distracted (Pearn, 1986). Although, with proper training and adequate water safety knowledge, older siblings who are physically able to make safe rescue would certainly be better than the lack of supervision all together.

Moran (2009) surveyed adults in care of children under the age of 10 (n = 769) in an investigation of their supervision behaviors, perceived water safety skills, and the perceived risks of drowning for their child, across 18 New Zealand beaches. Results indicated that many parents did not supervise their 5-9 year old child closely at the beach (46%), as well as over a quarter of the parents not appropriately supervising their under 5 year old child (29%). Additionally, males said their 5-9 year old's were good swimmers more often than female caregivers, and underestimated the risk of drowning for children in the 5-9 year old age group. Moran calls for water safety education to highlight the importance of vigilant supervision of children at the beach and to address the issue of overestimation of ability, in tandem with the underestimation of risk, of children in open water conditions. In a questionnaire about swim behaviors on the Great Lakes, 65% of college age participants (n = 55) identified that they swim alone on occasion, even though going to the beach alone was typically said to be avoided (Lapinski & Vikin, 2014).

According to water safety experts in the U.S., the highest priority research questions are centered around parental supervision, and ways to enhance parental supervision in and around the water (Katchmarchi, 2017).

There are already efforts being made to enhance parental supervision in and around water by many organizations in the U.S. Safe Kids Worldwide, along with a number of other drowning prevention organizations, advocate for parents to be "Water Watchers" (Safe Kids Worldwide, n.d.). Water Watchers are parents that take turns diligently watching the water, committing 15 minutes at a time watching over those in the pool, at the beach, etc. (Safe Kids Worldwide, n.d.). There are also public campaigns for parents to keep very young children, as well as non-swimmers, within "arms reach" to respond immediately (National Drowning Prevention Alliance, n.d.).

Barriers

In absence of supervision, or when supervision is not possible, physical barriers around the water can save lives, especially the lives of children and youth. In fact, the lack of supervision and barriers, in tandem, may be the primary cause for high drowning rates seen among young children (U. S. Consumer Product Safety Commission, 2012; CDC, 2016). There is ample evidence that barriers around the water are an effective measure in drowning prevention, and especially effective in protecting children and youth (Thompson & Rivara, 1998; WHO, 2020). A key component to the effectiveness of barriers is that they can keep people safe from entering an unsupervised pool, this is particularly useful in the safety of children, non-swimmers, and populations at higher risk of drowning. Installed fencing around a pool has been found to prevent up to three quarters of drowning among children (Thompson & Rivara, 1998). According to Pearn and colleagues (2008) even enforcement of barriers around pools is

estimated to protect children from drowning, reducing deaths by up to 30%. Thompson & Rivara (1998) reviewed three case-control studies that assessed the effectiveness of pool fencing in the reduction of drowning risk. For drowning, or near drowning, the authors found that fenced pools had an odds ratio (OR) of .27 compared to unfenced pools (95% CI .16 to .47).

Additionally, they found that when pools had isolated fencing, fencing that surrounds the pool itself and separates the pool from the rest of the yard, as well as from the home, it is far more effective than pool fencing that runs along the entire perimeter of the yard. Isolated fencing had an OR of 0.17 (95% CI 0.07 to 0.44) compared to perimeter fences. These differences are most likely due to the fact that perimeter yard fencing allows access from the home, while isolated, four-sided fencing, does not. Finally, the authors found evidence that four-sided fences are 83% more effective in protecting from drowning than a three-sided property line fence. During a 12 year period in Western Australia, only 30% of all drownings among children 5 years old and under occurred in pools with 4-sided fences, and each of these cases was due to a faulty latch/gate, or the gate being left open (Stevenson et al., 2003).

The Australian Water Safety Council (2016) recommends enhancing the adherence to the installation of proper barriers as a key objective moving forward in national water safety efforts, especially in light of reports of low compliance to pool fencing policy across the nation. The lack of compliance to fencing policy is one of the major barriers to drowning prevention efforts, turning closed water into open, unsupervised, and accessible water, and therefore increasing the risk of drowning. Among 795 pool owners in California, only 35% of those in favor of requirements for pool fencing that created a complete barrier around their pool had pool fencing themselves any fencing (Wintermute and Wright, 1991). Globally, the lack of adherence may not be the only reason barriers are not used. Consider that the installation of barriers is far more

difficult for low- and middle-income countries, with less fiscal resources, and most drownings occurring in natural bodies of water, like lakes, ponds and rivers where barrier placement would be extremely difficult (Leavy et al., 2015; Rahman et al., 2012; Linnan et al., 2012). Additionally, low-cost barrier options have rarely been explored in the literature, so little is known about whether they are as effective as traditional barriers like fences, self-closing/latching gates, etc., that may not be affordable for the low or middle class (Leavy et al., 2015).

There are other issues with barriers beyond the lack of adherence. For example, when barriers are not properly used, with issues like gates and doors not being shut or locked, and/or gaps in the fence line, barriers are now easily breached and do not provide the protection they are meant to. Also, mobile barriers, those put in place for children or pets at entry ways, have been shown as far less affective. According to Cordovil et al. (2009) most child barriers are only effective in delaying children from passing over them, and not a replacement for education and supervision to protect against drowning. Additionally, a community may also lack proper barriers due to constraints placed by policy and unsuccessful legislation efforts. Terzidis et al. (2007) noted that in Greece, pool fencing was not as readily used due to resistance from the tourist industry, and little movement in policy despite intense efforts to make barriers a requirement for pools. Education and policy can be used in tandem to effectively increase adherence to pool fencing legislation (Bugeia & Franklin, 2013).

Personal Floatation Devices

When water is accessible, and supervision is not provided, the next lines of defense for individuals participating in aquatic activity are personal floatation and self-rescue. When an individual is unable to swim, or is participating in aquatic activity that increases drowning risk,

personal floatation devices (PFDs) like lifejackets are essential to life safety. In 2010, the majority of deaths during boating incidents were due to drowning (72%), and the United States Coast Guard reports that 88% of those that drown were not wearing lifejackets (U.S. Coast Guard, 2010; Cummings, Mueller & Quan, 2011). Similarly, according to the 2019 Recreational Boating Statistics, 86% of drowning victims were reported as not wearing their life jacket. Using United States Coast Guard data of drawing incidents from 2008-2011, Viauroux & Gungor (2016) found that a 20% increase in lifejacket wear rate due to life jacket regulations would have saved 1,721 (out of 3,047) boaters or 1,234 out of 2,185 drowning victims.

According to Cummings et al. (2011), with use of approved personal floatation devices (PFDs), drowning among recreational boaters in the U.S. could have been reduced by 50%**.** Regulations requiring PFDs for boaters in Australia were observed as effective, with 59 drownings occurring in the six years before legislation, and only 16 drownings occurring in the five years after among recreational boaters (Bugeja, et al., 2014; WHO, 2014). The ISLF (2003) reports that small, motorized boats are involved in a high amount of drowning deaths, often occurring due to capsizing, falling overboard, or colliding with other boats/objects, and highlight the lifesaving impact of life jacket wear while on any boat. The Governing body of New South Whales, Australia, legislates, enforces and promotes the use of lifejackets as a key effort in safety during aquatic recreation like boating and navigating other watercraft (NSW Government, n.d.). There is ample evidence that PFDs are essential for the safety of high-risk populations (non-swimmers), those participating in high-risk activities, and incidents where individuals find themselves in trouble in the water.

Self-Rescue

For individuals without a PFD, and unable to get help during a potential drowning

incident, having the knowledge and skills to perform a self-rescue is critical for life safety. Stallman, Junge and Blixt (2008) discovered a number of key drowning survival themes during a review of drowning reports, interviews with individuals that survived drowning and individuals that participated in simulations of drowning. Victims typically did not recognize the risk involved in their behavior in or around the water, had unexpected water entry occurrences, had trouble getting to the surface, and low skill levels, all factors in making survival difficult. Therefore, knowing how to respond in these situations via effective self-rescue techniques is key to protecting individuals from drowning occurrence. Stallman and authors (2008) being unable to float was listed as a life-threatening factor among surviving participants.

Additionally, the Australian Water Safety Council emphasizes that the ability to self-rescue by staying afloat is an essential component of safe participation in coastal activities like surfing, paddling, sailing and fishing. Brenner et al. (2009) note, according to families of children lost to drowning, only 5% had the ability to float on their back (10 seconds), compared to 18% of surviving matched controls (p =.01). Staying afloat can help individuals calm down during emergency situations in the water, thus avoiding the dangerous psychological and physiological responses that occur due to panic. Floating can not only help individuals avoid panic, but floating can also increase the amount of time an individual can survive, buying time to get to safety or to get help (Great Lake Surf Rescue Project, 2013). Indeed, floating on your back is an essential component to self-rescue and life safety when in trouble in the water, and many water safety education interventions use this technique in teaching survival swimming or water safety competencies.

The Great Lakes Surf Rescue Project, one of the leading water safety and drowning prevention organizations in the Great Lakes region, endorses the “Flip, Float, Follow” technique,

arguing that simply saying “don’t panic” is not helpful to someone in the panic state while in trouble in the water (Great Lake Surf Rescue Project, 2013). In order to give proper direction on how exactly to avoid panic in the water, an individual should start by taking a deep breath and *flipping* onto their back, which helps by clearing the airway and helping the individual out of the vertical position. Next, the individual *floats* calmly on their back, taking deep breaths to increase lung volume and buoyancy, moving their arms or legs slightly to assist floatation if necessary. Finally, the individual will assess the situation they are in and *follow* the best course to safety, which could be a wide range of responses depending on the situation. This is a sound lifesaving technique, as the process of flipping onto your back, taking calming breaths, and floating may ease the psychological response of panic, and the particularly dangerous physiological responses that follow.

Drowning prevention experts recommend that floating be taught at the earliest developmental stages of learning water competencies, and that floating is essential to confidence building during the learning process, and maybe the most important confidence builder of all the water competency skills (Stallman et al., 2017). Long term, although swimming or treading water can produce heat, it will eventually yield heat loss in the water, and therefore stationary floating may be the most effective survival technique during long term water exposure (Golden & Tipton, 2002). Finally, floating is a skill that can be taught to all individuals, even children at a very young age can successfully learn this important lifesaving technique (Life Saving Victoria, 2014; Sakulrak et al., 2018).

Roughly, less than 5 in every 100 individuals truly cannot float, however even these individuals can find some buoyancy when the lungs are fully ventilated (Stallman, 1997). Although the vast majority of individuals have the capacity to float, floating can be impacted by

outside elements. Floating in conditions like wind and waves may provide challenges for individuals attempting to survive drowning, as Kjendlie et al. (2013) discovered in their work, floating skills among children were negatively impacted by waves. Counterintuitively, wearing clothing in the water, often thought to add weight to the individual as it soaks in water, can actually aid in floatation. Barwood and authors (2011) found that clothing my actually provide more buoyancy upon entering the water, as well as long term buoyancy and insulation from colder waters, all factors increasing the chance of survival. This means that lighter weight clothing may not need to be removed during sudden immersion events, as clothing may actually help with both buoyancy and the retention of heat (Stallman et al., 2017).

Even though floating is an essential life safety response to drowning there is evidence that not many children and youth are successfully able to perform this skill. In their work, Junge et al. (2010) found that most participating children (n=70) were unable to stop and float (94%) even though they were able to complete a swim of 25m in length. Moran et al. (2012) found similar trends among a group of older university age students (n=373), where 76% of university students could swim 300 m comfortably without stopping, yet 35% could not float for more than 2 minutes, and just over a third (40%) of students could float for 15 minutes. Toddlers have been found to become forward facing and semi vertical upon water entry, an unsafe position as when the body is vertical it is easier to begin to sink and rolling onto their back would provide better breathing while floating (Asher et. al., 1995). Additionally, Oliveira et al. (2013) provides evidence that children will find themselves in random positions after entering the water from a boat. These results further suggest that children need to learn the skills of reorientation onto their back, floating, and finally, finding the best course to safety.

Safe Rescue of Others

Beyond self-rescue, the ability to rescue others safely from the water is of additional importance in efforts to protect from drowning. Safe rescue may be best performed by professionally trained lifeguards, however, because rescue is often performed by family, friends, and bystanders from the community, safe rescue techniques are another key water safety competency for all. Bystanders play an important part in saving lives when rescue from the water is needed, and their efforts in both removal from the water and care after the incident can lead to more positive outcomes (Venema et al., 2010). The Australian Water Safety Council highlights that parents, neighbors, or other community members are typically those that perform rescue of children from drowning (Australian Water Safety Council, 2016). Unfortunately, bystanders who are untrained in rescue, or lack experience in the water, run great risks rescuing others, often drowning in the process of doing their best to save lives (Franklin & Pearn, 2010; Zhu et al., 2015; Turgut & Turgut, 2016). Although there are risks, the swift response of bystanders to a potential drowning incident, and the provision of basic life safety support (CPR) can save lives (Venema et al., 2010).

The primary risk when saving someone from drowning is what Franklin and Pearn (2011) identify as aquatic-victim-instead-of-rescuer syndrome (AVIR syndrome). Between 2004-2017, statistics from Surf Life Saving Australia (2019) show that there have been 53 coastal bystander rescuer drowning deaths on Australian beaches, none of these incidents reporting the use of floatation devices. Of 225 drowning rescue cases identified in mainland China, Zhu and authors (2015) found that drowning rates of the rescuer (13.3%) were actually higher than that of the primary drowning victims (11.5%). Moran, Webber, & Stanley (2016) note that from 1980-2014, there were 87 individuals that drown during rescue attempts in New Zealand (WSNZ,

2014. Moran and authors (2016) found success in the 4Rs of Aquatic Rescue training among adult participants (n = 174) in New Zealand. Most participants had never been trained in rescue techniques (71%), and after the training there were significant increases in the understanding of safe rescue. However, confidence, or willingness to perform rescues did not increase among participants. The authors suggest that these finding point to factors other than knowledge having an influence on the attitudes of participants. These are interesting findings in light of major motivational theory, mainly Self Determination Theory, which postulates that greater competence should cultivate greater motivation in a given task (Deci & Ryan, 2000). Therefore, as competence in safe rescue increases so to should motivation to perform rescues. There is potential that the Aquatic Rescue training program (Moran et al., 2016) may have bolstered the understanding of safe rescue through video demonstrations and pamphlet information without participants truly feeling that their skills and ability to rescue had improved.

There is evidence in water safety literature that many individuals have low competence in the rescue of others and are willing to rescue in ways that are unsafe. Youth in New Zealand were found to have low perceived rescue abilities, with one third (35%) of youth considering that they had no rescue ability at all, and over a half (59%) unsure about their ability to perform rescue in deep water (Moran, 2008). In later work, Moran (2009) found that across 18 different New Zealand beaches, more than three quarters (76%) of parents/caregivers (N = 769) watching over children under 10 years of age, had not received any training in rescue/lifesaving. Additionally, Moran and Stanely (2013) provide evidence of unsafe rescue practices among individuals (n = 415) in Auckland, New Zealand, where 47% of individuals identified they would just jump in and rescue a victim, and less than a third would get a floatation prior to making a save. Also, the authors found that significantly more males responded that they would

jump in and attempt a rescue (males 55%, females 40%). Considering what is known about the frequency and importance of bystander rescue, training bystanders to perform safe and effective rescue response is of incredible importance.

Flotation is key to saving time and saving lives in a rescue situation (Brander, 2019). By reaching to a victim, or throwing something that floats, a rescuer can safely respond to someone in trouble in the water without putting themselves at risk in the process (American Red Cross, 2014). Going in to save a victim without providing them something that floats is an extremely dangerous, life-threatening practice and should be avoided (American Red Cross, 2014). Next, the moments after safe rescue from the water are often critical, as rapid application of CPR, with rescue breaths, results in better outcomes for drowning victims, and ultimately saves lives (Kitamura et al., 2010; Venema et al., 2010).

Girasek (2011) provides evidence that children survive at rates up to 30% higher when cared for immediately by an individual trained in resuscitation. However, Meyer (2006) found that only about 30% of children receive BLS after an incident. The Australian Water Safety Council and World Health Organization advocate for community wide CPR training, as the rapid application of CPR, and swift provision of basic life support (BLS) by bystanders is related to significantly better outcomes (Australian Water Safety Council, 2016; Salomez & Vincent, 2004; Brenner, 2002; WHO, 2014). Trends reflecting those of private pool owner's beliefs verses their adherence to barriers are seen in the context of CPR. Wintermute and Wright (1990; 1991) surveyed pool owners and discovered that just 50% of those who were in support of CPR actually had CPR training. Larsen, Pearson & Galletly (2004) found that many individuals trained in CPR have hesitation in using these skills in an emergency incident. Because of this, it is important to overcome some of the perceived or real barriers to CPR training, and the use of

CPR after drowning incidents occur. Even children can learn the life-saving skills of CPR and help increase the rate of BLS application after drowning incidents occur. Mahruba et.al., (2016) provide evidence that 7-9 year-old children (n=811) can learn CPR and first aid skills. Yet questions still remain in so far as their ability to use these skills in an emergency and whether or not they retain these skills long term. Ultimately, the swift response and rescue of individuals in trouble in the water, performed by individuals with knowledge of safe rescue techniques, and trained in CPR, saves lives.

Lifeguards

According to the United States Lifeguard Association (USLA), an individual visiting a USLA guarded beach would have less than a 1 in 18 million (.0000055%) chance of drowning (Branche & Stewart, 2001). According to 2019 data, over 71,000 rescues were performed at USLA guarded beaches, along with over 16,000 boat assists and over 8 million preventative actions (Branche & Stewart, 2001). Surf Lifesaving Australia (2016) reports that over 13,000 rescues occur annually Life Saving Australia guards along the coast of Australia alone. Lifeguarding in the U.S. has become more effective over the decades, during the 1960s there was an estimated one drowning per 2,004 rescues at guarded beaches, by the 1990s, there was only one drowning to every 4,832 saves (Branch & Stewart, 2001). The number of lives saved around the world by lifeguards is vast, in fact, the International Life Saving Federation (ILSF) estimates that ISLF affiliated lifeguards will perform over 1,000,000 rescues each year (ILSF, n.d.). Indeed, the vast majority of water safety research provides evidence of the positive impact of lifeguards, saving lives across communities, and the negative impact of their absence, as most drownings will occur away from trained lifeguards (Branche & Stewart, 2001; ILSF, n.d.).

Lifeguards can drastically reduce the economic costs of drowning as well. As an

example, if one percent of the approximate 77,000 rescues made by guards in the US during the 1997 season were fatal drownings, (770) the comprehensive cost would reach upwards of 2.1 billion dollars (Branche & Stewart, 2001). In fact, comprehensive costs would reach 27.5 million annually if one percent were injured from these incidents (Branche & Stewart, 2001). These numbers are representative of costs in the late 1990s, and the value of a dollar has over doubled since 1990 (Inflationtool, n.d.). This means costs found in 1997 would be nearly twice as high if they occurred to date. With lifeguard presence on the Great Lakes shoreline a great number of these lives lost would have been rescues, saving communities and families from heartbreak, and saving resources and funds that could be used in other important areas of need across the state.

Although the statistics are overwhelmingly in support of lifeguards enhancing the safety of individuals in and around the water, there are some examples of the need for further guard training in the literature. Pelletier and Gilchrist (2011), for example, discovered that in 106 cases, bystanders recognized drowning victims first (78% of the time) and then alerted a lifeguard, while lifeguards recognized victims during the remaining 22% of incidence. Surprisingly, Leitzel and Moore (2010) found evidence supporting less than adequate lifeguard drowning recognition, finding that lifeguards recognized drowning no differently than untrained bystanders. Recognizing drowning is a difficult task, as public perception, shaped by media, is that drowning looks like waving and yelling, however, drowning is typically a quiet tragedy, with little waving or splashing (Vittone & Pia , 2006). There is great importance in educating the general public and first responders alike on what drowning incidents truly look like.

In an investigation of lifeguard rescues over a two-year period in Newport Beach, CA, Koon, Rowhani-Rahbar and Quan (2017) found that rescues increased 3.25 times for every foot

increase in wave height as long as waves were under 4 feet. Interestingly, for every foot increase in wave height above 4 ft saw a 48% decrease in rescues. This could be due to the fact that wave heights over 4 feet would keep most swimmers, especially the inexperienced, out of the water. Wave heights over 4 feet would also most likely yield red flag days, and more preventative efforts from lifeguards, both deterring the common beachgoer from entering the water. Lifeguards have been found to perform far more preventative actions (54.8%) than rescues (1.9%), this according to an analysis of lifeguard activity at a popular California (CA) beach (Koon, Rowhani-Rahbar and Quan, 2017). The authors also noted that the majority of both rescues and interventions occurred during the summer months, on weekends and in the afternoon. These temporal and spatial patterns can be used to inform more effective efforts to prevent incidents and to save lives.

Water Competencies

It is often thought that knowing how to swim is enough to stay safe in the water, a perception that has been cultivated primarily by the opinions of experts and anecdotal evidence (Stallman et al., 2017). Although most research points to swimming as highly important aspect of drowning prevention, the perception that all that is needed to protect against drowning is the ability to swim must shift to swimming instead being one of many important steps in drowning prevention, as swimming alone is not enough (Katchmarchi, 2018). The International Life Saving Federation states that a quarter of those lost to drowning knew how to swim (ILSF, n.d.). Stallman et al. (2008) found that swimming lessons are not entirely protective against drowning for children, as most learn to swim classes do not prepare children to deal with submersion events that are unexpected.

Although Brenner (2003) did not find evidence that swimming lessons were a protective

factor against drowning, in more recent work, Brenner et al. (2009) found that participation in swimming lessons significantly reduced drowning risks. In their case control study, Brenner and authors (2009) analyzed interviews with 88 families that had unfortunately lost their child (1-19 years old) to drowning, along with 213 closely matched controls**.** Drowning risks were found to reduce by 88% [CI 3%, 99%] among children ages 1-4 who had participated in swimming lessons, while there were no significant results in drowning risk reduction found in older age groups (5-19). Similarly, Yang et al. (2007) found that the lack of swimming lessons was a significant drowning risk for children ages 1-4 in a case control study of drowning incidents among 1-14 year-olds (n = 133) across 20 districts in rural China. Overall, swimming ability has been found as protective against drowning for children (Brenner et al., 2009; Linnan et al., 2011; Rahman, 2009; Yang et al., 2007), and drowning survivors will often state that being unable to dive, swim or float contributed to their near drowning (Stallman, 2008).

True drowning prevention, however, requires a wide range of water safety competencies, and swimming should no longer be thought of as the solution to the problem of drowning, but one of many important water safety competencies needed to prevent drowning. Moran (2013) identifies water competence as "the sum of all personal aquatic movements that help prevent drowning as well as the associated water safety knowledge, attitudes, and behaviors that facilitate safety in, on, and around water" (p. 4). Water competencies that are known to protect individuals from drowning include, but are not limited to, safe entry, breath control, open water skills, safe exit, and stationary surface competence (See Stallman et al., 2017, p.3). Programs focused on learning water safety competencies and water safety education differ from traditional learn to swim programs. These programs aim to enhance a number of water safety competencies including safe rescue, survival swimming skills, and building knowledge of safe practices in a

wide range of aquatic environments (Leavy, 2015).

Key Water Safety Competencies

A critical first step in water safety and drowning prevention intervention is understanding what competencies an individual should have to keep both themselves and others safe in and around the water. According to experts, effective water safety and drowning prevention efforts should cultivate the knowledge and skills to keep one self-safe and to self-rescue, to keep others safe through safely rescuing others, and to know impactful ways to prevent drowning in the first place. Prevention efforts include, but are not limited to, supervision, barriers, PFDs for the non/less experienced swimmer, and swimming close to a lifeguard (Ramos et al, 2015). Ramos and colleagues (2015) advocate for the use of the American Red Cross "Circle of Drowning Prevention" as a successful primary drowning preventions strategy. The Circle of Drowning Prevention includes close and constant supervision, four sided barriers around pools and spas, learning swimming and water safety competencies, wearing lifejackets when appropriate, and always swimming by a lifeguard. Self-safety in the water includes learning how to swim and gaining the necessary water competencies to protect from drowning, learning to float, how to perform safe entry and exit from the water, among many others (Stallman et al., 2008; Ramos et al, 2015). The safety of others often requires effectively recognizing drowning, safe rescue techniques, and proper response, including calling for emergency responders, and providing CPR if needed (Ramos et al., 2015).

Katchmarchi et al. (2018) reviewed water safety resources provided by drowning prevention organizations in the U.S. The research team analyzed 451 data points, from 25 water safety resources, revealing six water safety categories. These categories included safety precautions, supervision, preventing access, safety equipment, emergency procedures, and

aquatic education. Safety precautions include components like dive safety (not entering headfirst into shallow or unknown water depth), not running near the pool, and avoiding entrapment due to suction or drains. Supervision includes supervision by adults, lifeguards, and swimming with others (swimming with a buddy), while preventing access must deal with barriers around the water. Safety equipment incorporates wearing PFDs and using rescue equipment, and the category of emergency procedures includes both self-rescue and the rescue of others. Finally, aquatic education includes learning skills like swimming and floating. Safety precautions ranking so highly across drowning prevention resources in the U.S. is a surprising finding, as efforts like improving supervision, increasing barriers, and enhancing water safety education appear to be the most impactful drowning prevention efforts across water safety literature.

Stallman et al. (2008) recommend eight evidence-based skill elements needed to prevent drowning, which include: "(1) Entry (i.e., do not jump or dive) into deep water, (2) upon submersion, regain surface, level off and swim, (3) surface dive and swim underwater with comfort, (4) acquisition of at least two rudimentary strokes, one on the front, one on the back, (5) breath in a relaxed way and in a manner coordinated to the demands of the stroke, (6) change body position in the water (i.e., roll over from front to back and back to front), (7) change direction of travel (i.e., turn left and right both on front and back), and (8) remain afloat (i.e., stop and rest with minimal movement; no movement is necessary for prepubescent children and for women, all of whom can float; Stallman, 1997)." These eight key water safety competencies are based on a review of the skills highlighted by 25 aquatic organizations, all experts in water safety and leading nationwide programs in their respective nations (18 nations represented in total). Additionally, these competencies coincided with what the authors found in an exploration of drowning incident records, interviews with surviving drowning victims, and with those that

simulated drowning.

More recently, Stallman et al. (2017) provide a broader conceptualization of water competencies needed to protect against drowning. The authors break water competence into 15 essential skills, understandings, attitudes and values (p.3), and provide research evidence to defend the importance of each. These competencies include, but are not limited to, skills like safe entry and exit, floating, water orientation, and propulsion. The competencies also include important understanding like being knowledgeable of hazards found in the local aquatic environment, risk assessment, awareness and avoidance, personal assessment of competence levels, and recognizing drowning to name a few. Stallman and authors also highlight the importance of having positive attitudes and values that are in line with the importance of water safety. The relationship between attitudes and values and water safety knowledge and behavior around the water is not well understood and challenging to measure. Additionally, changing attitudes and values may require strong efforts to change the overall cultural value of water safety throughout communities.

Protecting others from drowning requires the ability to respond and rescue those in trouble in the water effectively and safely. Proper rescue of a drowning victim includes the "4 Rs" (Moran et al., 2016). The 4 Rs include recognize, respond, rescue, and revive and were drafted with consideration of the "Drowning Chain of Survival", developed by Szpilman et al. (2014). The Drowning Chain of Survival includes recognition of distress, provision of floatation, removal from the water and provision of basic life support like CPR and first aid as appropriate (Szpilman et al., 2014). According to the 4 Rs (Moran et al., 2016) the first step is recognition of drowning, and consideration should be given to knowing that drowning is typically a quite, sudden occurrence, and is very difficult to spot, *without* the waving of arms,

splashing and shouting (Vittone & Pia , 2006). Response should include calling for help of emergency first responders (Szpilman et al., 2014), and rescue should be done without direct contact, reaching something to them, or throwing something to them that floats (Brander, 2019; Szpilman et al., 2014; Stallman et al., 2017). Finally revive includes CPR and first aid efforts to keep individuals alive with BLS until more advanced life support arrives or the victim is revived (Australian Water Safety Council, 2016; Salomez & Vincent, 2004; Brenner, 2002; WHO, 2014).

Water Safety Knowledge Sources

Gaining an understanding of not only what individuals know about water safety, but also where they are receiving this information, is of additional importance in drowning prevention efforts, especially for youth. First, gathering this information will help with the cultivation of appropriate water safety curriculum by identifying gaps in water safety knowledge and competencies. Second, understanding the primary water safety knowledge sources of individuals can help the water safety community focus efforts on empowering these sources with evidence-based messages, and provide resources to support the continued education of these sources by experts in the water safety arena.

Attending to these efforts, Moran (2009) explored the water safety knowledge sources of year 11 youth (n=2,202) from New Zealand. Students were asked to identify the top three sources of water safety knowledge from a list of six potential sources, as well as recall if peers participated in eight risky practices, and if they had witnessed six positive actions in or around the water. Males identified peers as their primary water safety knowledge source, at a rate 10 times more than females, while females identified their main water safety knowledge sources as parents and schools. Males participate in high-risk activities more often and know less about

water safety than their female peers (Moran, 2008). Therefore, the fact that males cite peers as their primary water safety knowledge source is an issue, as their peers may be influencing them to participate in risk taking activity and providing misinformation about water safety, while parents and schools may be a more accurate, dependable source of water safety information. Overall, Moran (2009) found that students perceived schools as providing less than adequate opportunities to learn about water safety topics, of particular concern considering the platform schools have to offer consistent, equitable water safety education to youth.

Along the shorelines of the Great Lakes, USA, Lapinski and Viken (2014) interviewed 18-24 year-old males living in lake shore communities investigating risk communication. The authors found that participants felt their families, especially mothers, played essential roles in the communication of risks in and around the water. Participants also identified that signs and interventions made by lifeguards could be ways to reduce risks, but admitted to not usually using these information sources. Additionally, although participants said that signs and flags were important sources of information about risks, there was clear evidence that these sources did not have much influence on decisions whether or not to participate in risk taking activities like swimming in unsafe conditions, or jumping off piers, these decisions were far more influenced by collaborative decisions among friends. Boater safety and lifesaving classes, along with geography courses in high school and the YMCA were other common risk information sources, and to a lesser extent the internet or television. Interestingly, information seeking was rare among all groups, and most public safety messages learned, through the internet and, or, television, were identified as occurring unintentionally. Flags were spontaneously brought up by all participating groups at some point, some participants challenged the effectiveness of the flags, while others said they intentionally ignored them.

As highlighted by Lapinski & Vikin (2014), an individuals' actions are often influenced by what they see others do, as well as what their perception of what others think they should do. Additionally, interpretations of this information will typically occur via interpersonal communication, observation, or mediated messages. For example, when considering swimming on a red flag day, individuals can observe how many others are swimming on that day, they can communicate with others about what they think about swimming in those conditions, and they can read signs or other mediated messages that inform them on whether or not they should swim on a red flag day (Lapinski & Viki**n,** (2014). Finally, the authors note that when considering what others think about specific actions, individuals will primarily gather either approval or disapproval through the expressions of those around them (my friends cheer and clap when I run into the water on a wavy day).

Water Safety and Drowning Prevention Interventions

Cultivating essential water safety knowledge and competencies is an important process for individuals and communities alike. Water safety and drowning prevention intervention programs have been seen to significantly enhance both water safety knowledge and skills. In fact, there are a multitude of examples in water safety and drowning prevention literature of successful interventions occurring in a wide array of contexts, and among a diverse range of ages and ability levels. Long-term evaluation of intervention efforts, formative assessment within the target population, theoretical considerations/frameworks, and key stakeholders as part of the development process, are valuable steps often missing in water safety and drowning prevention work. The Center for Disease Control also identifies education as a key component to drowning prevention, and the WHO recommends water safety education and swim skills be taught to all school-age children. (CDC, 2014; WHO, 2014). An excellent way to lower the risk of drowning

in any given community is through an educated, and actively engaged public (Katchmarchi, 2018). Water safety education is particularly important for children and youth, as teaching swim skills, safe deck behavior, CPR and rescue techniques, have been seen to significantly reduce the risk of drowning among children (Australian Water Safety Council, 2012). Additionally, general health education has been established as one of the most important ways to protect youth from several public health problems (Institute of Medicine, 1997; Polivka & Ryan-Wenger, 1999; Public Health Service, 1994).

Youth in Bangladesh face incredibly high drowning risk. Tragically, among those 1 to 17 years of age, drowning rates in Bangladesh reach approximately 17,000 annually, an average of about 50 children and youth lost to drowning every day (CIPRB, n.d.; International Drowning Research Centre, n.d.). These rates inspired a number of community stakeholders, in partnership with RLSSA, to develop and launch the SwimSafe survival swim education program (CIPRB, n.d.). SwimSafe aims to protect children from drowning by teaching survival swim skills, promoting swimming as a sport, training youth to be future swim instructors for other children, and provide education about hazards in the water. The SwimSafe curriculum was created by experts in the water safety and drowning prevention arena, and local experts familiar with the characteristics and hazards of the local aquatic environment. Children, either non or low ability swimmers, are identified by SwimSafe trained Community Swimming Instructors (CSIs) with support from community leaders, and then invited to participate in the SwimSafe program. Youth graduate from the program when they show that they can tread water for 30 seconds, rescue others, and swim 25 meters (CIPRB, n.d.). Since 2006 nearly 500,000 children (4-10 years old) have been trained by SwimSafe (CIPRB, n.d.).

Talab et al. (2016) compared two cohorts of match children (n = 66,066), one group

participating in SwimSafe and the other group not participating in the program. Children in the SwimSafe cohort showed strong, statistically significant reductions in the relative risk of drowning, with an RR of .46 (95% CI 0.037 -0.071), SwimSafe trained children had far less chance (96%) of drowning than non-SwimSafe children (Talab et al., 2016). Beyond the protection of self from drowning, it appears that non-swimming youth in Bangladesh perform rescues much less than natural swimmers and SwimSafe trained swimmers (Mecrow et al., 2014). Mecrow and authors interviewed 3,890 SwimSafe graduates, and matched cohorts of natural swimmers and non-swimmers. Rescues (a total of 188) were reported by all three groups, yet only 2 occurred among non-swimmers. It appears that swimming and swim survival training is an important factor in the willingness and ability of youth to rescue others. Interestingly, the vast majority of rescues (90.9%) were in water rescues, and therefore further education on safe rescue practices are recommended by Mecrow and authors.

As recommended by Leavey and colleagues (2015), the SwimSafe program engages highly with the local community to recruit youth, train instructors, and maintain the quality of the program (CIPRB, n.d.). Asher et al. (1995) found that an 8, or 12 week, American Red Cross swimming and water safety skills program, adapted for younger children, bolstered swimming ability (rolling back to front, swimming for 5 feet, independent pool enter or exit, etc.), jump and swim ability (jumping in from the edge, then swimming to the side of the pool), and water recovery (getting back to their feet after being dropped in the water from 2 feet above water level) among children 24-42 months of age (n = 109). There was however no comparison group, and no exploration of negative impacts of the program. Further, participants volunteered their children and therefore may have had a vested interest in water safety. Finally, although the program was adapted to meet age group needs, no formative work was mentioned among

participants, families/community, or instructors.

Leavy et al. (2015) performed a meta-analysis of interventions aimed at drowning prevention among young people in low, middle and high income countries, with specific focus on the use of behavioral theory and evaluation frameworks in the process of intervention development. The authors found 15 studies that were categorized into one of four key drowning prevention themes identified by the International Life Saving Federation (ILSF). The four themes included, "education and information", "denial of access-barriers", "provision of supervision", and "acquisition of survival skills". Of particular interest, the authors discovered that behavioral theory and planning frameworks were rarely considered in intervention design, and formative evaluations were utilized in only one-third of the interventions.

Water safety interventions guided by theory can increase the chance for positive and sustained behavioral change in the lives of participants, and formative evaluations can help those designing water safety interventions understand gaps in the knowledge and skills of the target population, the unique environmental elements and risks of the community, while remaining culturally competent in language and delivery (Leavy et al., 2015). Additionally, knowledge alone does not necessarily instill behavior change, many important considerations are necessary to encourage change in behavior in and around the water, including, but not limited to, considerations of both the context and appropriateness in which the interventions are delivered (Leavy et al. 2015). There were only two studies that used behavioral theory to guide the development of intervention content/strategy. Bennet et al. (1999) used aspects of the protection motivation theory and social cognitive theory to guide the creation of messages for a media campaign aimed at increasing life vest wear among children 1-14 year olds in King County Washington. Components of the program were also informed by a baseline assessment of

potential strategies, behaviors and attitudes, drowning prevention research, and another Seattle based media campaign focused on helmet wear (Bergman, Rivara & Richards et al., 1990). The life vest campaign messages were publicized on the radio, in newspapers, during press conferences, public service announcement, on TV and even buses. The campaign ran for three years and produced modest, yet significant, increase in both life vest wear and ownership, especially for those that were aware of the campaign.

In a Think First For Kids program assessment, grade 1 to 3 students (n = 851) participated in a 6-week injury prevention program which included drowning prevention (Gresham et al., 2001). A total of 15 schools participated, 8 schools as part of the intervention group, and 7 were assigned to a control condition. Students learned about water safety as one of the six injury prevention components of the intervention program. After being trained in the TFFK program, teachers, nurses, and life skills educators delivered the curriculum, which consisted of activities, role-playing, math, reading, discussions as well as visual reinforcements. The program was designed with considering principles of Bandura's Social Cognitive Theory and structured to use varied messages throughout the program in order to enhance knowledge retention, understanding and sustained behavior change (Bandura, 1977). The TFFK participants from the 7 randomly sampled schools gained in knowledge of water safety rules, prevention of water-related injuries and drowning, and awareness that injury prevention is requires community wide efforts. However, there was no long term follow up of these gains among students, and results were self-reported, and not triangulated by teachers, parents, and others. Additionally, there was no formative work done within the schools or community to help guide the intervention curriculum or delivery.

In the previously discussed review of interventions, Leavy and authors (2015) also found

that only about one third of the studies did any formative work in order to inform the intervention content or strategy. Callaghan et al. (2010) analyzed the supervision of children in Bangladesh (6 months - 4.5 years of age) with, or without, being given a supervision aid (child playpen or door barrier). Six different villages were purposefully selected to participate, two villages received only educational messages about supervision, the others received either a playpen or door barrier. Formative work was done in a pilot to help develop the playpen and door barrier. Overall, those that received the playpen used it more readily than those that received the door; therefore, playpens may be an effective tool to help parents or guardians with the task of supervising young children.

Returning to Bangladesh, the Prevention of Child Injuries through Social-Intervention and Education (PRECISE) program, created to prevent injury in rural areas across the country, especially drowning (Rahman et al., 2012). There were two components of the PRECISE intervention, Anchals and SwimSafe, and children participated in one or the other. Anchals are essentially childcare centers (creches), set up in homes of the participating villages, and focused on increasing the supervision and education (general health/safety) of children 1-5, while SwimSafe was a water safety program for children 4-12. Participants of Anchals (n=18,596) saw a relative drowning risk of .181 ($p = .004$), compared with SwimSafe participants (n=79,421) who saw a relative drowning risk of .072 ($p<.0001$). PRECISE is another example of a water safety intervention allowing local communities the freedom to cultivate the content meet the specific needs of communities. As part of PRECISE, each participating village had an injury prevention committee, a team of local leaders who participated in promotion and planning. Also, after injury deaths occurred within participating villages, family members, along with village elders and neighbors, were brought together to discuss what led to the passing of that individual

and how to prevent these unfortunate occurrences in the future.

To enhance drowning prevention intervention work in low to middle income countries, Leavy and authors (2015) call for drowning prevention efforts to use a variety of different strategies, cultivated in the framework of applicable theory, utilizing formative assessment as a guide for program development. Overall, drowning prevention programs should be thoughtfully planned, delivered and assessed. Additionally, a number of the studies reviewed were identified as multi-strategy interventions, incorporating the aspects of education, supervision, and, or barriers in a community-based approach to drowning prevention. Due to a lack of strong methodology and evaluations, however, the mixed results from these studies are difficult to interpret. Leavy and authors identify the importance for community-based strategies using a unified front, not dependent on one single aspect of water safety. Finally, drowning prevention programs should be built on a foundation of policy change, advocacy, and the provision of sustained resources across the community to maximize their success.

School Based Water Safety Intervention Programs

There are a number of examples of successful water safety education and drowning prevention programs situated in schools. Petrass and Blitvich (2014) found that a 12-week water safety education program, integrated within an existing swimming and water safety program, successfully enhanced water safety knowledge ($p<.001$) and swimming ability ($p<.001$) among participating University students in Australia. The program covered a range of water safety and swimming competencies and content, including, but not limited to, swim techniques, survival and rescue skills, and learning about injury management. A collaborative, social leaning pedagogical framework was used, where students participated in their own learning, developed their own ideas, discussed solutions, and engaged in teaching one another. The program was

delivered by AUSTSWIM instructors, experts in the arena of swimming and water safety instruction.

Although the water safety education program saw gains in swimming ability and water safety knowledge, there was no significant difference in participants attitudes. These results are similar to those found among high school students in greater Athens (Terzidis et al., 2007) and the authors note a lack of consensus in the literature as to why little change in attitudes occurs during water safety interventions at these ages. Interestingly, formal swimming lessons, or school-based swim programs, had no influence on knowledge, attitudes or rescue and survival skills at pretest. The authors also discovered that water safety knowledge was consistently low among participants, a concerning finding as the nation of Australia makes many water safety education efforts, specifically through the work of RLSSA and AUSTSWIM.

Petrass and Blitvich suggest that poor water safety knowledge levels could be due to a greater ability in participants to retain physical tasks than cognitive tasks over time (Arthur et al., 1998). Greater retention of swimming and water safety skills of participants could also explain why those that had received formal swimming and water safety training were able to move from competent to proficient, even expert, levels of swimming and water safety skills during the program. As noted by the authors, with higher retention of these physical skills at baseline, this program may have acted more as a refresher for these participants, allowing them to gain in their abilities quite quickly (see Whisher et al., 1991). This study provides evidence that an in-depth, comprehensive program can be a sound drowning prevention program for young adults. The authors note the importance of future research that focuses on identifying the main factors effecting the maintenance or loss of water safety knowledge and competencies over longer periods of time.

In Vietnam, where drowning rates among youth are some of the highest in the world, Ramos and authors (2018) performed a pilot study on a school-based water safety education program designed in partnership with Swim Vietnam, Royal Lifesaving, and AUSTSWIM. The water safety education program was introduced and taught by physical education teachers, all of whom are trained by Swim for Life-Vietnam and Swim Vietnam. Teachers were trained to keep the main water safety messages consistent but were allowed to adapt the curriculum to address water safety considerations that may be unique to their local environment. The water safety education utilized a 1 and 1/2 hour land-based program, using direct instruction, hands on activities, and natural/common local props. A survey was given to students in grades 1-5 from the 229 schools, a total of 21,043 students participating in the pretest, and 19,155 in the posttest. Across all grade levels, and on each question, significant increases in knowledge were found from pre to post test ($p < .001$). The authors noted that future research should focus on repeated measures for program effectiveness and ways to assess behavior change in and around water.

Turgut (2016) evaluated a 5 week water safety education program situated in physical education class among youth (10-14 years old) from two cities in Turkey. Youth from Antalya ($n = 353$) had easy access to water, living near the Mediterranean Sea, rivers, waterfalls, etc., while youth from Ankara ($n = 123$) had little access to natural bodies of water. Youth were taught water safety messages from and adapted version of the American Red Cross Longfellows Whales Tales curriculum. Water safety messages were taught in tandem with the skill of life ring toss (LT), as the life ring toss has been found a safe, effective rescue technique (Turgut, 2016). Students were trained and assessed in the LT according to standards set by ILS (2013). Participant water safety knowledge was assessed via a pictorial evaluation where students were to circle safe practices and place an "x" over unsafe practices. By the end of the 5-week program

students saw increases in water safety knowledge in all seven curricular subtopics, as well as a 32% increase in water safety knowledge overall, and a 476.2% enhancement in LT abilities ($p<.05$). Although this program was run in partnership with local schools, it is unclear who taught the water safety education and LT program. Additionally, the ARC Whales Tales curriculum seemed to fall outside of the targeted age group, as the curriculum was designed for children and youth 5-12 years old, whereas participants in this study were anywhere from 10 to 14 years of age. There was also no mention of formative work among students or inviting instructors to help with program development.

Also using the ARC WHALES Tales water safety curriculum, Solomon et al. (2013) delivered an adapted version of the program to primary school children, ages 5-12, in Grenada ($n = 56$). Students participated in the program during the school day and received a pre- and post-test composed of nine pictures where students were once again asked to mark an "X" over unsafe practices in and around the water and circle with an "O" practices that were safe. The authors also designed an evaluation of the program which they gave to teachers, involving the administration of 11 Likert type questions focusing on the usefulness and adaptability of the program for their school children. Results showed that students from many grades saw significant improvements in survey scores and that 10 of the 11 teachers felt the program was effective and applicable among other positive results.

The authors note that the study was limited by a lack of formative work to help cultivate a program that would apply more directly to the lives of children in Grenada, their culture, and the native aquatic environments. Additionally, although teachers played a role in evaluating the program retrospectively, they could have played an important role in helping create a more effective version of ARC WHALES Tales for their students through the curriculum development

process. There is question to whether a program can be designed to be developmentally appropriate for 5- to 12-year-olds, and how a program can be appropriate for both kindergartners and sixth grade simultaneous. There was no long term follow up and questions remain as to why there was not significant results at the youngest ages.

Wilks et al. (2015) explored the influence of a one-day water safety training among year 6 students (11-12 years of age) in Australia. Participants (n=107) completed a pre, post, and and 8-week follow up assessment that showed statistically significant improvements in the recognition of important water safety concepts (meaning of the red flag, identifying rip currents, etc.) Participants also identified that they would be more willing to provide first aid to family/friends in case of emergency. Curiously, the majority of students were able to identify the colors of the lifeguards gear, and flags that identify safe/patrolled areas to swim, but many lacked the knowledge of a red flag which signifies that the water is dangerous and you should not swim. It appears that familiarity of lifeguards and safe/patrolled areas was more common among these youth than the warning aspect of the flag system, specifically the red flag. Overall, this study provided evidence that a one-day program can be effective in the enhancement of water safety knowledge among primary school children.

Terzidis et al. (2007) provide another example of an effective one-day water safety education program for children in partnership with local schools in the Greater Athens area. Terzidis and colleagues performed a school-based intervention with 202 kindergarten and 1st grade, 220 elementary, and 337 high school (first three grades of high school) students from the Greater Athens area. Partnering with school teachers, a one day in class event was held with a audiovisual presentation, discussions about the experiences of students, conversations about how events could have had better outcomes, and, or, the use of plays/drama among students. A one

month follow up of the "knowledge and attitudes" assessment was given to both the intervention and comparison groups. The assessment was a questionnaire designed by pedagogues, lifeguards and pediatricians cooperating in development. The questionnaire was self-reported and asked about students' pre-existing swimming knowledge, and a mix of open and closed ended questions about participants attitudes and knowledge about water safety.

In rural Victoria, AU, where youth are at higher risk of drowning than in urban communities, Life Saving Victoria conducted a pilot of the "Before School Swimming and Water Safety Program" (Birch et al., 2015). The survival swimming program included 10 lessons, designed for students of varying ability levels. The program focused on water safety competencies as well as important aspects of drowning prevention like leadership, being self-aware, and individual resilience. The program was created by the Life Saving Victoria Education Services Department, and founded on the National Swim and Survive program designed by the RLSSA (2011). Program effectiveness was evaluated in two parts. First, students received a survey, assessing self-reporting swim ability, water safety knowledge and aquatic exposure. Second, students participated in a pre and post practical water competency and swimming skills assessment. Qualitative exploration of the program occurred via surveys for parents and swim teachers, as well as focus group interviews with aquatic center management, school teachers and swim instructors. Of the 68 students participating in the program the vast majority saw improvements in at least one practical skill, and over half improved on swimming ability. Additionally, there was a 69% to 84% gain in the number of students who could float for over 2 minutes, an incredibly valuable skill for self-rescue and survival.

Examples of Water Safety Education Interventions in Michigan

Over the past 20 years the YMCA has provided an adapted version of the YMCA's water safety curriculum called "Safety Around the Water" (adapted for Great Lakes waterways) to about 1,000 students in Muskegon Public Schools. The YMCA administrative team believes they have seen 20,000 plus students over the years, but does not know of any evaluation or assessment done on the programs with children from area schools (C.Eenigenburg, Personal conversation, April, 2017). The administrative team states that every year they are unsure if the program will continue and recognize that not all schools can participate fully due to funding. It was also noted that program staff are currently working on a new pool location as their current pool had to shut down due to a lack of funding.

The YMCA has also had a third-grade water safety program in place for Ionia, Portland and Saranac public school districts over the past 20 years. Their water safety curriculum was developed by a team of water safety experts when the program launched. Since 2012, roughly 400 students participate annually, however, no longitudinal research has been done on this program (L. Carne. Phone Conversation. April, 2017). The Grand Haven Area Public Schools also partners with the YMCA to provide their students with water safety and swimming instruction, however, once again, no assessment has been done on the program.

The Holland Area Aquatic Center works with K-5 students throughout Ottawa County, and their staff estimates that thousands of students will go through their program annually, yet no assessment has been done on their program. The Holland Area Aquatic Center does however use the program "Whales Tales", a water safety curriculum developed with the American Red Cross, which has been shown to positively influence the water safety knowledge of children (Turgut, 2015). Traverse City Area Public Schools has incorporated water safety education with area

schools (high school initially) using the “Play it Safe in the Water” program, however, once again, no assessment has taken place on the “Play it Safe” program. The Great Lakes Surf Rescue Project provides water safety presentations to a number of Michigan area school districts, working with thousands of youths across the state throughout the school year. Since 2010 they estimate speaking to about 10,000 young people throughout the state, however, no assessment or official data is available.

One final example of the recent water safety work done in the state is work completed at the University of Michigan as part of the Michigan Sea Grant. They developed a suite of water safety lessons and resources specific to the beaches called “Be Current Smart”. Part of this suit was a series of high-quality education videos about the different types of currents on the Great Lakes and how to respond appropriately, along with many other important water safety lessons important when visiting the beach. Funding for this program has officially run out, however, during its implementation they have handed out an estimated 20,000 brochures at different events and programs (E. LaPorte. Phone Conversation. December 11, 2017; R. Register. Phone Conversation. December, 11, 2017).

Many organizations are partnering with local schools throughout Michigan to help teach kids how to swim and stay safe in and out of the water. The general theme across all intervention efforts, however, is that little, if any, evaluation or assessment is done to identify the water knowledge of youth, or the behavioral impact of their programs. Further, although there is evidence that these partnerships can be successful long-term, there is no long-term assessment of the influence of these water safety interventions on the knowledge or competencies of participating youth. Finally, although the existence of such partnerships is encouraging, further buy in from schools could allow for the development of much needed evaluation and long-term

assessment of these programs. Additionally, due to their professional knowledge and experience in education, including school teachers and administration in the process the development and delivery of water safety curriculum provided by aquatic industry partners would certainly be value added to the existing programs.

Water Safety Education in Schools

The Benefits of Teacher Participation in Water Safety Education

Leaders in water safety and drowning prevention agree, the provision of water safety education to all school aged children is an essential step towards preventing drowning (WHO, 2014). As seen in this review, water safety interventions situated in schools have been found to significantly increase water safety knowledge and competencies, and at younger ages, even attitudes about water safety. However, intervention work developed and delivered by schools has rarely been evaluated, and interventions developed and delivered by teachers themselves is even more rare. With an estimated one billion children and youth attending schools world wide (UNICEF, n.d.), 56.4 million in the U.S. (National Center for Educational Statistics, 2020) and just over 1.4 million in Michigan (MI School Data, n.d.), schools have the incredible potential to help provide water safety education to children and youth, and should be considered an essential resource in drowning prevention endeavors.

Best practice in the reduction of drowning rates, and in the protection of children from drowning, includes the implementation of water safety education into school curriculum (Lynch, 2012). Moran (2008) suggests a greater emphasis on helping students learn basic swim survival skills through fully funded, equitable, water safety opportunities provided by schools. Moran also recommends specialized surf and boater safety education for students, taught by professionals, with a mandatory CPR component, all by the age of 16 years old. Swimming and

water safety instruction within schools may additionally aid in bringing equity to those youth from communities without access to free or low-cost swim lessons and water safety education programs.

Irwin and colleagues (2009b) suggest the potential of community sponsorships for school-based programs as ways for communities to invest in schools and the safety of their youth. Youth could in turn invest back into their communities and use the Community Youth Development framework for the development of youth water safety skill and life skill tandem (Perkins et al., 2001). Ultimately, if water safety education is not done within the school system, partnerships with community pools and aquatic centers for this education is encouraged (Irwin et al., 2009b). A uniformed water safety and swimming curriculum within schools will provide equitable opportunities for students to learn how to be safe in and around the water, regardless of SES (Lynch, 2012). Minority youths, of lower SES, may be those at highest risk of drowning, therefore, these recommendations should be strongly considered for low SES schools.

Leavey et al. (2015) provide evidence that drowning prevention best occurs via community wide efforts. Perhaps the most influential community members outside of family and peers in the lives of youth are their teachers, and their efforts are then of incredible value. These efforts however, must be done by teachers "with conviction", passionate about teaching these skills in order to keep their students safe in and around the water (Lynch, 2012). Therefore, finding ways to help teachers become aware of the risk of drowning among youth, convincing them that they can make a difference in keeping their youth and communities safe, and supporting them with content and resources in educating their youth about water safety, could motivate teachers to deliver water safety curriculum with a sense of passion and conviction that saves lives. The investment of teachers in offering their direction in curriculum development,

and the conviction to which they deliver water safety education, is built on a foundation of belief (Lynch, 2012). When teachers believe that their efforts in water safety education can make a positive difference in the lives of their youth they will be more invested in the process of water safety curriculum development and delivery. Therefore, teachers that "buy in" to curriculum change will be motivated to teach the curriculum, be confident in their ability to deliver the curriculum (higher self-efficacy in teaching water safety) and believe that their efforts will make a positive impact on the lives of their students.

In Michigan schools, water safety education standards are situated in Physical Education, a content area that continues to decline statewide (Michigan Department of Education, 2016; Michigan Department of Education, 2017). Not only is participation in Physical Education declining, there are no assessments of water safety standards at the state level, and therefore no one really knows if Michigan students are receiving any water safety education (M. Teachout, Personal Communication, December 11, 2017). Previous research suggests that students are learning far more from families and peers than schools, even though, as seen in the United Kingdom, New Zealand and Australia, schools can effectively deliver water safety messages (Field, under review). Additionally, the fire service has made intentional efforts to provide annual fire safety education in Michigan schools, and Michigan students have been found to successfully recall several important fire safety messages (Field, under review).

Evidence based water safety education and drowning prevention interventions, focused on building the essential knowledge and competencies needed to protect from drowning, are essential in drowning prevention efforts. There is evidence that water safety and drowning prevention intervention programs are effective in several contexts, including programs in schools. School based water safety intervention programs have been found effective in

increasing knowledge and competencies of children and youth across the globe. However, very limited research on school-based water safety education has been done in the U.S., and no evidence of research in Michigan was found in this review. The vast majority of school-based water safety intervention programs utilize outside drowning prevention experts, and/or, their organizations to develop, implement and evaluate these programs. Including teachers in the process of development, delivery and evaluation of school-based water safety education programs could foster effective, sustainable water safety education efforts.

The state of Michigan does not evaluate water safety standards, or assess participation in water safety education, swim lessons, and other water safety competency building practices in its public schools. Therefore, the water safety competencies of teachers and their students, as well as the current water safety education efforts of teachers and their schools, is widely unknown. Additionally, there is a lack of understanding in regard to whether or not teachers would even be willing or motivated to participate in school-based water safety education efforts. Gaining an understanding of teacher's intentions to teach water safety education, and the factors that may influence them, is an important step towards the development of an effective water safety education program Michigan. Teacher intentions to participate in water safety education may be best explored in the frame of the Theory of Planned Behavior (Ajzen, 1991).

The Theory of Planned Behavior

The Theory of Planned Behavior (Ajzen, 1991) was cultivated to help both explain and predict human behavior in specific contexts. Behavioral intentions, a foundational component of the Theory of Planned Behavior (TPB), are believed to be the motivational factors that will collectively influence the performance of any given behavior (Ajzen, 1991). According to the TPB, behavioral intentions can be predicted by three main antecedents, an individual's attitudes,

subjective norms and perceived behavioral control towards performance of a behavior (Ajzen, 1991). Attitudes about a specific behavior (ATT) can be positive or negative and are produced by the beliefs an individual has about the experiences or outcomes they expect will occur by performing the behavior (Ajzen, 2020). These behavioral beliefs are built on an expectancy-value system, where ATT will be proportional to the strength of all accessible beliefs by their expected outcomes or experiences (Ajzen, 2020). Therefore, if an individual holds beliefs about the outcomes of a behavior, and these outcomes are viewed to be robustly positive, they will have strong positive attitudes towards that behavior.

Subjective norms are founded on an individuals' normative beliefs, which can be either injunctive or descriptive (Ajzen, 1991; Fishbein & Ajzen, 2010). Injunctive normative beliefs deal with the level of approval or disapproval from a given referent, where descriptive normative beliefs deal with an individuals' beliefs in whether the given referent performs the behavior (Ajzen 2020). Subjective norms (SN) are thought to be the product of an individuals' injunctive or descriptive beliefs by the importance of the referent to the individual (Ajzen, 2020). Subjective norms will be stronger then when an individual believes that a referent, who they value highly, approves of a behavior, or participates in the behavior themselves. The final antecedent of behavioral intentions is the perceived control an individual has over a behavior. PBC is the amount of perceived control someone believes they have over a given behavior and is drawn from all accessible control beliefs. Control beliefs are constructed from an individuals' evaluation of accessible control factors, and whether these factors will be facilitative or debilitative in the performance of a specific behavior (Ajzen, 2020). PBC is the product of the strength of these control beliefs and the perceived power of the associated control factors (Ajzen, 2020). For example, if an individual perceives they have a high level of skills, and that these

skills are of particular importance in the performance of a behavior, their perceived behavioral control will be high.

According to Ajzen (1991) PBC is most closely tied to the concept of self-efficacy (Bandura 1977, 1982), which is the overall belief someone has in their ability to perform a specific task. PBC is not only a major antecedent to behavioral intentions but is also thought to be a moderator in the relationship between both ATT and SN and intentions (Ajzen, 2020). Additionally, PBC, along with intentions, are theorized to be direct predictors of behavioral performance (Ajzen, 1991). However, according to the TPB, no matter how strong an individuals' intentions towards performing a behavior, the actual behavioral control an individual has in a given behavior will moderate the link between intentions and behavior. Finally, according to Ajzen's original theory, intention will only truly predict behavior if the individual can perform the behavior at will. Essentially, if there are factors outside the control of the individual that become barriers to the performance of a behavior, these factors will influence performance, regardless of the strength of their intentions or perceived control over the behavior.

Empirically, there is ample support for the usefulness of the TPB in providing a framework for predicting behavioral intentions, and, although to a lesser extent, behavioral importance. In a meta-analysis of the TPB in the context of knowledge sharing behavior, Afshar Jalili and Ghaleh (2021) analyzed 47 total studies, finding ATT ($r = .477$, $p < .001$), SN ($r = .281$, $p < .001$) and PBC ($r = .328$, $p < .001$) significantly correlated with knowledge sharing intentions. Further, the authors provide evidence that intentions ($r = .380$, $p < .001$) and PBC ($.280$, $p < .001$) were significantly related with actual knowledge sharing behavior. Similarly, in a review of nutrition behaviors among youth, Riebl et al. (2015) found that ATT ($r = .519$, $p < .001$), SN ($r = .374$, $p < .001$), and PBC ($r = .458$, $p < .001$) effectively predicted intentions, and

intentions (r =.383, p < .001) and PBC (r =.353, p < .001) to predict nutrition behaviors. In the context of health-related behaviors, Godin and Kok (1996) identified that TPB variables significantly predict intentions (R^2 = .41), and that intentions significantly predict behavior (R^2 = .34). In a more recent review of the TPB and health related behaviors, McEachan et al. (2011) establish ATT, SN and PBC as strong predictors of health behavior intentions (explaining 44.3% of variance), and intentions as medium to strong predictors of actual health behaviors (explaining 19.3% of variance).

Although there is empirical evidence that supports ATT, SN and PBC as significant predictors of intentions and behavior, the inclusion of new variables in the TPB framework should be considered as a valid practice, doing so may help increase the explanatory power of the model (Cheng, 2015). Ajzen and Albarracin (2007) suggest that identifying additional background variables as predictors of ATT, SN, and PBC could enhance the predictive power of the TPB (Lee et al., 2018). Ajzen (2020) also identifies that any number of background variables may influence intentions indirectly by informing the beliefs that shape ATT, SN and PBC. For example, Bornschlegl, Townshend & Caltabiano (2021) found background and personality variables like extraversion, agreeableness, neuroticism, public stigma, self-stigma, and gender were significant predictors of one or more antecedents of academic help seeking intentions among university students in Australia. Lee et al. (2018), exploring the influence of environmental background factors on intentions to quit smoking, found that agreement with things like regulations and taxes, as well as the number of smokers among participants 5 closest friends, had small, yet significant, influences on several TPB variables.

Beyond the addition of background variables, researchers have attempted to expand the TPB in efforts to better predict both intention and behavior, identifying additional direct

predictors of behavior and intentions. Ajzen (2020) does not discourage this practice but offers words of caution when entering new predictors of intention, and, or behavior into the model. According to the TPB; ATT, SN and PBC are the sole predictors of intentions and behavior, and no other antecedents should be needed. Combined, these variables meet what the author notes as the "assumption of sufficiency". However, it is important to consider that the current theoretical model of the TPB would not even exist if the original Theory of Reasoned Action had not been expanded to include PBC. Therefore, it is possible that additional antecedents exist that would significantly influence intentions and behavior and enhance the efficacy of the TPB model. Although the theory is open to the addition of new predictors, this practice should be done with consideration of past empirical evidence and thoughtful consideration (Ajzen, 2020). New predictors should be behavior specific, plausible as causal factors, independent of the predictors already in the model, and apply to a variety of behaviors (Ajzen, 2020). A wide range of research exists exploring additional predictors of intention and behavior in expanded TPB models. Knowledge, past behavior and risk perceptions are a few of the more commonly investigated predictors, all of which may be important factors in the development of teacher intentions to participate in water safety education

Knowledge

Whether or not knowledge, specifically the correctness of knowledge, plays a significant role in the development of behavioral intentions and performance has been up for considerable debate. Recent evidence suggests that knowledge may not only influence TPB variables, but also moderate and directly predict behavior itself. Ates (2021) examined eco-labeled food purchasing behavior in an extended TPB model. The author analyzed ATT, SN, PBC, willingness to pay, self-identity, personal norm, and knowledge as predictors of eco labeled food

purchasing intention and behavior. Of the additional variables willingness to pay and self-identity significantly influenced purchasing intentions. Knowledge positively influenced attitude towards eco-labeled purchasing intentions. Further, there was evidence that knowledge also had a direct, positive effect on purchase behavior. This means higher levels of eco-label knowledge among participants predicted more favorable attitudes towards eco-label purchasing, and the more they will purchase eco-labeled foods.

Guerin and Toland (2020) investigated the relationship between knowledge, ATT, SN, PBC/SE and intentions towards occupational safety and health (OSH) among eighth grade students (N=1,748). OSH knowledge was measured via 14 multiple-choice questions focused on OSH applied learning and facts before and after a young worker safety intervention. Knowledge was found to have a significant total effect on OSH intention at both pre and posttest, and significant indirect effects on intention through attitude at pretest ($b = 0.23$, $p < .01$), and through SE at pre ($b = 0.68$, $p < .001$) and posttest ($b = 0.43$, $p < .001$). Results indicate that knowledge may be influencing intentions through other mediating variables. Similarly, Mohajeri et al. (2021) examined the safety behaviors of construction workers, finding that knowledge and motivations to be factors that indirectly predicted behavior. Motivation was found to influence safety behavior through PBC, while knowledge influenced safety behavior through ATT and SN.

Knowledge, along with involvement and moral obligation, were found to moderate the relationship between PBC and household waste sorting behavior in China (Wang et al., 2020). Participants with higher knowledge of waste sorting were found to have higher PBC in regard to waste sorting, as well as actual waste sorting behavior. Knowledge has been found to not only moderate relationships in the TPB model, but also influence the antecedents of behavioral intentions through via both direct and indirect effects. Rahmafitria et al. (2021) discovered that

knowledge had a direct influence on ATT towards traveling and physical distancing during COVID, as well as an indirect effect on ATT through perceived risk, both relationships influencing intentions through ATT. Hence, knowledge was found to influence the level of perceived risk individuals had about the COVID pandemic, predicting their ATT and subsequent intentions to physically distance and travel during the pandemic. Adequate knowledge about COVID was linked to greater perceived risk, which correlated with a more robust attitude to remain socially distanced.

Regarding the addition of knowledge as a main predictor in the TPB, Ajzen et al. (2011) reviewed four studies dealing with the direct influence of knowledge on the performance of behavior. One of the four studies provided evidence of a true correlation between knowledge and intentions/behavior. However, they note, the relationship between knowledge and intention was mediated by attitude, and the relationship between knowledge and behavior by intention. The authors conclude that, although the TPB attests that the accuracy of knowledge may, at times, impact the formation of the control, behavioral and normative beliefs of an individual, knowledge accuracy is not a direct predictor of either intentions or behaviors. They also note that there is often a disconnect between general/factual knowledge, and behavior specific knowledge in TPB research, where factual knowledge may not have a direct influence on either intentions or behavior (Ajzen et al., 2011). Additionally, the authors state that knowledge tests could be more reflective of participant's ATT than the correctness of knowledge. Further, they claim that a focus on imparting accurate knowledge in behavior change work may be "misplaced", and that, instead of being concerned about knowledge accuracy, focus should shift on how knowledge can guide behaviors of interest. This may be a slippery slope, if practitioners perceive that accurate knowledge is not of real importance, and that only knowledge that

produces a desired behavior is, regardless of whether it is right or wrong. Although, it can certainly be assumed that this is not the intention of the authors.

In an example in the arena of water safety and drowning prevention, accurate knowledge about the appropriate steps of self-rescue when in trouble in the water yield not just behavior, lifesaving behavior. During an emergency situation in the water, having the knowledge of the correct steps is central to the appropriate response, i.e. behavioral performance. Consider, as well, if having a foundation of correct, factual knowledge is of value in the performance of a given behavior (i.e. teaching, coaching, consulting, etc.). Could the volume of, as well as correctness of, knowledge play an important role in the process of reasoning that is at the heart of formulations of behavioral intentions? For example, a teacher having a robust amount of knowledge in a content area, or a coach with a wide range of knowledge in a particular sport, may have greater behavioral intentions to engage in the teaching or coaching of that content/sport.

Further, accurate knowledge about risks could cultivate attitudes about the importance of specific behaviors, with accuracy once again being an important "participant" in the formation of intentions and subsequent behavior. To the point of Ajzen et al. however, inaccurate knowledge could also create the desired intentions. Take for example someone's intentions to supervise their children in the water on the beaches of the Great Lakes. If that person has high intentions of supervision due to the perceived risk that a shark could attack, the reality is the desired intention (to supervise) is present without the accuracy of risk information. However, knowing exactly why supervision is important in and around the water, and accurately interpreting risks in each aquatic environment is of great value in keeping others safe.

Risk Perceptions

There is evidence that knowledge influences many of the important variables in the TPB and may even directly influence behavior itself. There is additional research that links knowledge to another important variable for consideration in the model, perceived risk. Ferrer & Klein (2021) found an individual's perception of risk in traveling during the COVID pandemic to directly influenced their ATT towards traveling, and to play a mediating role in the relationship between knowledge and ATT. Risk perceptions were also found to directly predict intentions to travel during the COVID pandemic. Collectively, perceived risk was found to play a significant role in several paths towards behavioral intentions in the TPB. The authors suggest that their results show that the more knowledge individuals had about COVID-19, the more risk they associated with the COVID-19 pandemic. This elevated risk then negatively predicted intentions to travel during COVID-19.

Additionally investigating behavior during the COVID-19 pandemic, Adiyoso and Wilopo (2021) found that risk perceptions indirectly influenced intentions to socially distance during the COVID-19 pandemic through each of the TPB antecedents. Seong and Hong (2021) discovered that COVID-19 risk perceptions not only predicted ATT, SN and PBC towards visiting national parks during the pandemic, but also directly predicted risk-reduction behavior itself. However, the authors note that risk perceptions had a greater influence on risk-reduction behavior through the mediating TPB variables, than its direct effect on behavior (ß= .546 and .157 respectively). Further, Seong and Hong (2021) found that SN highly predicted intentions to visit national parks during the pandemic. Many of the previous studies provided evidence of a small, or even nonsignificant influences of SN on behavioral intentions. This study, however, provides evidence that SN played an important role in the context of the pandemic. In other

contexts, SN is not as predictive of intentions, yet other variables are, so the strength of the predictive power of a specific variable in the TPB may shift due to the context of the behavior, or the type of behavior itself. Similarly, the influence of perceived risk on intention and behavior may also be highly dependent on context or the specific behavior at hand.

Koh and Mackert (2016), for example, found no significant relationship between perceived risk and intentions to text while walking. The authors highlight a generally low perception of risk among participants, leading to most participants not believing that texting while walking is an unsafe or a behavior of high risk in the first place. However, risk perceptions were found to significantly moderate the relationship between conscientiousness and all TPB variable (ATT, SN and PBC) in the context of smartphone recycling behavior (Zhang, Wu & Rasheed, 2019). The authors provide evidence that higher perceptions of security risk in recycling smart phones among participants negatively influenced smartphone recycling behavior, even when consciousness (i.e. being motivated to do what is right) towards recycling their phones was comparatively high (Zhang, Wu & Rasheed, 2019). Could risk perceptions play a less significant role in predicting intentions or behavior when the mean perception of risk within the sample is generally low? Maintaining the same variance as when levels are low, would risk perception be more of a significant predictor among samples with levels that are comparatively high? Continued investigation of the potential role risk perceptions play in predicting behavior and behavioral intentions is needed, as these perceptions may be quite complex and anchored to the specific behavior being examined.

Past Behavior

Past behavior is another frequently proposed factor to be entered in the TPB model as a direct predictor of intentions and behavior. In the aforementioned study, Zhang, Wu & Rasheed

(2019) discovered that past smartphone recycling behavior was a significant direct predictor of smartphone recycling intentions. Even more curious, past behavior had a stronger influence on intentions than PBC, a variable that is often the most robust predictor of behavioral intentions, typically above and beyond ATT and SN. In an investigation of sitting behavior, Howlett et al. (2021) found that habit, alongside intention, significantly predicted sitting. The results provided evidence of a negative relationship because questions on the measure were contextualized in a way that participants were asked to identify if they *avoided* long periods of sitting, the opposite of the behavior itself (sitting). Gkargkavouzi, Halkos and Matsiori (2019) found PBC to predict habit, and habit to positively predict personal practices of pro-environmental behavior. Therefore, habit was found to mediate the relationship between PBC and actual pro-environmental behavior, while PBC still predicted pro environmental intentions and behavior.

However, when examining healthy food consumption frequency in rural China, Huang, Antoonides and Nie (2020) found no significant direct effects of habit on consumptions of healthy food frequency. Habit, however, did significantly predicted intentions to eat four of the five healthy foods explored in their study. Habit was found to not only moderate the relationship between PBC and intentions to exercise among elementary age children, but also the relationship between intentions to exercise and actual exercise behavior (Hashim et al., 2014). Interestingly, the authors found a more robust moderating effect between intention and behavior, and between PBC and intention to exercise when habit strength was low. The authors suggest that this finding may be due to less reliance on cognitive deliberation (the cultivation of intentions by way of thoughts on behavioral control) when habit strength is higher among participants. Additionally, Fu (2020) found that habit moderated decisions on how to commute (commute mode), including having a moderating effect on TPB factors. There is building evidence that past behavior, in the

context of habit, plays a significant moderating role in a number of TPB paths.

Reflecting on the efficacy of entering past behavior into the framework of the TPB, Ajzen (2011) argues that past behavior fails to meet the criteria for causal consideration in the TPB, mainly because suggesting past performance of a behavior can be directly linked to intention is unrealistic. Instead, he states that past behavior may be more of a proxy for habit strength. Ultimately, however, Ajzen provides ample evidence that past behavior has been found to account for significant variance in behavioral intentions, explaining that past behavior may be "capturing" additional variables that explain intentions, and that identifying what these variables may be is important work in future TPB research. However, the alternate explanation is that by some mechanism, past behavior is explaining much of this additional variance in and of itself.

In a review of past behavior in the TPB model, Sommer (2011) provides a variety of empirical evidence that suggests past behavior is a strong direct predictor of behavior, and that in the context of more automatically performed behaviors, past behavior can be an even stronger predictor than intentions (Ouellette/Wood, 1998, p. 66). Sommer (2011) concludes that past behavior should not be entered as an independent variable with a direct link to intention or behavior like ATT, SN or PBC. Instead, the author suggests that past behavior be somehow shown to influence the entirety of the process central to the TPB, that of reasoning. Further, the author states that although the TPB assumes a reasoning process that deliberately analyzes information in the formation of intentions, certain automatisms are likely to be a part of this process. Sommer additionally argues that an individual's path of reasoning, towards the performance of a behavior, will shift shift across context and behavior type. An individual may reach the point of performance of a behavior via evaluations, automatisms, or even semi-automatisms. Regardless of mode, Sommer (2011) argues that past behavior plays a critical role

in the formation of intentions and performance of behaviors, influencing all parts of the reasoning process central to the TPB.

Teacher Intentions

Beyond examining additional predictors of intention and behavior, the efficacy of the TPB has also been explored in a wide variety of contexts. The usefulness of the TPB in the context of predicting behavior in teaching is of particular interest in this review. Further, there is evidence that teacher intentions and beliefs play an important role in influencing the effectiveness of teaching (Lumpe et al., 2000). Fortunately, there are several examples of the utility of the TPB in the context of teaching across the literature. Among mathematics teachers in Germany (N=1,660), Lenski, Richter and Ludtke (2017) found that ATT, SN and PBC significantly predicted intentions to use a competency-based approach of instruction. Of all the TPB variables, PBC was found most strongly predict teacher intentions to use a competency-based approach with their students. PBC did not moderate the link between intention and behavior as hypothesized. According to the TPB, PBC should be a moderator influencing the relationship between intention and behavior (Ajzen, 1991). However, this finding is not all together surprising as Ajzen (1991) also notes that the moderating effect of PBC will be difficult to detect empirically.

Teo (2012) integrated the Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989) and the TPB to examine the intentions of pre-service teachers to use technology. The Technology Acceptance Model (TAM) suggests the intentions to use technology are determined first by perceived ease of use, which then influences both perceived usefulness and attitudes towards usage. Perceived ease of use also has an indirect effect on attitude through perceived usefulness. The final integrated model included all of the TAM variables, along with SN and

ATT and facilitating conditions (FC) in place of PBC. Of the TPB variables SN and ATT significantly predicted intentions to use technology among pre-service teachers. FC was found to have only a minimal effect on the intentions of participants, however, there was question as to whether or not using FC as a proxy for PBC caused unwanted variance in the proposed model.

Instead of model integration, Cheng (2015) explored the efficacy of three competing models in predicting the intentions to teach an ethics course among university lecturers. The three models were the original TPB, a Taylor and Todd (1995) decomposed TPB (DTPB), and a revised TPB (RTPB). The DTPB add teacher self-efficacy to the TPB model, where self-efficacy has an indirect effect on intentions to teach an ethics course through PBC. The RTPB on the other hand predicts, like PBC in the original model, a direct effect of self-efficacy on both intentions and actual behavior. The results of comparison showed that the RTPB had the strongest predictive power among the three models. Additionally, self-efficacy, ATT, SN and PBC were found to be satisfactory in explaining intention variance in all models utilizing these variables. Study results indicate that the addition of self-efficacy of teaching an ethics course into the TPB model increases the model's predictive power. However, SN was found to not be a significant influence on intentions, and therefore personal factors may be outweighing environmental factors in the decision-making process. Yet, when dividing the group into those with favorable verse unfavorable SN the authors found the predictive power or intentions on behavior to be greater among teachers from a cultural environment where mistakes could be tolerated. Therefore, it appears that environment still plays an important role in the link between intention and behavior.

Demirbag and Yilmaz (2020) explored preservice teachers' intentions to use renewable energy. The authors, however, did not integrate models, but instead modify the TPB by adding

the variables of teacher knowledge and risk perceptions to the existing TPB constructs. Knowledge negatively predicted perceived risk (dread and unknown risk types), while risk perceptions negatively predicted SN and AT. Risk perceptions did not significantly predict PBC, and interestingly the authors did not review why this was the case. None the less, PBC, SN and ATT all significantly predicted preservice teacher's intent to use renewable energy. What this study does offer, among a sample of nearly 700 elementary school teachers, is that knowledge significantly impacts risk perceptions, and risk perceptions significantly influence SN and ATT towards the use of renewable energy. Therefore, knowledge was found to have an indirect effect on two TPB constructs (SN and ATT), while risk perceptions had an indirect effect on teacher intentions through both ATT and SN. The authors also note that risk perceptions are commonly found to correlate highly with attitudes, renewable energy use behavior and knowledge.

Teo, Koh and Lee (2011) examined teacher intentions to educate on financial literacy after a financial literacy program in Singapore. Once again, a modified TPB was used in the exploration of teacher intentions. Perceived usefulness of financial literacy (PU), perceived ease of learning (PEL) and facilitating conditions (FC) were set as predictors of ATT, SN and PBC in their modified TPB model. Specifically, the authors hypothesized that FC would predict PEL, SN and PBC, that PEL would predict PU and ATT and PBC, and that PU would predict ATT. All other TBC constructs would then influence intention based on the theory. Of the TPB variables, ATT and PBC significantly predicted intentions, and SN predicted ATT but not intentions directly. This could mean that the personal factors, or agency, of teachers may be more of an influence in the formation of intentions to teach financial literacy. Among the additional variables FC significantly predicted PEL, SN and PBC, PEL predicted PBC but not ATT, and PU did not significantly predict ATT. This means that teachers that find an

environment facilitative to teaching financial literacy will perceive that financial literacy can be learned more easily, have more favorable SN and PBC towards teaching financial literacy. Additionally, teachers that perceive learning financial literacy to be easy will also perceive that financial literacy is useful. Curious that perceived usefulness and ease of learning did not influence teacher's ATT towards financial learning.

Research involving aquatics, waters safety and drowning prevention and the TPB is far more limited. Where some have used the theory to help develop messaging for water safety programs (Sandomierski, Morrongiello & Colwell, 2019), research with use of TPB to directly predict intentions in the water safety arena is minimal. The beliefs of aquatic instructors (ATT, SN and PBC) towards inclusion in aquatics classes were found to be shaped by both current inclusion practices in aquatics classes and competence (Conatser & Block, 2001). Aquatic instructors that are currently inclusive of students with disabilities in their classes had more favorable ATT, SN and PBC. Conceptually, current inclusionary practices would be considered past behavior, because aquatic instructors identifying that they currently practice inclusion are really identifying that they have been practicing inclusion (past behavior). The authors also found that aquatic instructors with more competence had more favorable ATT, SN and PBC towards inclusion. Competence was operationalized by total academic course work and certifications (knowledge), and instructor experience, and those with both more knowledge and experience had stronger inclusionary beliefs.

Discovering ways to protect individuals from the tragedy of drowning is a global concern, especially for children and youth. Drowning prevention efforts are of incredible importance when attempting to balance the many benefits of aquatic activity with the inherent risks of engaging with the water. The primary drowning risk factors have been, and will continue

to be, identified in water safety literature. A variety of preventative measures, resultant in reducing drowning and saving the lives of children and youth, have also been identified. Experts agree that school-based water safety education efforts can help cultivate the knowledge and skills needed to protect students from drowning. Children and youth in Michigan face particulate risks to drowning, living in a state with high access to water ways and shorelines, primarily unguarded by lifeguards, and with little evidence that water safety and drowning prevention are being taught to children and youth by Michigan schools. However, little is known about the water safety competencies of Michigan's K-12 teachers, the current water safety education efforts in Michigan's schools, and the future water safety education intentions of K-12 Michigan teachers. An understanding of these factors is an essential first step towards the development of an effective water safety education curriculum, and sustainable water safety education program, to help protect children and youth across the many waters of the Great Lakes State.

Therefore, the purposes of this study are to:

(1) identify the current water safety education efforts of Michigan K-12 teachers and their schools;

(2) identify the current water safety education levels of k-12 teachers in Michigan;

(3) explore the influence of teacher background/demographic factors, water safety knowledge, drowning risk awareness, past behavior in teaching water safety, ATT, SN, and PBC on teacher intentions to teach three, 30-minute water safety lessons to their students.

CHAPTER 3: METHODS

A cross-sectional study design was employed in this study to investigate the current participation in school-based water safety education efforts by Michigan K-12 teachers and their schools, as well as teachers' water safety knowledge and perceived aquatic skill levels, and their intentions to possibly participate in future school-based water safety education efforts in their classrooms. Additionally, the survey was designed to evaluate important background information (access to water, participation in aquatic activity, experience with drowning, experience with rescue, etc.) and demographics among participating teachers. Finally, the survey was created to explore teachers' possible intentions to teach water safety lessons in their classroom using the Theory of Planned Behavior (TPB) as a guiding framework. TPB questions were cultivated using Fishbein and Ajzen's guide (2010) to survey development. Questions on attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC), along with questions on background/demographic factors, water safety knowledge, perceived risk, and past behavior, were therefore guided by theory and evidence from the water safety literature. Ultimately, the main purpose of the WSEGLS survey was to gather the information needed to explore the influence of the above factors on teacher's intentions (INT) to teach three, 30-minute water safety lessons to their students the spring following the late winter data collection, through an extended model of the TPB.

Participants and Procedures

Michigan kindergarten through grade 12 teachers were recruited to participate in this study. To be included in this study, teachers had to currently be teaching in the state of Michigan at a Local Education Agency (LEA), Public School Academy (PSA), Intermediate School District (ISD), or Non-Public school, as defined by the Educational Entity Master (2011).

Recruiting from all LEA, PSA, ISD and Non-Public schools allowed for the inclusion of what would be considered all public, private, and charter schools throughout the state for this study. Additionally, to be included in this study, teachers had to have held a part-or full-time instructional position with their school(s), be directly instructing, or aiding in the instruction of students as part of their job description. Teachers of all subject areas and working with youth of all ability levels were invited to participate in this study. Just two principals requested or chose to take the survey, in addition to another school employee not currently in a teaching role. Participants were required to be able to complete, with competence, the online survey in the English language. Teachers willing to participate without easy access to the survey due to lack of internet access at their school, home, or other place of work, were offered a paper version of the survey to be provided to them either in person or through the mail if requested.

Driven by the purposes of this study, the ultimate goal of participant recruitment was to gather a representative state-wide sample of K-12 teachers in Michigan. Therefore, a random sample of just over 224 schools was drawn from all Michigan LEA, PSA, ISD and Non-Public Schools. Schools were selected at random from the Education Entity Master (EEM) public data set, a data set of schools that is provided by Center for Educational Performance and Information, the agency responsible for educational data in the state of Michigan. The list of all 6,934 LEA, PSA, ISD and Non-Public Schools is provided by the EEM on an Excel spread sheet, from which the schools were randomly selected using the INDEX function within Excel. Each selected school was then invited to participate in the study unless the school selected was permanently closed. If a selected school was closed, selection simply continued to the next school until a total of over 200 schools was reached.

The original aim was to reach 200 schools, however, due to several schools only

providing the emails or phone numbers of administration (and not teacher emails) 24 additional schools were invited to increase participation. Invitation to participate in the study occurred via an initial email to the school administration, providing them with information about the general purpose and procedures of the study, as well as the importance and potential benefits of their teachers participating in the study. In the email to the administrators, it was made clear that participation in this study was entirely voluntary for their teachers. However, they were asked to encourage their teachers to participate and advocate for the importance of participating in water safety education research. Additionally, administrators were notified that their teachers' responses would remain anonymous, and their school's identity would be entirely confidential. Teachers could therefore be encouraged to answer as honestly and authentically as possible, as their responses were in no way tied to themselves or their schools. An in-person or virtual meeting was also offered to administrators if they expressed interest in discussing additional details about the survey.

Alongside the email to administrators, an email was sent to the teachers from each of the selected schools, inviting them to participate in the study. The email invitations sent to teachers were like the emails sent to school administration, explaining the risks and benefits of participation, the purpose and procedures of the study, and that participation in the study is completely voluntary. The email also informed teachers that upon completion of the study they will be entered into a raffle to win one of 10, $25.00 gift cards. Many schools provided teacher emails on their school website, and the process of extending an invitation to the study directly through these emails was identified as an appropriate practice and was highly encouraged by a member of the Michigan State Board of Education. If a selected school did not provide teachers' emails on their website the principal or school director was emailed and then called to

request the list of teacher's emails. Principals were also offered the opportunity to share the anonymous link with their teachers if they did not want to provide emails for direct invitations to their teachers. Finally, if a school did not provide an email for anyone in the administration office, the school was called directly and provided a contact email to reach out to if their school was interested in participation. In total of nearly 2,890 invitations were sent to teachers directly by email, 120 principals were emailed, and 70 schools were called during the sampling process.

In order to participate in the study, teachers followed a link to the "Water Safety Education in The Great Lakes State" online survey. The first page of the online survey led to a consent form, and teachers could not participate in the survey unless they completed two key components of the consent form (Appendix C). First, teachers had to identify (forced response yes or no) that they understand their rights as participants, that their participation was entirely voluntary, that their personal identity and the identity of their school would remain confidential, and that they met the inclusion criteria explained in the letter. Second, teachers had to sign (with touch screen/track pad or mouse) that they understood the conditions of participating in the water safety survey and would like to begin taking the survey. Once teachers had completed the forced response question, and signed that they are willing to participate, they could then begin taking the survey.

The second page of the survey gave general instructions for completing the survey and explained the timeline of the study. This page communicated that the survey should take an estimated 20-30 minutes to complete, and that they have a total of 10 days to complete the survey if they chose to participate in this study. Participants were asked to complete the survey individually, to not have discussions with, or be influenced by, others during the survey, and to complete the survey in an environment they are able to concentrate best. Teachers were

encouraged to complete the survey in one sitting, even if small breaks were needed; however, it was made clear that completing over the course of multiple days was still acceptable and appreciated. Prior to the first official roll out the survey was piloted among 20 teachers. Teachers were asked to provide feedback on survey flow, ease of use, validity and if they had any recommendations for improvement (Appendix A).

The WSEGLS surveys were open to teachers for a total of 10 days. For each school, "day one" was the day teachers were initially invited to participate in the WSEGLS survey and provided the survey link. To maximize participation, teachers received multiple follow up messages that encouraged the completion of the survey and reinforced the value of participation. Throughout the 10-day survey window, teachers received follow up emails that requested their completion of the WSEGLS survey on Days 3, 6, 8, 9 and 10 (or until completion). The surveys were rolled out in seven phases to make sure there were no issues with the survey and stagger the results for incoming review. Teachers were given only 10 days to encourage participation and early engagement in the survey and because of a short timeline to complete the study during the Spring season. Once surveys were completed, they were stored securely on Michigan State University Qualtrics database, and only accessible by study team members.

Additionally, upon individual completion of the survey participants received a virtual thank you for their engagement in the study. A year after teachers completed the survey, they will be sent another thank you and a water safety infographic providing ways to keep themselves, their family and students safe in and around the water. Finally, after the study period was completed, participants were entered into a raffle for the $25.00 gift cards. All participant coded identities were entered into an excel file, and 4 winners were drawn at random for the first two days, and two additional winners were drawn on the third day, in efforts to adhere to state

regulations for the raffle of monetary gifts.

WSEGLS Measure

The study measure, "Water Safety Education in The Great Lakes State", (WSEGLS) is an evidenced based, online questionnaire (Appendix B). The survey included a variety of question types, including multiple choice, Likert scale, ranking, sliding scales, heat maps, and open-ended short response questions. The survey was built using Qualtrics, an online survey platform that provides safe, secure, and easy to navigate user experience for study participants. Survey results populated directly onto the Qualtrics database, where participant data were securely stored on a password locked, two-factor authenticated database only accessible by study team members. The survey began by first asking participants to complete demographic information including age, race, and gender, followed by their years of teaching experience and highest level of education in Section 1. Economic status was not asked of the individual teachers; however, the economic status of the school was estimated using the number of students above or below the state identified economic baseline (whether students are, or are not, of economic advantage). In Section 2 the survey provided participants questions about important background information, including, but not limited to, their past and present access to the water, their participation in aquatic activity, and their water safety experiences (if they have ever rescued someone from the water, or experienced a drowning of someone close like a family member, friend, peer, or student). Section 3 of the survey evaluated teachers' water safety knowledge, perceived swimming ability, and perceived risk through a series of multiple choice and open-ended questions. Water safety knowledge was assessed with a variety of open-ended questions centered around self-rescue, safe rescue of others, and effective drowning prevention measures. Understanding of prevalence and drowning risk was assessed with several multiple-choice and

sliding scale questions. Swim ability was evaluated using a multiple-choice question on the distance they felt they can swim in a pool, and teachers were also asked about any former or current lifeguard training and experience.

Section 4 of the survey focused on whether teachers, or their schools, currently provided any water safety education or drowning prevention programs for their students, while Section 5 explored teacher's intentions to teach water safety education to their students in the future. In Section 4, teachers were asked if they teach water safety education to their students in the classroom, at a pool, or at another body of water. They were also asked to identify whether their school provides learn to swim programs, or any school wide water safety events (like assemblies). Finally, teachers were asked if their school partners with any local aquatic centers or organizations to provide water safety education or swimming, and to identify who their school partners with if they say yes In Section 5 of the survey, teachers were asked a series of questions that aim to explore their attitudes about teaching water safety education (ATT), their perception of subjective norms about the teaching of water safety education (SN), their perceived behavioral control over teaching water safety education (PBC), and their intentions to "teach three 30-minute water safety lessons this spring".

The WSEGLS content was validated by Great Lakes water safety and drowning prevention experts who reviewed the survey in full. Salient beliefs regarding TPB variables were first drawn from a series of questions done by a former K-12 Michigan educator, firefighter, and trained surf rescue lifeguard, knowledgeable in the water safety and drowning prevention literature (Fishbein and Ajzen, 2010). TPB questions were drafted following recommendations by Fishbein and Ajzen (2010) which involved a review of beliefs, drafting of statements focused on ATT, SN and PBC based on these beliefs, and using a 7-point bipolar

scale to rate the statements. The survey was then piloted by 20 Michigan K-12 teachers, and the survey results and feedback informed several revisions to the pilot measure. A few questions were eliminated as they were redundant or deemed unnecessary in the scope of the study. Several questions with low variance or less relevance to the behavioral intentions of teachers were eliminated from the TPB section. The pilot was designed to intentionally have a larger number of TPB prompts than recommended for the final survey so this practice could be done while maintaining 6 or 7 questions for the value and expectancy sections of each construct (Fishbein and Ajzen, 2010).

Finally, a few questions were redesigned as there was feedback that the slider scale function was difficult to use. In total, about 20 questions were eliminated from the pilot survey, and only two intention questions were added, which is beneficial considering some pilot participants identified that they felt the survey took a long time to complete. Overall, the survey received positive feedback and participants validated that the WSEGLS was an effective way to assess teachers water safety knowledge, school water safety and swim participation and intentions. Participants were offered a 10-dollar coffee gift card for their participation.

Data Analysis

The WSEGLS data were cleaned and any anomalies in the data were noted. The responses to the main quantitative outcome variables were transformed to a numerical score; for example, teachers could earn up to 10 total points in the water safety knowledge section of the WSEGLS, 12 points in the perceived risk, seven on supportive school culture, etc. TPB questions were scored according to Fishbein and Ajzen (2010) with six ATT, eight SN and seven PBC combined expectancy-value items. TPB questions were based on a 7-point bi-polar Likert scale, as recommended by Fishbein and Ajzen (2010). Surveys with less than 5% missing data

remained in analysis (Montelpare et al., n.d.) and a series means was used for missing results. Surveys with missing open-ended responses intended for qualitative analysis were still accepted, and all provided qualitative content will be analyzed and included in qualitative results.

Descriptive statistics were used to analyze demographics, background factors, water safety knowledge, current water safety efforts of teachers and their schools, as well as ATT, SN, PBC and INT scores. Person correlations were used to analyze the relationships among demographic/background variables, teacher water safety knowledge, and water safety education efforts of teachers and their schools. Initially, purpose three was intended to be analyzed using a structural equation model (SEM) exploring the influence of background variables, water safety knowledge, perceived risk, past behavior and TPB antecedents on the future intentions of teachers to teach three, 30-minute water safety lessons (Figure 1). However, despite best efforts, the sample size collected was too modest for the complexity of the model. A minimum sample size for this model would have required anywhere from over 200 (Tabachnick and Fidell 2001; Kline 2010) to over 800 participants (Goodhue et al., 2012; Hair et al., 2011; Peng & Lai, 2012).

Due to the smaller than anticipated sample size, and the specific focus on teacher INT, a path model specified by the TPB was used to analyze purpose three (Figure 8). The path model was found to be identified (Kline, 2016), and was estimated using robust maximal likelihood (MLR) as the data collected was not normally distributed (Patrick Curran, 2017). Relative goodness of fit indices (TFI and CFI), absolute fit indices (RMSEA), and effect size (SRMR) were utilized to assess model-data fit. Resultant direct effect coefficients within the model were calculated using Mplus, and subsequently examined and interpreted. Finally, a content analysis was performed to identify any emerging themes or trends from open-ended responses that

addressed the current water safety education efforts of schools, experiences with rescue, experiences with drowning, and perceptions of Michigan's beach flags.

CHAPTER 4: RESULTS

Sample Characteristics

A total of 320 teachers responded to the request to complete the WSEMI survey. There were 238 participating teachers who completed enough of the survey to provide results for Purpose 1, 217 for both Purposes 1 and 2, and 184 teachers completed enough of the survey to provide results for all three purposes. Several principals decided to have their teachers participate using an anonymous link and not the direct email invite. Therefore, a completely accurate number of total participating schools and their demographics could not be obtained. Additionally, several participating schools were private schools who are not required to provide information to the state of Michigan for their database (MI School Data), and therefore certain demographics, like student SES, were not readily available for all schools.

Results showed that teachers participating via a direct, non-anonymous link (n = 221), represented over 80 schools across the state of Michigan. There were more schools represented in the sample, however, 22 teachers participated anonymously, and therefore an exact total of schools represented in this sample cannot be provided. However, the schools identified had wide geographic spread across every region of the state, with many schools situated along Great Lakes shorelines and several from the state's upper peninsula (Figure 2). Seventy-two schools were public, and 11 were private, with over half of participating public schools reporting 50% or more of their students at economic disadvantage (MI School Data, n.d.). Only eight schools represented in the survey reported less than 10% of their students being economically advantaged. There were 14 schools within about 30 minutes or less from of a Great Lakes Shoreline. Regarding school locales, 15 schools were identified as city, 25 rural, 20 town and 25

as suburban. Finally, insofar as school type, just under 87% of participating teachers were from a public school, and 13% of teachers were from a private school.

Figure 2

Geographic Spread of Schools Represented in the WSEGLS Survey

Most teachers reported being female (79.4%), followed by male (19.3%), with one identifying as non-binary (.4%), and two others selecting that they preferred not to respond (.8%). The majority of participating teachers were White (92%), while five were Black (2.1%), five Hispanic or Latino (2.1%), two American Indian or Alaskan Native (.8%), one Asian (.4%), and six did not report (2.5%). Just over half of the teachers taught at the high school or middle school level (54%) and more participants taught Physical Education (N=66, 28%) than any other subject. Sixty-four percent of the teachers reported that they had earned their master's degree and two reported completing a PhD.

Background factors including questions on perceived swim ability and lifeguard experience were asked to gain an understanding of two potential water safety competency areas.

Almost half of participating teachers reported being able to swim across the entire length of a pool without stopping (49%), while just over one third (35%) reported being able to swim across a pool multiple times without taking a break. There were 33 teachers (14%) who identified they could swim across about half of a pool, and three reported being unable to swim. There were two teachers who did not respond to this question, and so a series mean was used for their missing values. Several teachers (N=35) identified that they were once a certified lifeguard but no longer had their lifeguard certification, while 3 teachers reported that they have an active certificate but are not currently guarding, and 6 said they have both an active certificate and that they are currently providing services as a lifeguard.

Teachers also reported whether they had experienced rescuing someone from drowning, or if they had ever had someone close to them personally die due to drowning. This exploration provided evidence that 63 teachers (26%) had rescued someone from the water. Many of these teachers were willing to share about their experiences, and a few teachers wrote about several rescues. In total 65 stories of rescue were shared in the survey. Several important themes emerged from these stories. To start, many rescues were reported (60%) among children and youth, and males were reported to be rescued at far higher rates than females (24 reported males, 13 females, the remainder unidentified). Although some teachers reported rescuing a family member, most wrote stories of rescuing individuals that they did not know, their friends, or their friend's children. Many rescues occurred after a fall or slip into the water, followed by rescues due to rough waters, waves, and "undertow" in open water. Here are two examples, told by two different participating teachers:

> I had an in-ground swimming pool in our backyard. We have 3 children, and when they were small, all three of them at some point entered the water without flotation devices

> accidentally (while I was standing right there). I jumped in the water and was able to grab the child and pull them out of the water safely. We also had a friend's child fall into the pool while we were sitting by the steps. I jumped into the water and lifted the child out of the water. None of the children were in the water long enough to need life-saving measures. (Teacher One)
>
> The waters in Lake Michigan were getting rough during a family swim. We were being pulled around by the under tow. My children were with me and I had a rubber raft close to shore. The boat capsized and my children were tossed out and ended up floating away in different directions. They knew how to swim but were not strong swimmers yet. I had to grab them. A bystander helped me with one and I got both of them into the raft and we went into shore right away. (Teacher Two)

Additionally, many rescues occurred due to an individual finding themselves getting too deep while swimming in a pool, the individual being a non-swimmer, or due to panic. Just a few more rescues occurred in closed water environments, like pools, than open water environments like lakes, rivers, and beaches. Rescues at water parks, although closed water environments, were reported at extremely low rates. Several teachers provided further details about how they rescued the individual from drowning. From these reports, more teachers made unsafe, life-threatening rescues (e.g. jumping in and swimming to the victim without floatation), than those that made safe rescues utilizing recommended rescue techniques (e.g. reaching, throwing, or towing floatation to the victim). Finally, several teachers were able to provide great details about their rescue incidents, even many years after these events occurred. For example, another teacher wrote:

> The safety rope separating the deep (5') and shallow ends (3') of a pool was broken and not in place. A younger sibling (3' 9") who could not swim well tried to keep up with his older siblings and got too close to the sloped bottom connecting the two sides. The bottom was epoxy and offered no grip, so the little boy could not jump, walk, or otherwise get off the slope. He started to go under and panic. I jumped off my chair and could grab his arm from the side of the pool. As I made contact his mother jumped into the pool next to us. As I raised his head above water and brought him to the side she then took him. This all could have been prevented if a replacement safety line was available or the pool closed due to inadequate safety equipment. This was the only time in 15 years of lifeguarding that I ever had to make a rescue and it still bugs me 30 years later. (Teacher Three)

Unfortunately, 40 teachers (17 %) reported that someone they were close to personally (student, family, or friend) had died from drowning. Many of these participants shared more information about what happened during these events, with 36 total stories being submitted. Most of the drowning stories teachers reported occurred among children (N=21), and many were students (N=12). Teachers also reported, although to a lesser extent, losing their friends (N=6), or their friend's children (N=2) to drowning. Only a few teachers identified the ages of the individuals who died, reporting both adults and children drowning in an even distribution. However, although not reporting an age, many teachers (N=12) identified that it was a student who had drowned, and therefore drownings seem to have occurred more frequently among children and youth than adults. Only a few drownings were reported in pools (N=6), while the rest of the drownings reporting a location occurred in open water environments like rivers, lakes, the Great Lakes and in oceans. Children were most frequently reported to have drown in closed

water, while teens and adults drown in open water environments. Not all teachers reported the gender of the individual that died due to drowning, however, among the teachers that did identify gender there was evidence that drownings occurred almost exclusively among males.

Most drownings occurred due to conditions like rip currents, "rip tides" and "undercurrents", followed by drowning due to boat accidents or boat falls, falls into pools, being in pools while unsupervised, drowning while attempting to rescue someone else, and drowning due to entering the water with low swimming ability. Less frequently, drinking, heart attacks, and falling through the ice (on a snowmobile) were reported as reasons for drowning. A few teachers wrote about individuals they knew who had drown when attempting a rescue someone else from the water. Finally, several drownings occurred in the presence of others, even while there was supervision. In a tragic example, one teacher wrote:

> [There was a] child playing in pool at hotel with other children horse playing, splashing water, and playing water sports. No one notice that one of the children was actually struggling to stay above water and drowned. Many of the parents watching assumed he was playing with the other children splashing water, but he was actually fighting for his life. (Teacher Four)

Several teachers reported that they have lived 30 minutes or less from a Great Lakes shoreline (63%), and, surprisingly, 13% of teachers said that they have lived 30 minutes or less from an ocean at some point in their lives. Regarding closed water, 17% of teachers reported having a pool at their home. Over half of participating teachers (N=119) reported visiting a pool 10 or fewer times in a typical year, while 30 teachers (13%) reported visiting a pool 60 or more times a year. Additional survey results (Figure 3) provided evidence that teachers will, on average, visit inland lakes and the Great Lakes more than other natural aquatic environments.

Some teachers said that they visited these natural aquatic environments every day of the year, while others reported that they never visit a natural aquatic environment. Participating teachers also reported visiting the west side of Michigan, along the Lake Michigan shoreline, more frequently than any other natural bodies of water in the state (Figure 4). Outside of the state of Michigan, teachers reported visiting the water in Florida far more frequently than other states across the U.S. (Figure 5). The highest reported aquatic activities among teachers were boating, fishing, and canoeing/kayaking, while very few teachers reported kiteboarding, surfing, and competing in triathlons (Figure 6). Many teachers were highly involved in aquatic activities, with a total of 28 teachers identifying participation in aquatic activities 150 days or more throughout the year. However, a similar number of teachers (N=20) identified that they did not participate in any aquatic activity at all throughout the year at all.

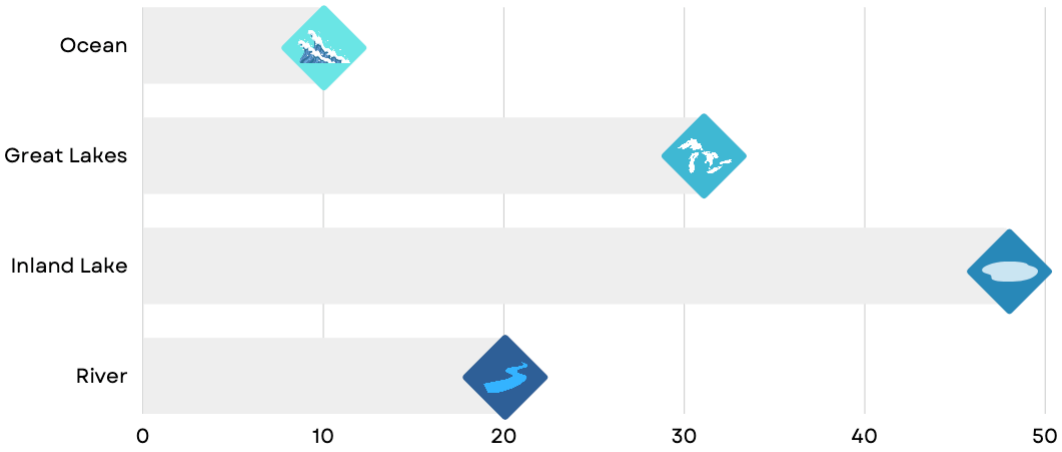


Figure 3

Number of Average Annual Visits to Different Natural Bodies of Water

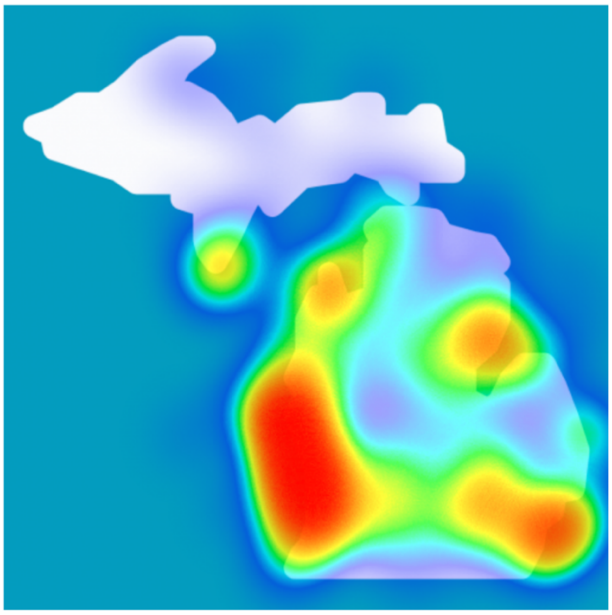


Figure 4

Heat Map of Most Visited Natural Bodies of Water in Michigan

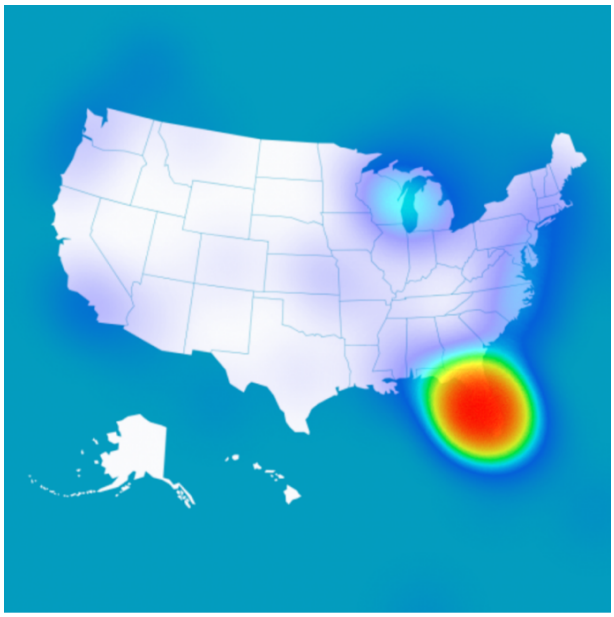


Figure 5

Heat Map of Most Visited Natural Bodies of Water in the U.S.

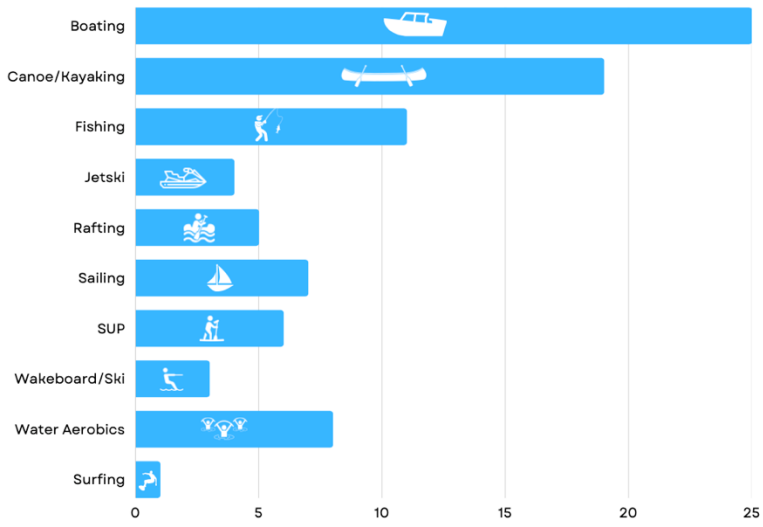


Figure 6

Number of Average Annual Days Teachers Participate in Aquatic Activities

In summary, participating teachers represented over 80 schools that were diverse in school type, demographics, and geographically spread across the entire state of Michigan, including the state's Upper Peninsula. Teachers were mostly female and White, with a wide range of access to water and aquatic participation levels. A surprising number of teachers reported living within 30 minutes of a Great Lakes shoreline or an ocean coastline. Several teachers had rescued someone from drowning, with a smaller percent reporting knowing someone close to them that had drown. A high number of teachers (N=200) perceived they had the ability to swim at least one length of the pool without stopping. Several teachers (N= 44) were once lifeguards, with just a few reporting they have current certificates or are currently guarding at a facility.

Purpose One - School Participation in Water Safety Education and Swimming

The survey provides evidence that Michigan teachers and their schools provide very few water safety education and swimming opportunities to their students. Only 13% of participants

reported that their school provides swim lessons to students (N=31), and just 11% of teachers reported that water safety education is provided during these swim lessons (N=27). Just 11% of teachers identified that their school provides water safety education in the classroom, and a single teacher (.4%) said that their school provides an all-school assembly or presentation about water safety to students. There were only eight teachers (3.4%) who said that they teach water safety education lessons to their students in the classroom, and very few teachers (N=2, .8%) reported being involved in teaching swimming or water safety at a pool or body of water. Finally, a small percentage of teachers (N=24, 10%) said that their school partners with a local water safety organization or aquatic center to provide water safety education or opportunities for swimming lessons to their students. The YMCA was listed more than any other partner, and the other listed partners included, but were not limited to, neighborhood clubs, parks and recreation, community education, even other schools. School participation correlated positively with only a few background factors, teacher education ($r = .167$, $p < .01$) and teacher lifeguard experience ($r = .207$, $p < .01$). There were no other significant relationships found between school participation and reported background variables among teachers.

Purpose Two - Water Safety Knowledge of Teachers

Water safety knowledge was also found to be generally low among teachers. Teachers scored a mean of 5.03 (SD = 1.6) out of 10 possible points, or just 50% correct, on the water safety knowledge questions. Only one teacher (.5%) answered all 10 questions correctly. Teachers scored an average of 1.3 (SD = .94) out of 3 possible points for correctly identifying the steps of self-rescue, with just 17 teachers (7.8%) identified all three steps correctly. Additionally, of the two points awarded for correctly identifying safe ways to rescue others, participants scored a mean score of .79 (SD=.64), and 26 teachers (12%) correctly identified both

steps. Teachers were more proficient in identifying effective ways to prevent drowning, with 94%, 86% and 75% of teachers correctly identifying three, two, and one evidence based drowning prevention practice respectively. However, when asked to identify what someone who is drowning looks like, teachers averaged only .41 (SD = .7) of three possible points, with just 2 teachers (.9%) identifying the signs that someone is drowning correctly.

When teachers were asked to identify the meaning of the different colored beach flags, a large number of teachers reported incorrect, even unsafe, perceptions of their meaning (Figure 7**).** For example, most participating teachers identified that the green flag means that the water is "safe", "good to go", "okay to swim", or "Go!". Very few participating teachers were able to correctly identify that the green flag means that conditions on the water are calm (USLA, n.d.). According to most teachers the red flag means, "do not swim", "do not enter", "danger", "unsafe", "not safe to swim", or that "the beach is closed". A small number of teachers correctly identified that the red flag means there are hazardous conditions on the water, including strong winds and high waves, and that swimmers are discouraged from entering the water (USLA, n.d.). Finally, most teachers correctly identified that the yellow flag means "caution", and that conditions on the water may be unsafe.

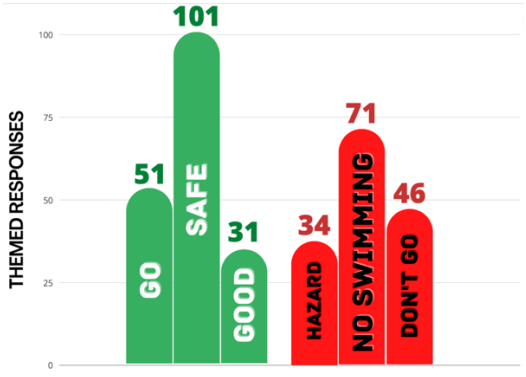


Figure 7

Teacher Perceptions of Michigan's Green and Red Beach Flags

As part of the water safety knowledge section of the survey, teachers were also asked to identify the risk of drowning for children and youth, about access to open water across the state, and about annual drowning rates in the Great Lakes. Teachers had high perception of drowning risk for children and youth, with 50% of teachers identifying drowning as the leading cause of unintentional death in children ages 1-4, and 45% of teachers identifying drowning as the leading cause for youth 5-14, as compared to four other common risks. There were only a few teachers with missing data to these two questions (6, 13 respectively). However, teacher's risk perceptions regarding access to water in Michigan were less accurate, with many teachers underestimating the amount of Great Lakes shoreline surrounding Michigan, the amount of open water across the state, and many teachers greatly underestimate drowning rates on the Great Lakes. In the final prompt prior to Theory of Planned Behavior based questions, teachers were asked to identify their level of confidence in correctly answering questions on water safety and risk. On a scale from 1 (not confident at all) to 10 (extremely confident), teachers showed a moderate level of confidence ($M = 6.4$, $SD = 1.9$). When exploring the relationships among water safety knowledge, school supportive culture towards water safety education, and background variables, several significant weak to moderate relationships were found (Table 1).

Table 1

Correlations for Background, Demographics, School Supportive Culture, and Water Safety Knowledge

Variable	Gender	Race	Edu	Swim	LGExp	ExpRes	ExpDro	SSC	WSK
Gender	1								
Race	.035	1							
Education	-.178**	.042	1						
Swim Ability.	-.187**	.008	.131	1					
LG Exp	-.002	-.022.	.044	.354**	1				
Exp Rescue	.079	.123	-.010	.109	.222**	1			
Exp Drowning	-.114	.101	.048	.121	-.018	.039	1		
SSC	-.054	.003	.191**	.066	.225**	.033	-.058	1	
WSK	.083	-.139*.	.159*	.038	.105	.087.	.061	.030	1

Note. Edu = Education, Swim = Perceived Swimming Ability, LGExp = Lifeguard Experience, ExpRes = Experience with Rescue, ExpDro = Experience Drowning, SSC = Supportive School Culture, WSK = Water Safety Knowledge.

In summary, teachers' water safety knowledge was low, with an average score of only 50% correct on water safety questions. Generally, teachers could not identify the correct steps of self-rescue, of the safe rescue of others, and to a lesser extent, identify effective drowning prevention measures. Although most likely due to misinformation in the media, teachers also struggled to correctly identify the signs of someone drowning and had misconceptions of the state's beach flag system. Perceptions of drowning risk among children and youth, however, were more accurate. Yet, the majority of teachers vastly underestimated annual Great Lakes drownings and access to water across the state. Although teachers scored quite low on the water

safety knowledge section of this survey and had misperceptions of the beach flags and state specific drowning risks, they had above average confidence on the correctness of their responses to water safety knowledge and risk questions in the survey.

Purpose Three – Intentions to Teach Water Safety

Generally, teachers' intentions to teach three 30-minute water safety lessons that would be developed and provided to them in the Spring were quite low. In the three questions centered around teacher intentions (INT), teachers scored a mean of only 7.03 out of a possible 21 points (Table 2). Teachers rated their attitudes (ATT) towards water safety education most favorably, followed by their subjective norms (SN), and finally perceived behavioral control (PBC) (Table 3). Regarding ATT, teachers had high expectancies that water safety education would be an effective way to protect their students from drowning and allow them to safely participate in aquatic activity. They also highly valued their students participating in aquatic activities and staying safe in and around the water (Table 4). However, they had little belief that teaching water safety is a responsibility of their job, while valuing job responsibilities.

In regard to SN, teachers did not believe that important referents would expect them to teach water safety education lessons to their students, however, teachers placed favorable values on the perceived expectations of these referents (especially professional referents like their administration and fellow teachers). Similar trends were found in teacher's PBC, where expectancies were low across all items, while value remained above average. Professional competencies to teach water safety and having support from their principal were the most powerful PBC factors. The subscales used to investigate teachers' ATT, SN, PBC and INT were found to be reliable (Table 5). It is important to note that item 6 (teaching three 30-minute water safety lessons this spring is a responsibility of my job) from the ATT subscale (teaching water

safety education lessons is a responsibility of my job) was removed from path analysis to reach a more acceptable alpha. This item was also believed to align more readily with SN than ATT.

Table 2

Mean Scores of Intentions to Teach Three 30-minute Water Safety Lessons

Intentions	
Prompt	**Score** (1-7)
I intend to teach three 30-minute water safety lessons to my students this Spring.	2.40
I expect that I would teach three 30-minute water safety lessons to my students this Spring.	2.33
I plan to teach three 30-minute water safety lessons to my students this Spring.	2.30

Table 3

Total Mean Scores for Theory of Planned Behavior Variables

TPB Variables – Mean Scores	
Variable	**Total**
Attitudes	36.13
Subjective Norms	4.20
Perceived Behavioral Control	-13.79
Intentions	7.03

Table 4

Mean Scores on All Items for Theory of Planned Behavior Antecedents

Attitude Mean Scores				
Teaching three 30-minute water safety lessons this Spring would…	**Expectancy** (-3 to +3)	**Not important at all – Incredibly important**	**Value** (1-7)	**Total Scores**
enable my students to keep themselves safe in and around the water.	1.32	My students keeping themselves safe in and around the water is _____	6.50	9.12
enable my students to save someone who was in danger in the water.	.63	My students saving someone who was in danger in the water is _____	5.66	4.47
enable my students to enjoy the benefits of the water safely.	1.42	My students enjoying the benefits of being active in the water safely is _____	6.34	9.43
be emotionally upsetting to me, and, or my students by talking about drowning.	1.75	Emotionally upsetting myself or my students by talking about drowning is (Bad-Good)	4.67	8.42
feel overwhelming for me.	.91	Feeling overwhelmed is (Bad-Good)	5.52	4.68
is a responsibility of my job.	-1.28	Meeting the responsibilities of my job is _____	6.52	-8.24

Table 4 (cont'd)

Mean Scores on All Items for Theory of Planned Behavior Antecedents

Subjective Norm Mean Scores				
I should not – I should teach three 30-minute water safety lessons this Spring.	**Expectancy** (-3 - +3)	**Disagree – Agree/Not much at all – Very much**	**Value** (1-7)	**Total Scores**
Parents of my students think _____	-.29	When it comes to matters of what I choose to teach, I want to do what parents of my students think I should do.	3.67	-.70
Fellow teachers think _____	-.49	When it comes to matters of what I choose to teach, I want to do what my fellow teachers think I should do.	3.99	-1.42
My principal (or supervisor) thinks _____	-.45	When it comes to matters of what I choose to teach, I want to do what my principal (or supervisor) thinks I should do.	5.60	-2.31
My friends think _____	-.28	When it comes to matters of what I choose to teach, I want to do what my friends think I should do.	2.66	.20
My family thinks _____	-.21	When it comes to matters of what I choose to teach, I want to do what my family thinks I should do.	2.80	.57
Public safety professionals in my community (like firefighters, safety officers, or lifeguards) think _____	.87	When it comes to matters of what I choose to teach, I want to do what public safety professionals in my community (like firefighters, safety officers, or lifeguards) think I should do.	4.74	5.19
Fellow teachers would	-.50	When it comes to matters of what you teach, how much do you want to be like your fellow teachers?	3.92	-1.50
Public safety professionals in my community (like firefighters, safety officers, or lifeguards) would	.93	When it comes to matters of what you teach, how much do you want to be like public safety professionals (like firefighters, safety officers, or lifeguards) in your community?	4.00	4.16

Table 4 (cont'd)

Mean Scores on All Items for Theory of Planned Behavior Antecedents

Perceived Behavioral Control Mean Scores				
I expect that I will have…	**Expectancy** (-3 - +3)	**Disagree – Agree**	**Value** (1-7)	**Total Scores**
access to a pool or waterfront where three 30-minute water safety lessons can be taught and skills demonstrated and practiced this Spring.	-1.69	Having access to a pool or waterfront will enable me to teach three 30-minute water safety lessons to my students this Spring.	3.70	-5.76
access to aquatic professionals (e.g., lifeguards, swim instructors, PE teachers, firefighters) who could help me teach three 30-minute water safety lessons to my students this Spring.	-1.10	Having access to aquatic professionals (e.g., lifeguards, swim instructors, PE teachers, firefighters) will enable me to teach three 30-minute water safety lessons to my students this Spring.	4.54	-3.99
the professional competencies (i.e., knowledge and skills) needed to teach three 30-minute water safety lessons to my students this Spring.	-0.81	Having water safety knowledge and skills will enable me to teach three 30-minute water safety lessons to my students this Spring.	4.71	-2.38
community support (including parental support) in teaching three 30-minute water safety lessons to my students this Spring.	-0.32	Having community support (including parental support) in teaching water safety will enable me to teach three 30-minute water safety lessons to my students this Spring.	4.45	0.07
support from my principal or supervisor in teaching three 30-minute water safety lessons to my students this Spring.	-0.35	Having support from my principal or supervisor will enable me to teach three 30- minute water safety lessons to my students this Spring.	4.90	-0.23
opportunities to influence and shape the curriculum this school year.	-0.33	Having opportunities to influence and shape the curriculum will enable me to teach three 30-minute water safety lessons to my students this Spring.	4.47	-0.44

Table 4 (cont'd)

Mean Scores on All Items for Theory of Planned Behavior Antecedents

Perceived Behavioral Control Mean Scores				
I expect that I will have…	**Expectancy** (-3 - +3)	**Disagree – Agree**	**Value** (1-7)	**Total Scores**
support from my fellow teachers to teach three 30-minute.	-0.60	Having my fellow teacher's support will enable me to teach three 30-minute water safety lessons to my students this Spring.	3.94	-1.06

Table 5

Cronbach's Alpha for Theory of Planned Behavior Sub-scales

Sub-scale	N	Items	Cronbach's α
Attitude	184	5	.702
Subjective Norm	184	8	.863
Preceived Behavioral Control	184	7	.813
Intention	184	3	.970

The proposed WSEGLS Structural Equation Model (Figure 1) was too complex to be run with the modest sample size collected in this study. Therefore, a path analysis using the TPB model was utilized to explore the influence of ATT, SN and PBC on intentions to teach water safety lessons (Figure 12). The path model exhibited excellent fit (RSMEA .000, CFI = 1.000, TLI = 1.000 and SRMR = .000), and SN was found to be the sole predictor of teacher intentions (B .486 $p < .001$).

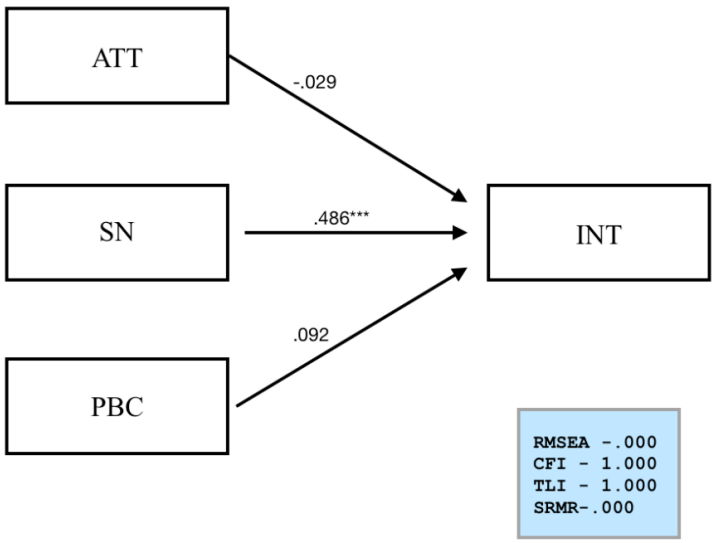


Figure 8

Path Analysis of the Theory of Planned Behavior Model

In summary, teachers' intentions to teach water safety lessons to their students were low, although they had positive attitudes and favorable values towards water safety education. Teachers did not feel that important referents expected them to teach water safety education and did not expect to have the support and competencies to do so. However, teachers highly valued these SN and PBC based factors. Specifically, teachers highly valued the expectations of their school leadership and public safety officers, having support from their principals and access to aquatic professionals who could help them teach water safety lessons. Finally, in a path analysis utilizing the TPB frame, SN was found to be the sole significant predictor of INT, positively influencing participant's INT to teach three 30-minute water safety lessons this spring.

CHAPTER 5: DISCUSSION

Characteristics of the Participants

There were three main purposes of this study: (1) To identify what teachers know about water safety and drowning prevention; (2) To explore what water safety education and swimming opportunities are being provided to students in Michigan by teachers and their schools; and, (3) To evaluate teacher intentions to teach three 30-minute water safety lessons in the Spring, if they were provided a water safety curriculum and the necessary resources. The evaluation of intentions was guided by an extended Theory of Planned Behavior which included supportive school culture (SSC) and water safety knowledge (WSK) as additional predictors of teacher intention (INT). To accomplish these purposes, a survey was solicited to teachers across the state of Michigan using a random sample of all Michigan K-12 schools.

The sample drawn through this process was found to be highly representative of the target population, reflecting the greater population of Michigan k-12 teachers across several categories. Specifically, recent data reports that 90% of Michigan teachers are White, 5.8% are Black, 1.4% Latinx, and that each of the remaining ethic/racial groups make up less than one percent of the total population of Michigan teachers (Hopkins, Kilbride & Strunk, 2021). Additionally, much like our sample, 76% of Michigan k-12 teachers identify as female. Insofar as education level, 63% of teachers have their Master's, and about 6% have a degree higher than a Master's degree. Finally, as was the case in this sample half of Michigan public school teachers work at the elementary level while the other half work at the secondary level (Hopkins, Kilbride & Strunk 2021: National Center for Education Statistics, 2021; n.d.; n.d.b; n.d.c). These statewide trends provide evidence that the sample obtained for this study closely matches the greater population of Michigan's k-12 teachers.

Beyond the demographic characteristics of teachers, the demographic, as well as the geographic characteristics of the schools represented in this study closely match schools throughout the state. Geographically, the schools that were selected to participate in the survey reflected the population density trends in the state of Michigan, with the highest number of participating schools coming from areas of highest population density (Figure 2). Participating schools closely matched statewide school locale trends where approximately 23% of students in Michigan attend urban schools, 44% suburban, and 21% rural. The economic status of students from public schools reflected those found in our sample population as well, 52% of students in Michigan's public schools report being economically disadvantaged (MI School Data, n.d.). The public to private school ratio was the only category not entirely representative of state trends. About 55% of schools in Michigan are private, and 40% public. In this study just under 87% of participating teachers were from public schools, and only 13% of from private schools.

It was interesting that no significant relationship was found between lifeguard experience and water safety knowledge among participating teachers. Even if the relationship between lifeguard experience and water safety knowledge was significant, it would have been a very weak correlation ($r = .105$). Why did lifeguards have water safety knowledge levels like their fellow teachers? Many lifeguards were formerly certified and not currently active lifeguards. It is possible that there was a lack of long-term water safety knowledge retainment. Although less likely, it could also be that lifeguards were somehow provided misinformation about self-rescue, rescue of others, prevention and recognizing drowning when trained, or not provided this information at all. Further, water safety knowledge was not related to subject area, and so being a P.E. teacher (the content area where water safety education is situated) did not influence water safety knowledge levels. Future research may want to explore the general water safety

knowledge levels of lifeguards and P.E. teachers compared to the rest of the teaching population to identify if this trend is found in a larger sample.

Stories of fatal drowning told by participating teachers were tragic, and, at times, teachers provided detailed accounts of these incidents. After performing a content analysis of these stories, many themes emerged that supported trends already reported in the water safety and drowning prevention literature. In their stories teachers reported a higher prevalence of drowning among children and youth than any other age group, and that males drowned far more than females (Barker, Sprinks, Hockey & Pitt, 2003; Blum & Shield, 2000: CDC, 2016; Drowning, 2012; WHO, 2020). Drownings among children were primarily reported to be in closed water settings, while drownings among teens and adults typically occurred in open water environments, trends that are once again consistent with previous drowning data (American Red Cross, n.d.; CDC, 2016; WHO, 2020). Several of the drownings occurred among individuals that went into the water to help rescue someone else that was drowning. Additionally, several drownings were reported to occur while in the presence of others, or even while under the direct supervision of others. These stories, coupled with evidence of limited knowledge on properly identifying drowning and the safe rescue of others among teachers, highlight the importance of education efforts focused on safe rescue from drowning, providing vigilant, active supervision, and accurately identifying someone who is drowning (Ramos et al., 2015; Vittone & Pia , 2006).

The stories of rescue provided by teachers, however, are extremely unique as there are very limited data about non-fatal drowning incidents in the drowning prevention literature, and a specific call from experts in the field to help identify the full burden of drowning by increasing the data and surveillance of non-fatal incidents (Peden et al., 2018; Peden & Richardson 2022). The findings from the data collected from this sample of over 200 teachers are extremely

valuable as they are in an area of drowning prevention that has very little available information. Additionally, it is important to note that many teachers identified how they rescued the individual from the water, and, in over half of these stories, teachers made rescues that were unsafe, jumping into the water without floatation and putting their own lives at risk. Many drownings occur due to unsafe practices in rescue, where the rescuer unfortunately becomes a victim (Franklin and Pearn, 2011). Finally, when retelling both drowning and rescue incidents, teachers often identified rough conditions using terms like "rip tide" and "undertow", these are important misconceptions to address among the general public, as there are no rip tides, and rip currents do not pull you under the water. Understanding how currents actually move will help individuals understand the true characteristics of the water, and how to better respond to these conditions if they are ever caught in a rip, longshore, or structural current.

Several teachers reported making a rescue after an individual fell unexpectedly into the water or drifted unintentionally into the deep end of a pool. Awareness issues, like unexpected falls and wandering into increased water depths, are not typically highlighted as risks in drowning prevention literature, and education on the importance of awareness around the water should be considered in future water safety education efforts. Engaging individuals to share stories of rescue in water safety and drowning prevention research may help uncover even more risks or trends that are currently underrepresented or unknown in the field. Additionally, there were more rescues made among males than females, confirming previous findings that males are at greater risk than females (CDC, 2016; Drowning, 2012; WHO, 2020). Previous literature has identified that these trends may be explained due to males underestimating risks to drowning while simultaneously overestimating their abilities and participating in higher risk activities in and around the water (McCool et al. 2008; Moran, 2011a). Finally, most teachers reported

rescuing individuals that were unrelated or unknown to them (not family, friend, etc.). This highlights the importance of supervision education among parents, guardians, and all individuals responsible for watching others in the water.

Consistent with previous research, survey results provide confirmatory evidence that females tend to have higher perceptions of drowning risk, and lower perceived swim ability, than males (McCool et al. 2008; Moran, 2011a). Race was negatively correlated with water safety knowledge, all other races identified in this survey attained lower water safety knowledge scores than their White colleagues. Drowning data have identified that American Indian or Alaska Native and Black individuals have higher drowning rates than White individuals, fewer individuals of diversity are involved in swimming lessons, and have less swim ability in the U.S. (Clemens, Moreland & Lee, 2021; Gilchrist & Parker, 20I4, Irwin et al., 2009;2018). Little evidence exists however regarding the relationship between water safety knowledge levels and race/ethnicity. Whether or not these trends would emerge in a larger sample would is worth future exploration.

Purpose One - School Participation in Water Safety Education and Swimming

Very few of the schools represented by teachers offer their students the opportunity to learn to swim or be safe in and around the water. Only 16% of teachers reported that their school offers swim lessons, and even fewer reported that water safety is taught as a part of these swim lessons (13%). Just 3% of teachers teach water safety to their students, and only 1% report helping teach water safety while at the water. Outside of the classroom-based water safety education efforts only two teachers (.75%) reported school wide water safety education events or assemblies, and about 11% of teachers reported having partnerships with local aquatic facilities. These results highlight an apparent lack of water safety education and drowning prevention

efforts in Michigan schools. To date, there has not been an evaluation of the of water safety education and swimming efforts among children and youth in Michigan's schools. Therefore, these data are incredibly valuable as it is the first data set of its kind in the state of Michigan and provides an indication that there are few opportunities for students to learn how to swim and about water safety, even though water safety curriculum is part of the state's standards.

The lack of water safety education and swimming lessons is indeed concerning. Without these opportunities Michigan children and youth miss out on building important knowledge and competencies to help protect them from drowning. Additionally, Michigan communities face increase risk with high access to water across the state, little protection along the state's vast shorelines, and limited preventative efforts occurring in schools. Water safety education has been found effective in increasing the water safety knowledge base of students at both the primary and secondary level (Ramos et al., 2018; Turgut, 2016). Further, opportunities for youth to learn survival swimming skills as part of swim lessons have been found to not only help youth build competencies, but also reduce drowning risk (Asher et al., 1995; Talab et al., 2016). The state of Michigan could benefit from helping communities become more aware of drowning risks throughout the state, from protecting those visiting the state's many water ways, and from commissioning schools to facilitate or provide drowning prevention efforts among their students.

In many ways it seems that there is a lack of "water safety culture" in Michigan schools, in spite of Michigan being the "Great Lakes State" of the U.S. Anecdotally, fire safety, for example, appears to be a consistent part of the educational experience of students across the state. Local fire departments work in collaboration with local schools and offer annual opportunities for schools to receive fire prevention education. Fire departments are encouraged by the National Fire Prevention Association (NFPA) to provide these opportunities to schools in

their community and provided resources to the Fire Service (NFPA Educational Messages desk reference for the public), and even teachers to help provide fire safety education (nfpa.org, n.d.). The product of this appears to be that fire safety is now a prevalent part of school culture, and initial research supports that students are well educated in fire safety (Field, in press).

Are fire safety messages important? Certainly. Is fire more dangerous to children and youth than water? Certainly not. The reason for the limited swimming and water safety education opportunities may be because there is not an accessible cultural equivalent to fire fighters, or police, for water safety. There is not a population of lifeguards at stations and pools in communities consistently making education efforts like other public safety fields. There are not even lifeguards along Michigan's beaches, so there is not infrastructure or workforce to have a cultural equivalent to the fire service when it comes to water safety education and drowning prevention. Local aquatic centers, like YMCAs and other community centers, appear to be filling this gap in water safety education and swimming lessons, but sparsely. Future investigation into whether the infrastructure and resources (both facilities and individuals like lifeguards, swim coaches, and swim instructors) exist to model something like what the fire service with fire safety education, is important. Additionally, evaluations of current partnerships between schools and aquatic centers/organizations (like the YMCA), and their effectiveness in providing swim lessons and water safety education can help provide valuable information to help guide and develop best practices in future water safety education efforts.

Purpose Two - Water Safety Knowledge of Teachers

The assessment of water safety knowledge among teachers participating in the WSEGLS survey brought forward many meaningful results worthy of discussion. Much like the evaluation of water safety education provision among teachers and their schools, this is the first ever

available assessment of the water safety knowledge among Michigan teachers. Teachers not only work with children and youth, those that are at highest risk of drowning, but also have a wonderful opportunity to invest in their safety by providing important safety lessons, including water safety. Therefore, there is value in understanding the current water safety knowledge levels of teachers when considering both future water safety education efforts in schools, and when considering that they may be a potential water safety knowledge source for their students.

The water safety knowledge of teachers was found to be considerably low, with teachers scoring a mean of 50% on the water safety section of the survey. Bolstering water safety knowledge among teachers would enhance competencies in the understanding of water safety, which may lead teachers to be more motivated to teach a water safety education curriculum to their students (Deci & Ryan, 2000). A closer look at perceived competency among teachers (question 11.3 and 12.3 in the PBC section of the survey) regarding the professional knowledge and skills to teach water safety lessons, provided evidence that perceived competency ratings significantly related to total INT scores ($r = .291$, $p < .01$). Therefore, teachers that felt they had the professional competencies (skills and knowledge) to teach water safety lessons had higher INT than their fellow teachers.

Results from the WSEGLS survey provided evidence that more teachers know the steps to save themselves in the water if drowning than how to safely save others when they are in trouble in the water. Teachers were generally able to identify two or more effective ways to prevent drowning, although very few teachers knew how to recognize someone in the water if they were drowning. Drowning is a quiet, sudden occurrence that does not look like it is often perceived in media, signage, etc. Media often portrays drowning as a more noticeable event with splashing, yelling, and waving when the opposite is usually observed (Vittone & Pia, 2006).

Therefore, the lack of knowledge about accurate drowning recognition may not necessarily be the fault of the teachers at all. In fact, drowning most frequently includes spinning, gasping for air, and quietly sinking because a drowning victim does not have the strength and ability to remain above water to splash, yell and wave. The issue is that the chance of rescue for those in trouble in the water will decrease if individuals do not know how to correctly recognize what drowning looks like in the first place. If individuals don't understand what to look for, they will not recognize someone in need and take the necessary action to help save them.

Similar to the issues with inaccurate conceptualization of the signs of drowning among teachers, communications from the state of Michigan, and in the media, regarding the state's beach flags system may be misguiding teachers in their understanding of the proper meaning of the beach flags. The beach flags are one of the few safety efforts provided to those visiting Michigan's public beaches. Michigan uses the green flag to indicate "Go", the yellow flag to indicate "Caution", and the red flag to tell people to "Stop" (Department of Natural Resources, n.d.). These definitions however are inaccurate, and therefore teacher's perceptions of the definitions of these flags were also incorrect, and even unsafe. To start, the green flag is not even approved for use by the United States Lifeguard Association (USLA). The USLA position statement states:

> In some areas of the U.S. green flags are flown to indicate calm or mild conditions. The International Life Saving Federation (ILS) considered this carefully and decided not to adopt the green flag. The primary reason is the fact that there is always a potential hazard present and the view that it is best to notify people when conditions are unusually challenging, rather than suggesting that they are ever completely safe. (USLA, n.d.)

The ILS position on the green flag is further confirmed by the results of this study, as many teachers identified that the green flag means that it is safe to swim. When people arrive at the beach on a green flag day and feel that the water is safe, children, youth, everyone in the water will be at higher risk of drowning as everyone's guard naturally goes down. The water is never safe, and drownings occur on green flag days as well. The false perceptions that the water is safe may only put more lives at risk. Most participating teachers were able to correctly identify the yellow flag as indicating to take caution in the water, and that the water may be dangerous. Experts maintain that caution should always be taken in and around the water, and therefore the yellow flag should be the flag flown during all conditions outside of increased hazard (USLA, n.d.). With the results from this study the state of Michigan should strongly consider the above risks and target more accurately communicating the meaning of the green flag to Michigan communities, or potentially stop using the green flag all together and use the yellow flag on days where the green flag was previously used.

The red flag is meant to be flown to discourage entry into the water and identify that there are hazardous conditions that present a higher risk to bathers (USLA, n.d.). The red flag does not mean "do not enter", or "do not swim", which were the two primary responses from teachers when asked the meaning of the red flag. Additionally, responses were frequently that the water is unsafe to enter, or the water/beach is closed. There were very few teachers that responded appropriately, indicating that the red flag meant high wind, waves, and or currents. However, even in these responses, many teachers indicated the dangers of "rip tides" or "undertow", two conditions that are misconceptions of a rip current. In fact, an "undertow" doesn't even exist. The overall theme emerging about the meaning of the red flag is that when the red flag is flown the water is "untouchable" and so dangerous entry is completely off limits.

There are several issues with this perception. The red flag is not meant to indicate that people cannot enter the water, it is only meant to discourage people from entering due to increased risk. On ocean beachfronts that employ lifeguards to appropriately use the flag system, body surfers and many others enter the water to participate in watersports during red flags, which allows them to further build water competencies in rough conditions. When Michigan communities and visitors believe the water is too dangerous to even enter on a red flag, these competencies cannot be built, which could end up being a debilitative factor for Michigan's beachgoers. During red flags days, the presence of properly trained surf rescue lifeguards would allow for those participating in these water sports to do so in a safer environment while they develop stronger water competencies in rough conditions. Finally, there is evidence that young adult males, at the highest risk of open water drowning, are drawn to red flag days (Lapenski & Vikin, 2014). Therefore, in the absence of lifeguards to protect those who are entering the water on red flag days, higher risk populations are being drawn to the water and are left to be saved by the untrained public. Curiously, WSK and SSC were not significant correlated, and SSC did not significantly predict WSK level. Perhaps other background variables play more powerful roles in a teacher's WSK, and teachers do not typically garner water safety knowledge even if water safety education and swim lessons are offered by their school. A school wide approach to water safety education may be of benefit, as this approach could provide teachers with the opportunity to learn important water safety content alongside their students.

The final questions of the water safety knowledge section explored teacher's perceived risk (PR) in drowning among children and youth, risks regarding access to water in Michigan, and overall drowning rates on Michigan's Great Lakes. While teacher's PR of drowning among children and youth were generally high, they underestimated the access to water throughout the

state, and greatly underestimated the number of annual Great Lakes drownings. It appears that teachers are aware of the high drowning risk among children and youth, but not the severity of the risk in waterways throughout their own state. These results may have been due to social desirability bias among teachers taking the survey, and the inaccurate perceptions of access and knowledge of drowning rates and indicator of this. Regardless, it is interesting that teachers generally perceived drowning as such a high risk for their students, yet drastically underestimated access to water and drowning rates locally. Teachers may perceive that most drownings occur in pools, however, for youth 5-14 open water is higher risk than other environments. If teachers underestimate access and the risk of drowning in their own state, they may also underestimate the need to teach their students to be safe. Michigan is surrounded by Great Lakes shoreline, yet teachers were unaware of the number of drownings and greatly underestimated drowning rates. There is a need for more effective communication from the state and county levels about the drowning risks across Michigan waterways to help better protect its communities from drowning.

Purpose Three - Intentions to Teach Water Safety Lessons

The third and final purpose of this study was to explore teacher's intentions to teach water safety lessons to their students in the Spring using an extend model of the TPB (Figure 8). Teachers responded to three questions rating their intentions to "teach three, 30-minute water safety lessons to their students this Spring". Participants were also directed to answer these questions as if they were provided with the water safety curriculum and resources, they needed to teach each lesson. Overall, participating teacher's intentions (INT) were quite low, with an average about 2 out of 7 possible points for each of the three intention questions. Interestingly, although teachers reported low intentions, they also reported favorable ratings of attitude (ATT)

toward teaching water safety lessons to their students. Teachers could have missed the explanation that the curriculum and resources for the water safety lessons would be provided to them. Additionally, teachers may have lost sight of this later in the survey as the explanation was at the front end of the TPB questions. If this was the case, many teachers could have believed that teaching three water safety lessons would require the development and preparation of the lessons.

However, if teachers were aware that the curriculum and resources would be provided to them, then other factors must be influencing teacher INT to teach water safety lessons, especially because their favorable ATT towards water safety education. The results of this study indicate that one potential barrier to intentions may have been situated in the normative beliefs of participating teachers, as many teachers believed there was a lack of expectations to teach water safety lessons from their administration, community, and peers. A math teacher, for example, may think "why would I teach water safety?". Delivering safety messages to students is not a typical communicated to be an expected task among content area teachers, like math, from important referents in the context of education (administration, fellow teachers, parents, etc.). Teachers with a stronger sense of these expectations (more favorable normative beliefs towards teaching water safety) had increased INT to teach water safety lessons to their students. In TPB research, ATT, and, or PBC are typically found to be the strongest predictors of INT (La Barbera & Ajzen, 2020). Therefore, the fact that SN was found to be the sole predictor of INT in the path model of this study was surprising. Additionally, the lack of significant influence from ATT and PBC all together provides further evidence that normative beliefs, and the value placed on these beliefs, are the driving factors in teacher INT towards delivering water safety lessons to their students.

Teachers had favorable ATT about water safety lessons, with ATT scoring over and above all other TPB variables. In sum, they believed that teaching water safety education would be an effective way to help keep their students stay safe in the water, enjoy the benefits of the water safely, and keep others safe. Teachers also valued keeping their students staying safe in and around the water, participating in aquatic activities safely and learning ways to protect other from drowning. There is evidence then, that teachers highly valued water safety education and felt it would be an effective way to save lives. It is interesting that intentions were found to be so low among teachers despite such favorable attitudes towards water safety education, and that attitudes did not directly predict teacher intentions. Especially because previous literature confirms that favorable ATT towards a behavior positively predict INT across several contexts (Afshar Jalili & Ghaleh, 2021; McEachan et al., 2010; Riebl et al., 2015). These results, along with the prevailing influence of SN, indicate that positive ATT towards new curriculum will not necessarily yield intentions to teach curriculum, and that the perceived expectations of important referents, especially administration, will be the driving factor in shifting intentions. In other words, teachers will intend to teach new curriculum when they feel they are expected to teach this curriculum from important professional referents, and in the current educational environment, this is typically only done through policy change. This conclusion is supported further when considering the item within the ATT sub-scale of the survey that produced the least favorable scores had to do with teacher's beliefs towards teaching water safety as a responsibility of their job. Especially considering that teachers overwhelmingly agreed that meeting the responsibility of their job was extremely important.

Teachers' beliefs about whether parents, fellow teachers, their principals, friends, and family felt they should teach water safety to their students were less favorable than their ATT

towards water safety education. Therefore, teachers reported not only a minimal sense of responsibility to teach water safety, but also being indifferent about whether there were social expectations to teach water safety from important referents. Teachers did however believe that public safety professionals (like fire fighters, police, EMS, etc.) think they should teach water safety education to their students. Regarding descriptive normative beliefs, teachers also believed that public safety professionals would teach water safety education lessons, and more felt that they would like to be like public safety professionals than other teachers. This was the only referent group teachers rated as having high expectations for them to deliver water safety lessons to their students. It was surprising that teachers rated the value of other groups, like parents and peers, lower than public safety officers.

Principals were a highly valued referent, above family, friends, other teachers, parents, and people from the community. Most teachers identified that, when it comes to matters of what they choose to teach, they wanted to do what their principals felt they should do far and above any other group. It was also surprising to find that teachers rated the social influence (both expectations and values) of referents like fellow teachers, parents, friends, and family so neutrally, especially among teachers that experienced making a rescue, or a drowning of someone close to them. Are teachers so driven to meet the expectations of their administration (i.e. evaluation of the adherence to the curriculum and standards set forward by the state and school) that other important social referents do not have the influence or the value they should? This could be an interesting area of study for future educational research.

Results in the final section of the survey provided evidence that teachers had low PBC in the context of teaching water safety lessons. There was little sense that teachers would have support from their principals and the community to teach water safety lessons. They also felt

they would have few opportunities to influence and shape their curriculum, and have little access to aquatics professionals (lifeguards, swim instructors and P.E. teachers) to help them teach water safety lessons to their students. Additionally, teachers felt they lacked the professional competencies (skills and knowledge) to teach water safety. Each of these expectancy factors were highly valued by teachers, as teachers believed that more support, autonomy in curriculum development, and access to aquatics professionals would help enable them to teach three water safety lessons.

The only TPB antecedent found to have significant influence on teacher's INT to deliver water safety lessons to their students in the path model was SN. This is a significant finding as multiple TPB meta-analysis in a wide variety of contexts highlight ATT and PBC as the driving predictors of INT and Behavior (Afshar Jalili & Ghaleh, 2021; McEachan et al., 2010; Riebl et al., 2015; Sur, Jung & Shapiro, 2022). SN is typically found to be the weakest predictor of INT, with either ATT or PBC commonly being the strongest predictors of INT in TPB literature (La Barbera & Ajzen, 2020). In the context of education similar trends occur with teacher intentions to perform a variety of behaviors (Keo, Koh and Lee, 2015; Lenski, Richter and Ludtke, 2019; Cheng, 2015).

Recently, La Barbera and Ajzen (2020) have provided evidence that the relationship between SN and INT is lower when PBC is high, as higher levels of PBC appear to strengthen the importance of ATT on INT and weaken the influence of SN. Initial results from the trimmed model, from the segmented models, and significant results from the path models provide further evidence of this trend. Participating teachers had low PBC in teaching water safety lessons to their students, and INT was influenced primarily by their SN. Additionally, the authors propose that the context of behavior may influence the relative relationship between PBC and SN, where

more individualistic behaviors may provide a context where higher PBC enhances the impact of ATT on INT, and more collectivistic behaviors that are influenced by the actions of others may provide a context where higher PBC will enhance the impact of SN on INT instead. For example, INT about behaviors that are more highly impacted by the actions of others may be more influenced by normative beliefs, where more individual behaviors maintain ATT and PBC as the primary predictors of INT.

Although the act of teaching seems an individualistic activity, teaching is typically done in the context of a team (administration, fellow teachers, and other staff), and the behaviors of a teacher (what they teach and how they teach it) are indeed influenced by the actions of administration, peers, parents, and the community. Therefore, teaching in the school environment seems a more collectivistic behavior than individualistic behavior. In many ways SSC attempted to capture the concept of collectivistic behavior, measuring behaviors across many areas of the school and the perceived collective efforts of the school in water safety and swimming education. SSC also included items asking if teachers had participated in teaching water safety themselves. These items are exploring the past behavior of teachers and were included in this variable because it was felt that if a teacher is allowed to teach water safety lessons in their classroom, or to be involved in other water safety education efforts in their school, they would feel a higher level of supported by the school in these efforts. It is postulated that teachers who are given the autonomy to teach water safety and/ or encouraged to participate in water safety education efforts, will perceive they have the support of their school to do so.

In the context of teachers delivering water safety lessons, the original model proposed that increased knowledge about water safety would influence the PBC of teachers, as teachers with higher levels of WSK would then perceive they had greater competency to teach students

about water safety. It is possible, as Ajzen argues, that teachers who perceive high levels of knowledge, which then bolsters perceived competence (i.e. PBC) will have greater intentions, even if their knowledge is entirely incorrect of off base (Ajzen et al., 2011). This would mean that participating teachers who had incorrect knowledge about water safety may still have higher intentions to teach water safety, if they believe their water safety knowledge is correct. Ajzen states that the correctness of knowledge is not all that important to focus on when considering INT and behavior in the context of the TPB (Ajzen et al., 2011).

Although this makes conceptual sense in the context of predicting INT, ignoring the pursuit of correct, evidence-based knowledge in the context of positive behavior change (the ultimate purpose of ethical behavior research) would place individuals on very shaky ground. If, for example, a group of individuals never swam alone in the Great Lakes because they believed sharks were prevalent in Great Lakes waters, we would see a desired behavior (supervision is an effective way to prevent drowning) although based on incorrect knowledge. However, if this group of individuals learns that there are not sharks in the Great Lakes, they may abandon the practice of swimming with others and think it is okay to now swim alone. Take that same group and teach them that this behavior is important because it can be a layer of protection against drowning, there will be no moment of realization that their knowledge is incorrect, and the chances of this safe behavior persisting long term increases. Correctness of knowledge does indeed matter and is likely more facilitative in the maintenance of healthy, positive, behaviors long term than having incorrect knowledge about behaviors. TPB research would benefit greatly from longitudinal study on the role of correctness of knowledge and long-term behavior maintenance and change.

The results from the path analysis, bring to light several important theoretical

considerations with regard to the TPB. To start, these findings further support the proposed interactions between PBC and SN, and PBC and ATT, were higher levels of PBC will strengthen the influence of ATT on INT and decrease the influence of SN, and lower levels of PBC will dampen the influence of ATT and enhance the influence of SN on INT (La Barbera and Ajzen 2020). In this study there was evidence that teachers had positive ATTs towards water safety lessons, but lower PBC in teaching these lessons to their students. Therefore, although teachers highly valued water safety education and believed water safety lessons would help keep their students safe, they didn't feel they had the resources, autonomy, support, knowledge, or skills to effectively deliver these water safety lessons to their students in the classroom. If teachers had higher levels of PBC the influence of ATT may have been significant and positively predicted INT. Instead, teacher's INT to teach water safety lessons were primarily influenced by SN, and potentially by, with SN the strongest predictor of INT. It appears that teachers were more influenced by SN than ATT because they had lower levels of perceived competence and therefore were uncertain in their ability to effectively deliver water safety lessons despite favorable beliefs on its importance and impact.

La Barbera and Ajzen (2020) suggest that the TPB variables that most strongly predict INT can shift and may be dependent on the context of the specific behavior being examined. Therefore, with behaviors that are more collectivistic in nature, SN may influence INT more readily than ATT or PBC. Behaviors that are more individualistic in nature may be influenced more readily by PBC than the others. The results from this study suggest that perceived competencies, as well as social and cultural factors, will better predict intentions than the original TPB variables. In the context of schools, teaching, although inherently an individual behavior, requires the efforts, support, and direction of a team of teachers and administration.

Additionally, teacher's perceived expectations from important referents like fellow teachers and administration are most likely based on the curriculum and standards put forward by school leadership (i.e. the state) and reciprocally encouraged by their peers who follow the same curriculum and standards. Therefore, it appears that the most effective way to influence intentions to teach new curriculum may be through policy change that requires this curriculum be implemented in the school, encouraged by school leadership, and embraced by fellow teachers. This may not be the most facilitative pathway for curricular change, as enhancing teachers attitudes towards new curriculum and building their competencies in teaching new curriculum are certainly beneficial. However, evidence from this study suggests that SN are indeed the strongest predictor of teacher INT.

Future Directions and Practical Implications

Several important paths ahead for research in water safety education and drowning prevention can be forwarded as a result of this research. To start, the exploration of background factors provided many considerations for future research directions. Lifeguards did not score significantly higher than other teachers on the water safety knowledge questions in the WSEGLS survey. Future research may want to investigate the general water safety knowledge levels of lifeguards regarding self-rescue, the rescue of others and prevention. Further, P.E. teachers did not score significantly higher than teachers of other subjects on the water safety knowledge questions. There is concern if lifeguards and P.E. teachers do not have higher water safety knowledge levels than the general teaching population. P.E. teachers have the responsibility to educate students on water safety as water safety is part of their state curriculum standards. Lifeguards are specifically trained to provide safety to those they oversee at their facility. However, if their general knowledge of prevention and self-rescue is found to be similar to the

general public, lifeguard training should include these important areas of drowning prevention to their curriculums, while remaining focused on rescue and resuscitation. Greater efforts from National water safety organizations may also be needed to help with the lack of basic water safety knowledge found in this study. National organizations should focus on providing the public with simple messages about self-rescue, others rescue and prevention that are easy to understand and retain long term. Campaigns in multiple media contexts with increased reach and more targeted focus on populations and environments could provide useful in these efforts.

Teachers shared many stories of both drowning incidents and rescues. Stories or rescue helped provide valuable information about non-fatal drowning, an incident vastly underrepresented in drowning data. To help in the development of more robust surveillance and data collection on non-fatal drowning continuing to explore stories of rescue may be an important step towards uncovering more about non-fatal drowning incidents, and, with mixed methods approaches, increase our understanding of the characteristics and breadth of the issue.

The literature provides ample evidence that minority populations in the U.S. have lower swim ability and participation less in swimming and face higher risks to drowning. However, little evidence exists however regarding the relationship between water safety knowledge levels and race/ethnicity. This study provided evidence that minority teachers had less water safety knowledge than their White peers. Whether or not a larger sample would continue to identify this trend is worth future exploration. Logically, correct knowledge would be more facilitative in the maintenance of healthy, positive, behaviors long term behaviors than having incorrect knowledge about the behavior. However, there is limited research in the relationship between correctness of knowledge and long-term behavior. TPB research would benefit greatly from

longitudinal research that investigates the relationship between correctness of knowledge and long-term behavior maintenance and behavior change.

Results from the water safety knowledge section also provided evidence that teachers have incorrect perceptions of the beach flag system. Teachers think the green flag means "go" and that the water was safe, and that the red flag means the water is too dangerous to enter and the water is closed. Because both perceptions are unsafe it is important to continue to explore whether these perceptions are present in a larger sample across the state. When Michigan community members and visitors believe the water is too dangerous to enter on a red flag they may be missing out on opportunities to develop important water competencies and developing a fear of the water. To identify whether this is the case, an evaluation of water competencies in relation to red flag perceptions and behaviors would be an important future study. Beaches that fly flags should consider better ways to convey their appropriate meanings, change them consistently and correctly when conditions on the water change. Additionally, due to the results of this study and the guidance from experts in beach safety, the state, cities, and counties may want to consider not using the green flag. Finally, a water safety campaign, communicated statewide through a variety of media, could help communicate the correct meaning of the flags to Michigan community members and visitors alike.

Subjective norms were found to be significant predictors of teacher intention, above perceived behavioral control and attitudes. Future research should extend beyond TPB antecedents and focus on investigating social and cultural variables, that could more robustly predict intentions in education and in the context of the school. A specific focus of this research should be on the influence of administration on teacher's intentions and behaviors. Teachers may be so focused on meeting the expectations of their administration (which are guided by standards

and benchmarks) that they are ignoring the opinions and beliefs of other important social referents and their beliefs in the importance and effectiveness of new curriculums like water safety.

Future research should also investigate not only the past behavior of the individual, but also the collective past behavior of important referents across many referent groups or categories. The TPB subjective norm prompts deal primarily with individual or group referents that are of a specific category. For example, in this study referents were other teachers, their principal and parents. When exploring the perceived support of "the school" you are referencing not a single individual or group of referents, but a variety of individuals and groups of referents. Teacher's perceptions of the behavior "the school" is therefore more of a cultural consideration that may be missed in the TPB variables of both subjective and descriptive norms. Finally, gathering a sample size that meets the statistical requirements to explore the originally proposed model may help answer some to the outstanding questions on the role of past behavior, perceived risk and water safety knowledge on teacher's intentions to teach water safety lessons.

The results of this study provide evidence that SN is the sole predictor of INT in the context of adopting water safety curriculum. Consider, if ATT and PBC were dropped from the model all together, would other social and cultural variables significantly predict INT to teach water safety lessons, and therefore better explaining INT in this specific context? Therefore, future TPB study should pay closer attention to the context of the behavior in question prior to model development, and researchers should consider that there may be predictors extending beyond ATT, SN and PBC that more readily predict the INT of that behavior in that specific context. Additionally, whether the behavior of interest is more individualistic or collectivistic in nature should be considered. Individualistic behaviors may rely more heavily on ATT and PBC

along with another variable outside of SN, perhaps knowledge or past behavior, while collectivistic behaviors may be more strongly influenced by normative beliefs. Starting with the TPB model, researchers could make decisions on what other variables to explore in the model dependent on results regarding PBC. If participants PBC is high, researchers could explore more individualistic variables that extend beyond TPB variables, and if PBC low, more collectivistic, socially situated variables could be introduced to the model.

The expectorations of public safety officers were highly valued by participating teachers, and teachers felt that access to aquatic professionals, including lifeguards, would be beneficial in effectively delivering water safety lessons to their students. Therefore, inviting lifeguards into schools to aid in water safety education efforts may be the best path forward. However, the availability and capacity of lifeguards to be a resource for schools in water safety education efforts is yet to be explored. Future investigation into whether the infrastructure and resources (both facilities and lifeguards) exist to model something like what the fire service with fire safety education, would be of great value. If the lifeguard service was charged with delivering water safety education to schools and communities during their offseason lifeguards could have full-time, year-round employment opportunities, and lifeguarding could begin to be considered as a career path much like Fire, Police and EMS.

Several teachers indicted that their school currently partners with water safety organizations and aquatic facilities to provide swim and water safety education to their students. However, little evaluation of these programs exists across the state of Michigan (Field, Under Review). Research that focuses on the assessment of the current partnerships between schools and aquatic centers/organizations (like the YMCA), and their effectiveness in providing swim

lessons and water safety education can help provide valuable information to guide best practices in future water safety education efforts in Michigan.

As part of the WSEGLS Survey many teachers reported unsafe rescues of others, jumping into the water without floatation and putting their own lives at risk. Finding ways to educate adults who are responsible for supervising others around the water on safer and more effective ways to rescue others is of great importance for future drowning prevention efforts. Additionally, several teachers reported making a rescue after an individual fell unexpectedly into the water. Working with children and youth on awareness of their surroundings when near the water may be a beneficial preventative measure that is not commonly addressed in water safety education curricula. Finally, most teachers reported rescuing individuals that were unrelated or unknown to them (not family, friend, etc.). This highlights the importance of supervision education among parents, guardians, and all individuals responsible for watching others in the water.

The first step to making a rescue is recognition. Results from this study provide evidence that most teachers cannot correctly identify someone who is drowning and that they have false perceptions of what drowning looks like. Engaging media to correctly portray drowning, and educating individuals, especially those more commonly in a role of supervision around the water, on ways to accurately identify drowning is yet another important step towards safer waters in Michigan. Because the majority of teachers had unsafe perceptions of the meaning of the green flag, an additional consideration for the state would be replacing the green flag with the yellow flag and educating the general public that the reason for this change is the water is never safe and you shouldn't just "go" into the water without taking caution. There is also an argument that the flag system should not be maintained at all, as beach flags are not recommended for use without

the presence of a lifeguard to change them appropriately, direct individuals in and out of the water when needed, and educate the public on their meaning (USLA, n.d.).

Each of the implications mentioned above have the potential to be met if the state of Michigan championed a water safety education campaign across the Great Lakes State. The state spends over 30 million dollars in marketing through the "Pure Michigan" tourism campaign, collects money from both citizens and visitors at its state parks, yet does not provide lifeguards or effective rescue measures to help keep people safe. If the state refuses to provide lifeguards at its many waterways and beachfronts a shift of resources to allocate for a statewide water safety campaign would be an essential step in educating Michigan's communities and visitors alike providing messages about self-safety, safe response to drowning, and prevention. Additionally, there is a need for more effective communication from the state and county levels about the drowning risks across Michigan waterways to help better protect its communities from drowning. The state of Michigan could benefit from helping communities become more aware of these risks and protecting those visiting the Great Lakes.

Currently water safety standards are situated within physical education curriculum, but they are not evaluated by the state, so it is unclear if these standards are being met. This study provides evidence that very little water safety education is being provided to children and youth in Michigan's schools. Additionally, there is evidence that students have few opportunities to learn how to swim. If schools decide to take on greater responsibility in providing water safety education, there are several viable options that would help them reach this goal and further protect Michigan's children and youth from drowning.

First, schools could be commissioned by the state to reach out to their local aquatic facilities and lifeguards to partner in water safety education efforts. This first model for water

safety education would reflect the current model for fire safety education in schools, where local firefighters and fire departments help provide school wide fire safety education opportunities. A school wide approach would also allow teachers the opportunity to enhance their own knowledge about water safety and drowning prevention, adding an extra layer of protection from drowning. A partnership with local aquatic centers and their lifeguards would be an even better model as there may be opportunities for children to also learn how to swim at their facilities if transportation can be provided and the faculty is willing to bring students in for free or at low cost to the school. As previously mentioned, it is unknown if the state has the infrastructure and resources for this partnership to occur, so a simultaneous push to employ more lifeguards and build pool infrastructures would most likely be necessary. The Minnesota Department of Education provides funding opportunities for schools and organizations aiming to bolster water safety instruction for populations at high risk of drowning, or to schools looking to hire and, or, train additional lifeguards and water safety instructors through a series of grants (Minnesota Department of Education, 2022). Michigan could model these efforts and provide financial support and incentives to schools and organizations that take on water safety education and swimming.

The second option would be a mandate by the state that Physical Education teachers deliver water safety messages annually, or at important grades. As part of this mandate teachers could be encouraged to partner with local lifeguards and aquatic centers to provide their water safety lessons and provide these partnerships to the state to be highlighted in some way so they are recognized in either academic or general media. If this is the path schools take there would need to be a refocus on water safety standards and their appropriateness for the different aquatic environments in Michigan and the hazards they present. This can be done at the state and local

levels via a situational analysis that reviews waterways, risks, and drowning trends to help shape a more appropriate water safety curriculum for Michigan children and youth. Additionally, a situational analysis would allow the state and their schools to identify resources that can help protect their students from drowning and develop community partnerships with these resources to bolster water safety education efforts and provide opportunities for students to continue to build water competency beyond school-based efforts. A partnership between P.E. teachers and local lifeguards to deliver water safety lessons would help educated lifeguards on general water safety and drowning prevention, including self-rescue and effective prevention measures.

The third option for consideration is providing all teachers an easy-to-use water safety curriculum, as well as the necessary resources, so that they can teach water safety lessons in their classroom. Recently, Louisiana Public Schools have adopted a bill that requires all schools to provide water safety instruction in the classroom (House Bill No. 963, 2022). All schools will be required to provide core water safety content in classes like health, physical education, etc. Additionally, schools are given the autonomy to use the core content and cultivate a curriculum that meets the geographical and cultural needs of the community, as well as provide this curriculum to the state for review and as a resource for others. The results of this study suggest that for this model to work in Michigan teachers would need to be provided education on water safety to help develop professional competencies, and to feel support from their school and community. Specifically, teachers would need to feel that their principals or directors value water safety education, that their principal or director expect them to help teach water safety lessons, to perceive that they have the skills and knowledge to teach water safety lessons, and that water safety education is a responsibility of their job.

The state could change policy so that all schools are required to teach water safety

education in their classrooms and communicate to school principals the importance of doing so. Principals would then have to commission and motivate their teachers to teach water safety lessons in their classroom. Teachers would then feel that teaching water safety is expected of them, valued by their leadership, and a new responsibility of their job. Schools, once again, could then be guided to reach out to local lifeguards and aquatic centers to help provide this education in their schools allowing teachers to feel even greater support from their communities. Each of these steps would help bolster the intentions of Michigan's teachers to teach water safety lessons as they would enhance a sense of responsibility among teachers, raise expectations to teach water safety lessons from valued referents, offer support from school leadership, and allow for partnerships with aquatics professionals from the community to help teachers successfully deliver water safety messages.

Strengths and Limitations

Through the WSEGLS Survey this study provides the first ever assessment of school-based water safety education and swimming opportunities for students in Michigan. The state of Michigan does not evaluate whether water safety education standards are being met by schools, and therefore, the results of this study provide a unique first look at current water safety education and swimming efforts in Michigan schools. Additionally, the WSEGLS survey was the first assessment of teacher's water safety knowledge in Michigan and provided important results regarding knowledge levels and perceptions. Valuable background information including but not limited to teacher's access to water, aquatic participation, and experiences with rescue and drowning, were gathered in this study. These results can be used to inform future investigations in the water safety and drowning prevention arena. Finally, the sample of participating teachers drawn for this study was found to closely match the greater population of

teachers and schools in Michigan across several important categories. Results can then be interpreted as representative of teachers and schools throughout Michigan.

Experts in water safety and drowning prevention have been calling for water safety and drowning prevention literature to provide more research grounded in theory. This study was designed using the TPB as a framework to help explore teacher intentions to teach water safety lessons to their students. Historically, the TPB has only been used a few times in the context of water safety. This study adds to an important piece to be considered for future work being done to be built upon TPB literature in the field of drowning prevention. Results in teacher's intentions, attitudes, subjective norms, perceived behavioral control are important to consider when determining the best path forward in the development of water competencies among children and youth in Michigan schools. Specifically, the results of the path model (Figure 12) provide evidence that subjective norms are primary factors influencing teacher intentions to deliver water safety lessons.

The lack of adequate sample size to analyze the model-data fit of the originally proposed WSEGLS model was previously discussed and is a major limitation of this study. Several other limitations in this study need to be discussed. Many of the background characteristics reported by teachers may point to the presence of participation bias. Well over half of participants (64%) have lived 30 minutes or less from a Great Lakes shoreline, and a surprising 14% have lived 30 minutes or less from the Ocean. Over 20% of participants were formerly trained or currently active lifeguards. Further, participants shared 65 stories of rescuing others from drowning, and almost 40 stories of someone they were close to drowning. However, teachers generally had little water safety knowledge, reported limited participation in water safety education, and had low intentions to teach water safety. If most teachers participated due to a background in

aquatics, or a vested personal interest in water safety and drowning prevention, then the expected results of this bias would be higher levels of water safety knowledge among participants, greater engagement in water safety efforts, and an enhanced interest in teaching water safety in the future. The opposite occurred in this study, as knowledge, engagement and intentions were found to be quite low. This may indicate that the other teachers from the population that are not invested in water safety have even lower levels, or that participating teachers from this sample have incorrect water safety knowledge sources. The later may be of specific interest for future study because, as previously mentioned, teachers' confidence in their responses to water safety knowledge questions was found to be above average.

TPB questions were constructed using recommendations by Ajzen (2019). Questions were bipolar rating the expectancy and value of teachers regarding ATT, SN and PBC on scales from 1 to 7. Guided by Ajzen's recommendations 1 was anchored by the more favorable response (extremely likely, I should, true, etc.) and 7 the less favorable (extremely unlikely, I should not, false, etc.). However, in typical Likert scale questions the higher value represents the more favorable responses. Therefore, it is unclear if teachers were confused by this scale and began to respond thinking 7 was associated with more favorable values. During pilot testing there was no feedback regarding the scale being confusing or anchored in the wrong direction. Additionally, many of the questions about perceived risk were about access to water and Great Lakes drowning rates. These facts are not readily available or communicated to the public in Michigan, and therefore these questions may have been unfair to ask teachers as part of the perceived risk portion of the survey. Survey results had missing values that could have been avoided if the survey functioned with forced response questions where participants had to complete questions before moving on. The reason the survey was designed this way was to

capture as much information as possible from teachers in areas that have little to no existing data. Missing values were replaced with a series mean. Missing values were minimal among only very few participants and maximizing the sample size was beneficial for path analysis.

The WSEGLS survey had a set of questions about teacher's intentions to teach three 30-minute water safety lessons to their students this Spring. As an introduction to these questions teachers were instructed to respond as if the curriculum and resources needed to deliver these lessons were provided to them. If teachers lost sight of this information, or missed this information all together in the introduction, they may have responded less favorably to questions on intention. Further, if a curriculum were presented to them to provide an example of what they would be teaching they may have responded more favorably to questions on intentions. Sampling was difficult for this study as not all schools provide teacher emails on their school website. Many schools sampled received a phone call, and, or an email to their principal requesting that they provide the emails or share the survey via an anonymous link. Almost 5,000 direct emails were sent to teachers inviting them to participate in the survey, and over 60 school principals were called to invite their teachers. In such a large sampling pool only 320 teachers even started the survey. A longer response time may have garnered more participants; however, the timeline of this study was limited. Additionally, an in-person invitation and survey process may have yielded a higher rate of participation among invited schools. Finally, because the survey was online teachers may have had questions about the survey that went unanswered or been confused about components of the survey. Without in-person help on these issues many teachers may have just stopped taking the survey altogether or answered without fully understanding the prompts.

Conclusion

Kindergarten through 12th grade teachers in Michigan highly value water safety education and believe it can be an effective way to help keep their students safe in and around the water. Surprisingly, most teachers identify that they would not be overwhelmed by teaching water safety lessons to their students. However, participating teachers do not feel that teaching water safety education is a responsibility of their job, or that they have opportunities to shape their curriculum. Several teachers also reported feeling that they lacked the support, competencies, and resources to teach water safety lessons to their students. Participating teachers highly valued important referents like their principals, fellow teachers and safety professionals from their community, but they did not perceive that these referents expect them to teach water safety education to their students. Further, teachers did not expect to have access to bodies of water or pools to teach water safety lessons, to aquatic professionals that could help deliver water safety lessons, or the knowledge and skills to enable them to teach water safety lessons in the spring. However, teachers expressed that having access to aquatics, gaining professional water safety competencies, and being supported by school leadership, their communities, and their peers, would be better enable them to teach three 30-minute water safety lessons to their students. Therefore, developing professional competencies, partnerships with local aquatics professionals, and gaining support from administration and public safety professionals, would be an important focus for future water safety education efforts in schools.

Teachers had little knowledge about how to perform self-rescue when in trouble in the water and how to safely help others during a drowning incident. Additionally, teachers greatly underestimated the number of annual Great Lakes drownings, the amount of water access across the state, and had inaccurate perceptions of Michigan's beach flags. However, teachers

accurately identified effective drowning prevention measures and the risk of drowning for children and youth. These results highlight the importance of school wide water safety education efforts, where the water safety knowledge of teachers can be developed alongside their students. The state of Michigan should also make further efforts to communicate water safety and drowning prevention messaging through statewide campaigns and provide accurate information about the beach flags and drowning and access risks across the Great Lakes State.

Teacher's attitudes about water safety education were quite favorable, however, their intentions to teach water safety lessons were very low. Subjective norms were found to be the sole predictor of teacher intentions to teach water safety lessons. Surprisingly, however, both attitudes about water safety education and perceived behavioral control towards teaching water safety lessons were not significant predictors of intentions. Therefore, it appears that the normative beliefs of teachers, both subjective and descriptive, have the strongest influence on teacher's intentions to teach water safety lessons. There is a possibility, then, that teaching is more of a collective behavior than individual behavior, influenced by administration, peers, parents, and the greater community. Additionally, because teachers valued the expectations of their administrators most highly, their subjective norms may be impacted primarily by the standards and benchmarks put forward by the state, which are then communicated to, and evaluated by, school principals. Therefore, policy change at the state level may be a driving factor in the cultivation of normative beliefs among teachers, where changes in policy will eventually influence the intentions of teachers via the expectations of school leadership. Ultimately, the social and cultural factors that shape the normative beliefs of teachers should be a focus of future research situated in teacher intentions to adopt and deliver new curriculum like water safety.

There are very few opportunities for children and youth in Michigan's schools to participate in water safety education and swimming lessons, a state surrounded by water. When considering the high risk of drowning for children and youth, and the landscape of water safety education and swim lessons in Michigan schools, it is important to find ways to provide students the opportunity to gain the competencies needed to keep themselves and others safe in and around the water. Perhaps, due to the importance of normative beliefs, a good starting point for future water safety education efforts in schools would be to developing a curriculum that was delivered in partnership with aquatics professionals, and, or, public safety officers, initiated by the state through new standards and benchmarks, and finally, implemented and encouraged by principals and school leadership. Considering the high risk of drowning for children and youth, and few opportunities for children and youth to participate in water safety education and swim lessons in Michigan schools, it is important to find new ways for students to develop the water competencies needed to help keep themselves and others safe in and around the water.

BIBLIOGRAPHY

Adiyoso, W., & Wilopo. (2021). Social distancing intentions to reduce the spread of COVID-19: The extended theory of planned behavior. BMC Public Health, 21(1). https://doi-org.proxy2.cl.msu.edu/10.1186/s12889-021-11884-5

Afshar Jalili, Y., & Ghaleh, S. (2021). Knowledge sharing and the theory of planned behavior: a meta-analysis review. VINE Journal of Information and Knowledge Management Systems, 51(2), 236–258. https://doi-org.proxy1.cl.msu.edu/10.1108/VJIKMS-02-2019-0023

Aito, S., D'Andrea, M., & Werhagen, L. (2005). Spinal cord injuries due to diving accidents. Spinal Cord, 43, 109-116.

Ajzen, I. (1991). The Theory of Planned Behavior. Organizational Behavior and Human Decision Processes 50, 179-211. Academic Press, Inc.

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. Psychology & Health, 26(9), 1113–1127.

Ajzen, I. (2020). The theory of planned behaviour: Frequently asked questions. Human Behavior and Emerging Technologies, 2(4), 314-324. https://doi.org/10.1002/hbe2.195

Ajzen, I., Joyce, N., Sheikh, S., & Cote, N. (2011). Knowledge and the Prediction of Behavior: The Role of Information Accuracy in the Theory of Planned Behavior. Basic & Applied Social Psychology, 33(2), 101–117. https://doi-org.proxy2.cl.msu.edu/10.1080/01973533.2011.568834

Ajzen, I., Albarracín, D. (2007). Predicting and changing behavior: a reasoned action approach. In: Ajzen I, Albarracín D, Hornik R, editors. Prediction and change of health behavior. Mahwah: Lawrence Erlbaum; p. 3–21.

American Red Cross. (2009). Water Safety poll. Retrieved from: http://www.redcross.org/ portal/site/en/menuitem.94aae335470e233f6cf911df43181aa0/?vgnextoid=3781a934e1e51210Vgn VCM10000089f0870aRCRD.

American Red Cross. (n.d.). Drowning Prevention & Facts. Retrieved from: https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/water-safety/drowning-prevention-and-facts.html

Araiza-Alba, P., Keane, T., Matthews, B., Simpson, K., Strugnell, G., Chen, W. S., & Kaufman, J. (2021). The potential of 360-degree virtual reality videos to teach water-safety skills to children. Computers and Education, 163https://doi.org/10.1016/j.compedu.2020.104096

Arthur, W., Bennett, W., Stanush, P.L., McNelly, T.L. (1998). Factors that influence skill decay and retention: a quantitative review and analysis. Hum. Perform. 11 (1), 57–101.

Ateş, H. (2021). Understanding Students' and Science Educators' Eco- Labeled Food Purchase Behaviors: Extension of Theory of Planned Behavior with Self-Identity, Personal Norm, Willingness to Pay, and Eco-Label Knowledge, Ecology of Food and Nutrition, 60:4, 454-472, DOI: 10.1080/03670244.2020.1865339

Australian Water Safety Council. (2016). Australian Water Safety Strategy Consultation Draft 2016-20. Australian Water Safety Council, Sydney.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147

Bandura, A. (1997). Self-efficacy: The exercise of control. New York, NY: Freeman

Barker R, Spinks D, Hockey R, Pitt R. (2003). Pool Fencing Legislation in Australia in 2003: The Way Forward. Brisbane: Queensland Injury Surveillance Unit.

Barwood, M.J., Bates, V., Long, G., & Tipton, M.J. (2011). "Float first": Trapped air between clothing layers significantly improves buoyancy after immersion. International Journal of Aquatic Research and Education 5(2), 147-163.

Bergman, A.B., Rivara, F.P., Richards D.D., et al. (1990). The Seattle children's bicycle helmet campaign. Am J Dis Child;144:727–31.

Bierens, J. J. L. M. (2006). Drowning: Prevention, Rescue, Treatment.

Birch, R., Matthews, B., Petrass, L. and Blitvich, J. (2015) The Before School Swimming and Water Safety Pilot Program: An innovative approach to provide Victorian primary school children with swimming and water safety education. Life Saving Victoria: Port Melbourne

Blitvich, J.D., Mc Elroy, G.K., Blanksby, B.A., & Douglas, G.A. (1999). Characteristics of 'low risk' and 'high risk' dives by young adults: Risk reduction in spinal cord injury. Spinal Cord, 37, 553-9.

Blum, C., Shield, J. (2000). Toddler drowning in domestic swimming pools. Inj. Prev; 6: 288–90.

Bo-Hyun Seong, & Chang-Yu Hong. (2021). Does Risk Awareness of COVID-19 Affect Visits to National Parks? Analyzing the Tourist Decision-Making Process Using the Theory of Planned Behavior. International Journal of Environmental Research and Public Health, 18(5081), 5081. https://doi-org.proxy2.cl.msu.edu/10.3390/ijerph18105081

Bornschlegl, M., Townshend, K., Caltabiano, N. (2021). Application of the Theory of Planned Behavior to Identify Variables Related to Academic Help Seeking in Higher Education. Frontiers in Education, 6. https://doi-org.proxy2.cl.msu.edu/10.3389/feduc.2021.738790

Branche, C.M., Sniezek, J.E., Sattin, R.W., & Mirkin IR. (1991). Water recreation-related spinal injuries: Risk factors in natural bodies of water. Accident Analysis & Prevention 23(1), 13-17.

Branche CM, Stewart S. (Editors). Lifeguard Effectiveness: A Report of the Working Group. Atlanta: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2001.

Branche C.M., Dellinger A.M., Sleet D.A., Gilchrist J., Olson S.J. (2004). Unintentional injuries: the burden, risks and preventive strategies to address diversity. In: Livingston IL, editor. Praeger handbook of Black American health (2nd edition): Policies and issues behind disparities in health. Westport (CT): Praeger Publishers. p. 317-27.

Brander RW, Warton N, Franklin RC, Shaw WS, Rijksen EJT, Daw S (2019) Characteristics of aquatic rescues undertaken by bystanders in Australia. PLoS ONE 14(2): e0212349. https://doi.org/10.1371/journal. pone.0212349

Brenner, R.A. (2002). Childhood drowning is a global concern. BMJ 2002; 324: 1049–50.

Bugeja, L., Cassell, E., Brodie L.R., Walter S.J. (2014). Effectiveness of the 2005 compulsory personal flotation device (PFD) wearing regulations in reducing drowning deaths among recreational boaters in Victoria, Australia. Injury Prevention, 23 June. doi: 10.1136/injuryprev-2014-041169.

Byard, R.W., Lipsett, J. (1999). Drowning deaths in toddlers and preambulatory children in South Australia. Am. J. Forensic Med. Pathol; 20: 328–32.

Canadian Safe Boating Council. (n.d.). Cold Water Awareness. 1-10-1 Principle. Retrieved from: https://csbc.ca/en/1-10-1-principle

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. [cited 2012 May 3]. Available from: URL: http://www.cdc.gov/injury/wisqars.

Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2013). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (producer). Available from: URL: www.cdc.gov/ncipc/wisqars. [2015/3/30].

Centers for Disease Control and Prevention (CDC). (2014). Drowning. Retrieved from http:// www.cdc.gov/healthcommunication/ToolsTemplates/EntertainmentEd/Tips/Drowning.html

Centers for Disease Control and Prevention (CDC). (2016). Unintentional Drowning: Get the

Facts. Retrieved from http://www.cdc.gov/homeandrecreationalsafety/water-safety/waterinjuries-factsheet.html

CDC. (2016). Wide-ranging online data for epidemiologic research (WONDER). Atlanta, GA: CDC, National Center for Health Statistics; Available at http://wonder.cdc.gov

Cheng, P.-Y. (2015). University Lecturers' Intention to Teach an Ethics Course: A Test of Competing Models. Journal of Business Ethics, 126(2), 247–258.

Chase N.L., Sui X., Blair S.N. 2008. Swimming and all-cause mortality risk compared with running, walking, and sedentary habits in men. Int J of Aquatic Res and Educ. 2(3): 213-23.

Chen, L., Chen, L., Fox, K. R., Fox, K. R., Ku, P., Ku, P., . . . Chang, Y. (2016). Effects of aquatic exercise on sleep in older adults with mild sleep impairment: A randomized controlled trial. International Journal of Behavioral Medicine, 23(4), 501-506. doi:10.1007/s12529-015-9492-0

CIPRB. (n.d.) News and Events. SwimSafe. Retrieved from: https://www.ciprb.org/swimsafe/

Clapham, E., Armitano, C., Lamont, L., Audette, J. (2014) The Ocean as a Unique Therapeutic Environment: Developing a Surfing Program, Journal of Physical Education, Recreation & Dance, 85:4, 8-14, DOI: 10.1080/07303084.2014.884424

Conatser, P., Block, M., & Gansneder, B. (2002). Aquatic Instructors' Beliefs Toward Inclusion: The Theory of Planned Behavior. Adapted Physical Activity Quarterly, 19(2), 172. https://doi-org.proxy2.cl.msu.edu/10.1123/apaq.19.2.172

Conover, K., & Romero, S. (2018). Drowning prevention in pediatrics. Pediatric Annals, 47(3), e112-e117. https://doi.org/10.3928/19382359-20180220-02

Connolly, J. (2014). Drowning: The exit problem. International Journal of Aquatic Research and Education, 8(1), 73-97.

Cugusi, L., Cadeddu, C., Nocco, S., Orrù, F., Bandino, S., Deidda, M., . . . Mercuro, G. (2015). Effects of an aquatic-based exercise program to improve cardiometabolic profile, quality of life, and physical activity levels in men with type 2 diabetes mellitus. Pm & r, 7(2), 141-148. doi:10.1016/j.pmrj.2014.09.004

Cumming, I., New, K. (2017) Are Adolescent Competitive Swimmers Cleverer? The impact of competitive swimming and swimming training on cognitive function. Retrieved from: http://www.swimming.org/assets/Are-Adolescent-Swimmers-Cleverer.pdf

Cummings, P., Mueller, B.A., Quan, L. (2011). Association between wearing a personal floatation device and death by drowning among recreational boaters: a matched cohort analysis of United States Coast Guard data, Injury Prevention,17:156–9.

Dail, T., Smith, C. (2016) Swimming and Children with Attention- Deficit Hyperactive Disorder: A Winning Combination, Journal of Physical Education, Recreation & Dance, 87:8, 16-20, DOI: 10.1080/07303084.2016.1216486

Darwin, G. H. (1898). The Tides and Kindred Phenomena in the Solar System. London: John Murray. pp. 21–31.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982– 1003.

Deci, E. & Ryan, R.M., (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. Psychological Inquiry. Vol. 11, No. 4, 227-268.

Demirbag, M. & Yilmaz, S. (2020). Preservice teachers' knowledge levels, risk perceptions and intentions to use renewable energy: A structural equation model. Journal of Education in Science, Environment and Health (JESEH), 6(3), 193-206. DOI:10.21891/jeseh.625409

Denny, S.A., Quan, L., Gilchrist, J., McCallin, T., Shenoi, R., Yusuf, S., Hoffman, B., Weiss, J. and COUNCIL ON INJURY, VIOLENCE, AND POISON PREVENTION. (2019). Prevention of Drowning. Pediatrics. 143 (5) e20190850; DOI: https://doi.org/10.1542/peds.2019-0850

Driscoll, T.R., Harrison, J.A., Steenkamp, M (2004). Review of the role of alcohol in drowning associated with recreational aquatic activity. Injury Prevention;10:107–113.

Edmond K.M., Attia J.R., Deste C.A., Condon J.T., (2001). Drowning and near-drowning in Northern Territory children. Med. J. Aust. 175: 605–8.

Felton, H., Myers, J., Liu, G., et al (2015). Unintentional, non-fatal drowning of children: US trends and racial/ethnic disparities. BMJ Open. 5:e008444. doi:10.1136/bmjopen-2015-008444

Ferrer, R., Klein, W. (2015) Risk perceptions and health behavior. Curr Opin Psychol. 2015 Oct 1; 5: 85–89.

Field, G. (Under Review). Water Safety Education in Michigan. Exploring the water safety knowledge, competencies, and experiences of third grade youth in Michigan. [Manuscript in preparation].

Fishbein, M., Ajzen, I. (2010). Predicting and Changing Behavior : The Reasoned Action Approach. Psychology Press.

Franklin, R. C., & Pearn, J. H. (2011). Drowning for love: The aquatic victim-instead-of-rescuer syndrome: Drowning fatalities involving those attempting to rescue a child. Journal of Paediatrics and Child Health, 47(1-2), 44-47. https://doi.org/10.1111/j.1440-1754.2010.01889.x

Fu, X. (2021). How habit moderates the commute mode decision process: integration of the theory of planned behavior and latent class choice model. Transportation: Planning - Policy - Research - Practice, 48(5), 2681–2707. https://doi-org.proxy2.cl.msu.edu/10.1007/s11116-020-10144-6

Giesbrecht, G.G., & McDonald, G.K. (2011). Exit strategies and safety concerns for machinery occupants following ice failure and submersion. Aviation Space Environmental Medicine 82(1), 52-57.

Gilchrist, J., Parker, E.M. (2014). Racial/ethnic disparities in fatal unintentional drowning among persons aged ≤29 years—United States, 1999–2010. MMWR;63:421–6.

Gkargkavouzi, A., Halkos, G., & Matsiori, S. (2019). Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit. Resources, Conservation & Recycling, 148, 145–156. https://doi-org.proxy2.cl.msu.edu/10.1016/j.resconrec.2019.01.039

Godin, G. and Kok, G. (1996), "The theory of planned behavior: a review of its applications to health-related behaviors", American Journal of Health Promotion, Vol. 11 No. 2, pp. 87-98.

Goldfish Swim School. (n.d.). Top 5 Reasons Why Goldfish Swim School Is Worth The Money. Retrieved from: https://www.goldfishswimschool.com/blog/2014/july/top-5-reasons-why-goldfish-swim-school-is-worth-/

Golob, M. I., Giles, A. R., & Rich, K. M. (2013). Enhancing the relevance and effectiveness of water safety education for ethnic and racial minorities. International Journal of Aquatic Research and Education, 7(1), 39-55.

Goodhue, D.L., Lewis, W., and Thompson, R. (2012). Does PLS have advantages for small sample size or non-normal data? MIS Quarterly, 36(3), 981-1001.

Gorsuch, M.M., Myers, S.L., Lai, Y…(2018). Vanishing racial disparities in drowning in Florida. Inj Prev;23.

Great Lakes Surf Rescue Project. (2020). Drowning Database.

Great Lakes Surf Rescue Project (GLSRP). (n.d.). Flip, Float, and Follow - Great Lakes Surf Rescue Project. (2016). Retrieved December 17, 2016, from http://www.glsrp.org/flip-float-follow

Great Lakes Surf Rescue Project. (n.d.). Statistics. Retrieved from: http://www.glsrp.org/statistics/

Great Schools. (n.d.). Michigan Schools. Retrieved from; https://www.greatschools.org/michigan/

Green, S. B. (1991). How many subjects does it take to do a regression analysis? Multivariate Behavioral Research, 26, 499-510

Guan, J., & Li, G. (2017). Injury Mortality in Individuals With Autism. American journal of public health, 107(5), 791–793. https://doi.org/10.2105/AJPH.2017.303696

Guerin, R. J., Toland, M. D., Okun, A. H., Rojas, G. L., Baker, D. S., & Bernard, A. L. (2019). Using a Modified Theory of Planned Behavior to Examine Teachers' Intention to Implement a Work Safety and Health Curriculum. Journal of School Health, 89(7), 549–559.

HOUSE BILL NO. 963, HLS 22RS-1733, 2022 Reg. Sess. (Louisiana, 2022). https://www.legis.la.gov/Legis/ViewDocument.aspx?d=1266141

Hashim, H. A., Jawis, M. N., Wahat, A., & Grove, J. R. (2014). Children's exercise behavior: The moderating role of habit processes within the theory of planned behavior. Psychology, Health & Medicine, 19(3), 335–343. https://doi-org.proxy2.cl.msu.edu/10.1080/13548506.2013.808751

Jiaqi Huang, Gerrit Antonides, & Fengying Nie. (2020). Social-Psychological Factors in Food Consumption of Rural Residents: The Role of Perceived Need and Habit within the Theory of Planned Behavior. Nutrients, 12(1203), 1203. https://doi-org.proxy2.cl.msu.edu/10.3390/nu12041203

Hair, J.F., Ringle, C.M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. The Journal of Marketing Theory and Practice, 19(2), 139-152.

Herman, J. & Sonntag, V. (1991). Diving accidents: Mechanism of injury and treatment of the patient. Critical Care Nursing Clinics of North America, 3(2), 331-337.

Hopkins, B., Kilbride, T., & Strunk, K. O. (2021). Trends in Michigan's K-12 public school teaching workforce. Education Policy Innovation Collaborative. https://epicedpolicy.org/wp-content/uploads/2021/05/Teacher_Workforce_Pol_Brief_May2021.pdf

Hong, J., Lee, B., Ha, E. H., & Park, H. (2010). Parental socioeconomic status and unintentional injury deaths in early childhood: consideration of injury mechanisms, age at death, and gender. Accident Analysis and Prevention, 42(1), 313-319.

Howland, J., Hingson, R., Mangione, T. W., Bell, N., & Bak, S. (1996). Why are most drowning victims men? sex differences in aquatic skills and behaviors. American Journal of Public Health (1971), 86(1), 93-96. doi:10.2105/AJPH.86.1.93

Howlett N, Schulz J, Trivedi D, Troop N, Chater A. Determinants of weekly sitting time: construct validation of an initial COM-B model and comparison of its predictive validity with the Theory of Planned Behaviour. Psychology & Health. 2021;36(1):96-114. Accessed February 9, 2023. https://search-ebscohost-com.proxy2.cl.msu.edu/login.aspx?direct=true&db=sph&AN=148111798&site=eds-live

Illinois State Geological Survey. (n.d.). Seiches: Sudden, Large Waves a Lake Michigan Danger. University of Illinois Prairie Research Institute. Retrieved from; https://isgs.illinois.edu/seiches-sudden-large-waves-lake-michigan-danger

Inflation Tool. (n.d.) Value of 1990 US Dollars Today. Retrieved from; https://www.inflationtool.com/us-dollar/1990-to-present-value?amount=1

Institute for Health Metrics and Evaluation. (2018) Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2017 (GBD 2017) Results. Seattle, United States. Retrieved from:http://ghdx.healthdata.org/gbd-results-tool

International Drowning Research Centre. (n.d.) Bangladesh. Child Drowning in Bangladesh: Fact Sheet. Retrieved from: http://swimsafe.org/wp-content/uploads/2009/08/Child-Drowning-in-Bangladesh-fact-sheet.pdf

International Life Saving Federation (ILSF). (2003) Facts About Drowning. Retrieved from: https://www.ilsf.org/2003/09/25/facts-about-drowning/

International Life Saving Federation (ILSF). (n.d.) Drowning Facts and Figures. Retrieved from: https://www.ilsf.org/drowning-facts-and-figures/

Irwin, C., Irwin, R., Ryan, T., & Drayer, J. (2009a). The mythology of swimming: Are myths impacting minority youth participation? International Journal of Aquatic Research and Education, 3(1), 10-23.

Irwin, C. C., Irwin, R. L., Ryan, T. D., & Drayer, J. (2009b). Urban minority youth swimming (in)ability in the United States and associated demographic characteristics: toward a drowning prevention plan. Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention, 15(4), 234–239. https://doi.org/10.1136/ip.2008.020461

Irwin, C. C., Pharr, J. R., Irwin, R. L., & Layne, T. E. (2018). Youth swimming ability and associated factors in the united states, 2010-17. American Journal of Health Behavior, 42(5), 32-42. https://doi.org/10.5993/AJHB.42.5.3

Janssen, I., LeBlanc, A. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. International Journal of Behavioral Nutrition and Physical Activity. doi: 10.1186/1479-5868-7-40

Johnson, R.T., Johnson, D.W. (1986). Action research: cooperative learning in the science classroom. Sci. Child. 24 (2), 31–32.

Jones, M. (2020) Upwelling And Its Impact On Lake Michigan. Spectrum 1 News. Retrieved from: https://spectrumnews1.com/wi/madison/wisconsin-weather-blog/2020/08/05/wisconsin-weather-blog-upwelling-and-its-impact-on-lake-michigan\

Jorgensen, R., (2013). Early-years Swimming. Adding Capital to Young Australians, Final Report. Griffith Institute for Educational Research.

Katchmarchi, A. (2017). A Delphi on Drowning Prevention Education Research. College of Physical Activity and Sport Sciences at West Virginia University.

Katchmarchi, A. B., Taliaferro, A. R., & Kipfer, H. J. (2018). A document analysis of drowning prevention education resources in the united states. International Journal of Injury Control and Safety Promotion, 25(1), 78-84. doi:10.1080/17457300.2017.1341932

KITAMURA, T., IWAMI, T., KAWAMURA, T., NAGAO, K., TANAKA, H., HIRAIDE, A., & Implementation Working Group for All-Japan Utstein Registry of the Fire and Disaster Management Agency. (2010). Bystander-initiated rescue breathing for out-of-hospital cardiac arrests of noncardiac origin. Circulation (New York, N.Y.), 122(3), 293-299. https://doi.org/10.1161/CIRCULATIONAHA.109.926816

Kline, R.B. (2010). Principles and practice of structural equation modeling. Guilford Press, New York.

Kline, R. B. (2016). Principles and practice of structural equation modeling (4th ed.). Guilford Press.

Koh, H., & Mackert, M. (2016). A study exploring factors of decision to text while walking among college students based on Theory of Planned Behavior (TPB). Journal of American College Health, 64(8), 619–627. https://doi-org.proxy2.cl.msu.edu/10.1080/07448481.2016.1215986

La Barbera, F., Ajzen, I. (2020). Control Interactions in the Theory of Planned Behavior: Rethinking the Role of Subjective Norm. Eur J Psychol. Aug 31;16(3):401-417. doi: 10.5964/ejop.v16i3.2056. PMID: 33680190; PMCID: PMC7909507.

Lapinski, M. Viken G. (2014). Great Lakes Swim Safety Risk Communication for 18-24 year-old Males: Review of Key Literature and Results of a Focus Group Study Final Report. Submitted to: Michigan Sea Grant and the Michigan Department of Environmental Quality Coastal Management Program. Retrieved from; https://www.michiganseagrant.org/wp-content/blogs.dir/1/files/2013/02/14-207-Lapinski-Viken_RiskReport_July-2014.pdf

Leavy, J.E., Crawford, G., Portsmouth, L. et al. (2015) Recreational Drowning Prevention Interventions for Adults, 1990–2012: A Review. J Community Health 40, 725–735. https://doi-org.proxy1.cl.msu.edu/10.1007/s10900-015-9991-6

Lee, C., Middlestadt, S., Seo, D.C., Lin, H., Macy, J., Park, S. (2018). Incorporating environmental variables as precursor background variables of the theory of planned behavior to predict quitting-related intentions: a comparative study between adult and young adult smokers. Archives of Public Health, 76(1), 1–9. https://doi-org.proxy2.cl.msu.edu/10.1186/s13690-018-0311-3

Lenski, A. E., Richter, D., & Lüdtke, O. (2019). Using the theory of planned behavior to predict teachers' likelihood of taking a competency-based approach to instruction. *European Journal of Psychology of Education*, *34*(1), 169–186.

Linnan, Michael, et al. (2012). 'Child Drowning: Evidence for a newly recognized cause of child mortality in low and middle income countries in Asia', Working Paper 2012-07, Special Series on Child Injury No. 2. Florence: UNICEF Office of Research.

Lhatoo, S.D., Sander, JWAS (2005). Cause-specific mortality in epilepsy. Epilepsia 2005; 46(Suppl. 11):36–39.McCool, J.P., Moran, K., Ameratunga, S., & Robinson, E. (2008). New Zealand beachgoers' swimming behaviors, swimming abilities and perception of drowning risk. International Journal of Aquatic Research and Education, 2(1), 7–15.

Lumpe, A. T., Haney, J. J., & Czerniak, C. M. (2000). Assessing teachers' beliefs about their science teaching context. Journal of Research in Science Teaching, 37(3), 275–292.

Mack, J. (2019). Where Michigan Children Attended School in 2016-17 - Public and Private. Mlive report on US Census Data. Retrieved from; https://www.mlive.com/news/2017/09/where_michigan_children_attend.html

Madeleine Bornschlegl, Kishani Townshend, & Nerina Jane Caltabiano. (2021). Application of the Theory of Planned Behavior to Identify Variables Related to Academic Help Seeking in Higher Education. Frontiers in Education, 6. https://doi-org.proxy2.cl.msu.edu/10.3389/feduc.2021.738790

McCallin, T., Morgan, M., Camp, E. A., & Yusuf, S. (2020). A pilot study on water safety education of providers and caregivers in outpatient pediatric clinical settings to increase drowning prevention knowledge. Clinical Pediatrics, 59(4-5), 490-495. https://doi.org/10.1177/0009922820903412

McCool, J. P., Moran, K., Ameratunga, S., and Robinson, E. (2008). New Zealand beachgoers' swimming behaviours, swimming abilities, and perception of drowning risk. International Journal of Aquatic Research and Education: Vol. 2 : No. 1 , Article 2. DOI: https://doi.org/10.25035/ijare.02.01.02

McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviors with the theory of planned behavior: A meta-analysis. Health Psychology Review, 5(2), 97–144. https://doi.org/10.1080/ 17437199.2010.521684.

MacKay J.M., Steel A., Dykstra H. (2016). Dangerous Waters: Profiles of fatal child drowning in the U.S. 2005-2014. Washington, DC: Safe Kids Worldwide, June 2016. Available at: www.safekids.org

McKay, C., Brander, R.W., & Goff, J. (2014). Putting tourists in harm's way - coastal tourist parks and hazardous unpatrolled surf beaches in New South Wales, Australia. Tourism Management, 45, 71-84.

Mecrow, T. S., Rahman, A., Linnan, M., Scarr, J., Mashreky, S. R., Talab, A., & Rahman, A K M Fazlur. (2015). Children reporting rescuing other children drowning in rural bangladesh: A descriptive study. Injury Prevention, 21(e1), e51-e55. https://doi.org/10.1136/injuryprev-2013-041015

MI School Data. (n.d.) Student Enrollment Counts. Retrieved from; https://www.mischooldata.org/student-enrollment-counts-report/

MI School Data. (n.d.) Staffing Count. Retrieved from; https://www.mischooldata.org/staffing-count/

Michigan Department of Education. (2016). Michigan Physical Education and Physical Activity Summary Report, 2014. Lansing, MI.

Michigan Department of Education. (2016). Third Grade Physical Education Grade Level Content Standards. Lansing, MI.

Michigan Economic Development Corporation. (n.d.). Michigan Tourism Facts. Retrieved from: https://web.archive.org/web/20161015171535/http://www.michigan.org/michigan-tourism-facts

Michigan Economic Development Corporation. (n.d.). Prosperity Region Initiative. Retrieved from; https://www.michiganbusiness.org/about-medc/regional-prosperity-initiative/

Michigan Sea Grant. (n.d.) Retrieved from; https://www.michiganseagrant.org/topics/coastal-hazards-and-safety/dangerous-currents/

Minnesota Department of Education. (2022). Minnesota Youth Water Safety – State – State Fiscal Year 22-23.

Mohajeri, M., Ardeshir, A., Malekitabar, H., Rowlinson, S. (2021). Structural Model of Internal Factors Influencing the Safety Behavior of Construction Workers. Journal of Construction Engineering and Management 147(11):04021156 DOI:10.1061/(ASCE)CO.1943-7862.0002182

Montelpare, W.J., Read, E., McComber, T., Mahar, A., Ritchie, K. (n.d.). *Applied Statistics in Healthcare Research*. Creative Commons Attribution-Non-Commercial - No Derivatives 4.0 International License, except where otherwise noted. Retrieved from; https://pressbooks.library.upei.ca/montelpare/

Moran, K. (2003). New Zealand youth water safety survey. Wellington: Water Safety New Zealand.

Moran, K. (2006). Re–thinking drowning risk: The role of water safety knowledge, attitudes and behaviours in aquatic recreation of New Zeland youth (Doctor of Philosophy Dissertation). Massey University, Palmerston North, New Zealand.

Moran, K. (2008). Will they sink or swim? New Zealand youth water safety knowledge and skills. International Journal of Aquatic Research and Education, 2(2), 114-127.

Moran, K. (2009). sdInternational Journal of Injury Control and Safety Promotion, 16:4, 215-221, DOI: 10.1080/17457300903307045

Moran, K. (2010). Risk of drowning: The iceberg phenomenon re-visited. International Journal of Aquatic Research and Education, 4(2), 115–126.

Moran, K. (2011a). (Young) Men behaving badly: dangerous masculinities and risk of drowning in aquatic leisure activities, Annals of Leisure Research, 14:2-3, 260-272, doi: 10.1080/11745398.2011.615719

Moran, K. (2011b). Rock-based fisher safety promotion: Five years on. International Journal of Aquatic Research and Education, 5(2), 164–173.

Moran, K., Podstawski, R., Mańkowski, S., Choszcz, D., & Sarevic, Z. (2017). Socioeconomics influences on the water competencies of young adult polish males. Physical Culture and Sport Studies and Research, 74(1), 19-33. doi:10.1515/pcssr-2017-0014

Moran, K., Stanley, T. (2013). Readiness to Rescue: Bystander Perceptions of Their Capacity. to Respond in a Drowning Emergency. International Journal of Aquatic Research and Education: Vol. 7 : No. 4 , Article 3. doi: https://doi.org/10.25035/ijare.07.04.03

Moran, K., Webber, J., & Stanley, T. (2017). The 4Rs of aquatic rescue: Educating the public about safety and risks of bystander rescue. International Journal of Injury Control and Safety Promotion, 24(3), 396-405. https://doi.org/10.1080/17457300.2016.1224904

Moran, K., & Gilmore, A. (2018). Children's understanding of water safety and perceptions of risk at the beach. New Zealand Journal of Educational Studies, 53(2), 227-239. https://doi.org/10.1007/s40841-018-0118-3

Morgan, D., Ozanne-Smith, J., & Triggs, T. (2008). Descriptive epidemiology of drowning deaths in a surf beach swimmer and surfer population. Injury Prevention, 14, 62-65.

Morgan, D., Ozanne-Smith, J., & Triggs, T. (2009). Direct observation measurement of drowning risk exposure for surf beach bathers. Journal of Science and Medicine in Sport, 12(4), 457-462.

National Center for Education Statistics. (2017). Selected Statistics From the Public Elementary and Secondary Education Universe: School Year 2015–16. Retrieved from; https://nces.ed.gov/pubs2018/2018052/tables/table_04.asp

National Center for Education Statistics. (n.d.). Fast Facts. Back to School Statistics. Retrieved from; https://nces.ed.gov/fastfacts/display.asp?id=372

National Center for Education Statistics. (n.d.b). Locale Lookup. Retrieved from; https://nces.ed.gov/programs/maped/LocaleLookup/

National Center for Education Statistics. (n.d.c). Local Classifications and Criteria. Retrieved from; https://nces.ed.gov/programs/edge/docs/LOCALE_DEFINITIONS.pdf

National Fire Protection Association (n.d.). Public Education. Retrieved from; https://www.nfpa.org/Public-Education/Teaching-tools/Educational-messaging

National Oceanic and Atmospheric Administration. (2020a). What is Upwelling? Retrieved from:https://oceanservice.noaa.gov/facts/upwelling.html

National Oceanic and Atmospheric Administration. (2020b). Great Lakes Statistics. Average Surface Water Temperature from the Great Lakes Surface Environmental Analysis (GLSEA) Retrieved from; https://coastwatch.glerl.noaa.gov

Nixon, J., Pearn, J., Wilkey, I., Corcoran, A. (1986). Fifteen years of child drowning – a 1967–1981 analysis of all fatal cases from The Brisbane Drowning Study and an 11 year study of consecutive near-drowning cases. Accid. Anal. Prev; 18: 199–203.

Ouellette, J. / Wood, W. (1998): Habit and intention in everyday life: the multiple processes by which past behaviour predicts future behaviour; in: Psychological Bulletin, Vol. 124, pp. 54-74.

Pajunen, T., Vuori, E., Vincenzi, F.F. et al. Unintentional drowning: Role of medicinal drugs and alcohol. BMC Public Health 17, 388 (2017). https://doi.org/10.1186/s12889-017-4306-8

Patrick Curran. (2017, November 15). *SEM Episode 6: Advanced Topics.* [Video] YouTube. https://www.youtube.com/watch?v=ihQ4iHtFREw

Pechter, Ü., Raag, M. & Ots-Rosenberg, M. (2014). Regular aquatic exercise for chronic kidney disease patients. International Journal of Rehabilitation Research, 37(3), 251–255. doi: 10.1097/MRR.0000000000000063.

Peden, A., Franklin, R. (2012). BENCHMARKING AUSTRALIAN CHILDREN'S SWIMMING AND WATER SAFETY SKILLS AND KNOWLEDGE: CHALLENGES AND LESSONS LEARNT. Injury Prevention;18:A68.

Peden AE, Willcox-Pidgeon S Autism spectrum disorder and unintentional fatal drowning of children and adolescents in Australia: an epidemiological analysis Archives of Disease in Childhood 2020;105:869-874.

People Pulse. (n.d.) SURVEY RESPONSE RATES. Tips On How To Increase Your Survey Response Rates. Retrieved from; https://peoplepulse.com/resources/useful-articles/survey-response-

rates/#:~:text=Internal%20Survey%20Response%20Rates&text=Internal%20surveys%20will%20generally%20receive,response%20rate%20for%20external%20surveys.

Peng, D.X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. Journal of Operations Management, 30(6), 467-480.

Perkins, D., Borden, L. & Villarruel, F. (2001). Community Youth Development: A Partnership for Action Community Youth Development: A Partnership for Action. School Community Journal. 11.

Petrass, L. A., & Blitvich, J. D. (2014). Preventing adolescent drowning: Understanding water safety knowledge, attitudes and swimming ability. the effect of a short water safety intervention. Accident Analysis and Prevention, 70, 188-194. https://doi.org/10.1016/j.aap.2014.04.006

Pitts, L. (2007) Black Splash: The History of African-American Swimmers. The International Swimming Hall of Fame.

Queiroga, AC & Peden, A (2013a) A 10 year analysis of drowning in children and adolescents aged 5-19 years in Australia: The Forgotten 50%. Royal Life Saving Society – Australia, Sydney

Queiroga, A.C., Peden, A. (2013b). Drowning Deaths in Older People: A 10-Year analysis of drowning deaths in people aged 50 years and over in Australia.

Ramos, W. D., Greenshields, J. T., Knee, E. N., Kreitl, B. K., & Espirito, K. J. (2018). Drowning prevention: Assessment of a classroom-based water safety education program in vietnam. Asia-Pacific Journal of Public Health, 30(5), 470-478. https://doi.org/10.1177/1010539518784396

Rahmafitria, F., Suryadi, K., Oktadiana, H., Putro, H. P. H., & Rosyidie, A. (2021). Applying knowledge, social concern and perceived risk in planned behavior theory for tourism in the Covid-19 pandemic. Tourism Review, 76(4), 809–828. https://doi-org.proxy2.cl.msu.edu/10.1108/TR-11-2020-0542

Riebl, S.K., Estabrooks, P.A., Dunsmore, J.C., Savla, J., Frisard, M.I., Dietrich, A.M. and Davy, B.M. (2015), "A systematic literature review and meta-analysis: the theory of planned behavior's application to understand and predict nutrition-related behaviors in youth", Eating Behaviors, Vol. 18, pp. 160-178.

Royal Lifesaving. (2018). National Drowning Report 2018. Research and Policy Highlights. Royal Life Saving Australia. Australian Government. Retrieved from: https://www.royallifesaving.com.au/__data/assets/pdf_file/0004/23197/RLS_N-DR2018_ReportLR.pdf

Royal Life Saving Society – Australia. (2011). Swim and Survive Aquapak: A guide for swimming and water safety teachers. Royal Life Saving Society – Australia, Sydney, Australia.

Royal Life Saving Society – Australia (2020) Royal Life Saving National Drowning Report 2020, Sydney Australia.

Safe Kids Worldwide. (2016). Keeping Kids Safe In and Around Water: Exploring Misconceptions That Lead to Drowning. Retrieved from: http:// www.safekids.org/ research-report/keeping-kids-safe-and-around-water-exploring- misconceptions-lead-drowning.

Sakulrak, S., Kerdsomnuk, S., & Sriwan, S. (2016). 1012 Situations of child drowning and prevention by "Merit maker" team in surin province. Injury Prevention, 22(Suppl 2), A360-A361. https://doi.org/10.1136/injuryprev-2016-042156.1012

Sandomierski, M. C., Morrongiello, B. A., & Colwell, S. R. (2019). S.A.F.E.R. near water: An in tervention targeting parent beliefs about children's water safety. Journal of Pediatric Psychology, 44(9), 1034-1045. https://doi.org/10.1093/jpepsy/jsz042

Schmiege, S.J., Bryan, A., Klein, W.M.P. (2009). Distinctions between worry and perceived risk in the context of the theory of planned behavior. J Appl Soc Psychol. 39(1):95–119. https://doi.org/10.1111/j.1559-1816.2008.00431.x.

Seong,B.-H.;Hong,C.-Y. Does Risk Awareness of COVID-19 Affect Visits to National Parks? Analyzing the Tourist Decision- Making Process Using the Theory of Planned Behavior. Int. J. Environ. Res. PublicHealth2021,18,5081. https:// doi.org/10.3390/ijerph18105081

Sherr, L. (2013). Swim - Why We Love the Water. The Perseus Books Group.

Sommer, L. (2011). The Theory Of Planned Behaviour And The Impact Of Past Behaviour. International Business & Economics Research Journal (IBER), 10(1). https://doi.org/10.19030/iber.v10i1.930

Stanley, T., & Moran, K. (2017). Parental perceptions of water competence and drowning risk for themselves and their children in an open water environment. International Journal of Aquatic Research and Education, 10(1), Article 4. Published online 9 February 2017, at: http://scholarworks.bgsu.edu/ijare/vol10/iss1/4

Statistica. (n.d.). Rate of deaths due to drowning in the United States from 1905 to 2018 (per 100,000 population)*. Retrieved from; https://www.statista.com/statistics/527366/death-rate-due-to-drowning-in-the-us/

Stempski, S., Liu, L., Grow, H. M., Pomietto, M., Chung, C., Shumann, A., & Bennett, E. (2015). Everyone swims: A community partnership and policy approach to address health disparities in drowning and obesity. Health Education & Behavior, 42(1_suppl), 106S-114S. doi:10.1177/1090198115570047

Stringhini, S., Carmeli, C., Jokela, M., Avendaño, M., Muennig, P., Guida, F. et al., (2017). Socioeconomic status and the 25 × 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 1·7 million men and women. Lancet (published online Jan 31.) http://dx.doi.org/10.1016/S0140-6736(16)32380-7.

Strong, W. B., Malina, R. M., Blimkie, C. J., Daniels, S. R., Dishman, R. K., Gutin, B., ... & Trudeau, F. (2005). Evidence based physical activity for school-age youth. The Journal of Pediatrics, 146(6), 732-737.

Stirbu, I., Kunst, A.E., Bos, V., &van Beeck, E.F. (2006). Injury mortality among ethnic minority groups in the Netherlands. Journal of Epidemiology and Community Health, 60(3), 249–255. PubMed doi:10.1136/jech.2005.037325

Sur, M. H., Jung, J., & Shapiro, D. R. (2022). Theory of planned behavior to promote physical activity of adults with physical disabilities: Meta-analytic structural equation modeling. Disability and Health Journal, 15(1). https://doiorg.proxy1.cl.msu.edu/10.1016/j.dhjo.2021.101199

Surf Life Saving Australia. (2016). National Coastal Safety Report 2016. Sydney (AUST): SLS Australia.

Surf Life Saving Australia (2019) National Coastal Safety Report 2019. SLSA: Sydney.

Tabachnick, B.G., Fidell, L.S. (2001). Using multivariate statistics. Pearson, New York

Talab, A., Rahman, A., Rahman, F., Hossain, J., Scarr, J., & Linnan, M. (2016). 270 Survival swimming – effectiveness of swimsafe in preventing drowning in mid and late childhood. Injury Prevention, 22(Suppl 2), A99-A99. https://doi.org/10.1136/injuryprev-2016-042156.270

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. Information Systems Research, 16(3), 144–176.

Teachout, M. (December, 11, 2017). Phone conversation.

Teo, T. (2012). Examining the intention to use technology among pre- service teachers: an integration of the Technology Acceptance Model and Theory of Planned Behavior, Interactive Learning Environments, 20:1, 3-18, DOI: 10.1080/10494821003714632

Teo, T., Koh, N., Lee, C. (2011). Teachers' Intention to Teach Financial Literacy in Singapore: A Path Analysis of an Extended Theory of Planned Behaviour (TPB). Asia-Pacific Education Researcher (De La Salle University Manila), 20(2), 410–419

Teo, T., Zhou, M., & Noyes, J. (2016). Teachers and technology: development of an extended theory of planned behavior. Educational Technology Research and Development, 64(6),

1033–1052.

Terzidis, A., Koutroumpa, A., Skalkidis, I., Matzavakis, I., Malliori, M., Frangakis, C.E., DiScala, C., Petridou, E., 2007. Water safety: age-specific changes in knowledge and attitudes following a school-based intervention. Inj. Prev. 13, 120–124.

Tobias, M. (2017). Social rank: a risk factor whose time has come. The Lancet 389(10075), 1172-1174.

Totten, S., Sills, T., Digby, A., Russ, P. (1991). Cooperative learning: a guide to research. Garland, New York, NY.

Tracy, S. J. (2010). Qualitative Quality: Eight "Big-Tent" Criteria for Excellent Qualitative Research. Qualitative Inquiry, 16(10), 837–851. https://doi.org/10.1177/1077800410383121

Treser, C. D., Trusty, M. N., & Yang, P. P. (1997). Personal floatation device usage: Do educational efforts have an impact? Journal of Public Health Policy, 18(3), 346–356. Retrieved from http://www.jstor.org/stable/3343315

Turgut, A., & Turgut, T. (2012). A study on rescuer drowning and multiple drowning incidents. Journal of Safety Research, 43(2), 129-132. https://doi.org/10.1016/j.jsr.2012.05.001

Tuval-Mashiach, R. (2017). Raising the curtain: The importance of transparency in qualitative research. Qualitative Psychology (Washington, D.C.), 4(2), 126-138. https://doi.org/10.1037/qup0000062

UK Department of Education. (2013). Statutory guidance National curriculum in England: physical education programmes of study. Retrieved from; https://www.gov.uk/government/publications/national-curriculum-in-england-physical-education-programmes-of-study/national-curriculum-in-england-physical-education-programmes-of-study

UNICEF. (n.d). Education. Every Child Has To Learn. Retrieved from: https://www.unicef.org/education#:~:text=On%20any%20given%20school%20day,secondary%20education%20than%20ever%20before.

United States Coast Guard. (2011). Recreational Boating Statistics 2010. Boat Responsibly. U.S. Department of Homeland Security. Retrieved from: https://www.uscgboating.org/assets/1/workflow_staging/Page/2010_Recreational_Boating_Statistics.pdf

United States Coast Guard. (2019). Recreational Boating Statistics 2010. Boat Responsibly. U.S. Department of Homeland Security. Retrieved from:

https://www.uscgboating.org/library/accident-statistics/Recreational-Boating-Statistics-2019.pdf

United States Department of Health and Human Services. (2008). 2008 physical activity guidelines for americans: Be active, healthy, and happy. Washington, D.C.: U.S. Dept. of Health and Human Services.

U.S. Department of Commerce, (Rev. 1975). The Coastline of the United States. NOAA, NOAA/PA 71046. Retrieved from: https://www.mlive.com/news/2013/04/who_has_more_miles_of_coastlin.html

U.S. Newswire. (2018). The Y to Offer More than 33,000 At-Risk Youth Free Access to Safety Around Water Program. Retrieved from: http://ezproxy.msu.edu/login?url=https://www-proquest-com.proxy1.cl.msu.edu/wire-feeds/y-offer-more-than-33-000-at-risk-youth-free/docview/2042714571/se-2?accountid=12598

United States Lifeguard Association. (2017). Statistics by Region. Retrieved from: http://arc.usla.org/Statistics/View/Display.asp

United States Lifeguard Association. (n.d.). USLA Approved Beach Warning Flags. Retrieved from; https://www.usla.org/page/beach-warning-flags

van Beeck, E. F., Branche, C. M., Szpilman, D., Modell, J. H., & Bierens, J. J. L. M. (2005). A new definition of drowning: Towards documentation and prevention of a global public health problem. Bulletin of the World Health Organization, 83(11), 853-856. https://doi.org/10.1590/S0042-96862005001100015

Venema, A. M., Groothoff, J. W., & Bierens, J. J. L. M. (2010). The role of bystanders during rescue and resuscitation of drowning victims. Resuscitation, 81(4), 434-439. https://doi.org/10.1016/j.resuscitation.2010.01.005

Vietnam Health Environment Management Agency. Injury Mortality Statistics in 2008. Hanoi, Vietnam: Health Environment Management Agency; 2010.

Vittone, M., Pia, F. (2006). It Doesn't Look Like They're Drowning" How To Recognize the Instinctive Drowning Response. On Scene. The Journal of the U.S. Coast Guard Search and Rescue. Retrieved from: https://mariovittone.com/wp-content/uploads/2010/05/OSFall06.pdf

Vulcan AP, Cameron MH, Watson WL. Mandatory bicycle helmet use: experience in Victoria, Australia. World J Surg 1992;16:389–97.

VSI Safety Committee. (2008). Safety Tip of the Month – July 2008 VSI Safety Committee"Hypoxic Training and Hyperventilation". Retrieved from; http://virginiaswimming.org/LSC%20Operations/Safety/Safety%20Tips/2007-2008/July%202008.pdf

Wang, Y., Long, X., Li, L., Wang, Q., Ding, X., & Cai, S. (2021). Extending theory of planned behavior in household waste sorting in China: the moderating effect of knowledge, personal involvement, and moral responsibility. Environment, Development and Sustainability: A Multidisciplinary Approach to the Theory and Practice of Sustainable Development, 23(5), 7230–7250. https://doi-org.proxy2.cl.msu.edu/10.1007/s10668-020-00913-9

Water Safety New Zealand. (2011). Water Safety New Zealand report on drowning 2010. Wellington, New Zealand: Water Safety New Zealand.

Water Safety New Zealand (WSNZ). (2016). 2011-2015 Drowning Toll – Regional Breakdown, Auckland DrownBaseTM. Water Safety New Zealand. Wellington.

Waxweiler, R.J., Harel, Y., O'Carroll, P.W. (1993). Measuring adolescent behaviors related to unintentional injuries. Public Health Rep. 108:11–14.

Williamson, A., Hatfield, J., Sherker, S., Brander, R., & Hayen, A. (2012). A comparison of attitudes and knowledge of beach safety in Australia for beachgoers, rural residents and international tourists. Australian New Zealand Journal of Public Health, 36, 385–391.

Wilson Van Voorhis, Carmen R, & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. Tutorials in Quantitative Methods for Psychology, 3(2), 43-50. https://doi.org/10.20982/tqmp.03.2.p043

Wiltse, J. (2007). Contested waters: A history of swimming pools in America. University of North Carolina Press.

Wilks, J., PhD., Kanasa, H., PhD., Pendergast, D., PhD., & Clark, K.,Dip T.A.E.Dip T.D.D. (2016). Emergency response readiness for primary school children. Australian Health Review, 40(4), 357-363. doi:http://dx.doi.org.proxy1.cl.msu.edu/10.1071/AH15072

WINTEMUTE, G. J., & WRIGHT, M. A. (1991). The attitude-practice gap revisited : Risk reduction beliefs and behaviors among owners of residential swimming pools. Pediatrics (Evanston), 88(6), 1168-1171.

White, P., and K. Young. 1997. Masculinity, sport, and the injury process: A review of Canadian and international evidence. Avante 3, no. 2: 1-30.

World Bank. (n.d.) The World Bank. Data. Retrieved from: https://data.worldbank.org/?locations=BD-XN

World Health Organization. (2008). WHO mortality database: tables. Geneva: World Health Organization; [21 April 2008]. http://www.who.int/healthinfo/morttables/en/index.html.

World Health Organization. (2020). Drowning. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/drowning

World Health Organization (n.d.). Violence and Injury Prevention. Drowning. Retrieved from: https://www.who.int/violence_injury_prevention/other_injury/drowning/en/

World Health Organization,, & Bloomberg LP,. (2014). Global report on drowning: Preventing a leading killer.

Wu, Y. P., Thompson, D., Aroian, K. J., McQuaid, E. L., & Deatrick, J. A. (2016). Commentary: Writing and evaluating qualitative research reports. Journal of Pediatric Psychology, 41(5), 493-505. https://doi.org/10.1093/jpepsy/jsw032

Zhang, Y., Wu, S., & Rasheed, M. I. (2020). Conscientiousness and smartphone recycling intention: The moderating effect of risk perception. Waste Management, 101, 116–125. https://doi-org.proxy2.cl.msu.edu/10.1016/j.wasman.2019.09.040

Zhu, Y., Jiang, X., Li, H., Li, F., & Chen, J. (2015). Mortality among drowning rescuers in china, 2013: A review of 225 rescue incidents from the press. BMC Public Health, 15(1), 631-631. https://doi.org/10.1186/s12889-015-2010-0

APPENDIX A: PILOT SURVEY FEEDBACK

Table 6

Overview of Responses to the prompt "Was the survey easy to navigate and use?"

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Very easy: Not easy at all	1.00	7.00	2.60	1.88	3.54	20

#	Answer	%	Count
1	1	55.00%	11
4	4	30.00%	6
5	5	10.00%	2
6	6	0.00%	0
7	7	5.00%	1
8	8	0.00%	0
9	9	0.00%	0
	Total	100%	20

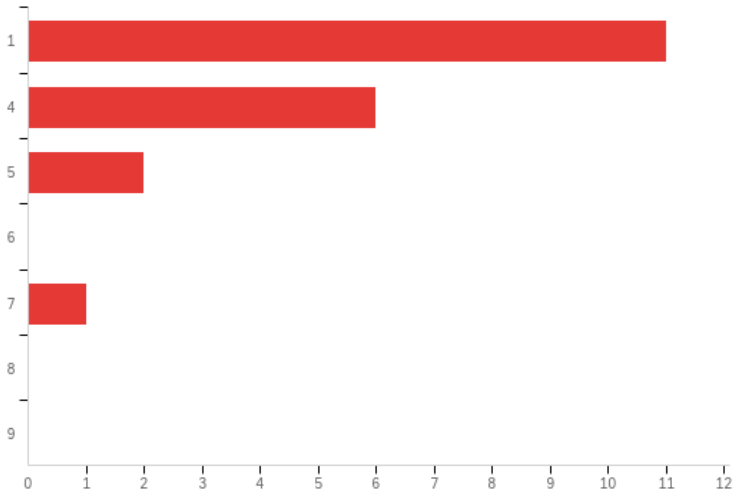


Figure 9

Responses to the prompt "Was the survey easy to navigate and use?"

Table 7

Overview of Responses to the prompt "Were the questions easy to understand?"

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Very easy: Not easy at all	1.00	7.00	3.15	2.06	4.23	20

#	Answer	%	Count
1	1	45.00%	9
4	4	20.00%	4
5	5	25.00%	5
6	6	5.00%	1
7	7	5.00%	1
8	8	0.00%	0
9	9	0.00%	0
	Total	100%	20

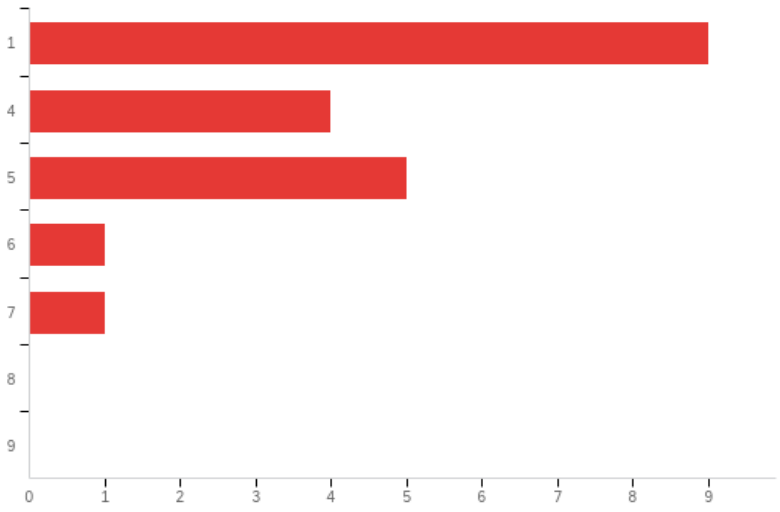


Figure 10

Responses to the prompt "Were the questions easy to understand?"

Where any parts of the survey difficult to use?

Where any parts of the survey difficult to use?
no
I didn't experience any difficulties.
none
No just a bit different. I have never seen the sliders used in a survey before.
NO ("Where" in this question should actually be "Were")
No
I started filling out the scales wrong. I think I'm used to having the positive answer (strongly agree, etc) on the right side. No biggie, just an observation
Not at all
not difficult to use just did not make complete sense
Not sure how water safety, although it is very important, is connected to all curricular areas.
n/a
It was too long. By the time I got near the end, I had to fight not to push any button just to finish up.
The sliding scale was a bit tricky/clumsy.
no
In one section, I had to redo some of my answers because the numbering system was backward from what I expected it to be.
no
No
No

Where any parts of the survey difficult to understand?

Where any parts of the survey difficult to understand?
no
I didn't have any problems understanding the survey.
I don't teach anything like this, so the questions sometimes were hard to answer.
no
NO ("Where" in this question should actually be "Were")
No
It all made sense
Because I am not incredibly knowledgeable with water safety, parts of the survey were difficult for me to answer.
No
n/a
I felt like a lot of the questions were leading. You certainly felt like you were supposed to teach water safety by the end of the survey. I also thought a lot of them did not fit for middle school--we have expected curriculum for our subject areas.
page that started with "Will would language here"
no
No
No

Table 8

Overview of Responses to the prompt "What did you think about the length of the survey?"

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What did you think about the length of the survey	1.00	3.00	2.00	0.55	0.30	20

#	Answer	%	Count
1	It took a really long time	15.00%	3
2	It didn't seem to take that long	70.00%	14
3	It went pretty quick	15.00%	3
	Total	100%	20

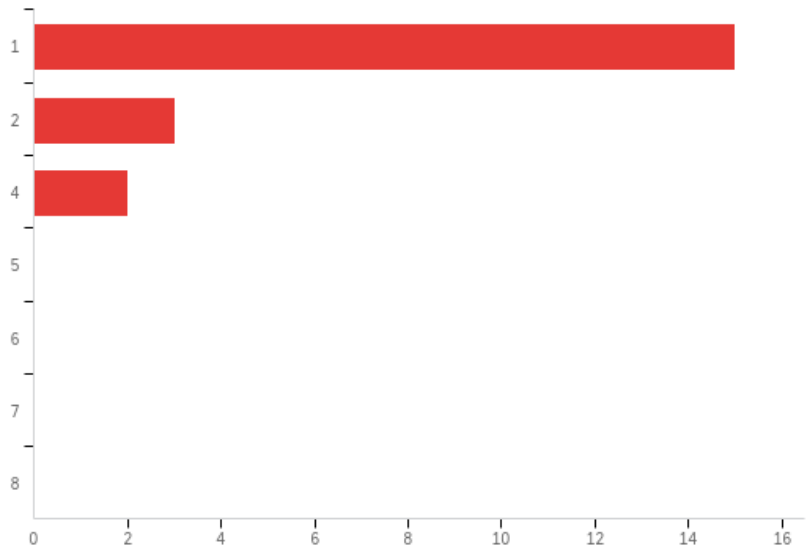


Figure 11

Responses to the prompt "What did you think about the length of the survey?"

Table 9

Responses to “Did the questions seem to relate to water safety and water safety education?”

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Completely:Not at all	1.00	4.00	1.45	0.92	0.85	20

#	Answer	%	Count
1	1	75.00%	15
2	2	15.00%	3
4	4	10.00%	2
5	5	0.00%	0
6	6	0.00%	0
7	7	0.00%	0
8	8	0.00%	0
	Total	100%	20

Overall, did you think this survey effectively evaluated your water safety knowledge, current water safety education practices, future water safety education intentions, and important background factors?

Yes
I feel as though my knowledge and opinions were evaluated appropriately.
Yes, it did. I just don't teach this or plan to teach this.
Yes
Yes
Yes
Yes
Yes
yes
Somewhat
It felt judgy. It also didn't take into account that people need to work with their colleagues to plan and implement lessons and curriculum.
Yes
yes, being in Michigan and around water we don't place much emphasize on water safety
yes
Yes
Yes

Do you have any recommendations on ways for us to improve this survey for the future?

No
I think it is super important to focus on water safety education in schools. I think it would be important to involve these lessons in PE or other similar classes.
It might be interesting if you could somehow show give info, at the end, about how many drownings there are in the great lakes. and then ask how important water safety is for schools.
No
No
I do not
Not at this time.
some of the questions about curriculum not sure it fit
n/a
Connect with Senator Roger Victory's office. He is very supportive of this project
no
No
No

APPENDIX B: WATER SAFETY EDUCATION IN THE GREAT LAKES STATE

Start of Block: Introduction

Welcome! **Thank you** for taking the time to complete our survey on Water Safety Education here in the Great Lakes State. In this survey you will be asked about your own water safety knowledge, about any current water safety efforts made by yourself or your school, and about your intentions to provide water safety education in the future.

Please fill out the following information to the **best of your ability,** with as much detail as you'd like. Although we'd prefer that you complete the survey fully, we understand you are incredibly busy and your time is valuable. Therefore, if you need to save your survey and return to complete it at a later time we completely understand. However, if you could **complete the survey within the next two weeks** that would be greatly appreciated.

The survey will take about 20-30 minutes in total. Your responses will be **entirely confidential**, and remain ***anonymous to both the public and your school, including coworkers and administration*.** If you have any questions or need technical assistance please send an e-mail to fieldgre@msu.edu. Thanks again, we value your input!

Page Break

End of Block: Introduction

Start of Block: Background Information

A **Background Information**

1.1 Date of Birth (MM/DD/YYYY)

_____

1.2 Gender

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

1.3 Race (select all that apply)

- [ ] American Indian or Alaskan Native
- [ ] Asian
- [ ] Black or African American
- [ ] Hispanic or Latino
- [ ] Native Hawaiian or Other Pacific Islander
- [ ] White

1.4 What subject(s) do you currently teach?

_____

1.5 What grade level(s) do you currently teach?

_____

1.6 How many years have you been a teacher?

_____

1.7 What is the highest level of education you have achieved?

- ○ High School
- ○ Bachelors
- ○ Master
- ○ PhD

1.9 Have you ever lived 30 minutes or less from a Great Lakes shoreline?

- ○ Yes
- ○ No

Q119 Have you ever lived 30 minutes or less from the coast of an Ocean?

- ○ Yes
- ○ No

1.10 What is your current estimated swimming ability?

- ○ I can swim many laps in a 25 meter pool without stopping
- ○ I can cross a 25 meter pool without stopping
- ○ I can cross about half of a 25 meter pool without stopping
- ○ I cannot swim

1.12 Do you have any experience as a lifeguard?

- ○ I am currently an active lifeguard
- ○ I am a certified lifeguard but not actively guarding
- ○ I was a certified lifeguard but am no longer certified
- ○ I have never been a certified lifeguard

1.13 Have you ever had to rescue someone from the water?

- ○ Yes
- ○ No

1.13a If you would be willing, please share more details about the situation and how you helped rescue the individual(s), thank you!

_____

_____

_____

_____

_____

1.14 Has someone close to you (family, friend, student from school, etc.) ever drown?

- ○ Yes
- ○ No

1.14a If you are willing to share, please tell us more about what happened. Thank you.

_____

1.15 Do you have a pool at your home?

- ☐ Yes
- ☐ No

1.16 In a typical year, how often do you go to a pool?
(Please slide to estimated days per year)

	0-10 days	10-20 days	20-30 days	30-40 days	40-50 days	50 or more days
Pool Visits Each Year	○	○	○	○	○	○

1.17 From your home, how far away are the following natural aquatic environments?
(Please select estimated drive time)

	On my property	< 5 minutes	5-10 minutes	10-20 minutes	20-30 minutes	30-45 minutes	45-60 minutes	Over an hour
Great Lakes Beach	○	○	○	○	○	○	○	○
Inland Lake	○	○	○	○	○	○	○	○
River	○	○	○	○	○	○	○	○
Other (please identify)	○	○	○	○	○	○	○	○

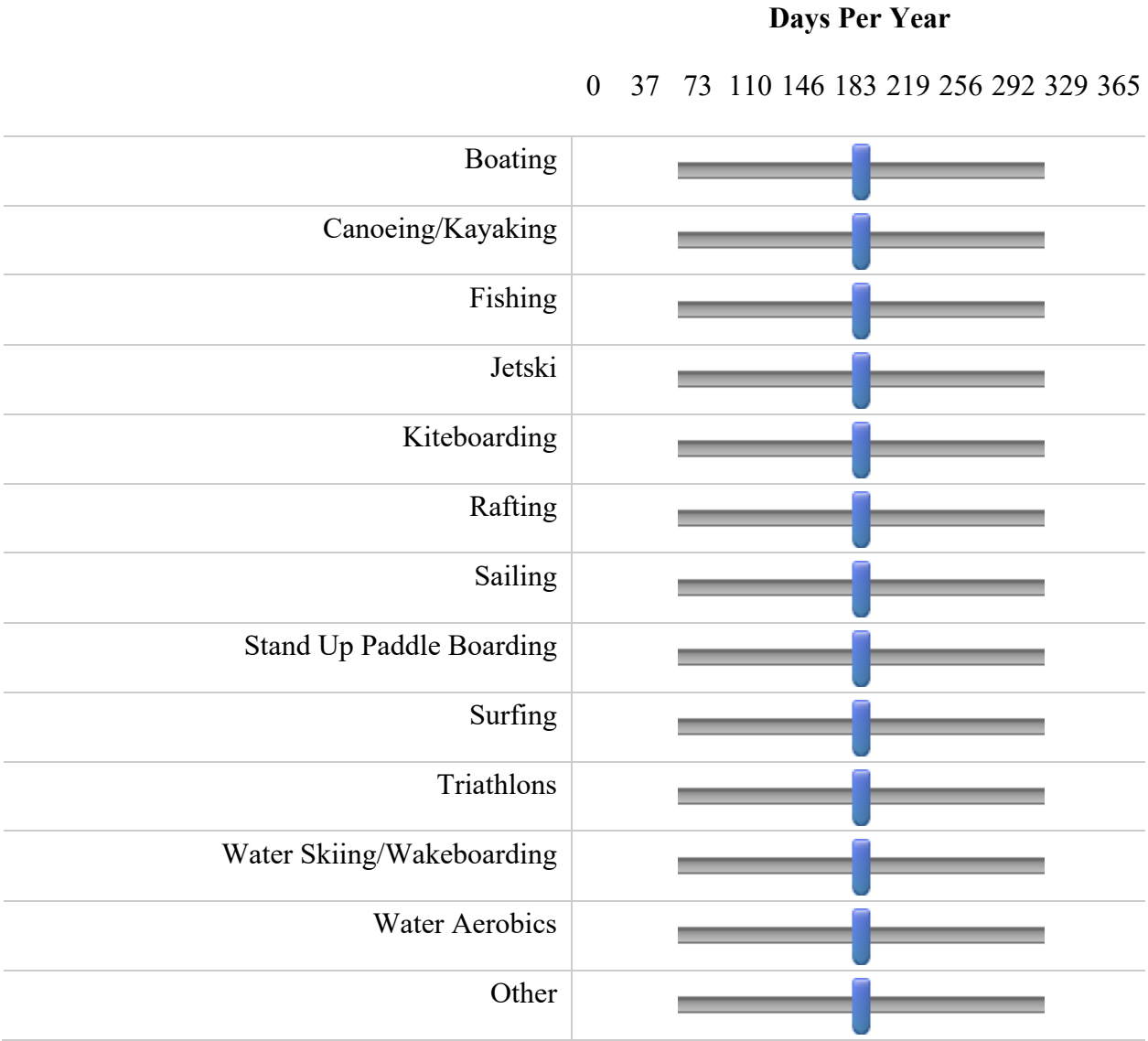
1.18 How often do you visit the following aquatic environments in a typical year?
(Please slide to estimated days per year)

Days Per Year

0 37 73 110 146 183 219 256 292 329 365

Ocean	
Great Lakes Beach	
Inland Lake	
River	
Other (please identify)	

1.19 In a typical year, how many days do you participate in the following aquatic activities? (Please slide to estimated days per year)



1.20 On this map of Michigan, select the area in which you **most frequently** visit a natural body of water (*rough estimates are acceptable*). If you do not visit a natural body of water please leave the map blank.

1.21 On this map of the U.S. please select the area in which you **most frequently** visit a natural body of water **outside of Michigan** (*rough estimates are acceptable*). If you do not visit a natural body of water outside of Michigan please leave this map blank.

End of Block: Background Information

Start of Block: Current School Based Water Safety Efforts

2.1 Does your school provide swim lessons?

- ○ Yes
- ○ No
- ○ Unsure

2.2 Does your school provide water safety education during swim lessons?

- ○ Yes
- ○ No
- ○ Unsure

2.3 Does your school provide water safety education during an all-school event or assembly?

- ○ Yes
- ○ No
- ○ Unsure

2.4 **Do you currently h**elp teach swim lessons, and, or, water safety skills to your students at a pool or other body of water?

- ○ Yes
- ○ No

2.5 **Do you currently teach** water safety lessons to your students in the classroom?

- ○ Yes
- ○ No

2.6 Does your school partner with any organizations or aquatic centers in efforts to offer swimming lessons or water safety education to your students?

- ○ Yes
- ○ No
- ○ Unsure

2.6a What is the name of the partnering organization or aquatic center that helps facilitate swimming or provide water safety education for your students?

_____

End of Block: Current School Based Water Safety Efforts

Start of Block: Water Safety Awareness

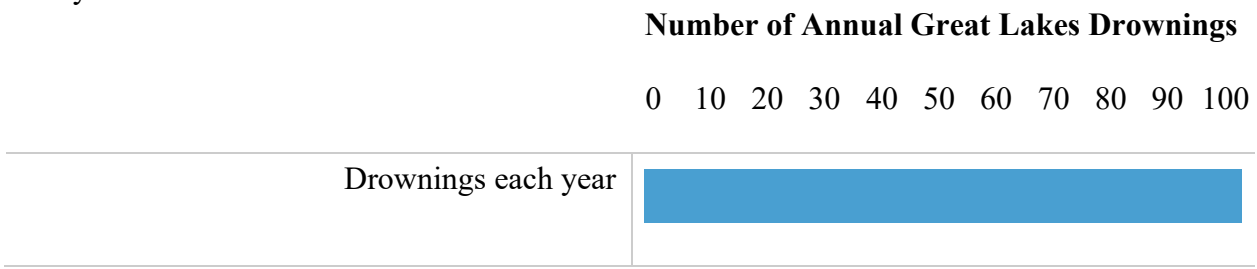
3.1 Compared to the East or West coast of the U.S., Michigan has _____ shoreline. (distance in miles)

- ☐ much less
- ☐ a little less
- ☐ the same amount of
- ☐ a little more
- ☐ much more

3.2 You are never more than about ____ miles away from a body of water in Michigan.

- [ ] 5
- [ ] 10
- [ ] 15
- [ ] 20

3.3 Over the past 10 years, there has been an average of _____ drownings on the Great Lakes each year.



3.4 For **children ages 1-4**, rank the following risks of unintentional death from highest (1) to lowest (5). Click and drag

_____ Car accidents
_____ Drowning
_____ Fire
_____ Severe Weather
_____ Violence

3.5 For children and youth **5-14 years old**, rank the following risks of unintentional death from highest (1) to lowest (5). Click and drag.

_____ Car accidents
_____ Drowning
_____ Fire
_____ Severe Weather
_____ Violence

End of Block: Water Safety Awareness

Start of Block: Water Safety Knowledge

4.1 **Self Rescue** - If you were in trouble in the water and started to drown, how would you save yourself?

_____

_____

_____

_____

_____

4.2 **Others Rescue** - If you saw someone else drowning, how would you help?

_____

_____

_____

_____

_____

4.3 **Prevention** - What are the top three ways to effectively prevent drowning among youth?

- ○ 1st _____
- ○ 2nd _____
- ○ 3rd _____

4.4 How would you identify if someone was drowning? What would they look like? (select all that apply)

- ☐ Splashing
- ☐ Waving arms
- ☐ Yelling or Shouting
- ☐ Spinning
- ☐ Quietly Sinking
- ☐ Gasping for Air

4.5 Michigan beaches typically use a flag system, please briefly explain the meaning of the flags you are familiar with below.

- ○ Green _____
- ○ Yellow _____
- ○ Red _____

4.6 How confident are you that your answers above are correct? No wrong answer here :)

	1			4	5	6	7	
Not at all confident	○	○	○	○	○	○	○	Extremely confident

End of Block: Water Safety Knowledge

Start of Block: Water Safety Eduction Attitudes

Instructions **Water safety education could potentially be delivered in three, 30-minute classroom based lessons. Please answer the rest of this survey as if you had access to these three 30-minute water safety lessons and could use them to teach water safety lessons to students in your classroom if you chose to do so. *Thanks!***

5.1 Teaching three 30-minute water safety lessons to my students this Spring would enable my students to keep themselves safe in and around the water.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.2 Teaching three 30-minute water safety lessons to my students this Spring would enable my students to save others from the water and prevent drowning.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.3 Teaching three 30-minute water safety lessons to my students this Spring would enable my students to enjoy the benefits of being active in the water safely.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.4 Teaching three 30-minute water safety lessons to my students this Spring would be emotionally upsetting to me, and, or my students by talking about drowning

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.5 Teaching three 30-minute water safety lessons to my students this Spring would feel overwhelming for me

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.6 Teaching three 30-minute water safety lessons to my students this Spring is a responsibility of my job

	1	2	3	4	5	6	7	

Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

5.7 I intend to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

Q128 I expect that I would teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

Q129 I plan to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

End of Block: Water Safety Eduction Attitudes

Start of Block: Water Safety Education Values

6.1 My students keeping themselves safe in and around the water is

	1	2	3	4	5	6	7	
Incredibly Important	○	○	○	○	○	○	○	Not Important at All

6.2 My students saving someone who was in danger in the water is

	1	2	3	4	5	6	7	
Incredibly Important	○	○	○	○	○	○	○	Not Important at All

6.3 My students enjoying the benefits of being active in the water safely is

	1	2	3	4	5	6	7	
Incredibly Important	○	○	○	○	○	○	○	Not Important at All

6.4 Emotionally upsetting myself or my students by talking about drowning is

	1	2	3	4	5	6	7	
Good	○	○	○	○	○	○	○	Bad

6.5 Feeling overwhelmed is

	1	2	3	4	5	6	7	
Good	○	○	○	○	○	○	○	Bad

6.6 Meeting the responsibilities of my job is

	1	2	3	4	5	6	7	
Incredibly Important	○	○	○	○	○	○	○	Not Important at All

End of Block: Water Safety Education Values

Start of Block: Water Safety Education Subjective Norms

7.1 Parents of my students think _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
I should	○	○	○	○	○	○	○	I should not

7.2 Fellow teachers think _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	

I should	○	○	○	○	○	○	○	I should not

7.3 My principal (or supervisor) thinks _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
I should	○	○	○	○	○	○	○	I should not

7.4 My friends think _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
I should	○	○	○	○	○	○	○	I should not

7.5 My family thinks _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
I should	○	○	○	○	○	○	○	I should not

7.6 Public safety professionals in my community (like firefighters, safety officers, or lifeguards) think _____ teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
I should	○	○	○	○	○	○	○	I should not

End of Block: Water Safety Education Subjective Norms

Start of Block: Subjective Norm Values

8.1 When it comes to matters of what I choose to teach, I want to do what parents of my students think I should do.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

8.2 When it comes to matters of what I choose to teach, I want to do what my fellow teachers think I should do.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

8.3 When it comes to matters of what I choose to teach, I want to do what my principal (or supervisor) thinks I should do.

	1	2	3	4	5	6	7	

Agree	○	○	○	○	○	○	○	Disagree

8.4 When it comes to matters of what I choose to teach, I want to do what my friends think I should do.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

8.5 When it comes to matters of what I choose to teach, I want to do what my family thinks I should do.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

8.6 When it comes to matters of what I choose to teach, I want to do what public safety professionals in my community (like firefighters, safety officers, or lifeguards) think I should do.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

End of Block: Subjective Norm Values

Start of Block: Water Safety Education Descriptive Norms

9.1 Fellow teachers would teach three 30-minute water safety lessons to their students this Spring.

	1	2	3	4	5	6	7	
True	○	○	○	○	○	○	○	False

9.2 Public safety professionals in my community (like firefighters, safety officers, or lifeguards) would teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
True	○	○	○	○	○	○	○	False

End of Block: Water Safety Education Descriptive Norms

Start of Block: Descriptive Norm Values

10.1 When it comes to matters of what you teach, how much do you want to be like your fellow teachers?

	1	2	3	4	5	6	7	
Very Much	○	○	○	○	○	○	○	Not at all

10.2 When it comes to matters of what you teach, how much do you want to be like public safety professionals (like firefighters, safety officers, or lifeguards) in your community?

	1	2	3	4	5	6	7	

Very Much	○	○	○	○	○	○	○	Not at all

End of Block: Descriptive Norm Values

Start of Block: Water Safety Education Perceived Behavior Control

11.1 I expect that I will have access to a pool or waterfront where three 30-minute water safety lessons can be taught and skills demonstrated and practiced this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.2 I expect that I will have access to aquatic professionals (e.g., lifeguards, swim instructors, PE teachers, firefighters) who could help me teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.3 I expect that I will have the professional competencies (i.e., knowledge and skills) needed to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.4 I expect that I will have community support (including parental support) in teaching three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.5 I expect that I will have support from my principal or supervisor in teaching three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.6 I expect that I will have opportunities to influence and shape the curriculum this school year.

	1	2	3	4	5	6	7	
Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

11.7 I expect that I will have support from my fellow teachers to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	

Extremely Likely	○	○	○	○	○	○	○	Extremely Unlikely

End of Block: Water Safety Education Perceived Behavior Control

Start of Block: Perceived Behavior Control Factors

12.1 Having access to a pool or waterfront will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.2 Having access to aquatic professionals (e.g., lifeguards, swim instructors, PE teachers, firefighters) will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.3 Having water safety knowledge and skills will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.4 Having community support (including parental support) in teaching water safety will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.5 Having support from my principal or supervisor will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.6 Having opportunities to influence and shape the curriculum will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	
Agree	○	○	○	○	○	○	○	Disagree

12.7 Having my fellow teacher's support will enable me to teach three 30-minute water safety lessons to my students this Spring.

	1	2	3	4	5	6	7	

Agree	○	○	○	○	○	○	○	Disagree

End of Block: Perceived Behavior Control Factors

APPENDIX C: WATER SAFETY EDUCATION IN MICHIGAN CONSENT FORM

On behalf of Michigan State University's Kinesiology Department, and the Institute for the Study of Youth Sport, we would like to kindly invite you to participate in a research study about school-based water safety education in Michigan's k-12 schools. Researchers are required to provide a consent form to inform you about the research study, to convey that participation is completely voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision about your participation in this study or not. Please feel free to reach out and ask the researchers questions at any time.

Study Title:
Water Safety Education in Michigan: Teachers as Navigators Towards Water Safety for Children and Youth

Researcher and Title:
Dr. Daniel Gould - Professor
Greg Field Jr. - Doctoral Candidate

Department and Institution:
Kinesiology - Michigan State University

Address:
308 W. Circle Drive, Room 134
East Lansing MI 48824-1034

Contact:
drgould@msu.edu
(517) 432-0175
fieldgre@msu.edu
(630) 817-7771

PURPOSE OF RESEARCH

You are invited to participate in an online survey about water safety, and water safety education, in Michigan. This survey aims to achieve the following purposes:

(1) To explore the water safety knowledge, competencies, attitudes, beliefs and experiences of teachers.
(2) To identify the current trends in water safety education efforts in Michigan schools.
(3) To seek the professional guidance of teachers in regards to water safety education curriculum development, instruction, and evaluation of a successful water safety curriculum.
(4) To explore teachers' willingness to teach water safety in the classroom, and their confidence levels in their ability to do so.
(5) To determine the support, and, or, resources teachers would need if tasked with teaching water safety.

(6) To analyze the relationship between a number of important variables identified by each participant.

PARTICIPATION

- If you decide to participate in this research, you will be asked to complete an online survey that addresses the purposes stated above. The survey requires internet access, but can be done at any time, and at any place you can best focus on completing the questions.
- The survey only takes about 20-30 minutes to complete, and we ask that you complete the survey in full once you begin. We also request that you take the survey on your own, without the help of any others, and, or any resources.
- Once your consent form is complete you will receive a confirmation email and your survey will be open. Once the survey is open you will have three weeks to complete the survey, and will receive reminders to complete the survey throughout each week. However, we kindly ask that you complete the survey as soon as possible.
- Once you complete the survey you will receive a completion message on your screen, do not stop the survey until you see the confirmation that you have completed the survey.

POTENTIAL BENEFITS

- Teachers are an important part of the curriculum and program development process in all areas of education. Water safety and drowning prevention programs however, frequently lack the professional recommendations and guidance from teachers in the formative steps towards creating water safety education. A potential benefit of this study is that we will be able to use your advice as a professional educator to inform future water safety education efforts for children and youth in Michigan.
- The level of water safety education students receive in Michigan schools is currently unknown. This study can help bring to light how frequently students are receiving water safety education, the types of water safety educations programs that exists, and whether or not these programs occur primarily within schools, or through partnerships with local aquatic centers, community organizations and, or, water safety experts,
- Finally, this study can help guide future water safety education efforts for children and youth in Michigan by helping stakeholders in water safety education understand the confidence teachers have in their ability to effectively teach water safety messages, their willingness to bring water safety lessons into the classroom, and the value they place on water safety, and water safety education for their students.

POTENTIAL RISKS

- The only foreseeable (although very unlikely) risk may be that a participant has had a negative experience in fire, severe weather, and, or, water. There are survey questions about these risks, including questions that ask whether or not teachers have had to save someone from drowning,

or lost a student to drowning. These survey questions may bring those experiences up once again, and therefore, teachers are hereby notified of this risk. If you are uncomfortable with answering these questions, may request an adapted version of this survey, or opt out of taking the survey all together. Additionally, you will only be asked to reflect on your experiences in rescuing others or with losing a student to drowning, if you are willing, and it will be made clear that your response is optional.

PRIVACY AND CONFIDENTIALITY

- The data for this project will be kept entirely confidential. Upon receiving your survey responses your name will be coded, and a key will be secured and maintained separately. Your responses will remain entirely anonymous, and your results will only be accessible by the researcher, research staff and the Michigan State Human Research Protection Program. Therefore, you will never be identified, and, or connected to your own responses, even to your colleagues or school administration. Your information will be kept confidential to the maximum extent allowable by law, and data will be kept safe and secure in the office of Dr. Daniel Gould (308 W. Circle Drive, Room 134, East Lansing MI 48824-1034) for at least 3 years after the research project is complete. The results of this study may be published or presented at professional meetings, but your identities will remain anonymous.

RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW

- Your participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.
- You have the right to say no.
- You may change your mind at any time and withdraw.
- You may choose not to answer specific questions or to stop participating at any time.
- Whether you choose to participate or not should have no effect on your employment status, or on your good standing with your administration and coworkers.

COSTS AND COMPENSATION FOR BEING IN THE STUDY

There is no cost to participate in this study. All participants will enter a raffle for a number of prizes (gift cards for coffee, books/materials, and, or sporting goods) at the end of the survey timeframe.

CONTACT INFORMATION

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury (i.e. psychological, social, financial, or otherwise), please contact Greg Field Jr. at fieldgre@msu.edu or by phone at (630) 817-7771. Additionally, you may

contact Dr. Daniel Gould at 308 W. Circle Drive, Room 134, East Lansing MI 48824-1034, or by email or phone at drgould@msu.edu, (517) 432-0175.

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

DOCUMENTATION OF CONSENT.

By clicking the button below, you acknowledge:

- Your participation in the study is voluntary.
- You are 18 years of age or older.
- You are aware that you may choose to terminate your participation at any time for any reason.

O I consent to participate in this study
O I do not consent, I do not wish to participate

Additionally, your signature below means that you agree to voluntary participate in this research study.

_____ _____

Signature Date

You will be given a copy of this form to keep upon request. Thank you for your consideration!

A signature is a required element of consent – if not included, a waiver of documentation must be applied for.