

Competitive Swimming and Racial Disparities in Drowning

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Introduction

Accidental drownings are a leading cause of death among African-American youth. There are wide racial disparities in self-reported swimming abilities and extremely low black participation rates in competitive swimming. This paper builds a unique data set from existing sources that will contribute to our understanding of the relationship between a) racial disparities in accidental drownings and b) underrepresentation of blacks among competitive swimmers. It provides apparently the first definitive evidence of a strong causal empirical relationship between two closely aligned phenomena: racial disparities in elite participation in one sport and racial disparities in a significant health outcome: accidental drowning.

The Problem of Racial Disparities in Drownings

The Centers for Disease Control report that drowning is the second leading cause of unintentional injury-related death for children between the ages of 1 and 14. Between 2000 and 2007, the fatal unintentional drowning rate for African Americans across all ages was 1.3 times that of whites. The fatal drowning rate of African-American children ages 5 to 14 is 3.1 times that of white children in the same age range. (Centers for Disease Control and Prevention, 2011)

The most comprehensive source of information on drownings comes from the Centers for Disease Control (Centers for Disease Control and Prevention, 2011). Only limited statistical analysis of this important data set has been undertaken to date. The most important of these analyses were conducted by CDC researchers themselves and provide the most accurate description of drowning rates by race, state and gender (Brenner, 2003; Brenner, et al., 2003; Brenner, et al. 2009; Borse, et al., 2008). Micro-level analyses of these data have yielded valuable insights about the sources of drowning rates and reporting of drowning rates among infants and toddlers. One of the main conclusions from these valuable contributions and carefully conducted micro-level studies is that we really do not know why there are such wide racial disparities in drownings.

Health Disparities and the Benefits of Swimming

Swimming is considered one of the best forms of physical exercise with numerous cardiovascular benefits (Thompson, et al., 2003). It is a life-long sport that is associated with many positive healthy living outcomes (Stephens, 1988). Swim training reduces obesity (Murase, et al. 2006; Scomparin, et al., 2006), reduces adverse effects associated with diabetes (de Oliveira, et al., 2007), and has the potential for ameliorating the impacts of asthma (Rosimini, 2003). And, swimming and swim training have the potential for reducing racial disparities in health outcomes because African Americans are more likely than whites to be obese (Cossrow, 2004), to have diabetes and to suffer from end-stage renal disease (Cowie, et al., 1989), and to suffer from early childhood asthma (Miller, 2000).

The Underrepresentation of Blacks among Swimmers

The potential for reducing the aforementioned health disparities through swimming and swim training, however, is thwarted by the fact that black youth are severely underrepresented among one of the most popular recreational and competitive sports among whites: swimming. As a competitive sport, swimming is often regarded as one of the most exclusively white sports in the United States. USA Swimming, the primary organization of competitive swimming among age-group swimmers (those who have not yet reached high school or college) and the central pipeline for Olympic hopefuls in the United States, reported that only 0.87 percent of its members were African-American (USA Swimming, 2005). African Americans are severely underrepresented in competitive swimming despite their apparent overrepresentation in sports overall. (Myers, 2011; Myers, 1998; Hoberman, 1997)

The Relationship between Drownings and Swimming Ability

Whereas the *indirect* public health consequences of racial differences in swimming ability are suggestive at best, the *direct* impacts of swimming ability on reducing accidental deaths and reducing racial disparities in accidental deaths are even less clear. Research on the relationship between swimming ability and drowning rates has produced conflicting evidence. (Brenner, et al., 2003). Brenner, et al. (2009) found that among those under 5, drowning rates were higher for those who had no previous instruction in swimming. However, there were no statistically significant impacts of swimming instruction on drowning rates for 5 to 19 year olds.

Even if one were to establish unambiguously a causal link between African Americans' poor swimming ability and their high rates of drowning, there is still the problem of explaining why blacks do not swim. There are a large number of myths about why blacks are underrepresented among swimmers. The myths range from the biology of physical predisposition to running vs. swimming (Bejan, et al., 2010) to a large variety of cultural explanations—black females do not like to get their hair wet or black males do not like to wear Speedos (Irwin, et al., 2009a).

The significance of the present paper is the demonstration of a heretofore undocumented aggregate relationship between racial disparities in accidental drownings and underrepresentation among racial minority group members in competitive swimming. We posit that the theoretical linkage between these two phenomena arises via the labor market for life guards and the influence that same-race life guards have on reducing drowning rates.

An official report of the American Academy of Pediatrics clearly admits that there is much that we do not know about racial disparities in drownings and the linkage to other factors. Jeffrey Weiss writes:

The reasons that black children and teenagers are more likely to drown are not clear, but poor parental swimming skills, lack of early training, poor swimming ability, and lack of lifeguards at motel/hotel pools may be important factors. (Weiss, 2010)

There is little but valuable literature that, to date, has been at best suggestive of a relationship between swimming ability and drowning rates. The literature on racial disparities in drowning rates is found in two substantive bodies of research. One is the public health research scholarship that has conclusively established and documented the wide racial disparities in accidental drowning rates, particularly among persons 5 to 14 years of age. The second substantive body of scholarship comes from the aquatics and sports research literature. This literature focuses on reasons for participation in swimming (Hastings, et al., 2006), explanations for drowning generally (Martin & Witman, 2010), and a more limited body of research focuses on racial differences in swimming ability (Berukoff & Hill, 2010; Irwin, et al. 2009b; Gilchrist, Sacks, & Branche, 2000).

Simply because of the unavailability of a comprehensive data set that merges information on drowning rates and swimming access, the existing literature is often quite speculative and imprecise about the causal relationships among these factors. For example, explanations offered for why there are racial disparities in drowning rates include: a) racial differences in swimming ability; and racial differences in access to swimming pools or swim training programs (Hastings, et al. 2006; Saluja, et al. 2006). Researchers have demonstrated that many of the behavioral or preference explanations are simply myths that cannot be validated in interviews or surveys of minority swimmers themselves (Irwin, et al., 2010, 2009a, 2008). However, the lack of support for these behavioral explanations does not provide the requisite support for the alternative explanations (e.g., differences in social/demographic backgrounds or differences in swimming access). In short, the data set we will produce and examine provides a highly valuable contribution to the emerging literature on racial disparities in drownings.

The Data

Two variables are critical for our analysis: drowning rates and competitive swimming participation rates. The information on unintentional drowning comes from the Centers for Disease Control (CDC). Public data by state, gender and race was retrieved from the Fatal Injury Reports 1999-2007, or nine years of data. We use data for non-Hispanic white and black children, 7 to 18 years of age, for each state and each year.¹

Data on competitive swimming participation comes from the Membership Statistics Reports of USA Swimming, the governing organization of youth competitive swimming in the United

¹ We retrieved from the Data and Statistics (WISQARS) system: number of deaths, population and the crude death rates by race, gender, year and state.

States. In order to compute the participation rates for non-Hispanic white and black children, we use as reference the "Year-round Athlete Membership – Ethnicity" table. Data on ethnicity-race is self-reported and is available by Local Swimming Committees (LSC); we transformed this data in order to aggregate it at the state level (for example, Texas and California have multiple LSCs). Race is a self-reported variable in the USA Swimming Reports: on average 25% of the female athletes do not report their race; for the case of male athletes, the average is 15%. The athletes' age ranges from 7 to 18. In order to compute the competitive swimming participation rate, we used the data from the USA Swimming Reports and the population data from the CDC reports, by state and year.

Additional control variables by state and year such as percent of black population, population density, income per capita and percent population with college degrees was retrieved from the Statistical Abstracts of the United States – U.S. Census Bureau².

The Model

A heuristic model that provides a plausible narrative linking black drowning rates to black participation in competitive swimming is the following: when there are more minority swimmers on teams or in programs that offer training for lifeguards, there will be more minority lifeguards, which in turn helps to reduce drownings. Relatedly, the relative dominance of swimming in local market area is captured by the degree to which teenagers invest developing and advancing skills in a particular sport and thereby become eligible for employment in sports-related occupations during their teenage years. Lifeguarding, it is well-known, is one of the most popular sources of summer employment for competitive swimmers. The workplace is often precisely the same as the training facility; the skill sets required are conditional upon having specialized training almost universally available to competitive swimmers. In some states, such as Minnesota, swimming is one of the most popular sports for teenage females, and as a result, disproportionate shares of life guards in that market are female. This dominance of swimming as a competitive sport increases the supply of lifeguards,

² Links to the data sources:

Centers for Disease Control (CDC). .

http://webappa.cdc.gov/sasweb/ncipc/mortrate10_sy.html

US Swimming Membership Reports.

<http://www.usaswimming.org/DesktopDefault.aspx?TabId=1521&Alias=Rainbow&Lang=en>

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increases the pool of persons who have swimming ability, and arguably, is associated with lower drowning rates. Other sports, such as basketball, football or track may be less amenable to increasing the relative supply of persons with swimming ability.

To model the relationship between competitive swimming and drowning rates, the research assembles a pooled cross-section, time series data set combining (a) annual data by state, by gender, and by race and ethnicity on membership in the USA Swimming and (b) annual data by state, by gender, by race and ethnicity from the Centers for Disease Control data on accidental drowning for persons 7 to 18.

The model we estimate is a pooled cross-section, time series data set. The basic data set has 1826 observations: 50 states and the District of Columbia for 9 years. The dependent variable is a measure of accidental drownings, δ_{jt} , in the j th state, race, gender group for the t -th year. It is a function of a vector of social and demographic factors, X , as well as a measure of competitive swimming participation.

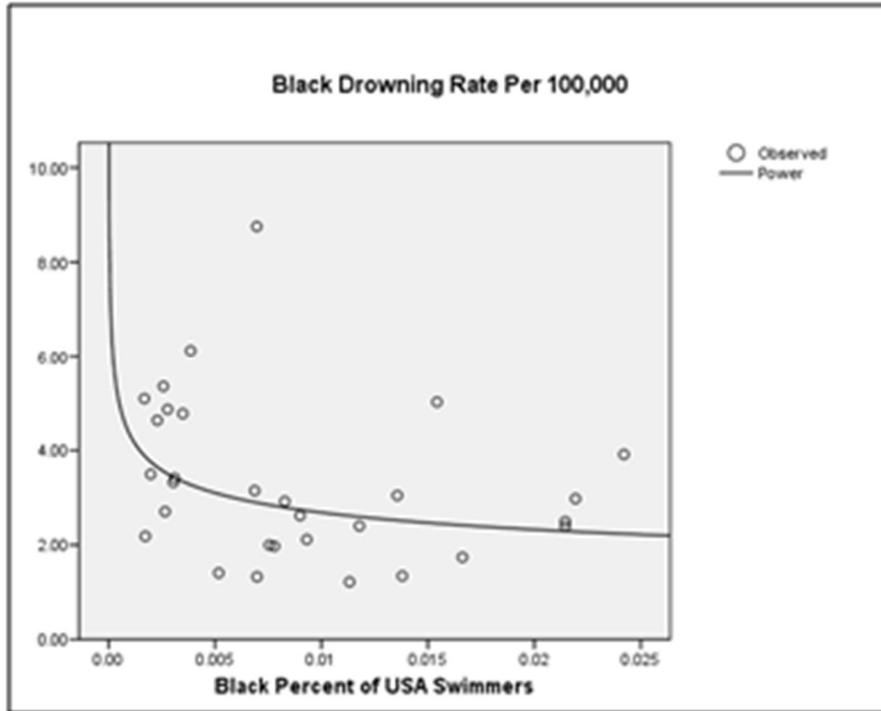
Equation 1

$$\delta_j = f(\sigma_j; X) + \mu_{jt}$$

where X denotes a host of predictors of drowning disproportionalities and σ captures participation in the USA Swimming Association and where the error term, μ , is assumed to be normally distributed with standard properties.

Preliminary Findings. The basic data from the combined state-level drowning rates by race, age ethnicity and gender for the years from 1999 to 2007 is available from the WISQARS retrieval system (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2011). We have merged with this data set state-level data on swimming participation rates by race, ethnicity and gender obtained from USA Swimming, producing the source of information for the empirical regularity displayed in Figure 1, the scatter plot of the percent of USA Swimming swimmers who are black against the number of accidental drowning deaths per 100,000 across the 30 states that had at least one black drowning death in the year 2000. The log-log equation fitting the plot of black shares of competitive swimmers to the black drowning rate per 100,000 produces an R-square of 0.124, a constant term of 1.032, and an estimated coefficient on black shares of competitive swimmers equal to -0.208, which is statistically significant at the 5 percent level. The interpretation is that a one percent increase in the black share of competitive swimmers reduces black drowning rates by about one fifth of one percent.

The effect is inelastic and not on a large order of magnitude, but it is statistically significant. This is very elementary evidence of the inverse relationship between black drownings and diversity in competitive swimming that is hypothesized in this proposal. These preliminary



results, of course, are only for one year, for one way of measuring diversity. Exclusion of states with zero black drowning rates—at times, 1/3 of all states in the nation—could produce skewed results. To accommodate the fact that drowning is a rare event, we have adopted a Poisson model to capture the zero drowning rates. The Poisson model takes the form of:

Equation 2

$$\ln(\delta_{j,t}) = \sum \beta_{i,j,t} x_{i,j,t} + s_{j,t} \cdot \sigma_{j,t}$$

or

$$\delta_{i,t} = \prod e^{\beta_{i,j,t} x_{i,j,t}} \cdot e^{s_{j,t} \cdot \sigma_{j,t}}$$

The interpretation of the coefficient, **s**, is the percentage change in drowning rates that can be explained by a small increase in competitive swimming rates. When this coefficient is negative, it means that increases in competitive swimming reduce drowning rates. When this coefficient

is positive, it means that increases in competitive swimming increase drowning rates. One way to compute the relative risk of drowning from the coefficients estimated is to recognize that all other things being equal, the difference between competitive swimming rates $\sigma(1)$ and $\sigma(2)$, where 1 and 2 denote different levels (e.g., the rates between blacks and whites), is given by:

Equation 3

$$\frac{e^{s \cdot \sigma(1)}}{e^{s \cdot \sigma(2)}} = e^{s \cdot [\sigma(1) - \sigma(2)]}$$

This result will be useful in interpreting the findings we present.

The Results

Table 1 presents the results of estimating the impacts of competitive swimming rates on drowning rates across all years, blacks and whites and males and females. The table also displays the impacts of competitive swimming rates separately for blacks and whites.

Table 1: Estimated Coefficients of the Effect of Competitive Swimming Rates on Drowning Rates from Poisson Regression

VARIABLES	Black and White Drowning Rate	White Drowning Rate	Black Drowning Rate
Competitive Swimming Rate	-1.84*** [0.111]	-0.41*** [0.113]	-0.76*** [0.270]
Year	0.02** [0.007]	-0.02 [0.015]	0.02*** [0.009]
Constant	-33.18** [14.810]	41.12 [29.424]	-45.73*** [17.214]
Observations	1,836	918	918

Standard errors in brackets
 *** p<0.01, ** p<0.05, * p<0.1

The only control in the equation is year. Thus, without controlling for ecological factors, we can conclude that a one unit increase in competitive swimming reduces drowning rates by about 1.84 percent overall. For whites, the reduction is only .41 percent while for blacks it is .76 percent. Instructive is the fact that the effects of competitive swimming are nearly twice as large for blacks as they are for whites. Using Equation 3 and comparing the average competitive swimming rate over the nine years and across males and females and blacks and whites of about .40 produces the result that the relative risk of drowning is about twice as high at the average swimming rate than it would be if the competitive swim rate were twice as

large.³ These combined effects are larger than the impacts on blacks and whites separately. The relative risk of drowning if competitive swimming rates were half as large (.40 vs .80) would be 35 percent higher for blacks but only 17 percent higher for whites.⁴

Table 2 reproduces the substantive findings of Table 1 while controlling for the percentage blacks in the population, population density, income per capita, percentage of persons over 25 with college degrees and a time trend. The results are obtained separately by race and gender.

Table 2: Estimation of Coefficients in Poisson Regression Model of Drowning Rates

VARIABLES	Black Males	White Males	Black Females	White Females
Competitive Swimming Rate	-2.15*** [0.479]	-0.15 [0.177]	1.81*** [0.342]	0.17 [0.116]
Percent Black in Population	0.44 [0.284]	-0.16 [0.482]	-3.25*** [0.677]	0.15 [0.998]
Population Density	-0.00*** [0.000]	-0.00*** [0.000]	-0.00 [0.000]	-0.00** [0.000]
Income Per Capita	0.00*** [0.000]	0.00 [0.000]	0.00 [0.000]	0.00 [0.000]
Percent with College Degrees	-0.03*** [0.008]	-0.03** [0.014]	-0.06*** [0.014]	-0.00 [0.027]
Year Trend	-0.07*** [0.014]	-0.03 [0.025]	0.27*** [0.028]	0.02 [0.046]
Constant	140.00*** [28.098]	68.03 [49.693]	-537.87*** [55.863]	-42.80 [92.371]
Observations	459	459	459	459

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

The impacts of competitive swimming in the more complete model are almost exclusively concentrated among blacks. Among white males, population density and college degrees substantially influence drowning rates. Among white females, there are few factors in the model that explain drowning rates. In neither the white male nor the white female regressions does the impact of competitive swimming rates emerge as a statistically significant determinant of drowning rates once income, population density and education are controlled for. By way of

³ To see this, note that $\frac{e^{s \cdot \sigma(1)}}{e^{s \cdot \sigma(2)}} = e^{s \cdot [\sigma(1) - \sigma(2)]}$. Thus: $e^{-1.81 \cdot [.40 - .80]} = 2.087568518$

⁴ $e^{-.76 \cdot [.40 - .80]} = 1.3553$ and $e^{-.41 \cdot [.40 - .80]} = 1.1782$

contrast, the effects of competitive swimming are large and statistically significant in the black male and black female equations. The effects are larger for black males than they are for black females, further underscoring the fact that competitive swimming manifests itself in disparate ways by race and gender.

Discussion

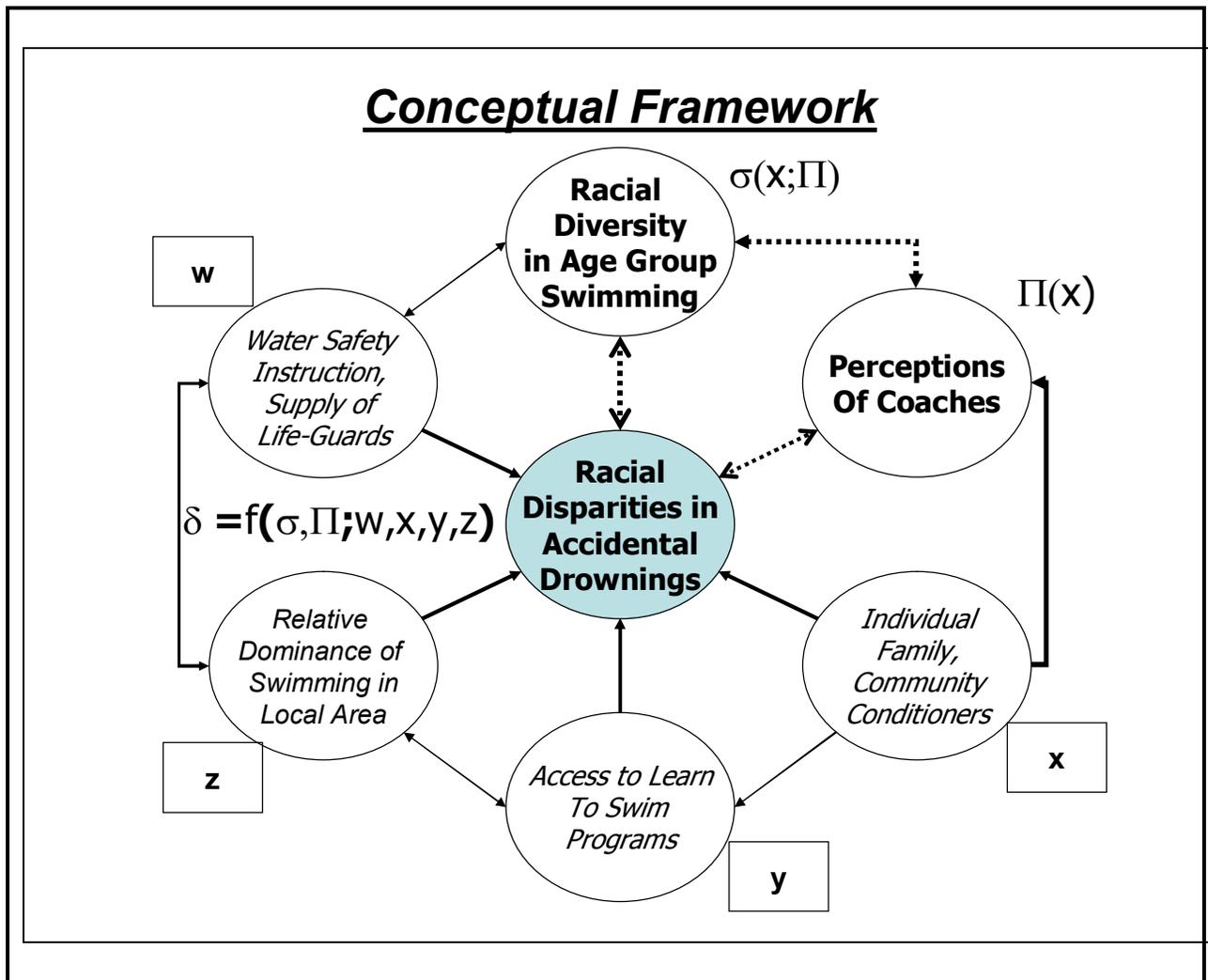
The foregoing analysis establishes a clear and unambiguous statistical relationship between competitive swimming and drowning. The results demonstrate convincingly that the effects of non-participation in competitive swimming are substantially larger on black drowning rates than on white drowning rates. In a critical sense, then, the research advances our scientific knowledge about a key health outcome in a world where there are many preconceptions and tightly held beliefs about the underlying causes of racial disparities.

It is often helpful when agents, e.g., healthcare delivery professionals or child protective service workers, are provided with empirically derived and objectively developed information about aggregate behavior so that it is possible to see racial disparities from a different perspective than one of *individual pathology*. This paper does not, however, explain how aggregated outcomes of drowning might flow from agents' beliefs and perceptions. The analysis of competitive swimming is a helpful metaphor for understanding the process by which beliefs and perceptions can influence aggregate outcomes in the sense that coaches (agents) have a significant influence on individuals, while exercising considerable authority over a broad array of aggregate outcomes, including safety training, preparation for lifeguarding, and the effect on the overall perception of the sport relative to other extracurricular activities. In the economics literature, this concept of the behaviors of some agents having unintended or un-priced impacts on others is called an externality. The externality of racialized perceptions can manifest itself in the form of the appearance that *individual* subjects adopt behaviors that are *pathological* (e.g., not learning how to swim because of the fear of drowning, Irvin, et al. 2010). In fact, however, the group or aggregate outcome may well be the result of unintended discouragement that results in blocked pathways towards success (e.g., subjects wanting to learn how to swim so that they can compete at elite levels, gaining scholarships, obtaining employment as lifeguards, and winning races).

This approach to the economic modeling of racial disparities has been well-tested and adopted in such diverse areas of scientific inquiry as disproportionality in arrests and incarceration (Myers, 2002a, 1993, 1986, 1985; Myers & Sabol, 1987), disproportionality in child maltreatment (Ards, Myers, Chung, Malkis & Hagerty, 2003; Ards, Myers, Malkin & Zhou, 2003; Ards, Chung & Myers, 2001, Ards, Chung & Myers, 1998), disproportionality in loan rejections (Myers, 2002b, 1995, 1983; Ards & Myers, 2001), and a wide array of other market and non-market outcomes.

Figure 2 reveals a more complex relationship between racial disparities in drowning and racial gaps in competitive swimming. It shows that community resources, such as access to swimming

pools and ‘learn to swim’ programs ought to matter. It shows that social and economic background factors and ecological determinants matter. But, in this conceptual framework, a coach’s perceptions also play a critical role in influencing both the participation in competitive swimming and the incidence of drawings among African Americans. Somewhat counter intuitively, the knowledge and belief that blacks are more likely to drown than whites can contribute to the formation and persistence of negative views about *black ability to swim* which, in turn, can adversely affect coaches’ outreach and support for minority competitive swimmers. This adverse impact can be neutralized, however, if there are critical masses of black elite swimmers who literally destroy the stereotypes that underlie the beliefs and assumptions that the main gatekeepers to the profession—coaches—harbor.



Another important factor illustrated in Figure 2 is the role of lifeguarding. Racial disparities in accidental drownings may depend on a wide variety of predictors or explanatory factors. Among them include such factors as family background, community and local conditions. One often overlooked factor in the analysis of racial disparities in drowning is the labor market for lifeguards. How might there be a linkage between water safety instruction, the supply of

lifeguards and racial diversity in swimming? When there are more minority swimmers on teams or in programs that offer training for lifeguards, there will be more minority lifeguards, which in turn helps to reduce drownings. Yet another policy-relevant variable is the relative dominance of swimming in the local area. In some states, such as Minnesota, swimming is one of the most popular sports for teenage females. This dominance of swimming as a competitive sport increases the supply of lifeguards, increases the pool of persons who have swimming ability, and possibly is associated with lower drowning rates. With other sports, such as basketball, football or track, dominant conditions may be less amenable to increasing the relative supply of persons with swimming ability.

The dominant explanation for racial disparities in drowning—that blacks simply cannot swim—is dangerous and superficial in its simplicity. Historically, coastal Africans were considered excellent swimmers with advanced boating skills. It is for this reason that slave owners took particular pains to prevent their slaves from swimming away (Wiltse, 2007; Hastings, 2006). Despite the ugly history of segregated swimming pools in America and the resulting lack of access to public pools in most black communities, many all-black teams emerged in the 1960s in response to segregation. Elite, inner-city swimming programs could be found in Atlanta, Baltimore, Washington, D.C., and Philadelphia. Frederick Douglas High School's swimming team won the Maryland Scholastic Association B Swimming Championships in 1966 and provided the pool of swimmers who would ultimately lead Morgan State University's swimming team to win consecutive CIAA national championships under legendary coach Ralph Jones. Historically Black Colleges and Universities (HBCUs) such as Howard University, Morehouse College, Morgan State University, and Florida A&M University produced, throughout the 1960s, elite swimmers who went on to serve as lifeguards, water safety instructors, and role models to inner-city youth. With the dismantlement of HBCU swimming programs and the exodus of many middle-class blacks from HBCUs to white colleges and universities, there is now a dearth of highly visible elite African American swimmers who can debunk the myth that blacks cannot swim (Myers, 2010).

Future research should explore these critical linkages, especially that between coaches' beliefs and racial disparities in competitive swimming. At this point, there is no evidence upon which to rule out any of these possible explanations for the empirical relationship between racial disparities in drowning and racial disparities in competitive swimming.

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