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Swimming For More Than Gold: How Swimming Participation and Success in Elite International Swimming Events Can Decrease Drowning Rates Across the World

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Abstract

International swimming provides an opportunity for thousands of swimmers to compete at the highest level of the sport. In this paper, I argue that participation and success in these events can influence drowning rates across the world. My analysis suggests that one of the most notable negative influences on drowning rates is swimming participation in countries that have the smallest roster sizes and the lowest average income levels. My analysis shows that swimming success in the Olympics has a significant positive effect on drowning rates in countries in the middle-income brackets.

Keywords

Health, Sports Economics

Cover Page Footnote

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Swimming for More Than Gold

How Swimming Participation and Success in International Swimming Events Can Decrease Drowning Rates Across the World

Over 1,000 people die from drowning across the world on average each day. Low and middle-income countries are disproportionately affected by these tragedies.[1] The World Health Organization (WHO) has called for increased attention on drowning in order to prevent more deaths.[1] Drowning incidents continue to be a public health crisis and new ways to decrease drowning are continuing to be explored. The WHO's recommendations to prevent drowning include installing physical barriers around water sources, increasing swim lesson and drowning education opportunities, enhancing swimming supervision, and improving public awareness of the vulnerability of children to drowning.[1] While these are effective techniques to prevent drowning across the world, are there additional ways to motivate countries and governments to take these steps?

The sport of swimming provides a unique opportunity to influence drowning rates across the world. It is one of the few sports that inherently teach people a skill that can assist in saving their life. Individuals reduce their risk of drowning simply by learning how to swim properly. As we see in Figure 1, even though drowning rates have been dropping steadily, there is still plenty of work to be done. Across the world in 2015, four out of 100,000 people die as a result of drowning.[2]

The International Swimming Federation (FINA) has recently focused on ways to enhance swimming opportunities in countries rarely included in elite international swimming competition, which are often lower income countries. These opportunities include creating entry spots at international swimming events for countries that have no qualified swimmers and creating scholarship programs for these swimmers to have access to elite facilities, coaches, and training

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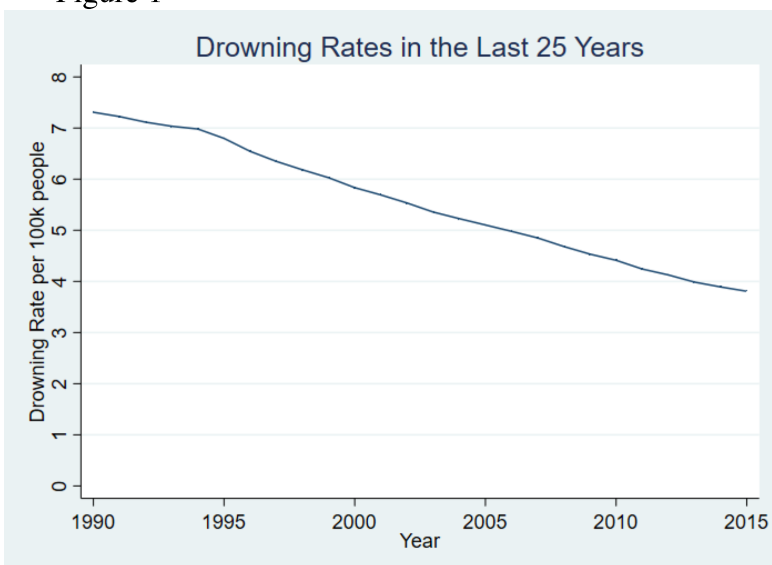
[1] "WHO | Global Report on Drowning: Preventing a Leading Killer," WHO, accessed February 9, 2017, http://www.who.int/violence_injury_prevention/global_report_drowning/en/

[2] Global Burden of Disease Study 2015 (GBD 2015) Life Expectancy, All-Cause and Cause-Specific Mortality 1980-2015 | GHDx," accessed November 2, 2017, http://ghdx.healthdata.org/record/global-burden-disease-study-2015-gbd-2015-life-expectancy-all-cause-and-cause-specific

resources.[3,4] The first opportunity, FINA's Universality Rule, allows countries that do not have any swimmers that meet the qualifying standards for elite international events – including the Olympics and World Championships – to enter one male and one female athlete for competition. This rule was instituted to introduce competitive swimming all over the world, especially to countries that had not previously competed in international swimming events. It has resulted in hundreds of swimmers receiving the opportunity to compete at the Olympics and the World Championships who would not have previously competed at this level.[5]

Figure 1



Source – Global Burden of Disease, 2015

In this work, I analyze whether international competitive swimming participation and success can influence drowning rates across the world. In particular, I emphasize the possible influence of the Olympics on global drowning occurrences. Additionally, I examine whether effects of swimming success and participation on drowning rate are influenced by country income and athlete roster sizes.

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[3] "BL 9.3 Entries | Fina.org - Official FINA Website," accessed December 6, 2017, https://www.fina.org/content/bl-93-entries.
[4] "Athletes Scholarships | Fina.org - Official FINA Website," accessed December 6, 2017, https://www.fina.org/content/athletes-scholarships.
[5] "FINA Releases 2016 Olympic Qualifying Procedure; Time Standards Held for December." SwimSwam, May 21, 2014. https://swimswam.com/fina-releases-2016-olympic-qualifying-procedure-time-standards-held-december/.

Most sports observers often view the summer Olympics as a few weeks of incredible performances every four years. Top athletes compete for medals while the rest of the world watches in awe. However, what does sport and its publicity achieve once the final ceremony concludes? In the United States, we have seen Michael Phelps drastically change the sport of swimming through his Olympic success. His popularity has been followed with millions of youth joining competitive swimming and taking swim lessons.[6] From his debut in the Sydney Olympics in 2000 to his groundbreaking eight gold medals at the Beijing Olympics in 2008 and the Rio de Janeiro Olympics in 2016, Phelps' achievements have revolutionized the sport of swimming and brought it to the center of attention during the Olympics.[7] Additionally, competitive swimming participation across the United States has seen major increases after Olympic games. After the 2008 Olympics, there was an increase in high school swimming participation by over 11%, while surrounding years experienced less than 3% per year.[8] Across the world, other swimming stars have had profound effects on their country's swimming. After Joseph Schooling's historic Olympic gold medal in 2016, the Singaporean government decided to commit S$100 million to enhance the sport and swimming programs countrywide.[9] The money and publicity connected to the Olympics are two powerful tools that can be harnessed to enact change after the closing ceremony.

My analysis uses an ordinary least squares regression method to determine whether measures of Olympic swimming success and participation influence drowning rates. I examine a panel of 102 countries in this study, accounting for different control variables including economic, demographic, and education measures. I find that one of the most notable influences on drowning rates is swimming participation in countries that have the smallest roster sizes, particularly those with one or two participating swimmers. Additionally, I find that success in the Olympics varies heavily across income levels, and that swimming success in the Olympics has a significant effect on countries in the middle two income brackets. Additionally, a country's debut in the Olympic swimming competition

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[6] "USA Swimming - LSC Statistics," accessed February 9, 2017, https://www.usaswimming.org/DesktopDefault.aspx?TabId=1521.

[7] "The Michael Phelps Effect: High School Swimming and Diving Participation Continues To Grow," SwimSwam, May 6, 2015, https://swimswam.com/the-michael-phelps-effect-high-school-swimming-and-diving-continues-to-grow/

[8] "The Michael Phelps Effect: High School Swimming and Diving Participation Continues To Grow," SwimSwam, May 6, 2015, https://swimswam.com/the-michael-phelps-effect-high-school-swimming-and-diving-continues-to-grow/

[9] "After Historic Olympic Gold, Singapore Sports Gets S$100 Million Boost," TODAYonline, accessed December 7, 2017, https://www.todayonline.com/singapore/after-historic-olympic-gold-singapore-sports-gets-s100-million-boost

has a considerable influence on drowning rates and this effect is not uniform across income brackets.

The rest of this paper is structured as follows. Section II provides a theoretical background and explanation of the data used. Section III describes the results and Section IV concludes.

Section II

Theoretical Background

I am most interested in studying the effects of Olympic swimming success and participation on drowning rates. I explore several variables that have not previously been analyzed in this context. These include Olympic roster size, success and participation at Olympics, a country's debut, and hosting Olympic events.

Olympic success, participation and increased funding for swimming could have an impact on drowning rates, but there are a lot of factors in between these elements. Swimming participation and swimming lessons are crucial elements to consider when studying this relationship. The link between swimming lessons, swimming participation, and drowning rates seems relatively straightforward. However, the relationship between these three statistics is not always clear or causal. Ruth Brenner, a researcher at the National Institute of Health, has published several studies on these topics. In one of her articles, she found evidence that "participation in formal swimming lessons was associated with an 88 percent reduction in the risk of drowning" for young children[10]. The World Health Organization has also studied these relationships and published a report detailing the most effective ways to prevent drowning. They name swimming lessons as the third most important factor and reference a study in Bangladesh that showed a 93% reduction in fatal drowning for participants of a swimming skills program[11]. RMK Tan also published a study on drowning prevention in Singapore. Tan recommends, "Swimming skills and water-safety should be widely taught in the schools and other institutions"[12]. While all of these studies reference that there are other factors that

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[10] Ruth A. Brenner et al., "Association Between Swimming Lessons and Drowning in Childhood: A Case-Control Study," *Archives of Pediatrics & Adolescent Medicine* 163, no. 3 (March 2, 2009): 203–10, https://doi.org/10.1001/archpediatrics.2008.563.

[11] "WHO | Global Report on Drowning: Preventing a Leading Killer," WHO, accessed February 9, 2017, http://www.who.int/violence_injury_prevention/global_report_drowning/en/

[12] Richard Tan, "The Epidemiology and Prevention of Drowning in Singapore," accessed February 24, 2017, http://www.academia.edu/5976127/The_epidemiology_and_prevention_of_drowning_in_Singapore.

affect drowning, they all conclude that increased swimming lessons and participation have an important relationship with decreasing drowning rates.

I anticipate that Olympic swimming success should have a negative relationship with drowning rates because increased success, especially at the highest levels, enhances the image of swimming in a country and have a positive impact on the swimming programs in the country. The swimming programs receive more publicity, likely more funding, and more participation because of this success.[13] These factors would contribute to more people learning how to swim and, as a result, understanding potential drowning risks.

I hypothesize that if a country hosted a major swimming event, it would have a negative relationship with drowning rates. Hosting one of these events should cause a decrease in drowning rates after the event because of the additional funding and attention surrounding swimming. Hosting such an event can increase popularity for swimming and access to swimming facilities and lessons. These factors could be a critical determinant in educating more people with swimming lessons and/or potential drowning risks.

An important consideration in the theoretical basis for this analysis is that no previous research exists directly linking international competitive swimming success or participation with drowning rates, despite the relative intuition of this link. Thus, more work should be performed to explore these links. I have determined control variables to include based on previous studies of factors that influence drowning rates.

The size of Olympic swimming rosters is a variable that may capture a breadth of factors that are difficult to measure. These include increased access to swimming education and supervision, swimming culture within a country, and funding for swimming. I have collected these roster sizes through Olympic reports compiled by the LA84 foundation.[14] Each report includes a list of the roster size for each country's swimming team at a particular Olympics. Roster sizes would increase if more members of a country are participating in swimming, which would mean that more people are learning how to swim. Additionally, increased roster sizes would indicate that the exposure of swimming in a country is improving because more people are able to compete at the highest international levels. Roster sizes are also indicative of the funding for swimming in a country and are linked to the overall income of a country. The United States Olympic Committee determines

[13] "After Historic Olympic Gold, Singapore Sports Gets S$100 Million Boost," TODAYonline, accessed December 7, 2017, https://www.todayonline.com/singapore/after-historic-olympic-gold-singapore-sports-gets-s100-million-boost

[14] "Search LA84 Foundation," accessed November 9, 2017, http://search.la84.org/search?site=default_collection&client=default_frontend&output=xml_no_dtd&proxystylesheet=default_frontend&proxycustom=%3CHOME/%3E

funding for sport based on previous performance and opportunities to medal.[15] In a sport like swimming, the allocation of funding can be critical to bringing one more person to the Olympics. Summary statistics in Table 2, which is included within the appendix, demonstrate the differences in roster sizes by income levels. In the two lowest income levels, roster sizes are 0.879 and 2.250, respectively. The two highest income levels have roster sizes of 3.770 and 11.39, respectively.

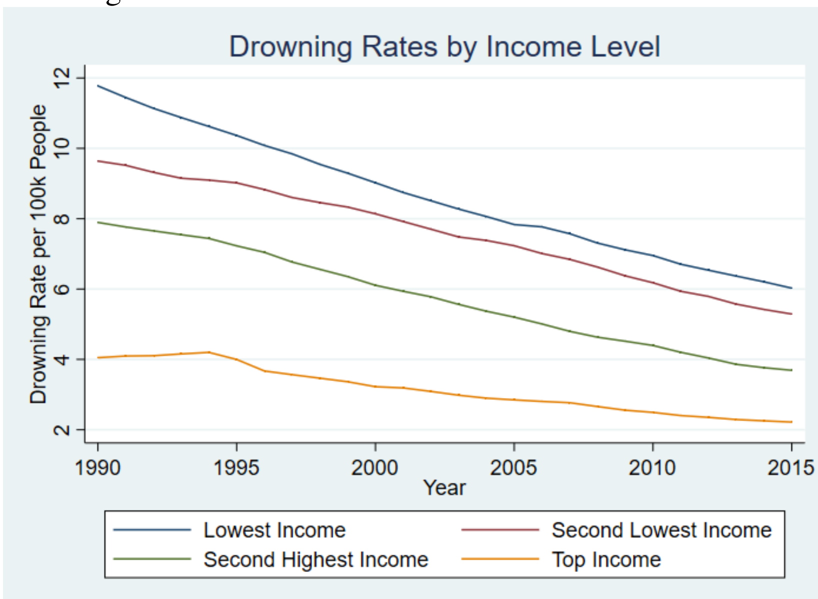
Income differences play an obvious role in a country's swimming roster size at the Olympics. Similarly, increased funding for a country's swimming programs should increase roster sizes. Swimming roster sizes should have a negative relationship with drowning rates. An increase in the roster size should be followed by a decrease in drowning rates.

I include variables that measure when country debuts in the swimming competition of the Olympics. A debut should be associated with increases in funding and resources for the entire country to become more engaged in swimming activities and education. A debut should result in a decrease in drowning rates. I also include a variable that measures when a country first experiences peak success in the Olympics with few successes beforehand. I measure when a country first receives a gold medal in a championship swimming event and have had fewer than three swimming medalists in the country's history. This should result in increased attention on swimming in the country experiencing the success and should cause a decrease in drowning rates.

The control variables I consider include economic, demographic, and education sectors. Economic variables include annual GDP growth and poverty levels. The growth in GDP of a country should have a negative relationship with the drowning rates. An increase in the GDP of a country is likely to result in a decrease in drowning rates (Peden and McGee, 2003). GDP growth would allow for additional opportunities – including swimming lessons, more supervision, etc. - where people are better prepared to swim and understand potential harms of going to a body of water. The poverty variable measures the proportion of a country's population that lives on less than $5.50 a day. Changes in the proportion of a population living in poverty should display a positive relationship with drowning rates. Drowning is often more concentrated in countries with higher levels of poverty (Tyler et al., 2017). Figure 2 illustrates some of the vast disparities in drowning rates across the world that are associated with income disparities. This figure assigns income levels by the standards determined by the World Bank for a country's net income per capita.

[15] "Funding for Elite Athletes Based on Results, Potential," USA TODAY, accessed May 3, 2018, https://www.usatoday.com/story/sports/olympics/2013/07/01/usoc-olympic-funding-based-on-results/2481617/.

Figure 2



Source – Global Burden of Disease, 2015

Demographic variables include age distribution, sex distribution, population density and the rural population. Changes in the percentage of the population that fall in the 0 – 14 age cohort should have a positive relationship with drowning rates. Children in this age group are at the highest drowning risk (Peden and McGee, 2003). Therefore, an increase in the 0-14 age portion of the population should increase the drowning rate. Changes in the percentage of a population that is female should display a negative relationship with drowning rates. Females are less susceptible to drowning and drowning risks (Hossain et al., 2015). As a result, an increase in the male percentage of the population should increase drowning rates. Population density should have a negative relationship with drowning rates. Previous studies have displayed that drowning rates decrease in areas with high population density (Hastings et al., 2006). The percentage of a population that lives in rural areas should have a positive relationship with drowning rates. Several studies have displayed that those who live in rural areas are more likely to drown because of increased access to water bodies, decreased supervision, and decreased educational opportunities (Yang et al., 2007; Hossain et al.,2015; Tyler et al., 2017).

Education variables include primary school enrollment. Primary school enrollment in a country should have a negative relationship with drowning rates. An increase in students participating in primary school is likely to result in a decrease in drowning rates. Increased educational attainment in a country should cause more children (who are most susceptible to drowning risks) to gain skills in swimming and better understand the risks associated with drowning. Additionally, parental education level can influence drowning risks. Increased education levels for parents is correlated with increased opportunities for swimming education and supervision while swimming (Yang et al., 2007). We can use primary school enrollment to better understand this effect.

Data

I use the Global Burden of Disease Study, performed by the University of Washington Institute for Health Metrics and Evaluation, to collect information on drowning rates throughout the world. This database collects data at the country level on instances where individuals have drowned.[16] This includes fatal and non-fatal accidental drowning instances. I use annual drowning rate data for 171 countries around the world from 1990 – 2015.

The second major database I use is the World Development Indicators provided by the World Bank. This database receives direct reports at the country level on numerous statistics.[17] From this database, I collected seven statistics: annual GDP growth rates (percentage), the percentage of the population that is within the age group 0 – 14, the percentage of the population that lives in a rural area, the percentage of the population that is female, the population density, primary school enrollment and poverty levels.

In order to accumulate information of Olympic swimming success, I use the International Swimming Federation (FINA) website.[18] I use a dummy variable to account for an individual who received at least two gold medals or at least three total medals in a single Olympic games between 1990 and 2015. Additionally, I include variables for the first time a country earns a swimming gold medal if they have three or fewer medalists in swimming. I generate a variable for the debut of a country in Olympic swimming. With all of these variables, I include variations of the duration for each count. For instance, when looking at the size of a country's roster, I include the roster size for the Olympic year it occurs in and the three years following.

[16] Global Burden of Disease Study 2015 (GBD 2015) Life Expectancy, All-Cause and Cause-Specific Mortality 1980-2015 | GHDx," accessed November 2, 2017, http://ghdx.healthdata.org/record/global-burden-disease-study-2015-gbd-2015-life-expectancy-all-cause-and-cause-specific

[17] "World Development Indicators | DataBank," accessed November 2, 2017, http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&preview=on#.

[18] "Medals | Fina.Org - Official FINA Website," accessed November 2, 2017, https://www.fina.org/event/17th-fina-world-championships/medals

I use archived Olympic reports from the LA84 Foundation to collect data on the size of each country's representation in the swimming competition.[19] I also use *The Guardian's* Olympic database to collect data for the aggregate medal counts for each country at all Olympic competitions.[20]

The final group of data encompasses the hosting of international or regional swimming events. These data were compiled by looking at the FINA website for major international events and event websites for each of the other international events listed below. This group includes three different variables. The event variable includes the two major events: the Olympics and Long Course World Championships. The second variable, major event, includes the next tier of international or regional events: All-African Games, European Championships, the Asian Games and the Short Course World Championships. These events collect a major audience, but do not have as large of an economic and visible presence as the top tier. The final variable, region event, includes the third tier of events: Pan-Pacific Championships, Commonwealth Games, and Pan-American Games. These events have a larger disparity in viewing between the competitive swimming community and the rest of possible viewers.

In order to determine which countries to analyze, I first rely on data accessibility. Any country that did not have a full data set for each variable or one that could not be reasonably interpolated/extrapolated using STATA was dropped. Additionally, for this analysis, I only include countries that have competed in the swimming competitions of the Olympics between 1992 and 2012. I focus on the influence of different forms of participation and success in the Olympics. As a result, my analysis includes only countries that have experienced at least one of these two. Table 1 displays the summary statistics for countries delineated by roster sizes. There are some differences in the mean of statistics between the two groups of roster sizes. However, these differences seem consistent with the average income differences that are evident between countries with different roster sizes. Table 2 presents the summary statistics for countries delineated by average income. There continue to be some differences in the statistics by income difference. However, none of these differences are of concern for my regressions.

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[19] "Search LA84 Foundation," accessed November 9, 2017, http://search.la84.org/search?site=default_collection&client=default_frontend&output=xml_no_dtd&proxystylesheet=default_frontend&proxycustom=%3CHOME/%3E

[20] "London 2012 Olympics Data + Olympic Games 2012 | Sport," the Guardian, accessed November 28, 2017, http://www.theguardian.com/sport/series/london-2012-olympics-data+olympics-2012

Empirical Methodology

I use an ordinary least-squares regression to analyze the panel data with country and year fixed effects. I use a country's drowning rate as my dependent variable in all regressions. I begin by performing standard regressions on each of the variables of interest – which include roster size, a debut at the Olympics, the first medalist at an Olympics for a country, success at the Olympics, and hosting an international swimming event. For all regressions, I start with the single variable. With each additional regression, I add one group of control variables until all control variables are included. Below is the generic estimating equation that changes with the variable of interest:

$$\text{Drowning Rate per 100k people} = \beta_0 + \beta_1(\text{Variable of Interest}) + \beta_2(\text{Annual GDP Growth Percentage}) + \beta_3(\text{Age 0 - 14}) + \beta_4(\text{Female}) + \beta_5(\text{Population Density}) + \beta_6(\text{Rural Population}) + \beta_7(\text{Poverty}) + \beta_8(\text{Primary School Enrollment}) + x_i + \alpha_t + \varepsilon_{it}$$

For every variable of interest, I include different time durations for each of the variables. I begin by only including the value in the year that it occurs (i.e. Olympic years) with a value of zero in each of the other years. Next, I include a variable's value for the Olympic year that it occurs and the three years after. This identifies each variables' value with a full Olympic cycle. Finally, for some value such as the debut, first success, or hosting an event, I include the value of the variable for the year it occurs and all years after.

I use roster size and income levels to delineate countries. To look at different roster sizes, I perform some regressions with only the countries that have two swimmers or fewer on their rosters. I use this as an attempt to identify the effects of the universality rule. I also split all the countries into one of four income groups, determined by the World Bank's net income per capita measure. I perform regressions on separate income groups to determine if the effects are similar across all groups.

I was concerned about endogeneity, specifically simultaneity bias, between some of my variables of interest and drowning rates. However, I performed an instrumental variable regression on these variables using the total Olympic medal counts for countries as a predictor for my Olympic success variables and found no reason to believe that my variables of interest are influenced by previous drowning rates.

Section IV

Results

My analysis begins by studying the effects of roster size on drowning rates. I began by studying different specifications. The only variant of roster sizes that produced notable results was when I included roster size values for an entire Olympic cycle. When I examine all roster sizes, I did not find any significant results. However, when I restricted my analysis to countries that include two or fewer swimmers, I found notable results. This subset includes all countries that are competing because of FINA's Universality Rule. Table 3 includes the full regression results for the countries that have two or fewer competitors. When I include all control variables, each additional swimmer results in a 0.299 decrease in the drowning rate, with significance at the five percent level. For context, this decrease accounts for about five percent of drowning incidents in the countries that compete as a result of the Universality Rule. Next, I perform this regression on all countries and separate them into different income brackets. Table 4 includes these regressions. I find that the most pronounced effect is on countries at the income extremes. For countries that are of the lowest income, an additional competitor is associated with a 0.399 decrease in the drowning rate.

Next, I present results of the debut of countries at the Olympics. The only specification that yielded notable results was when the value of the debut variable changed in the year the debut occurred and all years after. My final results provide reasonable evidence that the debut of a country's swimming program in the Olympics can decrease drowning rates, but in a small way. In my final regressions, I do not find results that are significant at even the ten percent level, but they remain consistently negative throughout my regressions. In my final regression, a debut is associated with a drowning rate decrease of 0.500. Full results are included in Table 3. I find some interesting results when I look at the debut variable across income levels. Each of the three lowest income brackets display results that are not distinguishable from zero, but the top income bracket displays results that are significant at the five percent level. A debut at the Olympics for one of these countries leads to a 1.181 decrease in a country's drowning rate. More comprehensive results are included in Table 5.

The next variable that was notable is success in the Olympics. I use the specification that includes a value for an entire Olympic cycle. In Table 3, we can see when looking at total Olympic success, there does not seem to be any noticeable effect on drowning rates. In fact, it may be the case that Olympic success increases drowning rates. When I perform these regressions on separate income brackets, this story continues to unfold. Table 6 shows the full results when I perform this regression on different income brackets. Notably, success in the Olympics leads to alarmingly high increases in drowning rates for countries in the middle two income brackets. Olympic success is associated with increases in drowning rates as high as 4.016 incidents per 100,000 people.

The two variables of interest that did not present notable results were those that indicated when a country hosted an international event. I performed regressions with multiple specifications, and even some to determine any effects one, two, or three years after an event, but could not find any effects on drowning rates.

Section V

Conclusion

My analysis includes determining whether different measures of international swimming success and participation influence drowning rates across the world. I present several notable findings. The first is that programs like FINA's Universality Rule, which is focused on expanding swimming's reach to countries historically underrepresented at the international swimming level, is enabling countries to influence their drowning rates through international swimming participation. Particularly in countries that compete with two or fewer swimmers at the Olympics, there are significant decreases in drowning rates after Olympic swimming participation. The second is that countries' debuting at Olympic swimming competitions are also displaying decreases in drowning rates. Specifically, in the highest income countries, there are substantial decreases in drowning rates after a debut. The final notable result is that Olympic success is not resulting in decreases to drowning rates in all countries. Particularly in middle income countries, Olympic success is associated with increased drowning rates.

These results provide several policy implications. The first is that FINA's Universality Rule seems to have a positive effect on the countries it is intended to benefit. More countries are able to compete in Olympic swimming competitions and are seeing fewer drowning incidents in the years following. FINA's Universality Rule is using the Olympics as an opportunity to show the true benefits of sport across the world. While the Olympics are an amazing venue to display sports prowess, they are also an opportunity to connect countries across the world in meaningful activity that can benefit each country. Swimming exists in a unique niche that can save lives while promoting competition. FINA should continue to stress the importance of using competitive swimming as an opportunity to benefit millions of people around the world. Countries that do not produce elite Olympic swimmers are still able to establish infrastructure and popularity around a sport that can prevent death across a country.

An additional implication is that having Olympic success does not always bring positive results. Olympic success increases drowning rates in many countries, particularly middle-income countries. It seems likely that this success breeds popularity and excitement around the sport of swimming, but is not followed by an additional influx of resources for safe swimming. This an important opportunity for improvement in FINA's vision around the world. Especially in countries that have had recent swimming success, countries should be ensuring that there are safe venues to swim. Additionally, increased attention should be placed on educating all people, especially children, to learn how to swim and increasing supervision for swimming.

The Olympics are often viewed as an opportunity to watch the world's best athletes compete on the world's biggest stage. The games are an amazing opportunity for everyone involved to participate, learn and share the myriad benefits of sport. But, one of the most beautiful aspects of sport is its ability to influence other areas of society. Swimming in the Olympics has already affected these areas, particularly in relation to drowning rates[21]. Around the world, there are opportunities to see similar influences even with countries that have not experienced peak swimming success. My analysis displays that countries that participate and succeed in Olympic swimming competitions are in unique position to use competitive swimming as an opportunity to decrease the negative effects of drowning.

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Appendix

Table 1

VARIABLES	All Countries	Countries with a roster size of 0 - 2	Countries with roster size >2
Country's drowning rate (per 1000 people)	5.292	6.750	4.129
Size of country's Olympic Swimming Roster	5.604	0.959	9.311
Debut - Dummy variable for country's debut at Olympics	0.0867	0.195	0
First - Dummy variable for country's first gold medal at the Olympics if country has fewer than 3 swimming medalists	0.0639	0	0.115
Success - Dummy variable if a country had individual with >2 golds, >3 individual medals	0.0240	0	0.0431
Major Event - Dummy variable if a country hosted a major international event	0.0952	0.0113	0.162
Annual GDP Growth	3.587	4.174	3.118
Percentage of country's population that is between ages 0 - 14	31.12	39.32	24.58
Percentage of country's population that lives in a rural area	45.23	59.92	33.50
Percentage of country's population that is female	50.52	50.19	50.78
Population Density of a country	116.3	129.1	106.1
Percentage of country's population living on less than $5.50 a day	46.58	72.31	26.04
Percentage of country's primary school age students that are enrolled in primary school	87.01	77.55	94.57
Number of countries	102	45	57

Table 2

VARIABLES	All Countries	Lowest Income Group	2nd Lowest Income Group	2nd Highest Income Group	Highest Income Group
Drowning Rate	5.292	7.770	7.111	4.845	3.193
Roster Size	5.604	0.879	2.250	3.770	11.39
Debut	0.0867	0.286	0.0748	0.0638	0.0312
First Success	0.0639	0	0.0216	0.0638	0.122
Success	0.0240	0	0.00288	0.00957	0.0601
Major Event	0.0952	0.0137	0.0187	0.104	0.182
Annual GDP Growth	3.587	4.621	3.786	3.897	2.798
Ages 0 - 14	31.12	45.21	36.13	29.69	22.54
Rural Population	45.23	75.64	54.20	38.75	30.47
Female Population	50.52	50.63	50.06	50.45	50.89
Population Density	116.3	84.09	150.6	110.4	107.1
Poverty	46.58	94.40	65.23	41.40	16.38
Primary School Enrollment	87.01	67.34	82.58	92.51	94.58
Number of countries	102	14	27	25	36

Table 3

VARIABLES	(1)	(2)	(3)
Roster Size	-0.299**	-	-
	(0.143)		
Olympic Success	-	0.402	-
		(0.323)	
Olympic Debut	-	-	-0.500
			(0.440)
GDP Growth	-0.0259**	-0.0196**	-0.0179**
	(0.0108)	(0.00905)	(0.00815)
Poverty	0.00938	0.0379***	0.0381***
	(0.0165)	(0.0119)	(0.0121)
Age 0 -14	0.225**	0.160***	0.160***
	(0.0848)	(0.0575)	(0.0571)
Female	-0.664	-0.519	-0.578
	(0.847)	(0.641)	(0.625)
Rural	-0.0527	-0.0206	-0.0280
	(0.0689)	(0.0389)	(0.0388)
Density	-0.0425**	-0.0353**	-0.0351**
	(0.0177)	(0.0170)	(0.0172)
Enrollment	-0.00267	-0.00616	-0.00345
	(0.0133)	(0.0112)	(0.0106)
Observations	1,147	2,584	2,584
R-squared	0.641	0.547	0.548
Number of countries	45	102	102

Robust standard errors in parentheses

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

Table 4

VARIABLES	(1) Lowest Income Group	(2) 2nd Lowest Income Group	(3) 2nd Highest Income Group	(4) Highest Income Group
Roster Size	-0.339**	0.0194	0.0464	0.00182
	(0.143)	(0.0314)	(0.0366)	(0.00514)
GDP Growth	-0.00737	-0.0206	0.00397	-0.0203
	(0.00913)	(0.0158)	(0.00963)	(0.0171)
Poverty	0.0480	0.0293	0.0435***	0.0445***
	(0.0909)	(0.0255)	(0.0123)	(0.0110)
Age 0 - 14	0.0246	0.139*	0.245**	0.255***
	(0.170)	(0.0739)	(0.118)	(0.0601)
Female	0.234	0.325	-0.944	0.775**
	(0.856)	(0.553)	(0.632)	(0.329)
Rural	-0.0144	-0.0219	-0.0593	-0.0560
	(0.107)	(0.0819)	(0.0660)	(0.0336)
Density	-0.0263*	-0.0617***	-0.00709	-0.00192
	(0.0131)	(0.0151)	(0.00984)	(0.00341)
Enrollment	-0.0399***	0.0370**	0.0168	-0.0168
	(0.0118)	(0.0135)	(0.0252)	(0.0121)
Observations	364	695	627	898
R-squared	0.759	0.746	0.598	0.615
Number of countries	14	27	25	36

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5

VARIABLES	(1) Lowest Income Group	(2) 2nd Lowest Income Group	(3) 2nd Highest Income Group	(4) Highest Income Group
Debut	0.164	-0.443	0.299	-1.181**
	(0.396)	(0.381)	(0.318)	(0.526)
GDP Growth	-0.00503	-0.0136	0.00525	-0.0141
	(0.00957)	(0.0147)	(0.0105)	(0.0158)
Poverty	0.0736	0.0309	0.0439***	0.0424***
	(0.0958)	(0.0250)	(0.0122)	(0.0109)
Age 0 - 14	-0.00398	0.134*	0.222*	0.248***
	(0.169)	(0.0715)	(0.113)	(0.0528)
Female	0.410	0.373	-0.984	0.657**
	(0.782)	(0.523)	(0.658)	(0.297)
Rural	0.0325	-0.0317	-0.0533	-0.0448
	(0.114)	(0.0851)	(0.0658)	(0.0282)
Density	-0.0274*	-0.0624***	-0.00818	0.00190
	(0.0150)	(0.0151)	(0.00995)	(0.00446)
Enrollment	-0.0410***	0.0368***	0.0125	-0.0129
	(0.0129)	(0.0115)	(0.0269)	(0.0128)
Observations	364	695	627	898
R-squared	0.745	0.747	0.592	0.630
Number of countries	14	27	25	36

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6

VARIABLES	(1) Lowest Income Group	(2) 2nd Lowest Income Group	(3) 2nd Highest Income Group	(4) Highest Income Group
Olympic Success	-	4.016***	2.642***	-0.0481
		(0.385)	(0.420)	(0.187)
GDP Growth	-0.00534	-0.0469**	0.00252	-0.0202
	(0.00901)	(0.0185)	(0.00807)	(0.0170)
Poverty	0.0703	0.0266	0.0389***	0.0446***
	(0.0965)	(0.0213)	(0.0131)	(0.0108)
Age 0 - 14	-0.00301	0.142**	0.231*	0.254***
	(0.171)	(0.0665)	(0.113)	(0.0590)
Female	0.344	0.296	-0.911	0.769**
	(0.888)	(0.543)	(0.626)	(0.333)
Rural	0.0220	-0.0166	-0.0551	-0.0576
	(0.104)	(0.0801)	(0.0664)	(0.0341)
Density	-0.0278*	-0.0616***	-0.00739	-0.00193
	(0.0149)	(0.0150)	(0.00961)	(0.00342)
Enroll	-0.0407***	0.0433***	0.0108	-0.0168
	(0.0130)	(0.0148)	(0.0268)	(0.0122)
Observations	364	695	627	898
R-squared	0.744	0.764	0.608	0.615
Number of countries	14	27	25	36

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1