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Department: Health and Sport Science

Advisor: Joshua Ambrosius, Ph.D.

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Abstract

The IOC has increased their focus on long-term effects for hosts of the Olympic Games, coinciding with increased academic interest in studying the positive and negative legacies of mega-sporting events in the host city. Recently, cities in relatively underdeveloped countries have won bids for mega-sporting events. City officials and the IOC have begun marketing mega-sporting events as transformational events for underdeveloped cities' economies, urban infrastructure, social landscape, and health. The thesis investigates the impact of hosting mega-sporting events for public health and infrastructure in three case studies: the 2016 Summer Olympics in Rio de Janeiro, Brazil, the 2014 Winter Olympics in Sochi, Russia, and the 2010 World Cup in Johannesburg, South Africa. By investigating health policy responses and urban infrastructure re-use projects, this research contributes to understanding the impacts of mega-sporting events on communities in host cities. Specifically, policy and health behavior theory are connected with the potential for health policy response and infrastructure re-use to benefit community residents in mega-sporting event host cities.

Dedication or Acknowledgements

I would like to first acknowledge Timothy Joseph for first bringing this topic to my attention; I would also like to acknowledge Dr. Ambrosius for his patience and wisdom, as well as Dr. Anne Crecelius, my academic advisor.



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INTRODUCTION

The Olympics and other mega-sporting events often bring a wave of media attention—to the athletes, to the host country, and to the host city. Mega-events are categorized by their relatively brief duration, long-term impact, and large scale (Roche, 2000). Mega-sporting events include the Summer and Winter Olympics and the FIFA (*Fédération Internationale de Football Association*) World Cup. Mega-sporting events are celebrated for a variety of reasons, partially to commemorate the universality of human physical achievements. Hosting a major sporting event is considered a great honor and, more controversially, an economic boon for the chosen locale.

Recent site selections have been guided by the “transformation from the modern to the post-modern” (Viehoff & Poynter 2015). This shift emphasizes the view that mega-events can serve as catalysts for urban and even national development (“Changes to Olympic Winter Games,” 2017). Bids, both successful and unsuccessful, increasingly come from non-Western host cities, including those in the developing world. Research has explored the consequences of hosting a mega-event in non-traditional contexts, oftentimes focusing on the resulting *legacy* effects on the host city and its communities.

Mega-event legacy, “irrespective of the time of production and space,” is “all planned and unplanned, positive and negative, tangible and intangible structures created for and by a sport event that remain longer than the event itself” (Preuss, 2007). It was not until 2003 after some years of negative scrutiny that the term appeared in the International Olympic Committee’s (IOC) language. Concerns surrounding white elephant investments and gigantism led to a shift in the discourse of mega-event hosting where legacy and a mega-event’s global and citywide achievements and contributions

were portrayed as enduring (MacRury, 2015). Legacy can have many components, but those most often studied are: sporting, social, urban, and economic (MacRury, 2015). A mega-events' legacy has a wider reaching impact than those five areas, however. Bizarro and colleagues (2016) note that there are very few studies focusing on components of health legacy.

The underlying goal of this research is to investigate the legacy potential for health—in other words, the ways that host cities attempt to create legacies aimed at improving the welfare of community members. In particular, this present project seeks to examine infrastructure reuse and policy change aimed at local public health improvements. It is theorized that countries largely ignore health concerns in designing their mega-events' legacy, resulting in an absence of policy addressing that issue. It is further posited that mega-event infrastructure is under-utilized after the event has ended, and that efforts to increase the sustainability of mega-event infrastructure have not come to fruition.

BACKGROUND & LITERATURE REVIEW

Olympic Allocation Process

The process of bidding for an Olympics is a costly and complex one, with multiple stages and investments. The Olympic website lists two stages in four parts of the bidding process. First is the invitation phase, where cities meet with the IOC, exchange ideas, and explore the logistics and requirements for hosting the Olympic Games. If a city then proceeds onto the next step they must make it through the three stages of the Candidature Process, described in Table 1.

Table 1: Olympic Games' Candidature Process

Stage 1	Stage 2	Stage 3
This phase is the strategic analysis phase, during which Candidate Cities put together their Games vision, concept and legacy plans.	This phase ensures that cities have the necessary legal and financial mechanisms in place to host the Olympic Games.	This stage analyses how Candidate Cities will deliver the Games and ensure a sustainable legacy. The application is also examined for how the Games will be delivered to and experienced by athletes and spectators.

Source: <https://www.olympic.org/all-about-the-candidature-process>

Throughout the process, a candidate city receives feedback from the IOC regarding their bid—including a sense as to whether or not a bid would/will be successful. This feedback contributes to the relatively small number of bids. Cities that make it through the process, waiting to hear their name selected on announcement day, have most likely invested over \$40 million (Fletcher, 2009). Those who are rejected are left with select upgrades made to impress the committee and the knowledge of how to navigate the process should they compete for a future host opportunity. Rarely do the perceived frontrunners for the event win: 5 of the last 6 Olympic hosts were not the expected winners. Some cities put their names in only to withdraw partially through the process. For example, Hamburg, Budapest, and Rome all withdrew their cities from consideration to host the 2024 summer games, leaving only two choices: Paris and Los

Angeles, which became the first dual awarded cities to host in 2024 and 2028, respectively.

FIFA Allocation Process

FIFA has a similar process, although less information is publicly disclosed on their website about the process. There are workshops and feedback given to potential cities before a host is chosen. FIFA lists benefits for countries who bid for the World Cup: “Increased cooperation and goodwill between the various stakeholders—the member association, the government and other bid stakeholders such as the bid host cities, commercial partners, the media and the community at large...A catalyst for new and improved facilities to support the development of the game at all levels” (FIFA, n.d.).

Legacy and Follow-Through

Once a host for a mega sporting event is selected, the city must go about fulfilling their promises. Many of the promises made, to both the IOC and the public during Stage 3, interest academics. The 2016 Olympics in Rio de Janeiro illustrate the way that the IOC views the impact of hosting into the future: “...when we award the Games to a city, our work is not just to look at the preparations for the games themselves but also to look at their legacy and to help the city and country to maximize the benefits of being an Olympic host” (“Rio 2016,” 2016).

Increasingly, developing countries and their cities are bidding and receiving more of these mega-events—amplifying the conversation about legacy and whether these events actually serve as catalysts for development. Table 2, reprinted from Baade and

Matheson (2016), demonstrates the sharp increase in bids from developing contexts—away from traditional industrialized countries.

Table 2: Number of Bids for Summer and Winter Olympic Games

Event	Bidders			Hosts		
	<i>Industrialized countries</i>	<i>Developing countries</i>	<i>Eastern European/ Former Soviet states</i>	<i>Industrialized countries</i>	<i>Developing countries</i>	<i>Eastern European/ Former Soviet states</i>
<i>Summer</i>						
<i>Olympics:</i>						
1896-1996	71 (82%)	9 (10%)	7(8%)	20 (87%)	2 (9%)	1 (4%)
2000-2020	23 (49%)	21 (44%)	4 (7%)	4(67%)	2 (33%)	0 (0%)
<i>Winter</i>						
<i>Olympics:</i>						
1924-1998	51 (93%)	1 (2%)	3 (5%)	17 (94%)	0 (0%)	1 (6%)
2002-2022	21 (56%)	4 (9%)	12 (34%)	4 (67%)	1 (17%)	1 (17%)

Source: Reprinted from Baade & Matheson (2016)

Economic Legacy Effects

Potential economic benefits are perhaps the most studied and talked about. Baade and Matheson's (2016) comprehensive analysis discusses costs and revenues, both intangible and tangible. Some sources of revenue for hosts include: money from endorsement deals with large corporations, increased tourism spending, broadcast rights,

ticket sales, and increased employment locally. The host cities are also left with sporting arenas, fields, and other specific infrastructure capable of hosting future one-time or ongoing events. However, these venues often require enormous maintenance costs, even if used. Additionally, housing and other buildings built to withstand the increase population of a city during the mega-sports event may go unused once the event is over.

Although the accounting is difficult, most economists have found that only one Olympics have generated more revenue than costs (1984 Summer Olympics in Los Angeles). Additionally, cities spend money to go through the bid process, and the firm deadlines of mega-events mean that cities often must spend extra ensure preparations are finished in time, resulting in budgets that often double or triple the initial estimate.

Sporting Legacy Effects

The sporting legacy refers to the impact on the culture of sport in the host city/country, as well as tangible improvements in the sporting infrastructure. For instance, FIFA has created grants to develop soccer at all levels in some World Cup locations, and many of the stadiums and venues used in mega-sporting events have the potential to be re-used for sport in the future (“Ensuring a lasting,” n.d.). For instance, the main stadium (then Centennial Stadium) for the 1996 Summer Olympics in Atlanta, Georgia, served to host the opening and closing ceremonies, as well as track and field events. Afterwards, the facility was transformed into a professional baseball stadium, and now hosts the football team for Georgia State. Centennial Stadium shows that mega-sport venues not only provide homes for sport during the event, but also can do so long after.

Social Legacy Effects

Mega-events have been marketed as an agent for social good for some time, with possible benefits including: national pride and unity, shared experiences, and community development (Swart & Bob, 2012). Months before the 2018 PyeongChang Winter Olympics, the IOC commented that legacy, “reinforces the mission of the International Olympic Committee to establish sport as an agent for positive change designed to benefit both humanity and the environment across several areas” (“PyeongChang Olympic,” 2018). Social legacy effects are not necessarily positive, however. Mega-events can also disrupt social life and create change by displacing residents. Construction and traffic not only impact residents’ daily lives but also can likewise impact the way they view the mega-event.

Urban Development Legacy Effects

Transformational impacts of mega-events in the urban environment may include upgrades in transportation and spatial capacities, increased hotel and lodging opportunities, and the resulting urban landscape after these changes, including the displacement of individuals, communities, and community assets. For recent events, like the 2012 Summer Olympics in London, scholars have discussed the concept of convergence, within which the themes of legacy again play out. Convergence seeks to use town planning and urban design to bridge the gap between deprived neighborhoods and the rest of the mega-event city. Convergence says that “by ensuring large-scale, post-Olympic Games development is designed to adequately address long-standing social issues directly associated with its built environment context” (Davis, 2015, pg. 63), the

Olympics, or any mega-event, can contribute positively to change in the city. The idea that the Olympic Games leaves behind a lasting effect, or legacy, is one that permeates urban development and other social science disciplines, and helps frame our discussion of potential health legacies of mega-events.

Table 3 summarizes the above discussion of mega-events' impacts on the communities that host them.

Table 3: Summary of Mega Sporting Events' Perceived Legacies

	Economic	Sporting	Social	Urban
<i>Benefits</i>	Endorsement deals	Increased sporting infrastructure	National pride and unity	Improved transportational facilities
	Sponsors	Increased exposure of sport	Shared experiences	Increased and improved accommodation facilities
	Ticketing		Increased community development	
<i>Negatives</i>	Large time oriented costs		Disruption of community life	Maintenance costs
	Large tax burden		Alienation of communities	Underutilized facilities
			Traffic	

Potential for Health Legacy

At this time, the literature is mixed on the ability for a mega sporting event to deliver an inherent positive health legacy, although Bizarro et al. (2016) demonstrate the need for health improvements in a host city. In past Olympic Games, any public health legacy was focused on recent events: for instance, the 2004 Athens Olympics had a focus on disaster preparedness as a result of the events of September 11, 2001.

The 2012 Olympics were a turning point, “seen as a catalyst to increase mass participation in physical activity through a possible demonstration effect and access to world-class sporting facilities, improvements in the environment that promote physical activity, and opportunities of active travel” (Wellings, 2011). Since then, there has been discussion about whether the pursuit of a health legacy for mega-sport events should join the other perceived effects as a key reason for hosting games. Key measures of such a legacy might include the construction and reuse of sport and exercise infrastructure that provides opportunities to community members, and campaigns or programs that are started as a result of the mega-event to encourage healthy, active lifestyles among the population. Of course, resulting increases in health behaviors, such as physical activity, among community members would be the ultimate impact under study. Such an effort to gauge an event’s impacts on health outcomes would require significant primary research on the ground.

It has been hypothesized that viewing elite sport encourages non-athletes to become participates in sport and other physical activities themselves. Weed (2009) termed this the “demonstration effect.” While there is currently no evidence to suggest that the demonstration effect exists, Weed (2009) argued that “evidence also suggests that

sports mega-events do have the potential to increase mass participation in sport if investment is made in strategies and initiatives seeking to harness the event to stimulate sport participation demand.” In addition, Weed makes a distinction between leveraging mega sporting events as sporting events or as festival events, concluding that events of the latter nature can tap into local and cultural communities to create a desire to participate in an event that is culturally and nationally significant. In the future, “The goal for physical activity participation policy and strategy will be to satisfy the desire to participate through providing physical activity (rather than sport) opportunities presented as fun community events or programmes” (Weed and Mansfield, 2012, p. 8).

Post Third World Cities

There has also been discussion of a theory called “The Post Third World City,” wherein it is theorized that mega-events will help developing cities emerge from some of the endemic problems that have historically plagued them. Richmond and Garmany (2016) examined the theory’s validity in Rio de Janeiro, Brazil. They conclude that “Rio’s current transformation is belatedly getting to grips with historic problems of weak urban integration, patchy public service and endemic violence” (Richmond & Garmany, 2016, p. 621). Together, Richmond and Garmany identify new generations of urban policies at the historical conjecture of a series of mega-sporting events. One examination of this research is the development and advent of urban policy timed with the allocation of the Olympic Games in the aim of affecting the legacy of the games and improving the quality of life of community members living in the host city.

Mega-Events as Focusing Events

The idea that a galvanizing event can lead to policy is one that Kingdon (2012) introduces. Kingdon outlines the concept of policy streams, which theorizes that the initiative for policy implementation stems from a window of opportunity. Three streams intertwine to create a policy window: problems, politics, and policy solutions. The problem stream is composed of problems large and systemic enough to be require governmental intervention. The political stream is composed of political turnover, swing in the public mood or public arena. For example, a new mayor in Rio de Janeiro represented a political swing as a new administration came in as the city's Olympic legacy was being discerned. The policy solutions stream is composed of the myriad of remedies experts and politicians propose and refine in the legislative process. When all three streams connect, the issue makes it onto the policy agenda.

Oftentimes, in order for a policy window to be created there must be a focusing event. In mega-sporting contexts, oftentimes media brings to light problems that have existed for some time. Politically, officials and representatives are under increased scrutiny and pressure by the public that invested itself in the upcoming event. Experts in the field increasingly study mega-sporting event contexts and make legacy suggestions. Together, there is evidence that mega-sporting events can serve as a focusing event in opening a policy window, therefore contributing via policy to the legacy of the sporting event. Potentially, public health officials can capitalize on the event by launching healthy lifestyle initiatives.

METHODS

In order to examine the potential health legacy impact of mega sporting events, three developing cities were chosen as cases for analysis: Johannesburg in South Africa, Rio de Janeiro in Brazil, and Sochi in Russia. A case study is an “in-depth multifaceted investigation using qualitative research methods, of a single social phenomena” (Feagin, Orum, & Sjoberg, 1991, pg. 2).

Criteria

The criteria used to determine these three specific cities can be split into three parts: the city must have hosted a mega-sporting event within the last ten years, the sites must have had some policy response to the mega-event, and the sites also had to be classified in the bottom one-third in health systems in the world. An additional requirement was the understanding that the city was *developing*. Each sites’ specific situation is explored below. Lastly, the Human Development Index (HDI) was used to further provide evidence that the host city is a developing context. The Human Development Index is “a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living” (Human Development Reports, 2016).

Johannesburg

Johannesburg was one of several host sites for the 2010 World Cup, but was the only site to host two stadiums. The Soccer City complex, located in Johannesburg, hosted the final match. South Africa was listed as a “Medium Developed Country” in the Human

Development Index. While the country beats other African countries on some measures of human development, a 2015 study found that over half of its population lives in poverty. South Africa was ranked 175/191 in world health systems, the 92nd percentile (Measuring, 2000). Johannesburg therefore meets the criteria of a developing country and host city because of the relative gap between the situation of the country when compared to traditional western host sites (such as those in England, France, Germany, and the United States).

Sochi

Sochi was the host of the 2014 Winter Olympics in what turned out to be the most expensive Olympics ever by some estimates (Farhi, 2015). Sochi, just as other cities, attempted to use the mega-event as a launching pad for further economic development (Trubina, 2015). Before the event, the city of Sochi was composed of 400,000 people. The city made significant efforts to expand the infrastructure and subsequently increase the capacity of the city for the long term (Muller, 2015). Russia was listed as a “Very High Human Development” country but individuals were found to have a six-year shorter life span than the preceding and succeeding countries on the list. This reason explains why this case is interesting for a study revolving around health in non-traditional host contexts. Russia was also ranked 130/191 among health systems of the world, representing the 68th percentile (Measuring, 2000). Sochi, Russia, therefore meets the criteria based on the sites’ health systems rating and the way in which the Sochi Olympics were designed to expand Sochi as a city.

Rio de Janeiro

Rio de Janeiro was the host of the 2016 Olympic Games. Brazil was listed as a “High Human Development” country. Perhaps no site better encapsulates the post-third world city hypothesis of Richmond and Garmany (2016). Brazil as a country is growing economically but still faces significant challenges in disrupting social problems that are deeply entrenched (Viehoff, 2016). Rio de Janeiro was at the time economically depressed after experiencing a depression, years after it was replaced as the capital of Brazil. Recent optimism for change in Brazil has been associated with mega-sporting events (Richmond, 2016). Brazil rates 125/191 in health systems in the world, again in the bottom third of the world (Measuring, 2000). Therefore, Rio de Janeiro met the criteria for further case study examination based on the room for economic development and the need for improved health systems.

In all, the cities fit the criteria for case studies of sites that hosted mega sporting events in contexts that are less developed than sites that historically hosted the Olympics. According to the HPI, the 4 Summer Olympics preceding Rio 2016 were hosted in countries that ranked an average of 33rd. Brazil ranks 79th. The 4 Winter Olympics preceding Sochi averaged a HPI rank of 16th. The Russian Federation currently ranks 49th. The 3 previous World Cup host sites (Japan and South Korea had a dual bid) preceding South Africa averaged 12th. South Africa ranked 97th around the time of the 2014 World Cup.

ANALYSIS OF CASE STUDIES

I. Rio de Janeiro

The 2016 Olympics in Rio De Janeiro, Brazil, was the last of a series of mega-events and sporting events that happened in the city. The Pan-American Games in 2007, World Youth Day, and FIFA Confederations Cup in 2013, and the 2014 FIFA World Soccer Games all preceded the Olympic Games. Rio de Janeiro had encountered hard times since its removal as the capital city in 1960 (Nobre, 2016). However, multiple policy and program initiatives had created new period of optimism and renewal. In fact, there was enough talk of a turnaround that officials decided the economic and political climates were suitable to institute wide-ranging and ambitious urban reforms (Richmond, 2016). As the Olympics grew closer, city officials had already begun to market policy initiatives as part of the “turnaround” of which the Olympics were a large part. As seen by the promises of city officials and the goals of their programs, there were, and still are, lofty expectations for the policies and projects.

Policy initiatives intended to leave a positive legacy for the Olympics include a Bus “Rapid Transit line, as well as a new metro line, increased sport activity access for 800,000 students, expansion of the Rio pacification program, and revitalization of the Rio Port area (“Rio 2016,” 2016).

In conjunction with these goals, the mayor of Rio stated in a TED talk that by 2020 all of the city’s slums would be urbanized. Priorities in these *favelas* (a Brazilian term for slum) were the creation of schools and health clinics. However, Richmond’s (2013) study of two favelas, Tuiti and AsaBranca, revealed little progress at that point in time (Richmond, 2013). Some communities have been notified that they have been

removed from the list and there is evidence and belief that *Morar Carioca*, the favela renewal program, no longer receives support, especially with a new mayor being elected in 2017. *Morar Carioca*, is of course tied to the Olympic legacy of Rio de Janeiro. The legacy of this effort is still being written, much like the legacy of the Rio de Janeiro Olympics at large, but there is plenty of evidence to suggest that it will be disappointing. Communities that were close to the Olympic upgrades were bulldozed and those that were too far away received little to no attention. Residents of the Vila Autodromo neighborhood were relocated to provide parking for the Olympic Park, and only favelas with the appropriate size, location, and reputation seem to have received the infrastructure upgrades promised in the program (Richmond, 2013).

As discussed earlier, there has been a shift in the language of the IOC when it comes to the legacy of their mega-events. One tangible outcome from the shift in language is evidenced in the inception of urban infrastructure that is considered “nomadic architecture” for the 2016 Olympics. Designed to be easy to dismantle, these buildings will quickly be converted into different projects. Plans before the Olympics list the Future Arena, Aquatic Stadium, and the Olympic Park. Future Arena is to become 4 different state-run schools (Poon, 2016). The Aquatic Stadium was to become two separate community pools to host large events in the future, and the Olympic Park was to be transformed into a public recreation area, which was completed in January, 2017. However, a *Vice News* report depicts the park as deserted and hard to get to. There are events scheduled that may bring people into the park, but it seems that the \$800 million park is not living up to the expectation (Richardson, 2017).

There, has, however been a dramatic improvement in the public transport capabilities for the city. Olympic transport expert Phillipe Bovy stated that, “The Olympic Games Rio 2016 shall be noted for its extraordinary high performance public transport infrastructure developments. Thanks to Olympic catalyst impact, it took Rio only 6-7 years to make a 25-30 year public transport progress jump towards much better urban mobility for all” (IOC, 2017).

In the lead up to the 2016 Olympics, researchers examined the availability of physical activity resources in low-income neighborhoods. Sousa-Mast (2016) found that low-income neighborhoods, neighborhoods often near the (at the time) construction, had less Physical Activity Resources (PARs) than more affluent neighborhoods. Additionally, research has found that only 13% of the Brazilian population is physically active (Bizzaro 2016). Together, the studies combine to show the need for healthy behavior promotion in Brazil, as well as the potential for widespread public health improvement.

Maracana Stadium, used for both the World Cup and the Olympic Games, is now deserted. The Aquatics Stadium has been left to rot and has not been disassembled into two community pools as was previously planned. The plans for re-use of Future Arena were abandoned by new mayor Marcelo Crivella (Drehs & Lajolo, 2017). A media center has been demolished and the debris left to rust (Davis, 2018). Searches for examples of re-use came up empty over the course of research.

In the months leading up to the 2016 Olympics, multiple media sources had reported on a public health crisis in Rio de Janeiro. The problems that garnished the most cause for concern were hospital and emergency services, environmental pollutants, and

the Zika virus. The responses to those problems serve to illustrate how a city can respond, or not, to social problems as mega-events bring attention and monies to the state.

In 2006, Brazil began implanting a national strategy for the public called Family Health Program, abbreviated as PSF. In 2009, Rio de Janeiro finally implemented the program citywide, and “Like many recent Olympic cities, Rio de Janeiro has linked upcoming mega-events with urban renewal and aims to create a social legacy for the Olympic Games by incorporating social policies, such as health” (Bortz, 2013). Rio de Janeiro’s health secretary implemented the PSF program in neighborhoods with the most need first. Additionally, the Unidades de Pronto Atendimento (UPA), or ambulant emergency wards, helped relieve a health system that had been in a declared state of emergency (Bortz, 2013). The whole health system prior to these initiatives had run out of money to address these needs, and as a result hospitals closed units, and salaries, equipment, and supplies were neglected.

Part of the Summer Olympic Games include aquatic sports such as open water swimming and sailing; however, concerns about water quality led to widespread reporting on the pollution of Guanbara Bay. Officials found virus and bacterial counts thousands of times higher than approved levels due to dumping of sewage and manufacturing run-off (Whelan, 2016). Rio State Governor Sergio Cabral therefore launched the Environmental Sanitation Program (PSAM) for the Guanbara Bay Area. As part of PSAM, Dutch environmental experts and NGOs worked together to create a system to clean up Guanabara Bay, but the project was eventually abandoned because Rio de Janeiro ran out of funds for it, despite the initial \$1.1 billion investment (Guanabara Bay, 2012). Though the efforts were not finished, the improvement, around

50-60% of the original goal, did make the area safer for swimmers and more conducive to aquatic life, resulting in a greater quality of environment for people in Rio (McCarthy, 2015).

Lastly, in the months before the Olympic Games, Brazil was in the midst of a Zika outbreak. When contracted by pregnant women, there is the chance of serious birth defects for the child. It was difficult for epidemiologists to project how much athletes and visitors would be at risk for infection and the subsequent transmission of the disease, but four countries were specifically listed as at risk for Zika because of their participation in the Olympic Games. The issue was great enough to attract the attention of the World Health Organization, who advised the Government of Brazil and worked on ways to decrease the number of mosquitoes that transmit the Zika virus (Zika, 2016).

In summary, there were three health policy responses to upcoming and current mega-sporting events in Rio de Janeiro: a Family Health Program, packaged as part of urban renewal for the upcoming games, aimed to address the needs of the most disadvantaged in Rio first; Zika mitigation efforts, coordinated with the World Health Organization; and environmental clean-up efforts

II. Sochi

Sochi, unlike Rio, did not have a storied past. Instead, the city was much less well known, with a population of 410,000, compared to Rio's 6.5 million people. Therefore, Sochi lacked much of the infrastructure required to host an event of such magnitude, and additionally lacked much of the sport specific infrastructure required for the events of the Olympics. The city therefore launched a \$31 billion program to upgrade the city, with

15% earmarked for actual sporting venues and 60% earmarked for transportation upgrades. Since the bid went to a smaller market city, Sochi's mega-event plan differs greatly from Rio in that many of the goals were not aimed at addressing social inequities, but aimed at upgrading the city into a destination. One requirement for attracting people to Sochi as a destination is the "thorough upgrade and extension of the available recreational facilities, turning 698 M Müller Sochi into a year-round resort" (Sochi Bidding Committee).

The estimates of Sochi's spending for the Olympic Games vary, with the largest estimate of \$51 billion making it the most expensive Olympics in history (the original estimate was \$12 billion.). Fisht Stadium, the site of the opening and closing ceremonies, is being re-purposed for the World Cup awarded to Russia in 2018. The IOC president admitted that part of the reason Sochi's bid for the Winter Olympics won was the opportunity to help a country rebuild a winter sports infrastructure that was lost with the dissolution of the Soviet Union (Armour, 2014). Reports have illustrated an influx of skiers in the winter, but on the whole the Olympic Park is now vacant. A few Russian oligarchs have unloaded projects on the Russian government, and some of the most vocal opponents of the project have called it the "museum of misery" (Stewart, 2015). Nevertheless, when polled, residents agreed more than disagreed that hosting the Olympics improved the quality of life for residents. They disagreed slightly, however, with the notion that they were personal beneficiaries of hosting the Olympics (Muller, 2012).

According to the Olympic website, there were a few initiatives designed to impact the health of children in the city of Sochi around the time of the Olympics. A program

worked to improve access to new infrastructure being built in Sochi, as well as to improve attitudes toward those who live with disabilities. An education campaign worked to communicate Olympic ideals to school-aged kids, one of which is an active society through sport. Lastly, “Public health legacies from the Games, meanwhile, included the City of Sochi encouraging youth to take up sports, with more than 16,000 young people attending 26 sports schools and more than 50,000 participating in annual sports events for schoolchildren” (Winter Games, 2016). Efforts to improve the physical fitness of Sochi residents also led to 136,000 people regularly participating in physical activity and sports at the end of 2012, nearly 10% higher than the 2011 participation rate (Winter Games, 2016). Additionally, General Electric embraced the legacy framework as a sponsor of the Sochi Olympics, donating a mammography machine to a region with an especially high incidence of breast cancer.

Other than the infrastructure upgrades, it seems there were few public health policy initiatives in Sochi—perhaps as problems in other areas received more attention, both domestically and internationally. The case study of Sochi is different the other two examples because of the emphasis on city building, but shares a strong emphasis on social legacy components—mainly an effort to impress spectators, tourists, and the global viewing audience. There were, however, efforts to re-use infrastructure, as well as to re-use it for future mega-events. Sochi also implemented programs that encouraged participation in sport and physical activity, contributing to the promotion of healthy behaviors in Russia.

III. Johannesburg

The legacy focus of the Johannesburg FIFA World Cup was twofold: to both improve the world's view of South Africa and Africa and to leave a framework for social and economic investments. In fact, FIFA even gave a \$65 million grant to South Africa for the legacy of the event. 4 years later, that money has collected \$72 million in interest and has been used to fund many upgrades in the infrastructure of soccer in South Africa, especially in women's soccer (Women, n.d.).

In fact, the 2010 World Cup was partially branded as "Africa's tournament." In this sense, the mega-event was used as a catalyst for change not just in a city or a country, but for an entire continent—especially considering the perception of Africa as underdeveloped.

Swart and Bob (2012) list main goals in mind when South Africa bid for the 2010 FIFA World Cup:

- Reintegrate South Africa into the world community after years of being excluded as a result of apartheid
- Create and promote economic legacies of promoting foreign and domestic investments in stadium infrastructure
- Showcase South Africa and its capabilities to the world.

Of those goals, the second is of the most interest to this study. There were 10 venues used throughout the 2010 World Cup, two in Johannesburg. Both the FNB stadium and the Ellis Park Stadium held games and required investments before the World Cup. Ellis Park Stadium (or the sponsored name of Emirates Airline Park) is the more historic of the two venues, having hosted the 1995 Rugby World Cup, of which

South Africa was the victor. In order to upgrade the Ellis Park stadium, around \$43 million was spent; and to upgrade the FNB (Soccer City Stadium), the cost was around \$318 million. In addition, the Ellis Park area was scheduled for a R2-billion precinct upgrade: “The regeneration project takes the form of a multi-developmental project, with plans focusing on education, sports and manufacturing (City of Johannesburg, 2008). The results of the Ellis Park upgrades include: an upgraded transport precinct, with increased capacity for foot traffic, a few upgrades to the Ellis Park Swimming pool, a new cricket oval, and three parks with play areas for children from poorer neighborhoods (Greater Ellis Park, n.d.).

There were some tangible benefits for the communities around the Ellis Park stadium. However, as with many of the stadiums built for the 2010 World Cup, the maintenance costs to upkeep the stadium exceed the revenue they bring in. All stadiums are still in use, most hosting professional soccer and rugby clubs. In this way, the World Cup has enhanced the sport legacy of Johannesburg and South Africa. In other ways, the urban legacy has seen small improvements with upgrades made to the surrounding areas.

There was large scale identification of the problems in South Africa in the lead up to the Olympics, which did lead to some responses. The 2010 World Cup, like other mega-events before it, has also been criticized by activists trying to raise awareness of the poor, homeless, and under-housed South Africans displaced by stadium and infrastructure development. These are the poor that organizers hope will be out of the tourist gaze. One response by FIFA and local World Cup organizers has been to fund local sport development and health promotion projects. This will result in 52 new soccer fields to offer young South Africans the facilities in which to develop their skills and 20 new

public health education facilities that will deliver among other things HIV/AIDS education” (Field, 2010).

In preparation for the large number of tourists arriving to watch the games in South Africa, there was a \$286-million investment in upgrading hospitals and emergency medical services. The United Nations also worked toward harnessing the potential of the World Cup for change in order to reach some of their Millennium Development Goals. “The World Cup is an event in which we actually see goals being reached,” as former Secretary-General Kofi Annan rightly wrote in 2006. With only five years left until the 2015 deadline to achieve the Millennium Development Goals (MDGs), the world’s largest sporting event—held for the first time on African soil—represents a historic opportunity for the UN family to raise awareness and harness the potential of the tournament to advance its objectives and ensure that the 2010 edition of the FIFA World Cup is remembered as a positive turning point in the history of African development” (Information Kit).

DISCUSSION

The idea that a mega sporting event could be used “as a catalyst to inspire people to develop healthy and active lifestyles,” (Glasgow City Council, 2010) is not a new one. Two mega-sporting events in Great Britain both explored the possibility of using mega-sporting events to increase physical activity levels (Weed, 2012). However, healthy behaviors are just one compartment of public health. The way that host sites respond to public health issues can help illustrate the potential, or lack thereof, for a mega-sport catalyst effect in public health.

Across the three contexts examined, a few things stand out. Firstly, the goals for legacy effects in each of the three contexts were different, but some results were the same. Sochi sought to increase its' capacity to hold tourists long-term and year-round, as well as to facilitate the growth of the population. In both Rio de Janeiro and Johannesburg the capacity to hold and respond to the needs of tourists were upgraded. In Rio de Janeiro, there was a lot of discussion on the power of the mega-events they hosted to transform the favelas through government programs and economic stimulus—and in Johannesburg similar concerns were raised.

Johannesburg and other African cities that hosted World Cup games worked to find re-uses for their stadiums. In Sochi and Rio de Janeiro, the central venues were transformed into an Olympic Park, which are now underutilized. There are very few, if any, examples of mega-sport infrastructure being re-purposed into something specifically beneficial to community members who helped pay for it in the three contexts examined.

Table 4 summarizes policy contexts and impacts in the 3 cases.

Table 4: Infrastructure Use and Reuse

<i>Rio de Janeiro</i>	<i>Sochi</i>	<i>Johannesburg</i>
Nomadic architecture allows for immediate and purposeful re-use; idea scrapped	Fisht (main stadium) being reused for World Cup matches	Most stadiums now host professional sports teams
Olympic Park rarely used	Olympic Park rarely used	Upkeep costs dramatically outweigh revenue
Some major stadiums abandoned and not maintained; already falling into disrepair	Winter Sports Infrastructure currently utilized for increased tourism and population.	Surrounding area upgrades made in some cases

Many of the similarities stop there, however. Johannesburg had relative success with finding ways to re-use their sporting infrastructure (the stadiums still lose money and generally have no benefit to the health of community members). Meanwhile, multiple venues in Sochi and Rio de Janeiro now lie in disrepair or inside a largely ignored Olympic Park.

When it comes to policy and program initiatives, Rio de Janeiro led the way with social and urban policy initiatives, despite limited success due to political turnover and lack of follow-through. In Rio de Janeiro, three main problems received attention: the emergency state of existing health care systems, the physical environment (which contributes to health via pollutants), and the Zika outbreak. In response to the emergency state of the existing health systems, two programs were implemented: the PSF and UPA.

PSF targeted low-income families first, while the UPA program relieved the pressure on hospitals in Rio de Janeiro by creating emergency wards. Both policies were launched in the lead up to Olympic Games and after significant media attention and public pressure. The physical environment, specifically water conditions, was considered dangerous for residents of Rio. Since athletes were competing in the same bays that took on the city's sewage, there was once again a movement to create policy to address a problem, which came to fruition in the PSAM program.

Table 5 summarizes infrastructure use and re-use across the 3 cases.

Table 5: Policy Contexts and Impacts

<i>Rio de Janeiro</i>	<i>Sochi</i>	<i>Johannesburg</i>
Morar Carioca; some impact, discontinued due to lack of funds and political turnover	Increased access to sport opportunities for the disabled	FIFA Legacy Fund to improve the sporting infrastructure in South Africa
Implementation of PSF and UPA programs: relieved pressure on hospitals and prioritized family in low-income neighborhoods	Winter tourism dramatically increased	Some local and community based sporting initiatives, most short lived
Implementation of PSAM program to address environmental health concerns; Worked with WHO to contain zika outbreak	A Campaign to Olympic ideals (healthy and active society) led to increases in sport and physical activity participation levels	20 public health centers built; hospital and emergency service upgraded

Meanwhile, Sochi focused on education and access to sport, leading to widespread, though potentially short term increases in physical activity through sport. Unlike Rio, Sochi did not face widespread criticism regarding health conditions in the city before the event (aside from a brief water delay), and public health initiatives did not, therefore, make it on city officials' agenda. In Johannesburg, FIFA's grant enabled South Africa to increase their soccer infrastructure for youth, once again increasing physical activity levels through sport. Johannesburg did build 20 public health centers and upgrade emergency services; however, these efforts were aimed more at tourists and visitors than for the existing population. Overall, the policy responses, or lack thereof, reflect the uniqueness of each site and also the problems that received the most attention from both domestic and international sources, and illustrate the potential interventions can have in mega-sporting event cities.

CONCLUSION

Thus far, much of the research on sport mega-event legacies has been selective in its focus, centering on economic impacts, and tending to neglect health and environmental legacies. My hypothesis that countries largely ignore health concerns in designing their mega-events' legacy was partially true; while there were cursory efforts, the potential to utilize the events as a focusing event for large scale change went mostly unrealized, despite research and precedent (London, 2012, and Weed) that illustrates the potential benefits. There were also few instances of sporting infrastructure being re-used

for community benefit: even plans to do so were discarded with political turnover, evidence that our second hypothesis was correct.

After having examined all three sites at length, I believe that the policy streams theory by Kingdon can be applied to mega-sporting events, which serve as focusing events. In Rio de Janeiro, there was significant news media coverage of the public health crisis, cementing health as a problem in Rio. As experts in the field turned their attention to the events in Brazil, they were consulted for solutions, exemplified by the Dutch engineering group that contributed to the bay clean-up. Politically, the attention that comes with the Olympics or a World Cup increased the pressure on politicians to respond to public concerns and challenges like health. Rio de Janeiro best illustrates the streams of the three host sites; in Sochi and Johannesburg the attention was often turned elsewhere.

The benefit of sport has been well documented, and physical activity has its own set of benefits for individual health. While in each host site there was some attempt to increase participation in sport, if infrastructure was re-purposed to meet the health needs of those who need it most, host sites could avoid the trap of white elephant expenditures while also addressing the needs of community members who helped pay for the event. All three developing contexts have health needs: all three ranked in the bottom third in the world in health systems. There is an opportunity to meet problems with new assets if challenges like funding and political turnover can be overcome. The urban change and renewal associated with mega-sporting events is real—ask the people who used to live in what are now Olympics Parks.

Over time, conversations about the legacy of mega sporting events have become more specific. Perhaps this is due to the increase of size and coverage of events like the Olympics and World Cups, but conversations that were once restricted to economic benefits and drawbacks have sometimes slowly progressed to urban, social, sporting, and environmental legacies. In the future, the same conversations should be had about health, as it is an important indicator of the quality of life for residents in the host and connected to the event itself.

That connection can be made clearer with more research on the demonstration effect and potential festivalization of mega-sporting events. If mega-sporting events can be turned into a cultural event that people want to be involved in, and that involvement consists of physical activity, then there will be a tangible connection between hosting a mega sporting event and encouraging health behaviors, and ultimately the health of residents in the host city.

In all, there were some health policy changes made, especially in Rio de Janeiro, as a result of mega-sporting events. Kingdon's policy streams illustrate the potential for more policy change, and the allocation of mega-sporting events to host cities in developing contexts, especially developing health contexts, illustrates the possible good to be achieved by policy initiatives. Forward thinking and planning has increased regarding infrastructure re-use, but follow-through on promises have yet to yield benefits for both cities and specific communities that surround the venues. Research in the future should explore the way that infrastructure is re-used, if it is re-used, and whom it is re-used for; research should also investigate the origins of public health initiatives around

the time of mega sporting events and look to connect healthy behaviors with the hosting of these events.

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