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Perceptions of the Impact of COVID-19 Countermeasures on Safe Foodservice Provision at International Sporting Competitions: A Qualitative Study

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Abstract: Over the past 2 years, the SARS-CoV-2 (COVID-19) pandemic has had a pronounced impact on the foodservice sector, including compliance to new food provision guidelines. International sporting events' over-crowded communal eating areas are considered to be high-risk areas for contracting infectious disease. The purpose of this study was to explore the perceptions, level of preparedness and perceived challenges of key stakeholders when providing food at major athletic competition events during a global pandemic. A qualitative methodology was employed using semi-structure interviews and data was analyzed using interpretive phenomenology. Inductive thematic analysis identified six major themes of COVID-19′s impact on foodservice systems. Adapting foodservice models to pandemic planning is pre-determined and dictated by settings and environments. There were common heightened concerns over sustainability practices, increase in waste management, costs and negative impact on social dining experience, which were all perceived to be impacted by the changes relevant to COVID-19. There was a renewed attention to improving food safety and quality control measures. The outcomes of this study suggest that International organizing committees of major competitions must now be tasked with updated guidelines, including supporting adequate budgets and communication, if stakeholders are to adapt their operations to control the spread of viruses, such as COVID-19, within all foodservice operations at major competitions. Attention should be directed to determine whether food provision changes continue to be recommended and how this will impact foodservice delivery, sustainability and the social dining experience at future sporting events.

Keywords: COVID-19; food safety; foodservice; food provisions; athletes; sustainability

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1. Introduction

Since the onset of the SARS-CoV-2 (COVID-19) pandemic, there has been a pronounced impact on the foodservice sector forcing businesses to close or the cancellation or postponement of large-scale events [1] Risk management recommendations by the Center for Disease Control (CDC) and the World Health Organization (WHO) suggest that foodservice operators should adapt their current delivery models to adhere to the various regional health and safety recommendations [2,3] while implementing new standards and guidelines in order to continue to operate [4]. These new guidelines coupled with the impact of COVID-19 on the food supply and labor shortages [5,6] has forced quick-fix solutions in order food service businesses to remain in operation [1,7].

The continuing effects of COVID-19 on food quality and safety has been investigated since the onset of the pandemic by the European Food Safety Authority (EFSA) and the United States Food and Drug Administration (FDA) and have closely monitored the transmission of COVID-19 and found that in previous outbreaks of related coronaviruses,

particularly MERS-coronavirus (MERS-CoV) and SARS-coronavirus (SARS-CoV), food is not a route of transmission [8,9]. However, the handling of food and packages should be followed by extensive hand washing or sanitizing to minimize any risk from touching food potentially exposed to coronavirus [10]. The FDA suggests that sanitization and cleaning of surfaces is a preferred precaution for food restaurants and commercial kitchens compared to environmental testing for the COVID-19 virus [9].

The FDA suggests that mass gatherings, as defined by the WHO where there is a "concentration of people at a specific location for a specific purpose over a set period of time, which has the potential to strain the planning and response resources of the country or community" [11] are considered high risk for communicable disease spread due to enclosed indoor spaces with exposure for prolonged periods [2]. Large-scale foodservice operations at international sporting events, like the Olympic and Paralympic Games, can then be considered to be high-risk areas for the spread of infectious disease, with communal dining areas, buffet style or self-service eating, over-crowded athlete dining halls and smaller cafeterias at sports venues.

Athletes are also more susceptible to infections, such as COVID-19, during periods of intense training and competition [12–14]. This presents an additional reason to focus on minimizing external risk factors. Available medical reports indicate that the leading infectious diseases which occur during major sporting events, are influenza, norovirus, respiratory infections and mumps and measles [12–14]. Research indicates that the leading causes for illnesses are gastrointestinal illnesses and allergic responses [14,15] which can be due to improper nutrition labelling and inconsistent foodservice safety guidelines [13]. Risks can vary dependent on the location of the event, and appointed caterers [16]; for example at the 2018 PyeongChang Winter Olympics where there were concerns about hygiene in the village and among the workforce [14].

Recommendations for foodservice operations suggest following local public health requirements (applicable to the Sars-CoV-2 pandemic), to ensure the identification and mitigation of any potential environmental and food safety risks to athletes [17]. Most guidelines appear to address the following: physical distancing, environmental aspects and safety, personal hygiene and occupational health, and educational and legal measures [18]. However, there continues to be inconsistencies in health care requirements, as stated in planning documents, between International Sport Federations and event host organizing committees, versus the actual safe food provision in the sporting environment [17]. Consensus-driven guidelines have been developed that describe the basic standards of services necessary to protect athlete health and safety during major sporting events [17]. The guidelines suggest that organizers must assess the following when hosting a major sporting event to ensure safety for athletes and staff: 1. food and water hygiene, 2. control of potential contamination of food and 3. information on the local food sources to the venue (local custom or quarantine regulations) to assist teams or individuals in supplementing the catering plan protocols and procedures for the management of any declared outbreak of food-related illness [17].

More recently, the International Olympic Committee (IOC) published guidelines in a "playbook" to minimize the risk of COVID-19 at theTokyo 2020 Summer Olympics and Beijing 2022 Winter Olympics, [19]. These recommended such countermeasures as including: plexi glass dividers on dining tables, limited seating and shorter wait times for physical distancing measures, mandatory mask and glove wearing of all staff and patrons, sanitization of multi-use areas and items, handwashing stations and sneezeguards on buffet tables [20]. Research has previously found that staff awareness and hygiene are the two most important attributes derived from the COVID-19 pandemic affecting food safety in catering establishments, with the need for more restrictive hygiene procedures and additional personal protective equipment [21]. Other mitigation strategies as sugessted by the FDA was the recommendation to discontinue communal salad bars, buffets, and self-serve beverage and condiment stations that require customers to share common utensils or dispensers. The use of disposable utensils, plates, single-use packaged food items and

pre-packaged meals or 'grab and go' styles whenever possible were encouraged [9,22,23]. Previous research has indicated that food companies who operate with food safety management systems have implemented more rigorous preventive measures in combating COVID-19 within their operating facilities and has been effective in promoting food safety during the pandemic [21].

Prior to the publication and implementation of the IOC playbooks [19,20], research focused on factors influencing athlete food choice and competition needs [24,25], dietary intake in the lead up to major events [26], and the food environment around nutrition labelling [27]. Only a few studies have investigated the quality and safety of food provision [28,29] and catering at major sporting events [15,27–29]. Recently a call for standardized foodservice models by stakeholders with experience in food delivery at major sporting events was made [30]. To date there is paucity on the impact of post-COVID-19 foodservice guidelines on the safety of food provision at major competition events.

The purpose of this study was therefore to explore the perceptions, level of preparedness and perceived challenges faced by stakeholders (event organizers, catering management, senior chefs, waste management staff and dietitians) when providing safe and suitable food to minimize the spread of infectious disease, regardless of COVID-19, at major sporting and competition events, regardless on.

2. Methods

2.1. Design

Through an Interpretive Phenomenological Analysis (IPA) we explored the perceptions of how prepared key stakeholders felt they were able to deal with COVID-19 food safety countermeasures at major sporting events. A qualitative approach was applicable because it aims to keep the commonalities of participants' responses and experiences at the centre of the analysis and focuses on the examination of their perceptions and experience itself [31,32]. IPA was best suited as the methodological approach as it allowed participants to articulate stories, thoughts, and feelings about their experiences [33], allowing for rapport to be developed, and understandings to be explored while being able to manage social interactive elements and allow the experiential focus to remain central [34]. This study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ): a 32-item checklist for interviews and focus groups [35] to facilitate discussion and allow for explicit and comprehensive reporting to the research questions. Interviewer probed until they felt data richness was achieved and had gained a deep understanding of each participants perspectives [36].

2.2. Participants

Key stakeholders (event organizers, catering management, senior chefs, waste management staff and dietitians) who had at least one major event experience were purposively selected based on key roles and considering their ability to present their perspectives in managing the spread of infectious disease within their catering operations. Stakeholders were invited via email in April 2021 to voluntarily participate in semi-structured interviews. Out of the original twenty identified stakeholders, eight participated and were interviewed between April, 2021 to December 2021. It should be noted that experienced key stakeholders in this field are limited, and the researchers determined that this sample size was representative of the three major stakeholder groups namely, Dietitians, catering managers/chefs and waste management caterers. Organizing Committee stakeholders did not volunteer to participate. Participants provided written or verbal consent prior to inclusion in the study. Ethics approval was obtained by University of the Sunshine Coast and confirmed that this project meets the requirements of the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*, #S211540.

2.3. Data Collection

All interviews were conducted by the principal investigator (AD) who had been introduced to participants through a study participation email describing the goals of the research. Interviews were recorded via Zoom recording function from a private home office. The interview questions were developed by (AD, FP, JT, HW) and guided by the perceptions from key stakeholders of the impact of COVID-19 on their food service operations; what are the challenges and what would be required to support them. The interview guide was not piloted, but peer-reviewed and reviewed by the research team and an independent researcher, (RT) who are experts in sports nutrition and large-scale foodservice. The first interview was conducted by the principal researcher and reviewed by the research team for comprehension and consistency in order to make any necessary changes to the interview questions. To minimize the potential for interviewer bias, AD recognized their own position and power in the relationship and ensured the participants' needs were respected.

Interviews were on average an hour in duration and used probing and exploratory questions to allow for fluid conversation and a flexible structure to collect relevant data and allow for unexpected data to emerge [36]. Discussions involved how stakeholders currently address foodborne illness and infectious disease spread in the athletes' village, dining halls and venues at major game events. Further questions explored how key stakeholders envisage COVID-19 may influence their current foodservice practices in relation to minimizing the risk of spreading foodborne illness and infectious diseases in main dining halls and venues at major comeptitions. The interviews were iterative and changed depending on the context described by the participant and the interviewer probed until a deep understanding of each participant's perspective was gained. Adequacy of the final sample size was evaluated continuously during the research process until sufficient information richness was achieved, based on the key stakeholder roles, indicating sample adequacy and data quality [37].

2.4. Data Analysis

Interview transcripts were transcribed verbatim, after de-identification, through Microsoft Word processing and cross-checked by AD, ABL, MT, JK for accuracy and reliability against recordings. Transcripts were returned to participants for confirmation of accuracy and were thematically organized at least twice using the data management tool NVivo version 12.0 (QSR International Version 12.0) qualitative analysis software [38]. Data were coded inductively using coding principles [39] to each theme and was cross-checked with all members of the research team to gain consensus, consistency, and result validity [38]. Once the themes and associate sub-themes were determined, a perspective theme mapping was created to illustrate the inter-relationships between themes and subthemes.

Throughout the entire research process, a reflexive research diary assisted the principal investigator in reflexive discussion and how interpretations were formed while minimizing researcher bias [40]. Reflexivity is recommended as a key strategy to minimise internal bias and enhance the credibility of qualitative research [38]. The aim was to acknowledge the impact of the researcher's views and values that inevitably are brought to the research process [41]). Thus, note-taking immediately after interviews was conducted to interpret the interview itself and think about any emerging themes that arose while ensuring research objectives were met. Three members of the research team FP, JT, HW allowed for independent consideration of themes. Internal coherence was also considered by linking the phenomenological methodology, epistemology and axiology to the research design to enhance credibility, dependability and transferability [42].

3. Results

Six major themes and subsequent subthemes emerged through inductive thematic analysis on the impact of COVID-19 pandemic on food provision and are described below. Representative participant quotes for each theme and subtheme are provided in Table 1.

Table 1. Themes, subthemes and sample responses from semi-structured interviews with key stakeholders (n = 8) in regard to their perceived level of preparedness of how COVID-19 standards impacts the food service system to provide safe food in a safe environment at a major competition during a pandemic.

Theme	Subtheme	Participant Responses
Renewed perceived attention to food safety measures	Better hygiene	*In an athlete's village environment, there is quite a strict regime about cleanliness in common areas . . . that regime has been increased in some senses tenfold, so rather than being done twice a day, it's done on the hour...I think for me from the COVID thing...what I did think was good was the focus on cleaning. I think focusing on cleaning your desk, cleaning your area, and people having some responsibility.* (P3) *I think the pandemic has shown us the value of taking care of minimal stuff like washing your hands and cleaning your spaces and being more careful about how close you are to people.* (P1)
	Less food handling (at self-serve buffets)	*When I think about a traditional affluent sort of dining room, the buffet style for me sort of always worked well because it was served to the athlete in most circumstances, so there was that control element trying to . . . minimize any risk of . . . touching or contamination.* (P5)
Increased costs associated with adapting food service models to pandemic planning	Increased product and material costs	*So that impact whether it be cleaners within the dining halls or cleaners across the board that it's had a much bigger impact on the industry, the associated cleaning chemicals, and the consumables as well.* (P8) *There wasn't exactly a COVID safe budget in the bottom of anyone's drawer. Back to those topics of viral outbreaks in the world and sporting events, no one's got a spreadsheet, dusts it off and says, "Hey guys, follow this spreadsheet" . . . that budget must come from the IOC and the organizing committee onto the caterer. It can't just be the caterers and the IOC writing the tender. "Oh, you guys also have to have follow the plastic sustainable plan", it's like, "well, OK, write that into my budget and I'll follow it.* (P2) *A decentralized model costs thirty, forty, fifty percent more because of infrastructure, right? So . . . it doesn't cost more in food, it costs more in kitchens. You've got to have more kitchens, more generators, more fridges.* (P4)
	Impact on staffing	*I mean you know to be honest, to talk about increasing staff, along with increasing staff increase costs . . . but I guess the balance now for organizing committees or clients in that regard as to the price you might put against . . . not having a blowout of COVID or other matters within your village or within your environment, so it becomes about striking the balance there.* (P5)
	Increased technology requirements	*How do we better embrace technology? I think we're seeing a lot now in our everyday lives around technology, click and collect or QR coding...because they can order something ahead of time or know what's on the menu before they get to that destination that they're actually already making a choice ahead of time. So, it's limiting their movement, limiting that need to queue and be amongst people if they don't have to.* (P5)
Heightened concerns over increased waste and sustainability	Increase in non-sustainable packaging	*Single use plastic bottles and single use this and single use that. And so they send the message out there that they want the event to take their environmental stance. And then you've got event organizers who are trying to work out how to deliver bulk services rather than single use services in a pandemic.* (P8)

Table 1. *Cont.*

Theme	Subtheme	Participant Responses
.	COVID-19 impacts sponsored products use and sustainability	*. . . Because they're trying to appease somebody who has an environmental awareness and, obviously, an environmental stewardship, those are the sorts of challenges they're up against. It's a different challenge . . . I guess in an Olympics where we're encouraged to use as many plastic bottles of Coca Cola and water as possible for a number of reasons . . . especially in the pandemic.* (P8)
	Impact of increased waste	*What do we do with gloves? With all those bags of gloves and all that plastic?* (P3) *Everything went back to flow wrapping of food, individually portioned meals...Individually wrapped cutlery, napkins,* etc. *. . . Which of course we know increases a massive amount of wastage in plastic, all the things we've been working so hard to stop during games over the past ten to twenty years since Sydney.* (P2)
Impact of changes relevant to COVID-19 on foodservice planning, preparation and delivery	Early planning needed to better prepare for pandemic requirements	*We used to have a stringent focus on how you plan ahead. In particular, when you look at inventory of goods and the biggest thing in the food industry for us was always around predominantly food safety, but it just goes so much further than that nowadays with making sure everyone is understanding the requirements of COVID.* (P5)
	Mutually Agreed Upon Set of COVID-19 Safe Standards	*I think we'll see a new era of planning, a COVID safe event will just be standard in any operational plan now. It will probably be number two- I'm guessing even number one. It'll be, "are you COVID safe for your event to run?" and then every process in our program management together will be that extra full stack of paperwork, unfortunately. Are your suppliers COVID safe? Are you COVID safe? Are your stores COVID safe?* (P2) *Having some sort of checklist, something where the teams are actually saying these are the things that are important, especially in a post COVID situation.* (P8) *There has to be some degree of recommendation and standards set, and especially when it comes to health and safety.* (P7)
	Restricted service operations	*I think the big challenge for buffet style service . . . is that those sorts of things are not really the major option at the moment. It's more assisted service . . . rather than self-service and that restricts the . . . volume you can get through in the time that it takes to serve rather than allow people to do it themselves.* (P8) *But there's areas like breads and all of that that are self-serve. So I don't know how you can change that without then creating so many limitations in flow that it becomes, you know, an impediment to people.* (P7)

Table 1. *Cont.*

Theme	Subtheme	Participant Responses
Pre-determined settings and environment dictate the food service delivery model	Physical setting and space influence the caterers' ability to adapt to COVID-19 counter measures	*One of the main challenges would be managing the volume of athletes at the same time at a dining hall and having enough space required to have the tables and separated with enough distance. I guess we would even have to put schedules in place and try to serve sports in schedules, like there's lunch one served from eleven to one and then there's lunch two from one to three, or things like that to be able to separate people and to manage the volume of people inside.* (P1) *Is it different formats to have more naturally ventilated sort of open dining spaces. It depends again on climate, location, locality, where these events are being held, what season during the year. But the committee here actually created these outdoor spaces partly to bring down their cost of not having to put up a structure around it. But it actually made sense in that type of climate and environment to do that, and it did actually work well because it was an outdoor space. Now and not knowing what was coming in a couple of years after that, what we're dealing with now, but those would be good examples of actually what did work as people were outside and it was circulating in the open air.* (P5)
Impact on social dining experience		*I get what they're trying to do, and to a degree that works, but by having all of the rules and regulations in place anyway, I don't think you saw that- what you used to see in dining halls in previous games is that they were a meeting place for- and you'd see different nations eating with each other, next to each other, talking to each other.* (P7) *The Perspex little glass cubby holes and the whole anti-socialization with eating and that sort of thing . . . I think the whole focus on people going into the dining room, getting some food and then leaving rather than hanging around and using it as a social space, because I think that's missing in the village, the dining hall becomes the socialization area.* (P3)

3.1. Improved Food Safety Outcomes from a Renewed Perceived Attention to Food Safety Measures

Stakeholders felt that there has been a renewed, heightened awareness on providing food in a safe environment including more attention to monitoring quality control measures. Stakeholders believed that reinforcing better sanitization with surface and hand sanitization, and mask and glove wearing, could further control the spread of diseases in communal eating areas, whereas previously this was not as frequently encouraged.

Use of single serve food and beverage/limiting self-serve stations was perceived to help reduce the risk of spread of disease and improve food safety in the communal eating areas but could potentially impact costs and sustainability.

3.2. Increased Costs Associated to Adapt Foodservice Models

Stakeholders felt that organizing committee budgets must allow for increases costs associated with mandatory glove wearing of all patrons, more pre-packaged food and single serve options with limited bulk food supply; increased staff required to facilitate extra sanitization and in multiple locations; serving food with no self-serve options; and extra waste management services. An identified issue associated with budgets was limited access to skilled foodservice workers who have major competition foodservice experience.

3.3. Heightened Concerns over Increased Waste and Sustainability

With the increased use of mask and glove wearing since the onset of COVID-19 and the potential for its continuation, along with single serve food product packaging, stakeholder felt that this would produce a significant increase in waste production and in addition

sustainability would be negatively affected due to the industry shortage of environmentally friendly single use packaging. Food procurement may be dictated by sponsored products and these companies may not have sustainable packaging.

3.4. Impact of Changes Relevant to COVID-19 on Foodservice Planning, Preparation and Delivery

Stakeholders felt that in order to effectively adapt their current foodservice models to support new safety guidelines that more effective and timely communication and collaboration in planning foodservice operations at game with key experts from organizing committees was essential. They believed that they would benefit from having a previously determined and mutually agreed upon set of standards and should provide input into layouts, menu planning and sustainable and effective waste management systems to better prepare them for at games operations. Some stakeholders, however, believed that implementing certain foodservice safety guidelines, such as eliminating self-serve buffets could potentially restrict the flow and efficient operations of the service.

3.5. Pre-Determined Settings and Environment Dictate the Foodservice Delivery Model

Stakeholders felt that the setting and environment (locations and structures of dining areas) often dictated the foodservice delivery model and their operations. This can be impacted largely by pre-determined set of standards in consultation with stakeholders which would inherently inform the best operational structure, setting and flow of service for both athletes and staff. Stakeholders anticipated that a change to a decentralized foodservice model would drastically increases costs, mainly from the number of staff required. Whether feeding locations were spread out across the athletes' village or venue/competition sites to minimize numbers in response to maximize physical distancing or because of the events' geographical footprint, did not impact their perception.

3.6. Impact on Social Dining Experience

Stakeholders felt that there could be a negative impact on the athletes overall social dining experience due to physical distancing from multiple locations, two level dining hall structures, limited seating times and plexi-glass dividers on tables, as perceived from previous competitions where these measures have been employed.

The results of the mapping of the relationship of the themes and subthemes are provided in Figure 1.

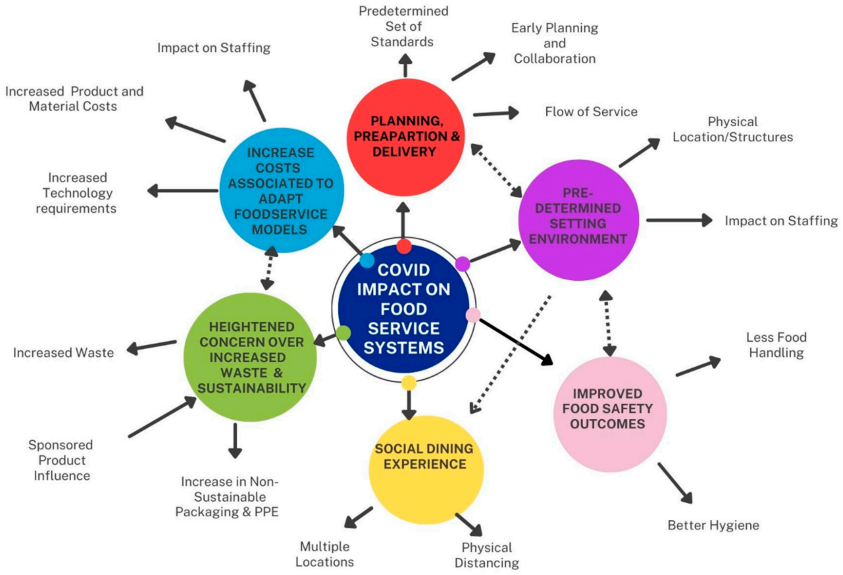

Figure 1. Schematic of the Relationship Between Themes and Subthemes from Key Stakeholders of COVID-19 Impact on Foodservice Systems.

4. Discussion

There were six themes that emerged from the stakeholder interviews, relevant to the impact of COVID-19 on food delivery. These were related to food safety, increase costs associated with COVID-19, waste and sustainability concerns, the impact of changes relevant to COVID-19 on foodservice planning, preparation and delivery and the social dining experience. One unintended consequence of the COVID-19 driven changes was the common perception by stakeholders that there has been a resulting positive impact on food safety controls. A renewed focus on food safety through temperature monitoring and quality control measures was believed to potentially reduce the number of incidences of illness and common viruses within the mass gatherings in an athletes' village, which have historically been the source of infectious diseases that have spread globally [43,44]. This was countered with the fear of increasing labour, waste and overall costs. With improved sanitization protocols and the replacement of packaged foods instead of self-served buffets, it is anticipated that there is a reduction in the risk of transmission of communicable disease in mass gathering environments. [43,44]. Some stakeholders were interviewed after the Tokyo 2020 Summer Olympics and were aware of anecdotal reports of reduced incidences of common viruses within the Tokyo 2020 athletes' village. However, there has not been any research to date that indicate whether COVID-19 countermeasures in feeding environments reduce the number of athlete illnesses at these events. This would be an area for future investigation from athlete illness and injury reports at major competition events.

Stakeholders believe that they would be better able to adapt their foodservice delivery models if they had efficient communication and collaboration with organizing committees. An internationally agreed upon set of standards they felt would help them better prepare and comply based on the settings and environments of their chosen food operations. Different caterers are commonly appointed for each major event and across different food outlets at the event making it difficult to adapt foodservice models and meet industry standards [12,17]. In the current study stakeholders suggested enhanced use of technology could assist with management of waste reduction, reduce seating times to limit physical distancing requirements, and optimize sustainability. It was recognized that this will incur added costs and could still potentially restrict the flow and service of operations.

Traditionally, foodservice settings are pre-determined without consultation with key stakeholders which often result in inefficient operational foodservice models faced by several constraints such as food accessibility in the host country and lack of availability of resources such as technology and integrated sports nutrition expertise [30]. The advent of COVID-19 places new additional challenges on the ability to comply with varying countermeasure guidelines due to physical constraints (i.e., use of tents, two level structures, decentralized and multiple smaller operations) that dictate the foodservice delivery. Stakeholders in this study suggested that new foodservice guidelines can impact their ability to provide nutritionally adequate and safe food provision at events. Consultation with nutrition experts they also felt was critical to help minimize the risk of spread of disease while meeting the needs of up to 12,000 athletes to provide safe, suitable and nutritionally adequate food [30]. The lack of involvement of skilled sports nutrition professional and catering staff early on in the food system planning process has previously been identified as a challenge in this setting [30,45].

COVID-19 driven need for additional staffing, equipment, technology, waste management requirements and rising food costs was recognized as areas that require an appropriate budget. There was a common concern that stakeholders will not have access to adequate, skilled staff. The strain that COVID-19 has placed on restaurant workers during the pandemic has resulted in higher levels of employee psychological distress and loss of jobs indicating that catering staff are leaving the industry [46]. Given the variable and international locations of these major events, it has been reported that experienced and trained workforce is important to the success of the foodservice operations [30,46,47]. Adding to this, COVID-19′s driven anticipated skilled staffing shortages, staffing can be considered a significant challenge.

Sustainable food practices have been identified as another factor impacted by COVID-19. Foodservice operations have been forced to rely on Single Use Packaging (SUP) such as plastic straws, bags, takeout cutlery, and plastic food packaging [48] which directly impacts waste and plastic reduction efforts to comply with food safety guidelines [47]. Since 2017, a main goal in the IOC's Sustainability Strategy [49] was to reduce waste quantities. Until the pandemic, some efforts have been focused on reducing plastic and food waste and eliminating SUPs used in catering activities [50]. Throughout the pandemic, however, plastic use in certain countries has been reported to have increased by 29% [51] and globally the amount of SUP waste (masks, gloves, sanitizers, aprons) generated since the outbreak is estimated at 1.6 million tonnes/day [49,52]. This concern over increased waste and pollution was observed within our stakeholder group and makes it difficult to comply with organizing committees' sustainability approaches while understanding that SUP-based Personal Protective Equipment (PPE) is the best defence against viral transmission [53].

Change due to COVID-19 also has broader social impacts. While social distancing, limiting seating times and use of plexi-glass dividers between individual eating "stalls" are recommended by health officials [9], stakeholders perceived that these social distancing recommendations within dining areas could have a potential negative impact on athletes' social dining experience by limiting interactions. Mealtimes in an athlete's dining hall have historically been perceived as a means to connect with others while fueling for stressful competition situations. While the overall dining environment, including a comfortable space and mood have been found to contribute to the dining experience and satisfaction [54]. Since eating alone is associated with stress [55], concerns were raised that athletes may experience more stress during dining due to the change to seating arrangements, use of plexi-glass dividers, and/or limited seating times.

At the present time there is uncertainty whether COVID-19 countermeasures will continue to be enforced by organizing committees. If they were to continue, it is perceived that stakeholders do not feel adequately prepared to meet such requirements based on current delivery models. On-going challenges need to be supported if change to current models are to be implemented, and further research is required to determine the impact of changes to current foodservice models on athletes' health and dining experience at major competitions.

5. Limitations

One of the limitations of exploratory or qualitative research is that it may reveal the researcher's own identity, background and beliefs in the creation and the analysis of the data. Participants were offered another interviewer in the case that there was potential they knew interviewer due to the small field. We recognize internal biases from the positions held and power in our professional relationships with AD ensured the participants' needs were always respected. Field notes were kept by the interviewer AD.

It is feasible that there were stakeholder groups whose views were not represented, such as those with experience on organizing committees for major competition events or representatives from the International Olympic Committee. It is difficult to recruit these individuals due to the limited number of individuals in this group. Additionally, some organizing committee stakeholders may have felt uncomfortable participating in discussions prior to the Olympic Games for confidentiality reasons. This could be considered a key area for future research to gain understanding into the comparisons between perceptions from our group of stakeholders to this unique key stakeholder group.

Participating stakeholders may have also felt uncomfortable discussing certain topics, thus true perceptions may not have been fully represented. Qualitative data thus can only be interpreted as perceptions, and additional research is required to triangulate the findings presented here with empirically measured factors. As we strive for information power it is suggested that addressing these perceptions in the future through on-site audits is needed.

6. Conclusions

Stakeholders of catering at major events do not feel they are prepared or supported to adapt their foodservice models with the on-going changes impacted by the COVID-19 pandemic. Barriers to change continue to reside with organizing committees who appear to rely on previous games' operation standards. The outcomes of this study suggest that International organizing committees of major competitions must now be tasked with updated guidelines, including supporting adequate budgets and communication, if stakeholders are to adapt their operations to control the spread of viruses, such as COVID-19, within all foodservice operations at major competitions.

Adequate education and best practice solutions for sustainable food service practices is needed to continue to optimize infection control through consistent hand hygiene, social distancing and respiratory regardless of COVID-19. Public health agencies should be vigilant of future mass gathering events, such as international major competitions. Future studies may also focus on quantitative analysis of caterers' compliance to current risk management guidelines at major competitions.

Attention now must be directed to determine how on-going change will impact foodservice delivery, food safety and the social dining experience in future major events.

Author Contributions: A.C.D. and F.E.P. conceived study and was responsible for research design. A.C.D. conducted the interviews. A.C.D. initially coded the transcripts with review by F.E.P., J.T. and H.W. All authors were responsible for data interpretation. A.C.D. was responsible for writing the original draft of the paper, with critical review, commentary, and revisions by all authors. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the University of the Sunshine Coast Human Research Ethics Committee (HREC, S211540, April, 2021) and confirmed that this project meets the requirements of the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) for studies involving humans.

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Data Availability Statement: Not applicable.

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