# Implementation of a mass gathering surveillance system during a Mozambican cultural ceremony in 2020

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**KEYWORDS:** Public Health Surveillance, Mozambique, Behavioral Risk Factor Surveillance System, Risk Assessment

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## ABSTRACT

**Introduction:** Cultural festivals are events that bring together a large number of people in close contact for extended periods of time, which can contribute to disease outbreaks and other public health threats. Every year in Maputo province, on February 2, the capital of Mozambique celebrates the traditional ceremony Gwaza-Muthini (GM), where nearly 5000 people participate. An enhanced real-time surveillance system was implemented to monitor the occurrence of health events during the GM event. **Methods:** A cross-sectional descriptive study was conducted between February 1-3, 2020. A direct observation of the event site, waste disposal, public toilets, hygiene, sanitation, and safety conditions of the food vendors was carried out prior to the event. To monitor health events, clinical patient data were collected from the event's medical post and the local health facility's registration logbooks, using a real-time electronic mobile system. For the diagnosis evaluation, they were divided into traumatic and non-traumatic origin. **Results:** Forty patients were seen at the two health facilities; of whom, 73% (29) were male, 58% (23) presented with traumatic injuries, 43% (17) with non-traumatic diagnosis. Of injuries, 48% (11/23) were victims of physical aggression, 35% (8/23) of traffic accidents. Of the 17 patients with non-traumatic diagnosis, 47% (8/17) were hypertensive. No foodborne disease was observed during the event. **Conclusion:** Although this study was focused on monitoring health events that could lead to outbreak diseases, such as foodborne diseases the 2020 annual GM traditional ceremony occurred without significant health risk, and patients had no condition needing hospitalization.

## Introduction

Gwaza-Muthini (GM) is a Mozambican cultural ceremony that takes place annually, celebrating the anti-colonial resistance´s defeat of the Portuguese colonial army on February 2, 1895 at the Nkomati River. The ceremony also marks the beginning of the season of Ukanhi, a traditional Mozambican drink made from Marula, or Canhu, fruit [1]. It is estimated that more than 5000 people participate in the event every year [1]. With large crowds of people, there is an increased need for surveillance of public health risks, and through epidemiological, health, environmental and occupational surveillance, health threats can be prevented [2-4].

Mass gatherings can be cultural, religious, or athletic events, in which the number of participants can overwhelm the local health services where the event takes place, exacerbating the preexisting health conditions among the participants and compromising health system conditions during the period of the event [4]. During those events, the combination of large influxes of people and social mixing in the presence of highly infectious pathogens, can lead to a large outbreak with negative consequences for health systems [5]. For this reason, health authorities need to monitor the public´s health and prepare contingency response operations [2,4].

The use of mobile technologies increases the timeliness and optimization of surveillance, enabling early detection of disease outbreaks during mass gathering events [6,7]. The 10th All-African Games at Maputo (2011), the 9th National Culture Festival in Sofala (2016) and the Pope's visit to Mozambique are examples of mass gatherings events where surveillance was implemented using real time tools [8,9]. It was implemented a real time surveillance system, with the aim of characterizing the cases captured by system as well as describing the 2020 GM preparedness steps taken.

## Methods

This was a cross-sectional descriptive study conducted from February 1-3, 2020 using direct observation checklist of the GM event site conditions and a patient questionnaire at Marracuene District, located in Southern Mozambican Province. Demographic and clinical data of patients was collected at the fixed medical post at the event site and at the Marracuene Health Center. To obtain presenting symptoms, patients responded to a questionnaire of 28 closed questions upon registration and, the clinical diagnosis was extracted from the logbooks and entered in a real-time electronic mobile system. Cases were defined as any individual presenting for medical care at one of the two mentioned health facilities during the study period. For the diagnosis evaluation, cases were divided into traumatic and non-traumatic origin.

One day before the festival, and during the event we conducted a direct observation of the event site to characterize the event´s place, waste management, and public toilets. Three more observations of the waste management and public toilets were made in the morning and at midday of the event day, and in the 3 February 2020 morning. It was also observed food preparation and preservation, and hygiene of utensils of all food vendors available at the event place on 2 February 2020.

## Results

### Profile of people seeking healthcare and the most frequently encountered health conditions

A total of 40 patients were seen at the event´s medical post and at the Marracuene Health Center, 73% (29) of whom were male, Table 1. The median age was 26 years (ranging from 2 to 65 years). The age groups that most sought medical care were 15-24 and 25-54 years, with 38% (15) each.

According to the records of these 40 patients, 58% (23/40) presented with traumatic diagnosis and 43% (17/40) with non-traumatic diagnosis. All patients with traumatic diagnose were male, and approximately half 48%, (11/23) were due to physical aggression which also accounted for 28% (11/40) of all diagnoses, 35% (8/23) were caused by road traffic accidents which accounted for 20% (8/40) of all diagnoses, and no case required specialized health care services Figure 1. Of the 17 patients who received a non-traumatic diagnosis, 47% (8/17) were hypertension, 12% (2/17) were gastroenteritis, and 6% (1/17) of alcohol coma Figure 2. Hypertension accounted for 20% (8/40) of all diagnoses. The most common symptoms that led patients to seek medical attention were: referred pain 55% (22/40), headache 18% (7/40), abdominal pain and dizziness 8% (3/40) each, fever and other symptoms with 5% (2/40) each.

### Description of the venue, waste management, and public toilets

During the festival, the venue was littered with bottles on the ground, even with the presence of garbage cans. Plastic bags

were available for the garbage produced by the food vendors. Fixed public toilets, separated by men and women, with water in a cistern tank truck for hand hygiene, were available at every stage of the event. There were no fire extinguishers for public use at the venue, but the public rescue corps, equipped with fire extinguishers, was present during and after the festival.

A total of 27 food vendors were available during the event and all of them were observed, of whom 67% (18/27) were open air, 78% (21/27) had floor and 96% (26/27) used electricity for lighting. To wash cooking and serving utensils, 52% (14/27) washed on the floor and 37% (10/27) used cisterns to obtain water from a well. All food outlets used charcoal for cooking and had no fire extinguishers. In terms of waste management, 89% (24/27) of the food vendors did not separate the garbage into a glass and organic mixed with plastic waste Table 2.

## Discussion

The annual Guaza-Muthini cultural ceremony requires a strategic organization to protect the health and wellbeing of participants and not to burden the venue with waste after the celebrations. The authorities need to prepare the locale for basic human needs, including access to potable water, sufficient public toilets, adequate food refrigeration systems, sufficient capabilities for the disposal of both liquid and solid waste, and the control of rodents and insects [10,11]. Although fire extinguishers were not available at the locale for use among the general public, the public rescue corps was present and equipped with fire extinguishers. At mass-gathering events, protection of participants and rapid response to events, such as a fire, must be ensured [12].

The majority of those seeking health services had mild symptoms that did not require hospitalization or transfer to a reference hospital. These findings are consistent with similar mass gathering events held in the country [8,9]. This could be explained partly by the intersectoral coordination to control the participant´s activities. During a mass gathering, the police, for example, play an important role in maintaining public order, avoiding the occurrence of situations that endanger the lives of the participants, associated with inappropriate behavior, controlling or monitoring behaviour, and remove people for behavioural reasons.

During Gwaza-Muthini, hypertension was the most common non-traumatic health event. This was also seen during the IX National Festival of Culture in Sofala Province in 2016 and during Pope Francis´ visit in 2019 and is possibly due to overcrowding, which can exacerbate stress and anxiety in individuals with hypertension [8,9]. The high prevalence of hypertension during the event might have been accidental and reflect the likely burden of the disease in the population. The activities performed at the event, especially the dancing, cause people to stand for a long time and without a break, and may cause anxiety, and this may exacerbate the hypertension.

Physical trauma was the more commonly reported during the Gwaza-Muthini festival. This is not consistent with other regions studies of large events and health outcomes. A study conducted in Senegal found trauma as the second most common reason for health consultation during a mass gathering, possibly due to the age of people that mostly participate in the event, related to alcohol consumption [13]. Falling was the least recorded cause of trauma, contrary to the study conducted in Sofala where falling was the main cause of trauma [8]. This was possibly because the GM event venue did not have a structure that would have posed a risk of falling to the participants, and most falls at this festival occurred during the dances.

No foodborne intoxications cases were recorded during the ceremony. It could be that the hygiene measures put in place were effective to prevent foodborne diseases. Given that the food outlets were authorized by the local authorities, there may have been menial supervision to ensure that the food was prepared in good hygienic and safe conditions.

On the night of the event, the participants were assisted at the Marracuene Health facility and not at the event site, and somehow some people may not have sought health care.

## Conclusion

Although this study was mainly focused on monitoring health events that could lead to outbreak diseases, such as foodborne disease and respiratory infections, there were no records of such health events, so this may be an indication that the local authorities were prepared to respond to any eventuality. It is recommended to include health education activities for participants with hypertension. Although the venue will have a water source for food vendors, it should be ensured that it is sufficient, so that people do not use unsafe sources.

## What is known about this topic

- Public health authorities plan for mass gatherings and develop plans for local health facilities and systems, based on their capacities
- Real-time epidemiological surveillance during mass gathering events can serve as an early warning system for disease outbreaks during an event.

## What this study adds

- In mass gatherings, special attention must be given to chronic diseases such as hypertension
- This study showed that in mass gatherings, physical trauma is common in young male, and the main cause is car accident.

## Competing interests

The authors declare no competing interests.

## Authors' contributions

GA and BN contributed to the conception, design, collection, analysis and interpretation of data and drafting of the final article. CB and ER, methodology and manuscript revision. AB, data collection, supervision and manuscript revision of the article. The manuscript was read and approved by all authors.


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## Tables and figures

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Figure2: Distribution of Non-traumatic diagnoses among patients at the event´s medical post and the Marracuene Health Centre during Gwaza-Muthini festival, February 1-3 2020

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| **Table 1.** Socio-demographics characteristics of people seeking medical care at Gwaza-Muthini festival, February 1-3 2020 | | | |
|---|---|---|---|
| **Characteristic** | | **N (40)** | **%** |
| Age group | 0-14 | 5 | 12.5 |
| | 15-24 | 15 | 37.5 |
| | 25-54 | 15 | 37.5 |
| | 55 - 65 | 5 | 12.5 |
| Gender | Male | 29 | 72.5 |
| | Female | 11 | 27.5 |
| Place of residency | Marracuene District | 27 | 67.5 |
| | Other districts | 13 | 32.5 |

| **Table 2.** Characteristics, hygiene and safety conditions of the food outlets at Gwaza-Muthini festival, February 1-3 2020 | | | |
|---|---|---|---|
| **Observed characteristics** | | **N (27)** | **%** |
| Type | Open | 18 | 66.7 |
| | Closed | 9 | 33.3 |
| Floor type | Floor | 21 | 77.8 |
| | Paved | 6 | 22.2 |
| Illumination | Electric current | 26 | 96.3 |
| | Candlelight | 1 | 3.7 |
| Place for washing utensils | Floor | 14 | 51.9 |
| | Stand | 8 | 29.6 |
| | Other | 5 | 18.5 |
| Source of water | Cisterns | 10 | 37.0 |
| | Public network | 9 | 33.3 |
| | Well | 8 | 29.6 |
| Separated garbage | Yes | 3 | 11.1 |
| | No | 24 | 88.9 |

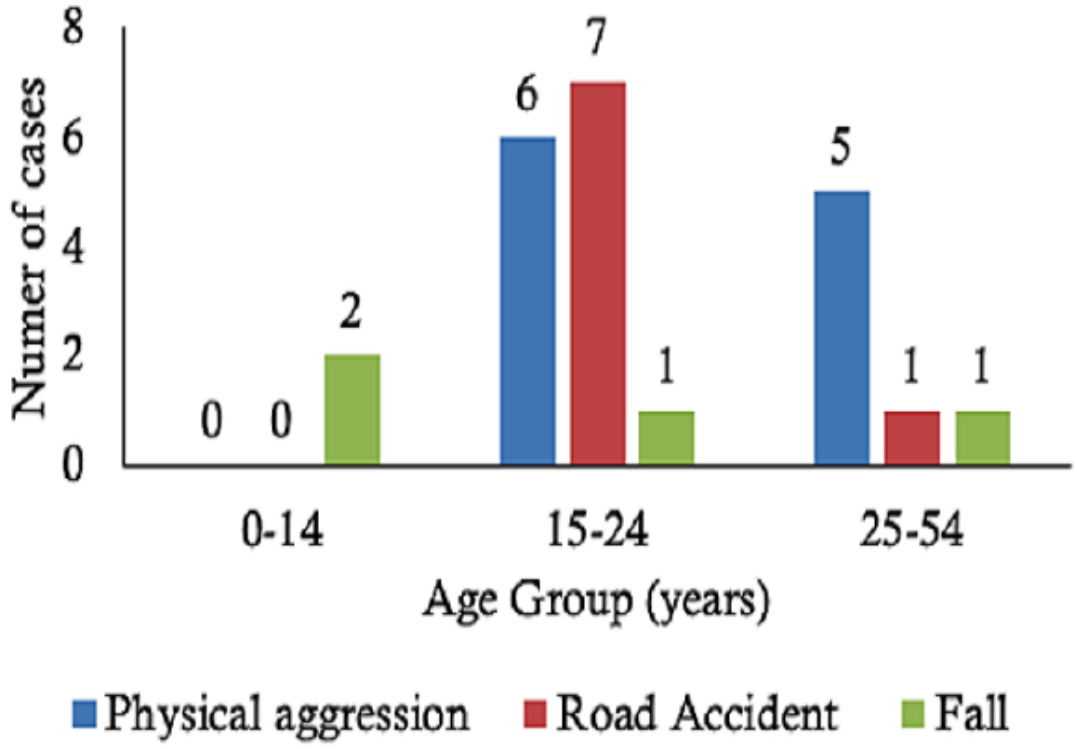


**Figure 1:** Distribution of causes of physical trauma by age group of patients seen at the event's medical post and the Marracuene Health Centre during the Gwaza-Muthini festival, February 1-3 2020

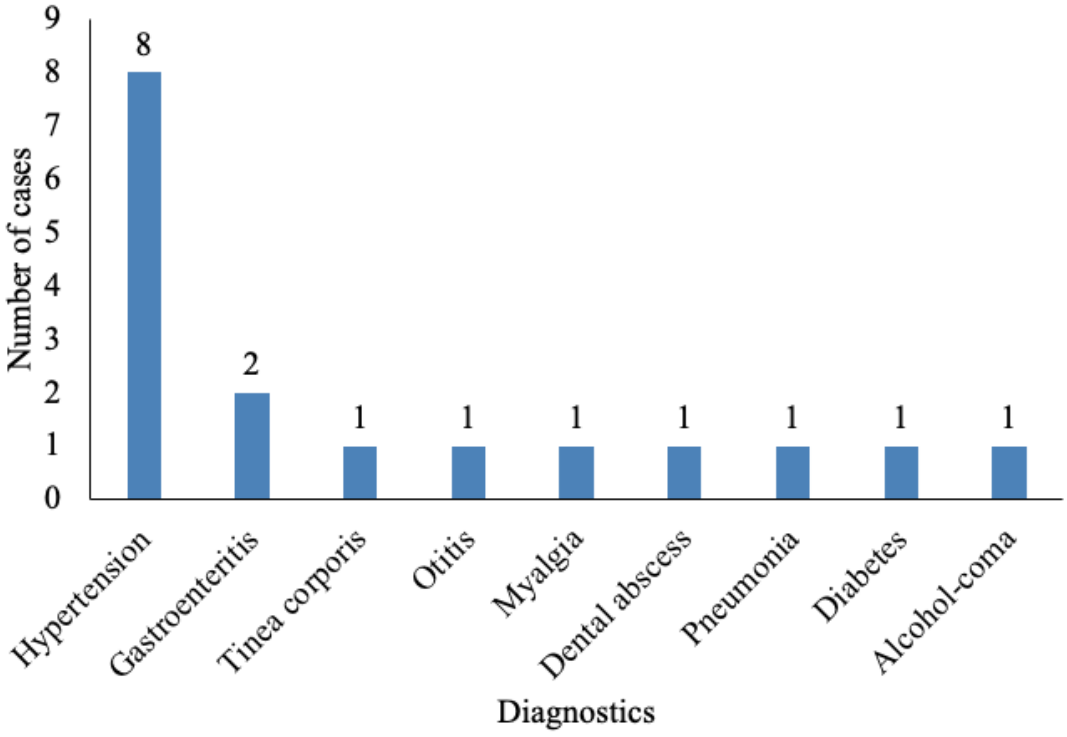


**Figure 2:** Distribution of Non-traumatic diagnoses among patients at the event's medical post and the Marracuene Health Centre during Gwaza-Muthini festival, February 1-3 2020