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## The Jubilee: prepared for pilgrims, but are we ready for pathogens?

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The Jubilee is a unique and significant year, derived from the *yobel*, the ram's horn that signals the Day of Atonement (Yom Kippur). Historically, it symbolizes a time of renewal, forgiveness, and reconciliation. In our present context, this symbolism takes on new relevance as we emerge from the shadow of the COVID-19 pandemic, heed the warnings of avian influenza, and remain vigilant against emerging threats such as Mpox. These crises serve as a stark reminder: prevention and rigorous epidemiological monitoring are essential to preventing local outbreaks from escalating into global emergencies [1].

Mass gatherings such as the Jubilee, which draw millions of pilgrims from across the globe, offer both an opportunity for collective renewal and a significant public health challenge. The concentration of large numbers of people in confined spaces creates a perfect environment for the spread of infectious diseases, including respiratory viruses, gastrointestinal infections, and vector-borne diseases. The convergence of high population density, international travel, and shared accommodations significantly amplifies the risk of outbreaks [2].

Historically, mass events have been linked to the rapid transmission of diseases. For instance, the MERS-CoV outbreak during the 2012 hajj pilgrimage demonstrated the potential for disease spread at large religious gatherings. The transmission of the virus was exacerbated by the high concentration of pilgrims from various nations, sharing confined spaces such as dormitories and public transportation [3]. Similarly, the SARS outbreak in 2003 spread significantly during large international gatherings, as demonstrated by the study of Riley et al. [4]. Additionally, the cholera outbreaks in Haiti following the 2010 earthquake underscored how large-scale population displacements and overcrowded conditions can exacerbate the spread of infectious diseases [5]. The Jubilee, with its vast movement of people, necessitates particular vigilance – especially in the

context of emerging pathogens and the growing global threat of antibiotic resistance [6].

In response, our research team has developed the *Jubilee 2024 Pandemic Preparedness and Response Plan*, a groundbreaking and tailored initiative for Rome. This plan represents an innovative, first-of-its-kind effort in the national public health landscape, crafted specifically to address the unique challenges posed by mass gatherings in the face of emerging global health threats. It combines the latest scientific research and public health strategies in a novel framework designed to protect the health of pilgrims and the wider community.

The plan is structured around seven strategic pillars, each designed to provide a comprehensive, multidisciplinary approach to pandemic preparedness and response:

- (i) **Epidemiological Surveillance:** At the heart of our plan is continuous, real-time monitoring of infectious disease spread, using advanced data collection methods, including genetic sequencing and cutting-edge bioinformatics tools [7]. This approach enables early detection of emerging pathogens and provides essential insights to guide rapid response measures.
- (ii) **Research and Innovation:** We propose a forward-thinking research agenda focused on the origins, pathogenesis, and transmission dynamics of potential pathogens. By harnessing advanced technologies such as artificial intelligence (AI), machine learning, and genomic sequencing, we aim to develop predictive models that can optimize interventions and interventions, marking a leap forward in integrating innovation into public health practices.
- (iii) **Education and Training:** Recognizing the critical importance of an informed and well-prepared workforce, we have developed a comprehensive capacity-building program.

This includes workshops, seminars, and public health campaigns aimed at health professionals and local communities, ensuring that stakeholders are equipped with the necessary knowledge and skills to respond effectively to health threats during the Jubilee.

- (iv) **Collaboration and Networking:** Strengthening ties with both national and international health organizations is vital to fostering a coordinated, effective response. Our plan emphasizes the creation of a collaborative network for knowledge exchange, facilitating the rapid mobilization of resources and expertise when needed. This collaborative approach will significantly enhance the global community's ability to respond to pandemics in the future.
- (v) **Prevention and Control:** The plan places a strong emphasis on evidence-based prevention measures, from vaccination campaigns to targeted health education and awareness initiatives. These tailored interventions will not only help mitigate the risk of outbreaks but also manage their spread through proactive and coordinated public health responses.
- (vi) **Emergency Response:** The ability to swiftly mobilize resources during an epidemic is crucial. Our plan includes clearly defined protocols for the rapid deployment of medical teams, equipment, and treatment facilities, ensuring an effective response to outbreaks in real-time.
- (vii) **One Health Approach:** A central innovation of our plan is the integration of the *One Health* approach, which recognizes the interconnectedness of human, animal, and environmental health. By addressing zoonotic diseases that may emerge during mass gatherings, we seek to create a holistic strategy that prevents and controls the spread of diseases that cross species boundaries.

This pioneering plan sets a new precedent in Italian public health, introducing a comprehensive, innovative framework for pandemic preparedness at large-scale events. By combining cutting-edge research, interdisciplinary collaboration, and tailored interventions, we aim to protect not only those attending the Jubilee but also establish a model for managing health risks at future international mass gatherings.

The ethos of the Jubilee – renewal – reflects our collective responsibility to build resilient health systems. Just as diseases do not recognize borders, our solutions must transcend them. Enhanced surveillance systems, robust pandemic response plans, and interdisciplinary collaboration are essential to safeguarding global health.

The lessons of recent years must not be forgotten. Investing in pandemic preparedness is no longer

optional; it is a moral imperative and a practical necessity. Closing gaps in knowledge, promoting international cooperation, and prioritizing prevention are the cornerstones of ensuring a safer and healthier future for all.

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## Authors' contribution

Francesco Branda: Conceptualization, Writing – Original Draft, Writing – Review & Editing. Massimo Ciccozzi: Validation, Supervision, Writing – Original Draft, Writing – Review & Editing. Fabio Scarpa: Conceptualization, Writing – Original Draft, Writing – Review & Editing.

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