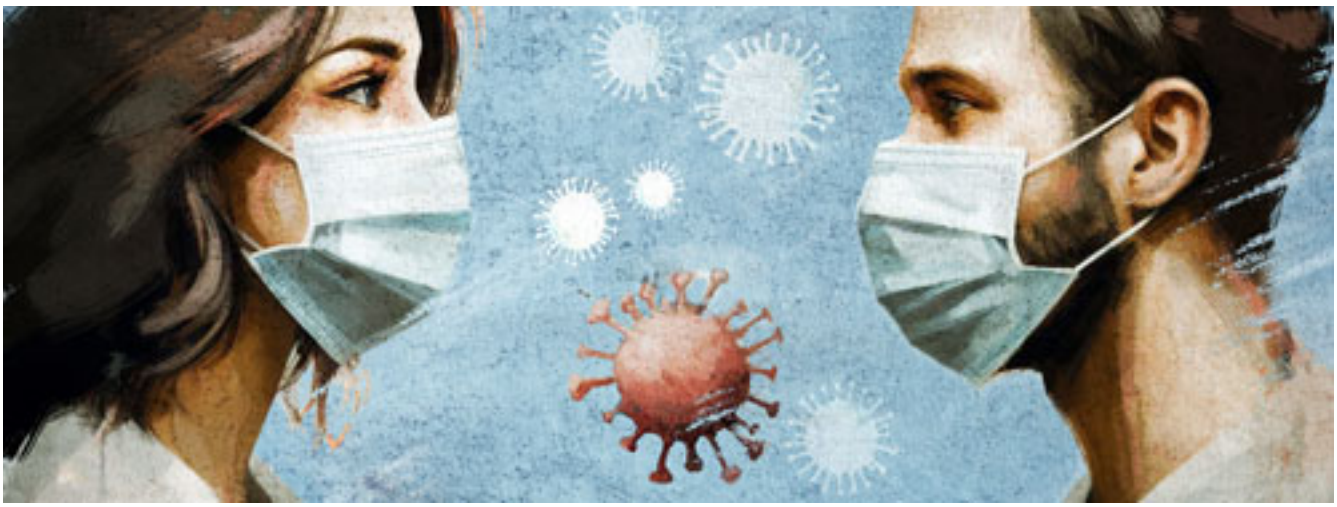
SARS-COV-2 Health Policies, Vaccination and Long COVID

Achievements and Challenges



The Pontifical Academy of Sciences (PAS) has been proactive in addressing the science and societal issues related to SARS-COV-2 through two conferences, along with related statements and publications. Pope Francis has emphasized the crucial role of science in tackling SARS-COV-2 and has called for greater attention to the equity aspects of the pandemic, including health and policy considerations. PAS remains committed to engaging with scientific, health policy, and ethical considerations to address the pandemic and its consequences.

Workshop Objectives:

1. **Draw Lessons from Health and Science Policies:** Review the diverse health and science policies implemented during the pandemic.
2. **Review Vaccine Innovations:** Examine experiences from vaccine development, testing, implementation programs, side effects, and communication strategies.
3. **Share Insights on Long COVID:** Discuss the long-term health consequences of SARS-COV-2 infections, including causes and potential cures.

1. Lessons from Health and Science Policies: Before focusing on vaccines and Long COVID, the workshop will conduct a high-level review of lessons learned from health and science policies during the pandemic. The SARS-COV-2 pandemic has caused profound tragedy, with a staggering death toll and significant economic loss. As of December 3, 2022, there were 645 million confirmed cases and 6.6 million confirmed deaths. Social and economic recovery is

ongoing. The workshop will share and review diverse experiences with health and science policies, including the impact of lockdowns on health, education, and child development, as well as international efforts like the COVAX (SARS-COV-2 Vaccines Global Access) initiative. Launched in April 2020, well before SARS-COV-2 vaccines were proven and available, COVAX aimed to accelerate vaccine development and ensure equitable access. Despite its innovation, upstream policy failures and downstream implementation constraints hindered widespread vaccine availability in low-income countries.

2. Vaccine Innovations and Implementation: The pandemic accelerated the deployment of scientific knowledge, leading to the rapid development of effective vaccines using various technology platforms. By August 2022, 356 SARS-COV-2 vaccine candidates were developed, with 34 in large-scale use after conditional approval by national regulatory authorities or under the WHO Emergency Use Listing. These vaccines, developed using mRNA, viral-vectored, inactivated whole virus, protein subunit, and plasmid DNA technologies, each have unique attributes.

The long-term support of vaccine development research by governments illustrates the crucial role of public funding for high-priority public goods such as vaccine technology. However, many governments have not designed appropriate ways to manage co-funded **intellectual property**, which results in privatization of intellectual property supported by government funding. Companies exercise rights to the technologies under patent, and charge prices for mRNA vaccine doses much greater than the actual costs of manufacturing. Some governments in poorer countries were unable to pay such prices, and had to wait for donations or discounts. This raises ethical issues. Low-income countries were left with no effective access to highly priced vaccines other than through mechanisms such as the Global Alliance for Vaccines and Immunizations.

The workshop will explore next-generation vaccines with broader epitope coverage, longer protection, and fewer logistical challenges.

Vaccine Side Effects and Hesitancy: Vaccine side effects are a significant concern. Post-market surveillance data are crucial for assessing vaccine effectiveness to prevent SARS-COV-2 infections, severe diseases or deaths in the real world, as well as the incidence of adverse reactions. Breakthrough infections, waning immunity and the emergence of new variants highlight the need for ongoing evaluation. The effectiveness to prevent post-vaccination infections is much less satisfactory than the efficacy assessed in the original clinical trials. Factors such as booster schedules, costs, logistics, and local production capabilities influence vaccine procurement decisions. Vaccine hesitancy, driven by safety concerns, efficacy doubts, and mistrust, remains a global health threat. Understanding and addressing these concerns through targeted information can reduce severe illness and mortality.

Vaccine hesitancy, defined as the “delay in acceptance or refusal of vaccination despite the availability of vaccination services,” was identified by the WHO as one of the ten greatest global

health threats. This issue is not unique to SARS-COV-2 and has existed for other vaccines as well. SARS-COV-2 vaccine hesitancy primarily revolves around concerns about vaccine safety, efficacy, perceived risks, and mistrust of governments and health institutions. In some instances, side effects of certain vaccines became apparent after their release, exacerbating concerns and fueling misinformation. Understanding the characteristics and degrees of hesitancy among those influenced by misinformation on safety, efficacy, and risk is crucial. This knowledge can help identify priority groups for targeted information campaigns about the safety and efficacy of SARS-COV-2 vaccines, which are essential in reducing the risks of severe illness and mortality.

3. Long COVID: Causes and Cures: Long COVID, defined by WHO as “the persistence of symptoms or emergence of new symptoms 3 months from the onset of SARS-COV-2 that last for at least 2 months and cannot be explained by an alternative diagnosis” remains poorly understood. It affects quality of life, education and employment.

Though it is widely accepted that long COVID is a real phenomenon, there are many questions about how to define the condition, what causes it and how to effectively treat it. It may actually be several diverse diseases. Accurate diagnosis is complicated by factors such as test methods, length of follow-up periods, accuracy of self-reporting, symptoms examined, reliance on parent-reported symptoms for children, negative PCR tests (false-negative results) in some patients, an absence of antibodies in patients who do not seroconvert, and difficulties in establishing a direct link between symptoms and the infection.

Studies have reported various rates of long COVID with a wide range of symptoms. It is suggested that up to 35% of patients treated for SARS-COV-2 on an outpatient basis and up to 87% of patients hospitalized with SARS-COV-2 continue to experience symptoms.[1] Underlying chronic conditions such as diabetes, hypertension, and cardiovascular diseases may also worsen after SARS-COV-2 infection, necessitating closer monitoring.

Long COVID could be related to several factors, including organ damage, persistence of the virus in the body, post-viral syndrome, chronic inflammation, immune response, post-critical-care syndrome, complications from comorbidities, reactivation of the Epstein-Barr virus due to SARS-COV-2-related inflammation, and adverse effects of medications.

Risk factors for long COVID include older age, female sex, having more than five symptoms during the acute stage of infection, comorbidities, the presence of autoantibodies, and previous psychiatric disorders. Vaccination against SARS-COV-2 reduces the odds of developing long COVID, and individuals who had long COVID before vaccination often see improved symptoms post-vaccination.

Long COVID has substantial physical, mental, social, and economic impacts. Many affected individuals may have long-term healthcare and social care needs, requiring multidisciplinary and

stigma-free care, which is not readily available in many settings. Continuous research and regular surveillance through international scientific collaboration are urgently needed. These efforts are essential for health and social care systems to develop effective long COVID treatment, rehabilitation, support algorithms, and policies related to disability, education, occupation, and finance.

Operational Information:

- The conference will be held in-person, with an option for virtual participation.
- Speakers are asked to provide a brief paper of 5 to 10 pages, which will be edited and published in the PAS conference series (Scripta Varia) following the workshop.
- Presentations with PPT will be recorded and placed on the PAS YouTube channel, with the presenter’s consent.
- A Final Statement will be drafted, reviewed, and discussed by all participants before being finalized.

[1] 1 A.V. Raveendran,a,b,* Rajeev Jayadevan,c and S. Sashidharand. Long COVID: An overview. Diabetes Metab Syndr. 2021 May-June; 15(3): 869–875. doi: 10.1016/j.dsx.2021.04.007