“PREVENTION OF COVID-19”. A Report by Sub-Working Group 1 (SWG1) of the ad hoc Working Group (WG) on COVID-19 of the European Union of Medical Specialists (UEMS), completed and submitted to UEMS Council President on 27 April 2022

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1. EXECUTIVE SUMMARY

Key messages to be taken by the recipients of this report

In this report we consider the questions: A. What are the salient characteristics of the current pandemic? B. What have been the deficiencies in our combating it to date? What response is needed, so that we mitigate it more drastically and possibly eradicate this and future pandemics caused by respiratory pathogens?

This Report is addressed primarily to physicians of all specialties, all UEMS Sections, National Medical Associations, national civil services involved in preventive health activities, Ministries of Health, Labour and Health in European countries, European Medical Associations, the European Union (EU) Council of Ministers, the European Commission, the European Parliament, the European Agency for Safety and Health at Work, the Council of Europe, the WHO, the ILO, the UNESCO.

Message 1. It is impossible to know with absolute certainty, whether the current pandemic would have been either eradicated or at least drastically mitigated, by now, so that we could live with together with SARS-Cov-2, being vaccinated annually against it, had different policies, laws and measures been implemented or enforced at different points in time. However, we assert that the resurges and the four waves of the pandemic following the untimely lifting of restrictions and the inadequate vaccination coverage in many countries, can only allow us to hope that the virus, which appears to have a “major” mutation approximately every six months, will eventually become less virulent and prevalent, and, at the same time a vaccine which will eventually be invented - each dose of which will protect us for at least a year.

Message 2. To confront future pandemics, a new WHO Treaty, a new ILO Convention, and a revised European Union Treaty must be planned, agreed by most Member States participating in them. These legal instruments should empower the UN, and the European Commission, to issue appropriate Conventions and Directives correspondingly. These, in turn, should to be reflected in National Laws, so that both the UN Agencies and the EU can supervise the enforcement of adequate control measures, included in new National Laws, aiming at preventing outbreaks of epidemics and swift eradication of them soon after they occur.

Message 3. The foundation of prevention of epidemics and implementation of any related legislation is community education, i.e. health education of the whole population at all levels: From kindergarten and preschool, through to elementary education (using gamification utilising technology), secondary (general and vocational, University (undergraduate, postgraduate, continuing) targeted education by appropriate means, and preparation, so that only a few aspects would need to be specified in the event of a future pandemic. Such education will necessitate also allocation and reallocation of adequate resources and collaboration with many international and European Organisations, including the UEMS. The aim of such education should be societal change, in regard to moral values, attitudes and behaviour and to empower children and adults to easily recognise on-line fake news, misinformation and information, i.e. increase their related preparedness and resilience, as well as their scientific understanding and ability to critically evaluate information.

Message 4. The reinforcement of the responsibility and authority of pandemic prevention experts, primarily specialist physicians (upgrading also public health specialists and occupational medicine specialists and the relates services) and the training and employment of public health nurses and public health inspectors. This will necessitate reorganisation of several civil service Departments.

Message 5. All COVID-19 related health protocols, procedures and services involved in the prevention of the spread of the pandemic should be audited and identified deficiencies revised and rectified as necessary. Preparedness for future pandemics should also include the establishment of an epidemic early detection and alarm system and of an "Epidemic Intelligence Service" modelled on the corresponding US Service.

Message 6. To combat "infodemic", mainly on-line, fake news, misinformation (i.e. spreading the wrong information, unintentionally, unwittingly causing harm) and disinformation (i.e. spreading the wrong information intentionally, wittingly causing harm), among politicians, anti-science orientated people and scientists, studies should be carried out to identify exactly by whom and how people are influenced and base heir views on. This would also necessitate the establishment of a system whereby, prompt, on-line, substantiated responses, (using also science based, clear, narratives including specifics). These should be given in an appropriate manner, so as to discredit irresponsible websites and to not alienate ambivalent citizens. The tactics, mechanisms and the contexts used by certain people for misinformation should be called out and what they are trying to feed to the public explained. People should have more opportunity to receive sound advice, through conversation, regarding the prevention of the pandemic and the usefulness, effectiveness and safety of vaccines, from people they really trust. More trusted websites should be established and related research carried out in all European countries. Only thus shall we manage to revert vaccine hesitancy.

Message 7. National and regional industries should be established as to ensure the requisite production and prompt availability of all the means necessary for prevention of a pandemic, caused by respiratory pathogens, used by the public or the health services. Measures already put in place e.g. in working places, should be retained, to the extent that they do not cause undesirable psychosocial side-effects.

Message 8. Long COVID-19 and long-term psychosocial effects of the pandemic, need to be further studied with the aim to mitigate them. Nevertheless, there is still also a need to phenotype long-covid and design treatment for it.

Message 9. Society and governments should become aware of the fact that public heath medicine and occupational medicine constitute major pillars in preventing the outbreak and the spread of pandemics.

Message 10. In regard to long COVID-19, in most European countries not enough long covid clinics have been established to date. There is a need for European and National follow-up studies, and establishment of adequate long covid services, such as inpatient or outpatient clinics, within primary health care services, including guidelines thereon. Thus, early diagnosis, treatment and rehabilitation would aim at preventing disability, in the frame of tertiary prevention.

2. INTRODUCTION - GENERAL ASPECTS OF PREVENTION OF COVID-19,

It is known that, historically, climate change, pandemics and economic **crises** appear as sequentially interrelated phenomena.

This report provides information on experience and knowledge acquired since the beginning of the COVID-19 pandemic and aims to support and reinforce efforts to control and possibly eradicate it.

Certain statistics are useful, in order to put in context the magnitude of the current pandemic, the response to it and its effectiveness. In the 1918 flue pandemic, 50 million deaths were recorded in 500 days (https://www.cdc.gov/flu/pandemic-resources/1918-commemoration/1918-pandemic-history.htm). The John Hopkins University reported that, as of 13 April 2022, since the beginning of the pandemic, in the USA (with a total population of 329.5 million) the total number of confirmed COVID-19 deaths was 989,366 and that of confirmed cases was 80,722,216, whereas in Greece (with a total population of 10.72 million) the corresponding numbers were 28,701 and 3,252,248 (https://coronavirus.jhu.edu/region/greece), in Germany (with a total population of 83,24 million) were 133,308 and 23,658,211 (https://coronavirus.jhu.edu/region/germany), in the United Kingdom (with a total population of 67.22 million) were 172,498 and 22,033,383 (https://coronavirus.jhu.edu/region/united-kingdom) (and in the world (with a total population of 7.9.billion) were 6,204,423 and 506,139,110 (https://coronavirus.jhu.edu/. It must be borne in mind that mortality from COVID-19 is much higher than that from flu. The US Centers for Disease Control and Prevention estimated that in the US the annual death rate (deaths per 100,000 population) from influenza (flu), in the period 1999 to 2018, never exceeded 15.7 (https://www.cdc.gov/flu/about/burden/2017-2018.htm#:~:text=The%20overall%20burden%20of%20flu,related%20deaths%20(Table%201). The estimated annual death rate from COVID-19 was 217.54 per 100,000 in the US and 206.73 per 100 000 in the UK. The global figure for the covid-19 death rate is estimated at 279 per 100 000 population. The difference in impact between flu and covid in terms of life years is e.g. in a bad flu year, on average around 30 000 people in the UK die from flu and pneumonia, with a loss of around 250 000 life years, which is a sixth of the life years lost to COVID-19.

Prevention of communicable disease pandemics can be achieved if pathogens are blocked from causing contagious infectious diseases in the first place, and if local and national epidemics do not break out. If, however, they do occur, their spread should be mitigated quickly and stopped, or at least mitigated so much that it neither harms people, nor downgrades quality of personal or community life. It is noted, that such prevention involves a very wide spectrum of activities, some of which is covered in this report.

For this to happen, appropriate international, EU and national strategies and action plans are required. These strategies should allow for contingencies, for primary and secondary prevention of infectious diseases, including notifications of cases of such diseases. The extent of usefulness of information technology in preventing the spread of the COVID-19 epidemic should be assessed.

It must be borne in mind that predicting changes in the spread of COVID-19 requires understanding of the interaction between natural processes, such as between the pathogen and host immunity, and non-pharmaceutical Interventions (NPIs), such as social distancing and wearing of masks, in pandemics caused by respiratory pathogens) (https://www.ecdc.europa.eu/en/covid-19/prevention-and-control/non-pharmaceutical-interventions). A framework for natural processes is provided by the coevolution of hosts and viruses. Although it is early in the co-evolutionary history of SARS-CoV-2 and the human host, complementary theoretical insights into the dynamics of host-pathogen interactions are becoming relevant, e.g., the possibility of endemic equilibria (also known as "living with the virus").

Drivers of disease dynamics can be conceptualised as a sequence of rings in a chain of infection which, in turn, relate to the life cycle of the pathogen and the host and present different intervention opportunities. The first link in the chain of infection is the pathogen itself. SARS-CoV-2 is an RNA virus, with the potential for high mutation and recombination rates and therefore a high diversity of genotypes. Mutations may contribute to enhancement of viral proliferation and infection as well as escape from host immune attack.

The chain of infection could be interrupted at the point of the reservoir, including other hosts (primary, intermediate) and the wider environment. Currently, there is no firm evidence yet of animal reservoirs for SARS-CoV-2, and therefore no ongoing transfer to humans, other than from the original hypothesized primary host (bats) in China (Joint statement on the prioritization of monitoring SARS-CoV-2 infection in wildlife and preventing the formation of animal reservoirs (who.int). SARS-CoV-2 can survive in the abiotic environment with half-lives of up to nine days, depending on the nature of the substrate and the temperature. Coronaviruses can persist in aqueous solutions for several weeks, again with a strong inverse correlation with **ambient** temperature**.** Various disinfectants have proved effective at killing the virus and therefore the abiotic environment is a potential target for disruption of COVID-19 dynamics.

The third ring is represented by the transfer of the virus between human hosts, which has been the main target of control measures, including use of masks, reduction of social activities, contact tracing, quarantine and physical/social distancing. As with other viruses transmitted through the respiratory route, SARS-CoV-2 is primarily transmitted by droplets and contact with contaminated surfaces and fomites (which in turn relate to the properties of the abiotic environment), and by aerosol formation.
“The droplets or aerosol particles vary across a wide range of sizes – from visible to microscopic. Transmission of COVID-19 from inhalation of virus in the air can occur at distances greater than six feet. Particles from an infected person can move throughout an entire room or indoor space. The particles can also linger in the air after a person has left the room – they can remain airborne for hours in some cases”
(https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19#:~:text=Transmission%20of%20COVID%2D19%20from,for%20hours%20in%20some%20cases.). It is noted that although fomite transmission of this virus might be less frequent than initially thought, as the relative risk of such transmission is low, compared with direct contact, droplet transmission, or airborne transmission (because of the many factors affecting the efficiency of environmental transmission),
(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7505025/pdf/aim-olf-M205008.pdf) it is still

accepted as being probable and relevant public health measures must still be in place as appropriately (https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-how-is-it-transmitted).

Some concern has been raised by the respiratory shedding of virus which peaks at the end of the first week after infection, just before and as symptoms are developing. Although testing of convalescent COVID-19 patients has provided evidence for persistent RNA shedding, there is no suggestion of chronic carriers of SARS-CoV-2.

The last ring of the chain of infection is represented by the characteristics of the susceptible human host. Active and passive immunization are the main actions to reduce susceptibility to SARS-CoV-2. The schedule of vaccination has been modified over time by introducing a booster dose, due to the waning of vaccine-induce humoral immunity 4-5 months after the second dose of vaccine (or after one dose in case of vaccines requiring only one shot). Passive immunization in early infected COVID-19 patients has been shown to decrease the rate of hospitalization of COVID-19 patients in acute and intensive care units. Similarly, new antivirals have been introduced in the clinical practice to decrease the viral load in early infected individuals. However, new SARS-CoV-2 variants, such as the recent Omicron variant, can infect fully vaccinated (i.e. three doses) individuals, even though in a minor extent as compared to the population of not vaccinated or vaccinated with one dose or two doses, and are partially or not responsive to antivirals and monoclonal antibodies that resulted effective against “old” variants, i.e. delta. Full vaccination coverage, new vaccines and monoclonal antibodies targeted against new variants are probably the main steps to reduce the burden of susceptible hosts.

Human genetic factors can also influence susceptibility to SARS-CoV-2, including effects via blood group, HLA genotypes and fibroblasts. The major genetic risk factor for severe SARS-CoV-2 infection and hospitalization seems to be related to variations on human chromosome 3. Finally, the role of innate immunity against COVID-19 is under study, since exposure to microbial signals and to cytokines trains myelomonocytic cells with enhanced effector function against microbial agents.

Lockdowns were effectively used at the initial stage of the pandemic in few European countries, e.g. in Greece, drastically and successfully mitigating the spread of COVID-19 the pandemic, but not eliminating it. Later on, lockdowns or strict Nonpharmaceutical Interventions (NPIs) imposed to control subsequent waves, when lifted in countries where a large proportion of the population, including vulnerable and older people, had been fully vaccinated, were not followed by a resurgence of it (for example in Australia, New Zealand and Singapore). On the contrary, in China where such vaccination coverage had not been achieved, an upsurge risk exists, at the timing of writing this report (25.4.2022).

Prevention of COVID-19 has been based on testing, diagnosing and isolating cases, tracking and tracing and isolation of case contacts during a large port of the course of the pandemic. At high incidence, however, these important pandemic containment measure has been shown to become inefficient, and, therefore, the spread of SARS-CoV-2 can most probably only be controlled through restrictions and, to this end, all European countries need to pursue a low incidence strategy in a coordinated manner, built on open communication and trust (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8720492/pdf/main.pdf)

At the time of writing this report, a combination of NPIs, to an appropriately high extent, and of a high vaccination coverage, especially among the vulnerable, susceptible and older people, combined with vigilance, by way of checking vaccination and infectivity status, when traveling between countries, should be, in the short term, the only way to further mitigate the pandemic in Europe. Nevertheless, a sine qua non imperative for eradicating the pandemic remains the provision of more resources and vaccines from richer to low and middle-income countries.

It is noted that during the current COVID-19 pandemic, the protective value of general good health resulting from healthy life styles, has been clearly shown, e.g. in a study based on data for 40 countries in the European Region (COVID-19 Mortality in Europe, by Latitude and Obesity Status: A Geo-Spatial Analysis in 40 Countries (nih.gov)) although it does not ensure immunity from serious illness or death.

As the body of knowledge about COVID-19 is growing, prevention measures are improved.

However, for the time being, we should not become complacent and think that the pandemic is over. The potential importance of (a) repeated reinfections with the same or different variants of SARS-CoV-2 and the possible weakening of immunity (to this type of virus or to other types of virus), (b) the possible infection by a combination of two variants of this virus in the same person at the same time, and (c) the long way lying ahead of us before we reach the situation where the new SARS-CoV-2 variant appearing every year is very similar to that of the previous year (thus allowing us to produce an annual vaccine adequately effective against the current year's variant based on the previous year's variant, just as it happens in regard to the annual flu vaccine flu), should keep us alert. Furthermore, there are most probably going to be more waves of COVOID-19, in between seasons, which will not be predictable, and also seasonal surges, which will be predictable. At present, in countries, such as the UK, where a very high percentage of the population have been vaccinated, COVID-19 seems to become endemic. Where this happens, people may have to prepare themselves how to live with COVID-19. However, even though case fatality from the O variant is low, on account of all restrictions having been lifted, increased hospitalizations occur, which put a lot of strain on the British National Health Service, probably because many of those over 75 years old have not had the second booster dose yet. The right way to respond to this situation would be to reinstitute testing, isolating cases and wearing masks.

Needless to say, that in the early months and weeks of the disease's spread across the world, some countries and regions measures were applied, which from today's perspective are unsubstantiated and not evidence-based, e.g. washing roads with soap and disinfectant fluids, trying to track the disease using all kind of apps (some of which helped, but most were waste of time and resources), or prohibiting currier and postal services. And yet, nobody can be blamed, as we knew very little about the disease, hoping that it would just go away with arrival of summer in 2020.

Information presented and recommendations made in this report are based on the COVID-19 pandemic situation prevailing up to 25.4.2022 and mainly pertain to communicable diseases caused by respiratory pathogens. The text of the report is structured in a logical sequence, starting with outlining the principles and types of prevention, proceeds with critically reviewing the international and the European context and perspectives of the pandemic, continues with underscoring the four pillars of pandemic prevention, and ends up with the five National

strategies that are needed to prevent the outbreak and the spread of the current and future pandemics, i.e. those of education, legislation, epidemiologic surveillance, vaccination and environmental control. In each section, we put forward relevant proposals in the form of recommendations.

3. PRINCIPLES AND TYPES OF PREVENTION, IMPLEMENTATION OF PREVENTIVE MEASURES

Prevention, i.e. preventing disease from occurring, is always preferable over treatment in many respects: E.g. it costs less, is less stressful and does not leave any scars on the tissue substrate. “A stitch in time saves nine”.

The precautionary principle is most effective in prevention. This principle should apply in a state of uncertainty of knowledge about when in the future a severe mutation of the virus might occur and what the capacity – virulence and transmissibility - of it will be, and also about the behaviour of the population in response to measures to control the pandemic, as clarified below. This should be the only prevention principle to be implemented fully and continuously throughout the course of the pandemic and determine earlier implementation of stricter control measures and health education activities. Decision makers should become aware of this necessity. This is evident so much more now, over two years into the pandemic, as it has been proven that enforcement of precautionary measures to adequately secure the highest possible level of public health, public peace and sustainable economic growth, should outweigh all other political considerations. This means that in the face of uncertainty about the actual magnitude of risk infection, restrictive prevention measures should be arbitrarily determined and enforced. The degree of restriction of such measures might be disproportionally higher than that warranted in reality, but these, possibly excessive measures would be certainly effective. It is noted that the concept of proportionate response (e.g. to violent actions) adopted by politicians in the prevention of the spread of SARS-CoV-2 is a legal one and certainly proved not to be suitable for effectively restraining and eradicating the current pandemic.

As regards the above principle and its application, a case in point exists in civil aviation, where for pilots who frequently fly over the poles of the earth, a limit of cosmic (ionising) radiation exposure of 6 mSv has arbitrarily been set in European countries. This does not mean that if an individual pilot is exposed to 7, 8, 9 etc mSv will be at greater ill-health risk of suffering a radiation health effect (cancer or teratogenesis in his offspring), the reason being that it is impossible to do epidemiologic (population) studies which would require millions of pilots flying over the poles as study subjects, in order to reveal the very low health effects of the very low exposure to cosmic (ionising) radiation. Hence annual flight plans for the aforementioned pilots are made for each pilot, based on an algorithm (which takes into account hours over the poles, hight of flight, season, flight path’s proximity to poles, i.e. latitude, etc), which set the maximum number of hours that he is allowed to fly over the poles each year, that must not be exceeded. Thus, the health of all pilots is protected. The precautionary principle of prevention should apply at the beginning of the pandemic and at all its stages thereafter. For example, education of the public should start before it transpires that part of the public is unwilling to conform with preventive measures (e.g. social distancing, hand disinfection, wearing masks, vaccination). It has been observed that if elimination preventive measures are taken after suppression have been unsuccessfully applied for long, must be stricter (e.g. imposition of a longer general quarantine), and consequently more unpleasant and less willingly tolerated by many members

of the public.

There are three levels of prevention: Primary (avoidance of disease causes), Secondary (early detection of disease, e.g. by case-finding, targeted, high-risk, opportunistic, random sample screening, as indicated by the circumstances), Tertiary (rehabilitation following disease). Europe-wide case definition of COVID-19 and of Occupational COVID-19 diagnosed in accordance with Section of Occupational Medicine of UEMS criteria is needed, as well as harmonisation of criteria in the European Union, A. for the recognition of COVD-19 as (a) an occupational disease or (b) as a work accident, and B. for related diagnostic procedures, and criteria to be used in occupational health practice. Harmonisation of criteria used for the diagnosis of death due to COVID-19 should also be achieved, so that these are the same in all European countries. Thus, National Statistics of COVID-19 cases and deaths **in** European countries could be based on uniform criteria and would be really comparable.

All COVID-19 related health protocols, procedures and services involved in the prevention of the spread of the pandemic should be audited and identified deficiencies revised and rectified as necessary. Preparedness for future pandemics should also include the establishment of an epidemic early detection and alarm system and of an "Epidemic Intelligence Service" modelled on the corresponding US Service. To the same end, National industries should be established as to ensure the requisite production and prompt availability of all the means necessary for prevention of a pandemic, caused by respiratory pathogens, used by the public or the health services. Measures already put in place e.g. in working places, should be retained, to the extent that they do not cause undesirable psychosocial side-effects.

Eradication (and not suppression or mitigation) of the current pandemic (and future pandemics), which allows also swifter recovery (restarting) of sustainable economy, growth and prosperity, should be the final aim of pandemic prevention. Achieving this aim is contingent on the fulfilment of four prerequisites: (a) Statesmanship and increased disregard of political cost by more politicians, (b) timely elaboration of strategies and their appropriate implementation, (c) collective leadership and partnership to bring around change within communities, and (d) leadership on the part of physicians.

4. DIFFICULTIES IN COMBATING THE PANDEMIC AND SUGGESTED UEMS RECOMMENDATIONS ON HOW TO OVERCOME THEM

The circumstances of the current COVID-19 pandemic in a globalised world community are quite dissimilar compared with those of past pandemics. Therefore, partly different preventive and efficiently coordinated international actions on a much larger scale are needed. Nevertheless, governments put forward a weak argument declaring that they are "dealing with a new virus" in an attempt to fully justify their failure to control the pandemic. The existing principles, experience and knowledge of preventive medicine and public health, could have been much more successful in eradicating this pandemic, had they been applied properly.

The following have been the main difficulties for the eradication of this pandemic to date:
Case fatality of COVID-19 is many times higher than that of influenza recorded in the last twenty years. However, it is not high compared with that of other diseases e.g. cardiovascular diseases

(https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Cardiovascular_diseases_statistics)
or many other communicable diseases. Therefore, governments and societies have not treated the pandemic as a really major emergency, and have not implemented existing plans prepared for dealing with major disasters.

It is also worth mentioning that Governments in several countries, mistakenly put the onus of the successful implementation of preventive measures on personal responsibility. Unfortunately, by and large, they proved to be wrong: A minority of citizens did not conform to COVID-19 prevention rules and contributed to the extension of the course of the pandemic, whereas law abiding citizens had to endure a longer period of restrictions affecting their quality of life, as a situation of full normality in their lives has not been restored yet.

Moreover, individuals protected do not know whether they have been protected themselves due to having benefitted from protective measures; false sense of in invulnerability and audacity; holding health as a value inferior to wealth and current lifestyle; lack of intergenerational solidarity; expression of pre-existing anti-establishment attitude; fake news, biased perception of value of prevention as being theoretical and not practical; deficient health education, short-term pursuits of financial gains.

Despite the fact that public health medicine and occupational medicine specialists are the main operatives of primary and of a large part of secondary prevention by virtue of their training and experience (also in health education, risk management communication, public health policy, epidemiology, health economics, community health), their related services have been on the decline in recent decades. In the midst of the pandemic, the need for these specialties and related services to be reinforced has not yet been sufficiently appreciated by governments, many specialists holding medical specialties other that the aforementioned, and the majority of the public. Politicians, who have many imperatives, should strike the right balance between keeping social peace and enforcing measures to eradicate the pandemic. Furthermore, the public has experienced fatigue, due to the long duration of the pandemic, accounted for, in many European countries, largely by governments adopting suppression policies, which lead slowly to unsustainable results, instead of stricter eradication policies, which could have led more swiftly to sustainable results. In addition, the sets of preventive measures decided by governments occasionally appeared like tergiversations making part of the public distrustful towards politicians, or even leading it to apathy. Sometimes measures had to be changed because the pandemic evolved in a way that could not be predicted by available medical knowledge, but, regrettably, adopting them was not preceded by adequate health education of the population. However, at times, measures not medically justified and substantiated, were not introduced because of political expediency. A case in point is that in certain European countries, at the beginning of the pandemic, wearing protective masks were considered not be necessary by the authorities. Furthermore, governments in different countries of Europe, at the same point in time, were imposing by Law different distances (of 1, 1,5, or 2 meters) between people, as a safe distance preventing the transmission of SARS-CoV-2, and, on other occasions, one government, at different points in time, changed the length of the distance it considered to be safe. This can probably be accounted for by the scarcity of public health intervention studies, more of which are needed. Occasionally, governments prematurely relaxed measures mainly for political reasons, to satisfy financial concerns of certain parts of the population, for fear of political cost. Sometimes they decided to announce preventive

measures which were either complex or unclear, or unenforceable, or simply not enforced (e.g. allowing overcrowding in political demonstrations and religious events), or difficult to be checked as to their implementation. It is noted, that, on certain occasions, different European countries while being at the same stage of the pandemic took, at least initially, preventive measures of different severity, whereas on others countries while being at different stages of the pandemic took measures of the same severity. So far, within the European Union, the principle of subsidiarity, insofar as the timing and type of preventive measures and their implementation, has proven to be counterproductive as regards the eradication of the pandemic.

In regard to long COVID-19, WHO set a clinical case definition in October 2020b by adding a " to the ICD codes, post COVID-19 condition" (https://www.who.int/standards/classifications/classification-of-diseases/emergency-use-icd-codes-for-covid-19-disease-outbreak). However, in most European countries not enough Long Covid clinics have been established to date (https://doi.org/10.1136/bmj.o158) . European and National follow-up studies, and establishment of adequate Long Covid services, such as inpatient or outpatient clinics, within primary health care services, including guidelines thereon, are needed. Thus, early diagnosis, treatment and rehabilitation would aim at preventing disability, in the frame of tertiary prevention. Nevertheless, there is still also a need to phenotype Long Covid and design treatment for it, considering that this disease manifests itself as four different clusters of syndromes.

5. INTERNATIONAL AND EUROPEAN CONTEXT AND PERSPECTIVES ON PREVENTIOIN

The preparation of recommendations on how to improve capacity for pandemic prevention, preparedness, and response made by the World Health Organization (WHO) Independent Panel, was highlighted by its distinguished co-chairpersons (Clark H., Johnson Sirleaf E., Ending this pandemic and securing the future. BMJ 2021; 375:n2914, https://doi.org/10.1136/bmj.n2914 , Published 29 November 2021, accessed on 27.1.2022, and accompanying "Rapid Responses" to this article). This resulted in a WHO General Assembly decision taken at its special session on 1.12.2021 to launch a global process to develop a pandemic treaty which is to be drafted by an intergovernmental negotiating body, and then be considered, agreed by 194 governments and finally adopted at its 77th World Health Assembly (WHA) on 28.05.2024 (WHO agrees to launch process to develop historic global accord on pandemic prevention, preparedness and response, WHO News release, 1 December 2021. Geneva. https://www.who.int/news/item/01-12-2021-world-health-assembly-agrees-to... accessed on 27.1.2022). That was a tall order. Notably, certain key topics have not been allowed for in the program of work of the Panel, or addressed in papers commissioned by it *(*Victoria Haldane V., Jung A-S, Neill R.. From response to transformation: how countries can strengthen national pandemic preparedness and response systems. BMJ 2021;375:e067507. doi: 10.1136/bmj-2021-067507*),* or in its recommendations Among them was the paramount need for increased utilisation of the specialty of occupational medicine and of health education as well as for drastically reducing the application of the principle of subsidiarity at national level with respect to implementation of COVID-19 prevention measures *(*The Independent Panel. Covid-19: Make it the last pandemic. Report presented to the World Health Assembly in May 2021. https://theindependentpanel.org/wp-content/uploads/2021/05/COVID-19-Make-it-the-Last-Pandemic_final.pdf accessed on

27.1.2022). These topics are essential for the treaty to be globally effective, and need to be substantial constituents of such an international instrument and of any relevant European Commission Directive.

UNESCO has developed certain pandemic prevention activities (UNESCO: COVID-19 response. https://en.unesco.org/covid19 accessed on 27.1.2022) even though its Constitution doesn't include specific provisions on health or health education. The WHO pandemic treaty needs to provide for close collaboration and coordination with it.

To be effective (by being adequate and more proactive than the existing International Health Regulations) and not merely a wish list, a WHO treaty needs to: be ratified by most States (to impact global health); be legally binding; involve both social partners; underscore the importance of primary prevention and the precautionary principle (Centers for Disease Control and Prevention (CDC). Aircrew safety and health. Cosmic radiation. https://www.cdc.gov/niosh/topics/aircrew/cosmicionizingradiation.html , accessed on 27.1.2022) (to be implemented by medical advisory committees, and governments "when making decisions on preventive measures at all stages of a pandemic, in the face of uncertainty about the degree of infectivity, virulence and case fatality of an infectious pathogen and about the extent of societal compliance or dissatisfaction"); utilise (as per its Constitution (WHO. Constitution. Article 2 (b) https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1 , also the expertise of multinational professional groups of physicians, e.g. the European Union of Medical Specialists (UEMS, Presentation. https://www.uems.eu/about-us/presentation accessed on 27.1.2022); include provisions for reinforced occupational and public health services, adequate supervision, certification of compliance and auditing the enforcement of health prevention standards and measures, at individual country level (making use of pertinent ISO know-how (ISO - International Organization for Standardization. https://iso.org accessed on 24.1.2022) and for efficacious timely imposed sanctions for States violating the treaty.

The degree of compliance with it on National level will depend more on the duration and the perceived severity of a pandemic and on the extend of societal change and the collaboration between countries, including economic collaboration between high income and middle and low income countries, than on the treaty per se or any commitment to sharing data, information, resources, knowledge, and tools (Clark H., Johnson Sirleaf E.. Ending this pandemic and securing the future. BMJ 2021; 375:n2914, doi: https://doi.org/10.1136/bmj.n2914 (Published 29 November 2021, and "Rapid Responses" to this article). It is worth noting that measures to prevent the outbreak or the spread of a pandemic must be implemented at **a** national, European and International level in a coordinated way in order to be successful.

Notably, the 27 leaders of the European Union have struggled to find a common position on travel restrictions and additional measures to prevent the spread of the omicron (O) variant of COVID-19, when they met on 16.12.2021 (EU leaders struggle to find unity on COVID travel measures. https://www.dw.com/en/eu-leaders-struggle-to-find-unity-on-covid-travel-... accessed on 27.1.2022), revealing the challenges faced even by states with similar societal values and a shared large body of law in reaching consensus on pandemic prevention measures.

In this connection, it needs to be more widely understood that the implementation of different

prevention rules in European countries results in stalling the end of the pandemic. A case in point are differences in travelling rules for EU Member States citizens, when travelling between EU countries. For example, in April 2022, in Greece and Germany, frequency rate of tests taken, percentage of positivity of them, percentage of population vaccinated, percentage of population having booster doses, were all significantly different. Regardless of such discrepancies, recorded COVID-19 morbidity and COVID-19 mortality rates, were lower in Germany than in Greece. During the same period, rules for Greeks entering Germany, a lower COVID-19 risk country, were stricter that for Germans entering Greece (a higher COVID-19 risk country): Accepted validity period of vaccination certificates (without a booster dose), was six months for Greeks and nine months for Germans. Greeks entering Germany, had to provide proof of recovery showing a positive PCR test result carried out at least 28 days but no more than three months prior, or negative result to a test taken no earlier than 48 hours before the actual arrival or the scheduled time of entry.
(https://reopen.europa.eu/en/from-to/GRC/DEU#:~:text=What%20are%20the,departure%20is%20decisive). However, Germans entering Greece, had to provide proof of recovery from COVID-19, valid between 14 days and 6 months (i.e. not only three months as Greeks should) after the first positive test result, or a negative result to a pre-departure molecular test (valid for 72 hours, i.e. not for 48 hours as Greeks should) or to rapid antigen test (valid for 24 hours) (https://reopen.europa.eu/en/from-to/DEU/GRC). However, Greek and German travellers if infected, on returning home, would transmit the virus, albeit to a different extent, and contribute to probably levelling off the differences of the COVID-19 morbidity and mortality rates previously existing between their countries.

It was encouraging to note that there have been calls for Europe to come together to confront the omicron variant
(http://dx.doi.org/10.1136/bmj.o90)

It is worth noting that in several European countries, the specialties of primary health care, public health, and occupational medicine did not play a leading role in investigating and stopping the pandemic. Instead, physicians holding therapeutic medicine specialties (such as infectious disease medicine or clinical immunology) took over the entire management of the pandemic.

It is noted that in many European countries, measures, including vaccination, to prevent the spread of infectious diseases are provided for by public health law, e.g. regulations to ensure medical fitness to work of food handlers, and are accepted without question. Clearly, in view of this situation, there is a need to formalise and standardise a uniform procedure and a common bioethical view to be applied nation-wide in Europe, pertaining to whether, when, in which sets of circumstances and for which groups of the population, vaccination against COVID-19 should be mandatory. As COVID-19 is a disease, we, as physicians, support the contention that the most suitable approach for tackling this issue should be more medical, taking into account the real societal need for survival and good health, rather than legal, put less emphasis on proportionality, and disregard political expediency without ignoring the need for public peace.

The “European Strategic Framework on Health and Safety at Work” should be reviewed and revised so as to include extended sections on COVID-19 prevention at work and provide for

increased harmonisation and coordination of related activities in the European Union. There should also be Europewide studies to determine when each type of measures should be implemented, for how long, and to what degree, where (i.e. in schools, in restaurants) depending on currently prevailing, set of epidemiologic indices and knowledge about SARS-CoV-2. Thus, in all European countries, i.e. all across Europe, the pandemic would be controlled in a uniform way. This will result in (a) not occurring vast variations in the epidemiologic situation between European countries,(b) the economies of the European countries (which differ as regards type and strength) not being differently affected by the pandemic, and (c) the SARS CoVa-2 not being continually "exported" from one country with high viral burden to another with a lower one, also in view of different rules having been enforced in European countries for travellers in borders moving between European countries.

6. THE FOUR PILLARS OF PANDEMIC PREVENTION: Limited subsidiarity, public health, occupational health, community education

In the framework of preparedness against any future pandemic the following should serve as four of the major pillars of prevention:
Expansion and increased utilization of public health services and of occupational medicine service, health education provision, and - in view of the politicisation of many countries' responses - limitation of application of the principle of subsidiarity (i.e. the principle that functions which can be exercised at a lower level of organization should so be rather than being taken over by a higher level organization), to the implementation of preventive measures, including standardised response to any global, European outbreaks of epidemics and major industrial accidents.

The role and value of work of public health physicians, occupational physicians (also in protecting the health of all relevant health professionals in various contexts e.g. community clinics, acute hospitals, long-term institutions), of other medical and health specialists, and of other specialists (sociologists, economists) in pandemic prevention, as well as of public and occupational health services needs to be considered and promoted in the future.

By definition, public health services are most appropriately placed to plan, coordinate and execute prevention of ill-health activities.
Public Health is defined by WHO as "the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society" (Acheson, 1988; WHO, in https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6023515/#:~:text=Public%20health%20was%20defined%20by,of%20society%E2%80%9D%20%5B5%5D). Activities to strengthen public health capacities and service aim to provide conditions under which people can maintain to be healthy, improve their health and wellbeing, or prevent the deterioration of their health. Public health focuses on the entire spectrum of health and wellbeing, not only the eradication of particular diseases. Many activities are targeted at populations such as health campaigns. Public health services also include the provision of personal services to individual persons, such as vaccinations, behavioural counselling, or health advice

(https://www.euro.who.int/en/health-topics/Health-systems/public-health-services , and https://www.euro.who.int/__data/assets/pdf_file/0007/152683/e95877.pdf).

Since the beginning of the COVID-19 pandemic, a number of organizations have begun tracking implementation of PHSMs (Public health and social measures), which are measures or actions by individuals, institutions, communities, local and national governments and international bodies to slow or stop the spread of this an infectious disease around the world (such as COVID-19)
(https://www.who.int/emergencies/diseases/novel-coronavirus-2019/phsm#:~:text=Public%20health%20and%20social%20measures%20(PHSMs)%20are%20measures%20or%20actions,%2C%20such%20as%20COVID%2D19). A systemic review identified only one completed randomised control trial of a PHSM, in sharp contrast with the hundred of trials completed for drug treatments of COVID-19 treatment (https://www.bmj.com/content/375/bmj-2021-068302).
There is strong evidence that several personal protective and social measures, including handwashing, mask wearing, and physical distancing, are associated with reductions in the incidence of COVID-19, but further research is needed to better understand the effectiveness of public health measures after adequate vaccination coverage.
(https://www.bmj.com/content/375/bmj-2021-068302).

Occupational health and occupational medicine services, complement and partly overlap with public health services. The remit of the former is not confined to the workplace. In fact, COVID-19 pandemic exposed more than ever before the relationship between health and economy, and the importance of general health on the ability to work well (Dame Carol Black. Apothecaries lecture: The emerging world of Work. Whither OH? In: Health and work beyond COVID-19. RSM Webinar. 12 May 2021. London,
UK. https://www.rsm.ac.uk/events/occupational-medicine/2020-21/omp57 accessed on 9.6.2021). It brought to the fore occupational health (OH) and occupational medicine, which within enterprises attend to employee health and can reduce sickness absence.
It would be useful if occupational health services, especially in COVID-19 (or in infectious disease with a pandemic potential) high risk enterprises or organizations, e.g. hospitals, nursing homes, care homes and retirement homes, are accredited as being safe and effective, high quality on the basis of published standards, by external assessment and evaluation international organisations, such as ISO or, national professional and academic organisations, e.g. the Faculty of Occupational Medicine in the UK
(https://www.fom.ac.uk/media-events/publications/seqohs-publications). Thus, the standard of the services they provide would be raised and this would make a difference to the health of people of working age.

Occupational physicians (OPs), due to their experience in communicating with employers and with employees, proximity to the workplace and knowledge of workers' health status and working conditions, (in many countries and the UK) frequently advise on, participate in and contribute crucially to planning, coordinating, supervising, implementing, evaluating and revising various COVID-19 prevention programs. These pertain to: workplace rules of social distancing, mask wearing; improving disinfection and workplace air quality and ventilation; track and trace testing; vaccination and vaccine hesitancy; health education (on the necessity of prevention measures and their correct implementation, on long COVID-19); COVID-19 risk assessments at workplaces; health surveillance of vulnerable workers; modification of work

organization (e.g. adding shifts, compartmentalising work, using substitute groups of workers), methods and workplaces. OPs also diagnose occupational covid-19 and ill-health effects of work from home and teleworking, and provide advice on fitness to work of vulnerable staff with chronic illnesses and on return to work following covid-19, recommending any necessary work adjustments. Furthermore, they provide advice to employers occupational mental health related matters: (a) On how best they can effectively manage presenteeism, which is particularly important during a pandemic, to ensure that employees and enterprise remain healthy and perform the best, (b) on investing in training of supervisors and managers, to enable them to support their staff and identify and address the early signs of stress, which increased during the pandemic, and in couching techniques to facilitate critical well-being conversations with them, even when they work from home or externally (https://doi.org/10.1093/occmed/kqaa193).

Occupational health interventions can play a pivotal role in safeguarding public health, for instance in the case of outbreaks of infectious diseases; especially in low- and middle-income countries, where the capacity to deal with outbreaks of (new) infectious diseases can be limited. It can play a crucial role in emergency response (https://www.som.org.uk/sites/som.org.uk/files/Occupational_Health_the_Global_Value_and_Evidence_April_2018.pdf). Clearly, OPs apply similar methods, aimed at primary, secondary and tertiary prevention in enterprises, as those used in in the community. Their work impacts also public health, considering also the existing two-way transmissibility of covid-19 between the workplace, and the home and general environment. In the EU strategy for occupational "health" and safety for 2021-2027 (EC. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU strategic framework on health and safety at work 2021-2027 Occupational safety and health in a changing world of work. COM/2021/323 final. Brussels, 28.6.2021. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0323&qi... accessed on 27.1.2022.), COVID-19 is dealt with. However, the terms "medicine", "occupational medicine", "physician", "occupational physician"
don't appear anywhere in it.

In 25 of the 27 EU Member States, covid-19 is recognised and reported as a prescribed occupational disease and/or a work accident (EUROSTAT. Possibility of recognising COVID-19 as being of occupational origin at national level in EU and EFTA countries.
Luxembourg: Publications Office of the European Union, 2021.

https://ec.europa.eu/eurostat/documents/7870049/13464590/KS-FT-21-005-EN... accessed on 27.1.2022). In the UK, it is a reportable occupational disease, but not a prescribed disease, incurring benefits (HSE. RIDDOR reporting of COVID-19.
https://www.hse.gov.uk/coronavirus/riddor/index.htm Sightedon 27.1.2022, and Maritime Coastguard Agency. MIN 618 (M+F) COVID-19: Guidance on the reporting of occupational diseases. 1 November 2021). The Section of Occupational Medicine of the European Union of Medical
Specialists has issued a "Statement on COVID-19 as occupational disease", in which the diagnostic criteria to be used are outlined.
(https://www.uems.eu/__data/assets/pdf_file/0005/128903/Statement-on-the-recognition-of-COVID-19-as-occupational-disease-UEMS-format.pdf. Diagnosis and reporting of occupational COVID-19, will reveal the financial burden of it on insurance schemes. Knowing

it will facilitate planning and implementation of measures at the workplace aiming at preventing it.

A question that remains unresolved is whether occupational COVID-19 can be diagnosed only if this disease is diagnosed in workers employed in certain occupations and types of workplaces, e.g. health or social welfare or social service (as is the case in e.g. in France) or in any occupation and type of workplace (as is the case, e.g.in Italy and Germany).

In this context, it must be noted that the OH Conventions 187,161,155 (Convention C187 - Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) (ilo.org) Sighted on 27.1.2022. Convention C161 - Occupational Health Services Convention, 1985 (No. 161) (ilo.org) Sighted on 27.1.2022.
Convention C155 - Occupational Safety and Health Convention, 1981 (No. 155) (ilo.org) Sighted on 27.1.2022) of the tripartite International Labour Organization (ILO) have been ratified by less than half of its 187 member countries and less than half of the 27 EU countries. The UK has ratified only the first of them. The impending WHO pandemic treaty also needs to dovetail with these ILO Conventions, reinforce and particularize them. This would lead to merging certain pandemic prevention responsibilities, being currently confusingly overlapping between National Ministries of Health and Ministries of Labour.

Community education on pandemic prevention, underpinned by a code of appropriate values (e.g. intergenerational solidarity), incorporated in curricula throughout the educational systems of all countries, will serve to critically assess information provided in the internet, and to develop a preventive health culture. It will enhance trust towards physicians presenting evidence-based advice, and distrust towards anyone spreading misinformation. It is the foundation stone of societal transformation conducive to effective, mainly primary, health prevention. During this process, legal, ethical issues and the key societal values need to be reconsidered as to their ranking and to what constitutes “the greater good”. As a consequence: politics might be shaped less by political gain (which has always been one of the strongest human motives (Thucydides. Book 1, Chapter 76, Section 2 [1.76.2]. The Peloponnesian War. London, J. M. Dent; New York, E. P. Dutton. 1910)), and more by the pursuit of “honour” (good reputation) emanating from real statesmanship; certain mass media owners and journalists might appreciate high television viewing rates less than appropriately presenting health evidence-based information and education.

7. NATIONAL STRATEGIES

GENERAL POINTS

The next stage of prevention of preventable diseases, following policy determination and legislation, is working out the requisite strategies.

Preventive strategies allowed for in Law aim at reducing SARS CoV-2 in the population and in the environment (in a city, in a country, in Europe) to very low levels. Their purpose is to make control of COVID-19 possible, by enforcing existing public health and emergencies laws and also by issuing new regulations using the “urgent procedure”

Such legislation should secure timely materialisation of all medically appropriate preventive

measures during the pandemic and after it ends. The former should aim at reaching a situation in which administering annually a booster dose of the vaccine would avert its relapse, or at eliminating it in humans. The latter should provide for preparedness and prevention of any future pandemic.

It has been shown that for responding to new infectious diseases of more than moderate severity, with pandemic potential, elimination by applying commensurate measures is probably the preferred strategy, which can be achieved quickly and sustained with informed scientific input, strong political commitment and decisive action
*(*https://doi.org/10.1136/bmj.m4907*).*

The shorter and more effective (but restrictive) eradication (elimination) strategy should be considered and assessed in contrast with the longer lasting suppression strategy, which would also ensure the early control an eradication of any future outbreak.

Each country should prioritise the objectives in the prevention of COVID-19 strategies, prepare plans of action identifying specific targets for progress towards these objectives and specify the timeline for achieving them. Older authorised disaster plans should be reviewed and updated according to what we now know about the behaviour of this virus (as there is no need to completely reinvent the wheel). Progress must be monitored and the plans reviewed and revised, as necessary. The measures aimed at preventing this disease can be group and/or area targeted, prioritised, and depend on the epidemiologic, and demographic, information, reviewed and revised as necessary. Obviously, measures of eradication are stricter than those of suppression.

7.A. HEALTH EDUCATION PROGRAMS ON PREVENTING COVID-19 AND OTHER PANDEMICS

WHO definition of health education. “Health education comprises consciously constructed opportunities for learning involving some form of communication designed to improve *health literacy*, including improving knowledge, and developing life skills which are conducive to individual and community health.

Health education is not only concerned with the communication of information, but also with fostering the motivation, skills and confidence (self-efficacy) necessary to take action to improve *health*. Health education includes the communication of information concerning the underlying social, economic and environmental conditions impacting on health, as well as individual risk factors and risk behaviours, and use of the health care system. Thus, health education may involve the communication of information, and development of skills which demonstrates the political feasibility and organizational possibilities of various forms of action to address social, economic and environmental *determinants of health”.*

Lessons learned: Programs of Health Education based on well-known principles have not been used adequately in appropriate programs to control this pandemic

Objective: To educate and incentivise working and nonworking people to voluntarily implement preventive measures against COVID-19.

Prerequisites for success of health education programs endorsed by the UEMS and suggested recommendations:

The foundation of prevention of epidemics and implementation of any related legislation is education, of the whole at all levels: from kindergarten and preschool, through to elementary education (using gamification utilising technology), secondary (general and vocational, University (undergraduate, postgraduate, continuing) targeted education by appropriate means, and preparation, so that only a few aspects would need to be specified in the event of a future pandemic. Such education will necessitate also allocation and reallocation of adequate resources and collaboration with many international and European organisations, including the UEMS. The aim of such education should be societal change, in regard to moral values, attitudes and behaviour and to empower children and adults to easily recognise online fake news, misinformation and information, i.e. increase their related preparedness and resilience, as well as their scientific understanding and ability to critically evaluate information**.**

Continual surveying of a random sample of the general population (working and not working) requiring proper and early design and allocation of adequate resources (so that the less representative and reliable non-probability sampling is avoided), and of certain target groups, should be put in place, from the beginning and throughout the pandemic. These should aim to obtain information about: people's knowledge, attitudes and behaviour, regarding risk of becoming infected with SARS-CoV-2, taken ill, infecting other people, the severity of COVID-19, social distancing, disinfection of hands, wearing masks, lockdown, vaccination, vaccine effectiveness and side effects, compulsory vaccination, the current and future course of the pandemic, performed at a Primary Health Care level (e.g. General Practitioners), and collected also in the frame of electronic surveys. Furthermore, occupational health physicians and occupational health nurses could perform such surveys in enterprises. Health education content and methods should also be piloted as to their effectiveness, in target groups. Based on this information, surveys would render health education programs more relevant, target oriented and effective.

An obligatory (i.e. not elective) separate lesson (of several hours in total) in all preschools, primary and secondary schools and a separate educational unit in all vocational training schools, and in university schools (of several hours in total) on "Individual and collective implementation measures for (a) preventing epidemics, and (b) for responding to them and to any other major disaster: earthquakes, floods, industrial accidents" should be introduced and included in their curricula as appropriately, starting as soon as possible, during the course of the current academic year.

The salient specific elements of these programs, thus integrated at all levels of education, should be highlighted, reinforced and used in future emergencies as shorter, quasi health educational refresher courses, provided by the appropriate private and state organisations.

In addition, health training and education programs on COVID-19 prevention should be introduced as soon as possible to "educate the educators" as appropriately and as necessary, and appropriate learning materials on COVID-19 risk prevention and related methods should be prepared.

In order to ensure the continued efficiency of preventive measures, health education programs

for the prevention of COVID-19 prevention should be directed towards:

(a) population other than working population: all elderly people (working or not),
(b) all susceptible and/or vulnerable people (working or not), all parents (working or not)
(c) the non-working population (in public and private sector, primary, secondary and sector of the economy and in service industries, prioritised (e.g. in health and social welfare and care, old people homes and nursing homes, catering and accommodation services - in large- medium- and small size enterprises,

by economic sector) education- and job- adjusted, by appropriate means, followed by monitoring, revision, review and evaluation:

i. health care, social welfare and care professionals, social care workers,
ii. all employers and workers, those susceptible and /or vulnerable as a matter of priority,
iii. occupational health and safety professionals, health and safety representatives
iv. human resources personnel, enterprise managers,
v. pupils and teachers in schools and nurseries, student and professors in universities and vocational training schools and management schools
vi. employers- and employees- organizations,
vii. mass media journalists,
viii. church administrative staff, ministers, priests, elders,
ix. military and police academies,
x. politicians,
xi. immigrants, especially refugees
xii. minority groups (e.g. Roma people *)*
xiii. indigent persons

7.B. COVID-19 PREVENTION POLICIES AND LEGISLATION FROM A MEDICAL STANDPOINT [See also Subgroup 5. "Medical-Evidence-Based-Input for decisions related to health policy; Sound and credible information offered by medical specialists to the public and the press"]

Lessons learned:

As regards prevention legislation and policies with respect to their implementation the situation is as follows:

(The international medical community and global society still lacked the following, up until late 2021, i.e. at the moment of writing this version of the document),

As late as January 2022, a targeted medication oral treatment with molnupiravir, a new antiviral drug, was approved and started being used in certain European countries, e.g. in the UK (https://www.bmj.com/content/375/bmj.n2697), Greece (https://www.moh.gov.gr/articles/ministry/grafeio-typoy/press-releases/10098-xorhghsh-antiikwn-farmakwn-se-astheneis-me-loimwksh-covid-19**),** for the early treatment only of COVID-19 of mild or medium severity, at its early and mild stages, in adult patients in most susceptible groups suffering from certain diseases, putting them at an increased risk, so as to alleviate their symptoms and prevent progression to pneumonia or other severe complications

of COVID-19 or their underlying disease. Hence, deaths or long-term health impact, i.e. disability, long covid, as well as hospitalization and health sector overloads, skyrocketing health expenditures and adverse impact on health system capacity to care for patients suffering from other diseases could be prevented. However, it must be emphasized that this or any other drug for treatment of COVID-19 to be invented, is much less effective in preventing the spread of SARS-CoV-2 than the vaccine. The former does not prevent its transmission before the symptoms appear, or contraction of COVID-19 after treatment is completed, for as long a period as the vaccine does.

Over two years into the pandemic primary preventive measures such as keeping up - officially recommended or mandatory - reasonable social distancing, the use of face masks (especially in closed spaces, including transport etc.), observing basic hygiene norms and, as of the beginning of 2021, also getting vaccinated remain trusted and tested tools humanity holds in its own hands.

The world is still going through ups and downs of huge pandemic waves, which affect the lives and livelihood of millions of people. It is not clear when (or how, as the result of what) these waves will subside. Europe, despite significantly higher vaccination coverage compared to other regions, is not an exception**.** Clearly, drastic measures must be enforced very soon in regard to increasing the vaccination coverage in all countries and in all continents (by exporting many millions of vaccines - and sending health personnel to train local people - to low and middle-income countries) and by diligently protecting regions', countries' and continents' borders so that COVID-19 cases and new variants are contained**.** At the peaks of these waves countries and territories are forced to install and re-install partial or even total lockdowns – the most radical but also the most effective preventive approach and tool we have today, in addition to vaccination. It has been often noticed and reported that preventive interventions, mandates and decisions were (and are) not always taken rationally from a medical standpoint. Instead, these are, unfortunately often taken by prioritizing political and/or economic and financial interests**.** The UEMS WG thus aims to provide the appropriate framework for facilitating and increasing the effectiveness of all preventive activities against COVID-19, so as to eradicate the pandemic, or else we might have to be prepared to live with it for the foreseeable future.

Prerequisites for successful policies and implementation of legislation endorsed by the UEMS and suggested recommendations:

A. Health education on COVID-19 (or any future pandemic) should precede legislative action. It is important to note that COVID-19 related education must be targeted and **such** interventions must be relevant to the specific local and community contexts. Education process should be continuous and integrated into conventional primary care, formal and informal education frameworks or media platforms, including social media.

B. Politicians and physicians ought to refrain from making inconsistent statements, some of which later need to be retracted, and from offering pieces of unsolicited advice regarding laws and emergency laws (and sufficiently explain and substantiate the reasons for any related changes), when addressing the public, in regard to magnitude of COVID-19 risk and effectiveness of measures (e.g. wearing masks, vulnerability (albeit reduced) also of vaccinated people for becoming infected and from SARS-*CoV-2* and suffer from COVID-19,

and possibility of transmitting the virus). Any decision, for example regarding the validity period of COVID-19 pass documents following vaccination or recovery should be clearly grounded **in** scientific evidence, rather than presented or derived from personal (politicians') opinions, wills or decisions driven by any reason but scientific evidence. It is understood that often governments are hesitant to introduce politically unpopular restrictive measures or mandate vaccination, considering strong rejection of such interventions by a significant part of the populations in many countries. Academics, medical specialists, sociologists, policy and decision makers thus need to work together to identify the most appropriate and effective communication mechanisms, approaches, educatory, environmental, coercive measures and appropriate incentives to achieve optimal uptake and compliance with the range of preventive measures operated to prevent spread of the disease and related health complications and deaths.

C. It is necessary for COVID-19 prevention policies and legislation to be worked out for all types of enterprises, communities, social activities and establishments. More detailed COVID-19 prevention policies should be determined in each medium size and large enterprise and in high infection risk establishments, specifying in detail national policies,

Legal and regulatory frameworks should include Articles in regard to:

i. timely introducing, reviewing and revising all COVID-19 related legislation and regulations,
ii. defining role of social partners and of charities concerning COVID-19 prevention, developing adequate manpower of public health medicine specialists, public health nurses, specialists in occupational medicine, primary health care doctors (General Practitioners), secondary and tertiary care doctors (clinicians), occupational health nurses and other occupational health professionals i.e. environmental health officers ("public health inspectors"), occupational psychologists, physical therapy doctors, occupational therapists [see also Subgroup 4." Workforce planning to ensure a balance of general and specialised skills; Attention to the physical and mental wellbeing of healthcare professionals"],
iii. developing realistic detailed implementation laws and regulations taking into account country's culture, and public's degree of conforming to laws in general, and securing their enforcement diligently, by all appropriate means, as necessary. When this is no impossible due to lack of research-based evidence, countries and territories should conduct relevant sociological and anthropological studies, public health policy analyses and other research to form evidence-base and ensure evidence-informed and realistic legal frameworks and regulations. Considering dynamism of the situation, in many cases, such studies need to be repeated periodically.
iv. strengthening self-regulation rules of mass media pertaining to news broadcasts and news and current affairs programmes in television channels and radio stations, articles and news published in newspapers and periodicals, and overseeing their implementation, ensuring objective, truthful, clear, balanced, comprehensive, i.e. not fragmented, evidence-based information and presentation of reality, without restricting freedom of press, also by establishing "Codes of Good Practice in regard to reporting and interviewing pertaining to COVID-19", for journalists**.** [See also report of Subgroup 5. "Medical-Evidence-Based-Input for decisions related to health policy; Sound and credible information offered by medical specialists to the public and the press"],
v. strengthening rules regarding committees of medical experts with respect to: breadth of

membership, i.e. representation also of non-medical specialists (e.g. medical sociologists, health economists, health risk communication experts), functioning, transparency of work, terms and extent of possible legal immunity (?) for committee members, meritocratic selection of members by the use of preestablished criteria, as well as ensuring transparency of the processes for forming them*,*

vi. applying staged emergency rules concerning enforcement of restrictive preventive measures for the whole population, which limit options for transgressors, e.g. regarding entering indoor spaces such as workplaces or shops, based on established medical evidence, *and their implementation*, i.e. furlough, non-fitness to work on grounds of susceptibility, and assessing the rationale and ethical considerations of two schools of thought regarding (directly or indirectly) compulsory enforcement of measures e.g. vaccination,

vii. recording, reporting, monitoring of infection rate, morbidity, case fatality, Rt, mortality indices, deciding on timing and other criteria for introduction and lifting of measures based on scientific evidence,

viii. building diagnostic capacity [see also subgroup 4], assessing extent of vaccination capability and vaccination prioritization, in workplaces based on ad hoc risk assessments performed by occupational physicians,

ix. managing the pandemic (with transparency, meritocracy, utilizing appropriately and adequately medical, health professional and other specialist resources),

x. protecting and ensuring early detection of COVID-19 ill-health effects on physical and mental wellbeing of healthcare professionals [see also subgroup 4. “Workforce planning to ensure a balance of general and specialised skills; Attention to the physical and mental wellbeing of healthcare professionals”],

xi. returning to work following COVID-19 recovery,

xii. air-conditioning, ventilation and disinfection of workplaces, disinfection of work equipment

xiii. teleworking (providing comprehensively, specifically and adequately for(a) prevention of ensuing difficulties regarding health risk assessment at work for teleworkers, diagnosis and prevention of occupational diseases and psychosocial health effects of teleworking in them, fitness to work as a teleworker, (b) for practical, ethical and legal ramifications.

xiv. Mandatory work from home rules, during certain stages of the pandemic, whenever feasible

xv. prevention of spreading SARS CoVa-2 in civil aviation.

xvi. Introducing rotating travelling lines for people commuting to work and different work starting times and flexible shifts,

xvii. protection of health care professionals, (N.B. health care workers, especially early on in the pandemic, accounted for a disproportionate 10%-19% of the worldwide SARS-CoV-2 cases, and they, suffer from the post-COVID syndrome to a similar extent to that of the general population; thus, their employers should develop supports for them, so as to prevent possible serious implications for health services planning and for patient safety (potential impact of post-COVID symptoms in the healthcare sector | Occupational Medicine | Oxford Academic (oup.com)),

xviii. preventing the publicising of unsubstantiated, non-evidence based information and views by health professionals,

xix. planning and executing programs of psychosocial support in regard to COVID-19 for the whole public, including programs for school children, adolescents, health care workers, people afflicted by COVID-19 and their families, people suffering from chronic diseases, establishing psychosocial support telephone helplines.

xx. avoidance of publicising unsubstantiated, non-evidence based information and views by health professionals by introducing relevant amendments in codes of ethics and other regulatory documents of professional associations, health care delivery and other relevant organizations.

Also regulations and guidance notes on the following topic**s** need to be issued:

i. Guidance for travellers entering a country, applicable at country entry points and related health protocols.
ii. Guidance regarding special work activities (schools, nursery schools, means of transport, ship and air crews, armed forces) and related health protocols.
iii. Guidance for the general public and related health protocols.
iv. Guidance regarding medical laboratories and related health protocols.
v. Guidance for hospitals and old people homes and nursery homes and related health protocols.
vi. Epidemiologic surveillance.
vii. Curfews and furloughs.
viii. Guidance by Specialist Medical Societies regarding Specialist physicians, patients, surgeries and related health protocols**.**

7.C. EPIDEMIOLOGIC SURVEILLANCE

Lessons learned:

The recording of infections (which are wrongly called cases in some countries, including Greece) is often managed in a rather vague way. The same applies to deaths, since regardless of the underlying diseases that could have led to death, if the patient is (or was recently infected) infected and dies, his death is recorded as death due to COVID-19.
Consideration should be given to an examination of the veracity of the claim that official death tolls might undercount the total number of fatalities in certain countries (Tracking covid-19 excess deaths across countries | The Economist , accessed 20.4.2022)

In some countries, e.g. in Greece and Georgia, the detailed COVID-19 illness and death records are not available for scientific research to independent researchers, but are kept undisclosed by the health authorities.

Strong epidemiological indicators, such as mortality attributable to COVID-19, as well as the related case fatality rates, cannot be utilized, as there is ambiguity as to the case definition of this disease.

According to the CDC *"*COVID-19 should not be reported on the death certificate if it did not cause or contribute to the death"
(https://www.cdc.gov/nchs/data/nvss/coronavirus/cause-of-death-data-quality.pdf, https://www.cebm.net/covid-19/death-certificate-data-covid-19-as-the-underlying-cause-of-death/).
Furthermore, "When a definitive diagnosis cannot, but the circumstances are compelling within

a reasonable degree of certainty, certifiers may include the term “probable’ or “presumed” in the cause-of-death statement”(COVID-19 Death Data and Resources - National Vital Statistics System (cdc.gov))
However, in several countries in Europe e.g. in Greece, and Germany (RKI - Coronavirus SARS-CoV-2 - Antworten auf häufig gestellte Fragen zum Coronavirus SARS-CoV-2 / Krankheit COVID-19) and elsewhere, in the death certificate of any person who dies and is a SARS-Cov-2 carrier, COVID-19 is recorded as the cause of death, without any comment, regardless of whether this virus accelerated death or contributed a little or at all to the deterioration of an existing underlying illness, or whether he/she had any pathognomonic signs or symptoms of COVID-19. Recording deaths of all SARS-Cov-2 carriers, as deaths from COVID-1 and it may well result in overcounting them. This can partly invalidate secular and inter-country comparisons, during the pandemic, e.g. following the nonconcurrent spread of less virulent variants, such as the “O”. Moreover, cause-of-death information is valuable to families of the departed patients.

A continuing debate has developed about whether and when illness (and death) from SARS-CoV-2 can be a “work accident” or an “occupational disease”. This debate is based on arbitrary, mainly insurance related criteria, and undermines the potential role of occupational physicians in recording and reporting COVID-19 morbidity in the workforce of enterprises.

In several European countries, the role of occupational physicians in thoroughly recording cases of infections in general and of COVID-19 in particular has been overlooked; these specialists could have made a significant contribution. Moreover, tracking is rarely done by occupational physicians, or by other primary health care physicians. It is mainly done by staff of civil protection services.

Country-Level Risk Factors for the Spread of COVID-19 in Europe using machine learning, such as wave duration, mobility changes (especially in retail and recreation), demographics, diabetes prevalence and the countries’ response time, and the vaccination status of the countries were identified, in a study based on data for 33 countries on the European Continent (https://pubmed.ncbi.nlm.nih.gov/35337032/).

Useful experience was acquired in modelling, scenario building and calculations based on statistical data, during the pandemic, in several European countries, e.g. in Greece and in the UK. Modelling is used to inform decisions. However, it needs to be used on a long-term basis, if it is to serve as tool for epidemiologic surveillance and response in the next pandemic, i.e. it must not only be developed on the occasion of outbreaks of pandemics.

The value of the reinforcement learning system, nicknamed Eva (which is a software program) (https://www.nature.com/articles/s41586-021-04014-z) utilising artificial intelligence was assessed. This software program processes data from Passenger Locator Forms using an algorithm, to identify early COVID cases and case contacts at: (a) entry gates into Greece, and (b) areas of Greece where COVID-19 risk of spread may significantly increase, so that appropriate effective preventive measures are imposed selectively and in time, in a "smart" way, i.e. not unnecessarily sooner or stricter than they ought to be. Eva helped Greek authorities develop profiles of the travellers who were likely infected but asymptomatic and

needed testing, and, thus, to recommend who should be tested (https://news.usc.edu/192093/greece-covid-testing-travel-eva-algorithm-usc-study/#:~:text=After%20months%20of%20design%2C%20development,the%20demographics%20of%20each%20traveler**.).**

Objective: To monitor the effectiveness of measures already in place to stop the outbreak of a local epidemic and to observe the effectiveness of additional measures implemented following the course of a pandemic before and after it develops into a pandemic, so that (a) such measures can be modified in time, and (b) some predictions regarding the suppression and the elimination of it can be made.

Prerequisites for successful epidemiologic surveillance (depending on the stage of the pandemic) endorsed by the UEMS and suggested recommendations:

Reporting all diagnosed COVID-19 cases, collection of reliable and complete primary data, collected centrally and swiftly from the whole country.

Public health doctors in charge of Community Medicine and Primary Health Care, in each Borough (Municipality), Region. Serial testing using PCR or rapid tests for active infections of random samples of the population should be performed, and made technically possible and feasible, following adequate logistical preparation and support, and early good survey design planning and execution. Monitoring of circulating SARS-COV-2 strains should be continuous when a pandemic is in full bloom, with sequencing of randomly selected biological samples to identify the strains. When a high percentage (90%) of workers have acquired immunity either after having been vaccinated, following high vaccination coverage, or having recovered from COVID-19, serial testing would not be cost-effective. Nevertheless, in view of reinfections occurring frequently and the pandemic being far from being over, they might need to be reintroduced. Moreover, in the earlier stages of the pandemic, representative population samples (using probability sampling) in European and national seroprevalence studies (with the objective of revealing trends of the development of the pandemic, using such tests as ELISA or ECLIA) were utilised in the pre-vaccination pandemic era to obtain data which have been used to guide policy making processes (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8871128/pdf/diagnostics-12-00295.pdf), and should still be of value in specific areas in 2022.

Due recognition should be afforded to:

i. Necessity for testing (pre-symptomatic screening) using continual random sampling in general public to accurately assess spread, course of pandemic and effectiveness of preventive measures taken (in a country or in a region or in a city), separately from testing contacts (identification of cases, trucking and tracing of contacts, e.g.in the community or in an enterprise workforce). Deficiencies of non-random sampling needs to be explained adequately to decision makers.
ii. Screening of non-working population.
iii. Screening in workplaces is easier due to easy access to workers.
iv. Value of use random sampling of a country's population in epidemiologic surveillance.
v. Magnitude, usefulness and limitations of value of rapid tests (https://doi.org/10.1136/bmj.n208)
vi. Value of monitoring the viral load of sewage, and of the degree it indicates early changes

in the course of the pandemic.

vii. Value of continual periodic population representative seroprevalence studies, preferably in combination with collection of other data (such as behavioural, demographic, preventive measures attitudes, etc.) to identify population groups at highest risk for self and others.

viii. Value of epidemiologic modelling, in predicting the course of the pandemic, taking into account the multitude of numerous parameters which might influence it, including unexpected human behaviour and mutations of the virus. Value of rolling weekly average of cases of COVID-19, deaths from COVID-19, case fatality Rt index, in monitoring and predicting the course of COVID-19 pandemic.

7.D. VACCINATION

Lessons learned:

Misinformation and fake news about vaccines in certain mass media and in anti-vaccination posts on social media have affected vaccine uptake. These fake news and false information are spreading faster than the pandemic virus. Hence, this spread has been named “infodemic”. It causes vaccine hesitancy and, hence, many deaths in many countries and has impacted on our response in controlling the COVID-19 pandemic.

Finding solutions to it is considered as vital for saving lives as public health measures. Too little too late was done to resolve this issue, probably resulting in prolonging the pandemic in certain European countries.

In several European countries mass media, notably television, have presented positions for vaccination equally with those against it, thus promoting confusion and vaccine hesitancy. In other instances, they merely presented, initially and for many months, inadequate, incomplete, unconvincing, inappropriate, very brief messages (as advertisements spots of slogans pertaining to consumer goods), in favour of vaccination, which frequently tended to raise more questions and doubts among viewers about its safety and protective value.
Monetary incentives for unvaccinated people to be vaccinated, in the form of “cultural” vouchers (for example allowing free entrance to museums, theatres, museums and archaeological sites, and limited free travelling by boat) which have used in certain countries have been met with limited success on the part of many of those who had been vaccinated prior to their introduction and occasionally considered to be unethical by others. By contrast, carefully thought out counter-incentives, such as exclusion of non-vaccinated people from certain types of entertainment proved to be more effective.

Different ethical and legal considerations with respect to compulsory vaccination against COVID-19 in certain circumstances, have prevailed in European countries, based on different recommendations issued by national Committees on Bioethics, thus limiting uptake. In some countries such vaccination has become mandatory **(**Austrian Parliament. COVID-19-Impfpflichtgesetz—COVID-19-IG (164/ ME, Dec 9, 2021, https://www.parlament.gv.at/gegenstand/XXVII/ME/164 , accessed Dec 17, 2021), and BBC. Covid: Greece to fine over-60s who refuse Covid-19 vaccine. Nov 30, 2021, https://www.bbc.com/news/world-europe-59474808 (accessed Dec 17, 2021**)**. In some others,

similar mandates or being contemplated or have been adopted in certain workplace settings **(**Reuters. Factbox: countries making COVID-19 vaccines mandatory. Dec 8, 2021.

https://www.reuters.com/business/healthcare-pharmaceuticals/countries-making-covid-19-vaccines-mandatory-2021-08-16/
(accessed Dec 17, 2021).

The target of vaccinating 75% of the population, set for the Alpha and subsequent variants of SARS-CoV-2 that appeared up until November 2021, seems to be no longer sufficient to develop full population protection, so that the new, more transmissible variant "O" of the coronavirus stops spreading. A 90% target would most probably be needed, which is very difficult to achieve, in view of the lesser virulence and case fatality of this variant. Prevention and management of this variant required (e.g. length of isolation period of COVID-19 patients and of case contacts) and probability of reinfection, are different compared to those of previous variants. At any rate, the emergence of new strains should be taken into account when updating the immune range of vaccines against new mutations. New variants of the virus are expected to occur.
In some European countries, e.g. in Greece, the O variant has been spreading in parallel with the Delta variant. This is due to the fact that many people over 60 years old are not vaccinated despite having to pay a fine, (on account of breaking the regulation whereby vaccination of those over 60 is mandatory), and that many people have not had the third dose of the "two dose" vaccine over six months after they had the second one.

The effectiveness of the vaccines against variant O appears to be doubtful for the age groups 0-5 years and 6-11 years. In those aged over 60, a substantial decline of the high ("protecting against the O variant") specific IgG antibodies levels measured after the third dose of the "two dose" vaccines, back to the "inadequate" (i.e. not affording enough immunity against SARS-CoV-2) levels observed following six months from the second dose.

Just as an attempt was made to utilize the services of pediatricians and other clinicians practicing private medicine to vaccinate children, so should occupational physicians also be asked to contribute to the vaccination of workers.

The delay in providing enough vaccines and specialised personnel to poor countries, i.e. global inequities, to assist them in educating local staff in organizing the administration of vaccines and the emergence of O variant, and possibly future variants, which are more transmissible than the original one, may well result in the ending of the current pandemic after SARS-CoV-2, after it completes its full circle of dispersion in the world population.

Objectives:

To reach the required vaccination coverage necessary to eradicate the pandemic as soon as possible. To explain to Governments, Social partners and to the whole of the population why the usefulness of the vaccination against COVID-19 is massively higher to that of any medicine (that may be used for treating the disease) in preventing the spread of the epidemic. To evaluate the advantages and disadvantages of giving incentives (including direct or indirect financial gain) on the one hand, versus limiting options in regard to social and working life, or compulsory vaccination on the other.

Prerequisites for required high (varying% and up to 90% of adult population) vaccine uptake endorsed by the UEMS and suggested recommendations:

In regard to fake news and misinformation, while acknowledging the complexity of defining them, of relying on scientific consensus and of the power of narratives, more innovative, agile and swift responses to them – beyond questioning whether to remove, demote or label them - should be designed (https://doi.org/10.1136/bmj.n26).

To combat "infodemic", mainly on-line i.e. fake news, misinformation (i.e. spreading the wrong information, unintentionally, unwittingly causing harm) and disinformation (i.e. spreading the wrong information intentionally, wittingly causing harm), among politicians, anti-science orientated people and scientists, studies should be carried out to identify exactly by whom and how people are influenced and base their views on. This would also necessitate the establishment of a system whereby, prompt, on-line, substantiated responses, (using also science based, clear, narratives including specifics). These should be given in an appropriate manner, so as to discredit irresponsible websites and to not alienate ambivalent citizens, but understand why they might adopt fake news, and debunk the main conspiracy theories and not their subtle arguments. The person who would give the correct information and advice should start a conversation with a point that the antivax person would agree with and then build up step by step.

Moreover, it should become more widely known that mass media and websites make greater profits from polarising people and keeping them discussing for long on mass media or on the web. The tactics, mechanisms and the contexts used by certain people for misinformation should be called out and what they are trying to feed to the public explained. People should have more opportunity to receive sound advice, through conversation, regarding the prevention of the pandemic and the usefulness, effectiveness and safety of vaccines, from people they really trust. More trusted websites should be established and related research carried out in all European countries.

Comprehensive and effective health education programs should be carried out [see section above] (combined with intervention studies to evaluate their effectiveness) leading to a preventive culture and trust in usefulness and safety of vaccines.

Methods to convince people about the value of vaccination and persuade them to get vaccinated against COVID-19 should be further elaborated and reinforced. To this end it is necessary to explore:

Targeted health education programs in regard to vaccination against COVID-19 should be designed and executed by various health professionals for:

i. Children (e.g. in schools)
ii. the elderly (e.g. in old people's homes and nursing homes)
iii. working population (e.g. in enterprises)
iv. elderly or disabled people living in remote areas, who may not have easy access to vaccination centers, and who should be visited by mobile vaccination units and vaccinated at their homes by Local Authority's (Municipality's) social health care staff.

Nation-wide systems should be established for physicians and other health professionals to enable them to report the reasons of refusal (or hesitancy) for vaccination and ways they used to overcome it. Some of these reasons are listed below:

1. The general reasons for inadequate COVID-19 vaccination uptake are: political, economic, mass media management related, virtual absence of "educating the educators", with regard to health education about the pandemic, and also insufficient advocacy resulting in: (a) limited participation in preventing the spread of the pandemic, and (b) inadequate enforcement of official Government COVID-19 related rules and recommendations and reduced compliance with medical advice regarding vaccination,

2. The specific reasons for hesitancy of vaccination are: (E.g. (a) inadequate knowledge about vaccine effectiveness and side effects, and fear sometimes combined with denial, (b) Lack of personal prompting by a health professional, (c) low sense of personal susceptibility to any disease,(d) undesired side effects - e.g. acute or chronic respiratory disease after vaccination - following previous vaccinations, (e) receiving inadequate information for all types of COVID-19 vaccines, (f) delaying or negligence, (g) difficulty in accessing the vaccine, (h) distrust toward pharmaceutical companies and their financial interests (i) questioning the degree of effective protection provided by the vaccine), (j) highlighting the need for large (qualitative and quantitative) population studies in all European countries, but also among (a) clients of large Health Centres and (b) health professionals and other staff working in them,

3. The need should be considered for (a) boosting the role of health professionals especially those in Primary Health Care (PHC**)** and of occupational medicine and public health specialists, paediatricians and gynaecologists in early spotting and refuting fake news in a substantiated evidence-based way, and (b) expanding COVID-19 related provision of information and education to all physicians and all health professionals (also with a reading list prompting them to read more about the vaccine) to control the pandemic.

4. The fact should be acknowledged that 80% of COVID-19 infected people are asymptomatic and how one can deal with the view "Imagine, if you will, a vaccine so safe, you have to be threatened to take it, so deadly you have to be tested to know if you have it!"

5. It is worth noting that a person would be vaccinated if he has the necessary correct knowledge, the opportunity, which entails for example, easy access to the vaccination point and certainty that any resulting time off work, due to going to the vaccination centre or on account of vaccine side-effects, would be paid by the employer, and motivation.

Evidence-based uniform Europe-wide criteria should be established to be used to decide on the interval between the administration of vaccination booster doses.

Although mandatory vaccination requirements must be designed with great care (so as to ensure that it does not violate rights); be regulated by statute rather than by executive regulations; meet the legal principle of proportionality; be implemented following constructive engagement, e.g. community-led education, interventions with groups which show reasonable hesitancy, there is no reason to think they are inherently incompatible with human rights law **(**https://www.thelancet.com/action/showPdf?pii=S0140-6736%2821%2902873-7).

On either side of this position lie the following views:

(a) “The only purpose for which power **can** be rightfully exercised over any member of a civilised community, against his will, is to prevent harm to others. His own good, either physical or moral, is not a sufficient warrant”. (John Stuart Mill (1806-1873). *Liberty*, XVIII: 223; cf. Liberty, XVIII: 292, https://plato.stanford.edu/entries/mill/#LibeFreeCharActi, and in: Origin of diseases and their prevention, in: Donaldson R.J., Donaldson L.J., Essential Community Medicine, 1983, MTP Press Ltd, Falcon House, Lancashire, England),

(b) “With respect to ensuring a high vaccine uptake: ensure that citizens are informed that the vaccination is not mandatory and that no one is under political, social or other pressure to be vaccinated if they do not wish to do so”(Parliamentary Assembly, Council of Europe. Article 7.3.1. Resolution 2361 (2021) Covid-19 vaccines: ethical, legal and practical considerations (https://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-EN.asp?fileid=29004).

Vaccination hesitancy among health-care staff constitutes a particular problem. It was shown among hospital workers in academic hospitals to be associated with a 12-fold increase in the risk of COVID-19 infection (https://www.mdpi.com/1999-4915/14/1/26). It is worth mentioning that in some European Countries, e.g. Italy and Greece, vaccination of health personnel working in public hospitals, was eventually made mandatory; those who refused to be vaccinated were suspended. By contrast, in some other countries, e.g. the UK, major medical organisations, such as the Faculty of Occupational Medicine of the Royal College of Physicians of London, did not support mandatory vaccination, including mandatory Covid-19 vaccination, as a condition of employment. It believes an ‘inform and consent’ approach, together with organisational leadership and reiterating professional responsibility of staff is more likely to achieve a higher uptake of workplace vaccination. It also argued that mandating the vaccine poses ethical and practical challenges and may increase vaccine hesitancy (https://www.fom.ac.uk/wp-content/uploads/COVID-19-Guidance-on-Vaccination-and-Testing.pdf).

It is noted that in many European countries, measures, including vaccination, to prevent the spread of infectious diseases are provided for by public health law, e.g. regulations to ensure medical fitness to work of food handlers, and are accepted without question. Clearly, in view of this situation, there is a need to formalise and standardise a uniform procedure and a common bioethical view to be applied nation-wide in Europe, pertaining to whether, when, in which sets of circumstances and for which groups of the population, vaccination against COVID-19 should be mandatory. As COVID-19 is a disease, we, as physicians, support the contention that the most suitable approach for tackling this issue should be more medical, taking into account the real societal need for survival and good health, rather than legal, put less emphasis on proportionality, and disregard political expediency without ignoring the need for public peace.

It has been suggested, that the outlook for a multiple vaccination program for adults, analogous to the National immunisation program for children, which would allow for annual vaccinations for protection against several diseases, including COVID-19, is possible. Capacity to manufacture vaccines and administering them on a very large scale is developing Thus, if COVID-19 becomes endemic in many countries, the whole adult population could be

vaccinated annually.

7.E. ENVIRONMENTAL MEASUREMENTS AND CONTROL

Lessons learned:

Environmental measurements for the new coronavirus cannot be used to accurately detect morbidity. They are to be used only indirectly or experimentally for merely observing trends. Occupational and environmental hygiene (and occupational medicine) services could play a substantial role in carrying out environmental measurements to detect SARS-Cov-1 (in sewage and in indoor air in workplaces. However, no such actions were promoted by governments.

Prerequisites to consider and act in regard to the following issues endorsed by the UEMS and suggested recommendations

i. modification of work places,
ii. choice of workplaces (teleworking or not, hybrid work)
iii. disinfection of workplaces and evidence based assessments of effectiveness of various means, appropriate choice of means and methods (e.g. fumigation, UV radiation devices, type of disinfectant), in e.g. hospitals, schools, hotel rooms
iv. banning (or use with protective measures) of recreational facilities (e.g. cinemas, theatres, gyms, swimming pools).
v. air-conditioning and ventilation in rooms of indoor workplaces
vi. engineering our built environment, e.g. the hospital environment to reduce air circulation and transmission of respiratory pathogens.