Table 1 A COVID-19 control package using a Systems Thinking Biomatrix Tool and administrative actions

Biomatrix Item	Description	Component or Action	Examples
Aims (Vision)	**The Outcome(s):** the results that the system wants to achieve. Aims create focus.	**A nation without Coronavirus!** (Positive public Communication)	
Ethos	**Organizational Culture:** its unique expectations, and values and is expressed in its self-image: "As you think, so you will become".	**We always win!** (Positive public Communication)	
Structure	**The Organogram:** the anatomy of a system.	• **Strategic Multidisciplinary**, Intergovernmental body with its comprehensive administrative and executive components. • **Strategic Roadmap** for the Health-care sector and the population as a whole. • **Monitoring and Assessment** unit with timely data capture, analysis and action supported by efficient information technology platforms.	Multidisciplinary Team from all ministries, nongovernmental organizations, social support societies, charitable organizations, professional unions, international agencies etc.
Process	**The Activities:** describes the activities of the system: the activities involved in the delivery of services (training) to the customers.	**Health care directed:** • Facility preparedness • Staff education and training • Confirmed and suspected patients' clinical management pathways • Staff support and incentives, etc. • Patient and family education	• Efficient screening of staff and patients • Effective diagnostic capabilities • Reducing in-hospital transmission (personal protective equipment (PPEs), handwashing, triaging, cohorting of patients and of staff, disposal of hazardous material, environmental cleanliness and hygiene, restricting non-urgent clinical services, virtual outpatient and inpatient patient encounters, etc.) • Screening of visitors and restricting hospitalized patients visits by relatives, friends, etc.
		• **Population Directed:** Education and empowerment, Personal hygiene practices e.g. hand washing, sneezing and coughing etiquette etc., Social Distancing, Wearing masks, Restriction of social gathering e.g. at work, schools, sporting events/social events, Robust contact tracing and isolation, Augmenting population innate immunity: e.g. education on healthy foods and herbs rich in immunopotentiators etc.	• Quarantine and isolation centers • Robust contact tracing, isolation and close monitoring during isolation etc.
Resources	**Material and Intellectual Assets:** refer to the resources of the organization, such as its capital equipment, financial resources, intellectual property, staff capabilities etc.	• System Leadership • Diagnostic and treatment facilities • Internists • Infection Control Specialists • Patient Educators • Epidemiologists • Infectious Diseases Specialists • Intensivists • Trainers and Educationalists • Statisticians • Financial Resources • Monitoring teams/IT Specialists • Social Psychologists • Audiovisual Resources • Covid-19 cyberspace resources, Website, Blogs in simple language etc. • Local Social and Religious support teams	

Table 1 **A COVID-19 control package using a Systems Thinking Biomatrix Tool and administrative actions** (concluded)

Biomatrix Item	Description	Component or Action	Examples
Environment	**Local & Surrounding Facilitators & Barriers:** (the latter need to be resolved at the outset).	• Social activists and local support networks in the community. • Incentive Program for all healthcare workers. • Insurance and financial support to healthcare workers who get infected. • Collaboration with Research Centers, Technology and Innovation Centers, Evidence-based Practice Centers, Quality Improvement Organizations, International bodies etc.	
Governance	**Regulation & Monitoring:** The function of governance in an organization is to set aims and to monitor and regulate the movement of the organization towards the attainment of these aims.	• Daily reporting from the monitoring unit and assessment of progress, successes and failures and timely interventions to improve performance and deal with unintended consequences.	

On the other hand, New Zealand and Jordon applied both mitigation and suppression measures with significant population-based lockdown strategies (*19–20*). Their current daily figures are less than 10 cases. All three countries employed thorough screening and diagnostic methods, contact tracing, isolation, and reporting of cases. These were coupled with robust organizational capabilities, electronic tracing, education, monitoring, positive public health communication, and involvement governed and monitored by high-level administrative structures (*18–20*). However, better outcomes in the latter two countries are primarily due to employment of all system elements. A recent review exploring the elements and measures in many countries supports this Systems Thinking approach (*21*).

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