Ethics-driven policy framework for implementation of movement restrictions in pandemics

Siddhesh Zadey, Surabhi Dharmadhikari, Pradeeksha Mukuntharaj

ABSTRACT
In the ongoing COVID-19 pandemic, countries across the globe undertook several stringent movement restrictions to prevent the virus spread. In April 2020, around 3.9 billion people in 90 countries were contained in their homes. Discourse on the ethical questions raised by such restrictions while historically rich is absent when it comes to pragmatic policy considerations by the decision-makers. Drawing from the existing literature, we present a unified ethical principles–pragmatic considerations–policy indicators framework flexibly applicable across different countries and contexts to assess the ethical soundness of movement-restricting policies. Our framework consolidates 11 unique but related ethical principles (harm, justifiability, proportionality, least restrictive means, utility efficiency, reciprocity, transparency, relevance, equity, accountability, and cost and feasibility). We mapped each ethical principle to answerable questions or pragmatic considerations to subsequently generate 34 policy indicators. These policy indicators can help policymakers and health practitioners to decide the ethically substantiated initiation of movement restrictions, monitor progress and systematically evaluate the imposed restrictions. As an example, we applied the framework to evaluate the first two phases of the largest lockdown (March–May 2020) implemented nationwide in India for its adherence to ethical principles. The policy indicators revealed ethical lapses in proportionality, utility efficiency and accountability for India's lockdown that should be focused on in subsequent restrictions. The framework possesses value towards ensuring that movement-restrictive public health interventions across different parts of the world in the ongoing pandemic and possible future outbreaks are ethically sound.

INTRODUCTION
Globally, COVID-19 has resulted in over 3,294,009 deaths and 158,366,256 cases as of 10 May 2021. To limit the loss of life at the hands of an unknown virus, governments across the world introduced movement restrictions of varying stringency as public health interventions. The large-scale mass movement restrictions with stay-at-home regulations referred to as "lockdowns" hereafter, arguably, have been the most restrictive non-pharmaceutical public health intervention against the ongoing pandemic. The WHO had described the first lockdown implemented in Wuhan, China on 23 January 2020 as "unprecedented in public health history." Since Wuhan, lockdowns have been implemented in over 70 countries, the largest one being in India. In the first week of April 2020, about 3.9 billion people worldwide were contained in lockdowns in their respective countries. The cross-country evaluations using disparate analytical methods have converged on movement restrictions being effective, advocating for the benefits of early-on implementation. Even...
so, all restrictions, particularly lockdowns, have led to significant economic losses and humanitarian suffering. One-third of all workers around the world lived in a place with severe workplace closure leading to a loss of over 400 million full-time jobs in the second quarter of 2020.9 During the national and local lockdowns, about 1.5 billion children were put out of schools.5 Conservatively, the stalling of economies was predicted to push 71 million people into extreme poverty.10 In India, the debilitating effects of the lockdown led to over 300 deaths.11 Researchers, policymakers, and politicians have focused largely on the efficacy of movement restrictions and hailed their importance particularly noting the hypothetical counterfactual harms.12-14 However, studies looking at the ethics of such restrictions are negligible. For instance, updated COVID-19 guidelines by the WHO or other global stakeholders for ethically appropriate implementation of movement restrictions such as lockdown seem to be missing. In several instances, the liberty, autonomy, and livelihood of people have been disproportionately restricted without any transparent communication or reciprocal benefits from the authorities implementing the movement restrictions.15 We assume that incorporating ethical considerations can enhance the effectiveness of such movement restrictions by generating the necessary conditions for compliance and public participation. Drawing from existing literature, we present a unified principles–considerations–indicators framework that could be used by decision-makers for value-based implementation, monitoring and evaluation of movement restrictions.

During the COVID-19 pandemic, the most stringent form of movement restriction was the lockdown. Therefore, for an exemplary application of the framework, we decided to focus on the ethics of the lockdown. One of the largest, longest and most stringent lockdowns was implemented in India from 25 March to 3 May 2020 that drew global attention.16-17 Also, we believe that the framework should be applied by stakeholders that understand the region’s sociopolitical context. Given our familiarity with the Indian context and widespread global attention to its lockdown, we demonstrate an exemplary application of the framework for the evaluation of the nationwide lockdown in India that could help researchers and policymakers to understand the ethical soundness of the past response. While inexhaustive, the framework is meant to initiate a discussion around and provide an objective structure for understanding the ethics of movement restrictions as we face waves of outbreaks in the ongoing pandemic and for future pandemics.

**ETHICS PRINCIPLES IN THE FRAMEWORK**

The ethics of voluntary and imposed movement restrictions have been previously discussed for infectious disease outbreaks and other biohazards. In 2001, Barbera and colleagues18 examined the ethical considerations for large-scale quarantine for bioterrorism threats. They primarily focused on assessing the need, feasibility and cost–benefit ratio. Arguably, these ethical considerations for large-scale quarantines18 could be adapted for lockdowns in the ongoing COVID-19 pandemic. In the context of the 2003 severe acute respiratory syndrome epidemic, Upshur discussed ethical principles of harm, proportionality, reciprocity and transparency (see table 1) as requisite justifications for public health interventions,19 and applied them to the imposed and voluntary quarantines.20 In 2007, the WHO’s report on the influenza pandemic discussed the ethical principles to be upheld by governments in case of movement restrictions.21 Beyond those suggested by Upshur, this report also brought forward social justice, liberty, confidentiality, fair process, efficiency and accountability as requirements for ethical imposition of restrictions. In 2015, the Presidential Commission for the Study of Bioethical Issues listed out ethical considerations for restrictive measures in response to the public health planning for the Ebola epidemic.22 The commission report recognised that an ethical implementation should adhere to considerations of the harm, reciprocity, least infringement, evidence-based action proportionality (as beneficence and non-maleficence), justice and fairness, and ensuring equitable benefits sharing across socioeconomic strata. In 2016, the WHO released generic guidance for ethical management of infectious disease outbreaks.23 Recommendations for restrictions on freedom of movement included the justifiable basis for imposing restrictions (known harm and evidence-based action), least restrictive means, cost consideration (utility efficiency), ensuring humane conditions (reciprocal benefits), addressing financial and social consequences, due process protections (fair process), equitable application (fairness and distributive justice), and communication and transparency.

There is a conceptual convergence among these differently named sets of principles and considerations that are unified into an extended list of unique principles (table 1). It is noteworthy that this extended list demonstrates that some of the past discussions have ascribed different notions to a given principle or invoked different principles to present the same idea. For instance, there is a conceptual overlap between the basis of the necessity of intervention and its justifiability. Or that reciprocity has been used to represent the treatment of people at the hands of the authorities and also to denote the obligation of members of a community towards one another. There are also perceivable relationships among the principles. For instance, the harm principle can be considered a precondition for justifiability as without establishing the harm, imposing a restriction cannot be justified. In other words, the evidence underlying to denote harm also acts to affirm the justifiability of the interventions. In another instance, the least restrictive means principle can be thought of as a complement of the proportionality principle where the former concerns the stringency of the restrictions relative to each other, while the latter can be thought to address if the evolution
<table>
<thead>
<tr>
<th>Ethical principle</th>
<th>Description of principle as per the source reference</th>
<th>Questions/considerations raised under the principle</th>
<th>Corresponding policy monitoring and evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harm/necessity</td>
<td>► Warranted by previous medical and public health analyses</td>
<td>► Is there measurable harm due to the disease outbreak?</td>
<td>► Presence of scientific evidence indicating harm (eg, human to human transmission, mortality)</td>
</tr>
<tr>
<td></td>
<td>► Knowledge of measurable harm</td>
<td><img src="https://via.placeholder.com/150" alt="image" /></td>
<td>► Presence of decided metric for harm measurement (eg, death count, case count, case fatality ratio)</td>
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<tr>
<td></td>
<td>► Presence of justifiable basis for harm</td>
<td><img src="https://via.placeholder.com/150" alt="image" /></td>
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<tr>
<td>Justifiability</td>
<td>► Reasonable expectation that it will have a significant impact; reliance on best available scientific evidence</td>
<td>► Is there scientific evidence for the effectiveness of the restriction to prevent/reduce harm?</td>
<td>► Presence of prior peer-reviewed scientific publications on the effectiveness of restrictions</td>
</tr>
<tr>
<td></td>
<td>► A justifiable basis for imposing restrictions, based on evidence, with continuous re-evaluation</td>
<td>► Is the appropriateness of the restriction being continuously re-evaluated as and when more evidence emerges and when the course of the outbreak changes (increase/decrease in cases)?</td>
<td>► Successful historical precedent (any instance before)</td>
</tr>
<tr>
<td></td>
<td>► Scientific justification for the quarantine, plausible way to determine who should be quarantined</td>
<td>► Is the restriction being withdrawn when new evidence suggests that the original rationale is no longer applicable?</td>
<td>► Presence of a dedicated response team for review of literature, adequate data collection, impact evaluation and situational monitoring to continuously determine the effectiveness of the restrictions</td>
</tr>
<tr>
<td></td>
<td>► Measures should be grounded in the best available scientific evidence</td>
<td>► Are the restrictions placed based on some valid parameters (eg, case counts in a locality) that can determine who is at the risk of harm?</td>
<td></td>
</tr>
<tr>
<td>Proportionality</td>
<td>► Mandatory restrictions should only be instituted as a last resort; restrictions to be terminated when no significant benefit seen</td>
<td>► Is the restriction proportional to the potential harm?</td>
<td>► Matching stringency of measures with the growth of cases and deaths in the epidemic*</td>
</tr>
<tr>
<td></td>
<td>► Restrictions should be proportional to the disease control goal</td>
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<td><img src="https://via.placeholder.com/150" alt="image" /></td>
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<tr>
<td></td>
<td>► The restriction should be accurately tailored to specific risks</td>
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<td><img src="https://via.placeholder.com/150" alt="image" /></td>
</tr>
<tr>
<td>Least restrictive means</td>
<td>► Mandatory measures should only be instituted as a last resort</td>
<td>► Is the least restrictive measure applied before other measures severely curbing individual and communal rights?</td>
<td>► The number of steps between the least (eg, voluntary physical distancing at public places) and the most restrictive (eg, mandatory lockdown) measures</td>
</tr>
<tr>
<td></td>
<td>► Voluntary measures should come before mandatory ones</td>
<td>► Are voluntary restrictions implemented before mandatory restrictions?</td>
<td>► Whether sufficient time intervals are given for every set restrictive step to show maximum effect*</td>
</tr>
<tr>
<td></td>
<td>► Mentioned as the principle of least infringement, which suggests minimisation of impingement on individual liberties</td>
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<tr>
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| **Utility efficiency** | ➤ Potential benefits should outweigh the adverse effects\(^{18}\)  
➤ Maximising aggregate benefits under fewest costs\(^{21}\) | ➤ Do the probable benefits of the restriction outweigh the probable risks?  
➤ Are the restriction benefits achieved under the smallest costs? | ➤ Does the analysis of trade-off (eg, cost–benefit analysis) between loss of livelihood and other losses against deaths averted and cases averted show net positive benefit?\(^*\)\(^†\) |
| **Reciprocity** | ➤ Provide means of mitigating adverse effects; provide employment protection; address financial and employment consequences\(^{21}\)  
➤ Ensuring humane conditions, addressing financial and social consequences\(^{23}\)  
➤ Communication strategies should be designed to avoid stigmatisation (mentioned under communication and transparency)\(^{23}\)  
➤ Society has a reciprocal obligation to individuals for curtailing their liberties\(^{20}\)  
➤ The needs of detainees must be addressed\(^{18}\)  
➤ Those who bear the burden of restrictive policies should be supported by society and public agencies\(^{22}\) | ➤ Is the government reimbursing the individuals for curtailing their rights and for the loss of income/loss of livelihood due to restrictions?  
➤ Is the government placing relief mechanisms ensuring that the restricted individuals are not facing an undue burden?  
➤ Are measures being taken to avoid stigmatisation and discrimination of those under restrictions?  
➤ Are the societal groups less affected by the restriction taking care of those affected gravely by them? | ➤ Cost and population coverage  
➤ Presence of tax and loan payment concessions  
➤ Postponing non-essential routine activities (eg, examinations, sports events, etc)  
➤ Anti-discriminatory mass media practices  
➤ Guidelines in place for responsible news media reporting to avoid discrimination and reduce stigma  
➤ Presence of helplines to deal with mental health issues that may arise  
➤ Presence of grassroots ventures that help the impoverished groups |
| **Transparency** | ➤ Process and rationale of decision-making should be made transparent and public (mentioned as publicity of measures)\(^{21}\)  
➤ Decision-makers should publicly explain the basis for decisions, including the uncertainties in decision-making\(^{23}\)  
➤ Communicate clearly the justification for quarantine\(^{23}\) | ➤ Are the policy decisions regarding restrictions and their rationale being continuously informed to the public in comprehensible ways? | ➤ Presence of press conferences in local languages  
➤ Frequency of press conferences  
➤ Presence of outreach methods and materials that are easy to understand, in local languages, and are widely distributed  
➤ Presence of a public record of justification for the quarantine that is conveyed to lay people in local languages |
| **Relevance** | ➤ Reasons, principles and evidence for the decision should be considered relevant by the affected stakeholders; develop strategies with community input\(^{21}\)  
➤ Solicit community members’ views on restrictions (mentioned under communication and transparency)\(^{23}\) | ➤ Are the restrictions being implemented with feedback from the community that is affected by them? | ➤ Presence of public opinion polls  
➤ Presence of people’s representatives in the decision-making process of dedicated response teams |

*Continued*
of restrictions matches the trajectory of an outbreak. Reciprocity between the members of a community can have an impact on the equitable distribution of the burden of restriction. Commitment to accountability on the part of decision-makers can engender transparency and mechanisms of checking relevance (eg, conducting public polls on the acceptability of intervention), and can make decision-makers be aware of the problems to initiate a cascade of accountable remedies. Considerations made towards cost and feasibility of implementing a restriction can determine the utility efficiency and vice-versa, while both these principles are conditional to the judgement of necessity. The interdependencies of the principles have a pragmatic value for the policymakers. It

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| Equity            | ► Special attention to protecting vulnerable populations21  
► Equitable application of movement restrictions22  
► Rights and liberties of restricted individuals should be protected, disproportionate distribution of the benefits and burdens of PHI to certain individuals/groups should be prevented; mentioned as the justice and fairness principle22 | ► Is there equitable distribution of the available resources for relief to the marginalised communities?  
► Is there a disproportionate burden of the restriction on vulnerable populations? | ► Presence of food and shelter security for the below poverty line and low-earning unorganised labour groups affected by the restrictions  
► Presence of domestic violence helplines for women and children  
► Availability of healthcare access for the chronically ill and elderly groups |
| Accountability    | ► Provide individuals with legal recourse to challenge their isolation/quarantine; revisability; appeal mechanisms21  
► Due process protections; decision-makers should be held accountable for abuse of authority,23  
► Allow for a process of appeal20 | ► Are there measures in place for individuals to express grievances and challenge the restrictions?  
► Can the decision-makers be held accountable in case of losses (economic/health)? | ► Presence of grievance redressal and feedback portals  
► Presence of public platforms to challenge the restrictions by speaking to authority figures  
► Presence of laws that allow for a process of appeal  
► Uninterrupted and autonomous working of the judicial system for fast-tracking the restriction-related appeals  
► Mechanisms for demanding reparations in case of life and livelihood losses due to restriction |
| Cost and feasibility | ► Countries should review if their existing laws provide authority for actions that may be needed in a pandemic; mechanism in place for enforcement/regulation21  
► Feasibility of implementation and maintenance of quarantine18  
► Costs and practical constraints need to be taken into account23 | ► Are financial and other resources available to carry out a restriction?  
► Does the country have legal and disciplinary systems in place to enforce the restriction?  
► Are there enough resources to provide food, shelter, counselling to the community during the period of restriction? | ► Presence of laws that allow the implementation of restriction  
► Presence of a police force for restriction (eg, confinement) implementation  
► Ability to create places of confinement for restricted (eg, quarantined/isolated) individuals |

*These indicators depend on the intrinsic characteristics of the disease in question and need to be modified based on disease knowledge to be made dichotomous.
†This analysis incorporates the trade-off between total economic loss versus economic catastrophe averted in the form of saved lives. Such analyses routinely involve calculations over the value of statistical life or quality-adjusted life-years estimates.30

PHI, public health intervention.
is conceivable that upholding or acting towards satisfying all the principles is improbable under the expectation of an urgent response in uncertain circumstances. For instance, limited and uncertain evidence for the magnitude of harm at the onset of an outbreak can make the measurement of harm challenging and thereby impede the judgement over necessity and justifiability. Additionally, the limited and uncertain epidemiological evidence can complicate defending whether or not a restriction is proportional. Hence, at the onset, against the contrast of inability to justify harm or determine the proportionality of the proposed intervention, the ‘ethical focus’ of policymakers should be on complementary principles such as transparency of communication, establishing accountability and conveying the need for reciprocity. Ensuring the basis for least restrictive means and equity becomes important too. As the biomedical, epidemiological and other implementation evidence emerge, policymakers can expand the focus to defending past actions and clarifying future decisions calibrating them according to harm, justifiability and proportionality principles.

INDICATORS IN THE FRAMEWORK AND CONSIDERATIONS FOR APPLICATION

Based on the principles that have been unified in the framework (table 1) and the notions represented by them, we first derived actionable considerations or answerable questions. Next, the considerations were mapped onto measurable indicators useful for initiating implementation, monitoring and evaluating restrictions. The importance of principles and the choice of indicators are contingent on the context. The relevance of the policy indicators to a country or local region is determined by, among other factors, the sociocultural acceptability of the corresponding ethical principle. For instance, the demand for the level of transparency along with what counts as transparent communication varies across societies. Hence, although transparency is desired across societies, the indicators for its suitable measurement might at times differ. Most of these indicators are based on easy-to-collect data that are available to the decision-makers. Some specific analytical indicators might require the expertise of the technical (eg, economic) advisors. However, such aid is often available to high-level policymakers and health planners and can also be provided from global collaborations in the absence of local experts.

The current presentation of the framework consolidates the previous discussions around the ethics of movement restrictions as public health interventions (PHIs) into 11 unique principles. The ethical principles are mapped onto 34 policy indicators. For simplicity, 31 out of the 34 indicators (table 1) have been constructed to have dichotomous (yes or present/no or absent) responses of which 3 indicators (analysis of trade-off, matching stringency of measures with the growth of cases and deaths, and sufficient time intervals given for every restrictive step to show its desired effect) are specific to the infectious disease epidemic or pandemic. For instance, in the case of COVID-19, the least restrictive measure was recommended at least a week before the first case. However, this recommendation could vary for other pandemics. With evolving knowledge, the proposed framework could incorporate thresholds to dichotomise these indicators. The remaining three indicators (number of steps between the least and most restrictive measures, cost and population coverage of relief measures, and frequency of press conferences) have numerical responses with no normative thresholds. However, higher values for each of these indicators would depict greater adherence to the corresponding ethical principles. For instance, a greater number of steps between the least and most restrictive measures indicates that there was a gradual increase in the restrictions, which corresponds to greater adherence to the ‘least restrictive means’ principle. We do not suggest a fixed scoring system/rules for using the framework. The framework can be applied flexibly with suitable scoring at the discretion of the stakeholders. Generally, anyone with adequate knowledge and the necessary data can use the framework to critique the ethics of movement restrictions. More specifically, it is meant to be a systematic guide for policymakers (eg, local and national pandemic task force members) to ensure ethically sound movement-restricting policies. Before implementation of the movement restrictions, it can be used by the health planners/policymakers/task force for systematically considering the ethics of the movement restrictions. After implementation, it can be used for monitoring whether the ethical aspects of the restrictions are being upheld. It can also be used by independent researchers and policy analysts to assess or critique the ethical soundness of movement restrictions.

Here, we apply the framework to India’s initial national lockdown during the COVID-19 pandemic. In our scoring, we consider that the ethical principles were satisfactorily adhered to if all the dichotomous indicators have an affirmative response (ie, yes) and partially adhered to if more than half the indicators corresponding to the principle had an affirmative response. We did not include the indicators that could not be made dichotomous in this scoring (table 2).

APPLICATION OF THE FRAMEWORK TO THE NATIONAL-LEVEL INDIAN LOCKDOWN

On 18 January 2020, much before the first COVID-19 case in India, India began airport screening of travelers from China. On 11 March, the Disaster Management Act was invoked, all visas were suspended and compulsory quarantine was initiated for all international travelers. A voluntary curfew was proposed by the prime minister on 22 March and widely popularised by the media. India initiated the largest lockdown (here referred to as lockdown 1.0) in the world on 25 March 2020 for 21 days, containing about 1.3 billion people (see online supplemental file 1). Subsequently, it was
Table 2  Assessment of Indian national lockdown (1.0 and 2.0) from 24 March to 3 May 2020 for the performance with regard to policy indicators

<table>
<thead>
<tr>
<th>Ethical principle</th>
<th>Policy monitoring and evaluation indicators for response measures</th>
<th>Performance of indicator</th>
<th>Did response measures adhere to the principle?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harm and necessity</td>
<td>Presence of scientific evidence indicating harm (eg, human to human transmission, mortality)</td>
<td>✓</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Decided metric for harm measurement (eg, death count, case count)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Justifiability</td>
<td>Presence of prior peer-reviewed scientific publications on the effectiveness of restrictions</td>
<td>✓</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Successful historical precedent (any instance before)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of a dedicated response team for review of literature, adequate data collection, impact evaluation and situational monitoring to continuously determine the effectiveness of the restrictions</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Proportionality</td>
<td>Matching stringency of restrictions with the growth of cases and deaths in the epidemic In case of COVID-19: most restrictive measure (national lockdown) at least 2 weeks before 100th case and least restrictive measure (travel bans) at least 1 week before first case</td>
<td>✗</td>
<td>No</td>
</tr>
<tr>
<td>Least restrictive means</td>
<td>The number of steps between the least (travel bans) and the most restrictive (national lockdown) measures</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Whether sufficient time intervals are given for every restrictive step to show the maximum effect</td>
<td>✓*</td>
<td></td>
</tr>
<tr>
<td>Utility efficiency</td>
<td>Does the analysis of trade-off (eg, cost–benefit analysis) between loss of livelihood and other losses against deaths averted and cases averted show net positive benefit?</td>
<td>✗</td>
<td>No</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>Cost and population coverage INR 21.7 trillion (US$294 billion) covering 420 million people</td>
<td>Partially</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tax and loan payment concessions</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Postponing non-essential routine activities (eg, examinations, sports events, etc)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anti-discriminatory mass media practices</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guidelines in place for responsible news media reporting to avoid discrimination and reduce stigma</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of helplines to deal with mental health issues that may arise</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Surveys for awareness among people about avoiding discrimination</td>
<td>✗</td>
<td></td>
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<tr>
<td></td>
<td>Presence of grassroots ventures that help the impoverished groups</td>
<td>✓</td>
<td></td>
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<tr>
<td>Transparency</td>
<td>Presence of press conferences in local languages</td>
<td>✓</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Frequency of COVID-19 press conferences On average 1 in 40 days</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Presence of outreach methods and materials that are easy to understand, in local languages, and widely distributed</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Presence of a public record of justification for the quarantine that is conveyed to lay people in local languages</td>
<td>✓</td>
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Continued
extended into lockdown 2.0 (15 April–3 May), lockdown 3.0 (4 May–17 May) and lockdown 4.0 (18 May–31 May), followed by phased reopening or unlock periods.28 For a while, some restrictions stood in place, with a push towards safely restarting the economy. However, in light of the disastrous second wave of COVID-19, lockdowns have re-emerged across various Indian states.29 Here, as an example, we apply the framework to lockdowns 1.0 and 2.0 that were imposed by the Central Government of India. We do not include lockdown phases 3.0 and 4.0 as the decision-making became more locally driven during these with individual state governments and authorities playing a greater role, thereby making assessment challenging.

Our findings for Indian lockdown phases 1.0 and 2.0 are summarised in table 2 and extensively described with references to evidence in the online supplemental file 2.

limited by other evaluators depending on the context.

Table 2 Continued

<table>
<thead>
<tr>
<th>Ethical principle</th>
<th>Policy monitoring and evaluation indicators for response measures</th>
<th>Performance of indicator</th>
<th>Did response measures adhere to the principle?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>Presence of public opinion polls</td>
<td>✓</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Presence of people’s representatives in the decision-making process of dedicated response teams</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>Presence of food and shelter security for the below poverty line and low-earning unorganised labour groups affected by the restrictions</td>
<td>✓</td>
<td>Partially</td>
</tr>
<tr>
<td></td>
<td>Presence of domestic violence helplines for women and children</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Availability of healthcare access for the chronically ill and elderly groups</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Accountability</td>
<td>Presence of grievance redressal and feedback portals</td>
<td>✓</td>
<td>No</td>
</tr>
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<td></td>
<td>Presence of public platforms to challenge the restrictions by speaking to authority figures</td>
<td>✗</td>
<td></td>
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<td></td>
<td>Presence of laws that allow for a process of appeal</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Uninterrupted and autonomous working of the judicial system for fast-tracking the restriction-related appeals</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanisms for demanding reparations in case of life and livelihood losses due to restriction</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Cost and feasibility</td>
<td>Presence of laws that allow the implementation of restriction</td>
<td>✓</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Presence of a police force for restriction (eg, confinement) implementation</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ability to create places of confinement for restricted (eg, quarantined/isolated) individuals</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

✓ = yes or present; ✗ = no or absent.

*Sufficient time interval given for every restrictive step to show the maximum effect was derived from31 which calculated the time taken for travel restrictions, school/workplace/public place closures and lockdowns to show maximum effect. No recommendations were given for social distancing measures. Of the three restrictive measures, India followed the minimum time requirement for travel restrictions and lockdown but not for school/workplace/public place closures. Since more than half of the available minimum time standards were met, we considered this indicator to have ‘yes’ as the response. INR, Indian rupee.

LIMITATIONS OF THE FRAMEWORK AND ITS CURRENT APPLICATION

Limitations of the current analysis can be grouped into those relating to the framework itself and those in its current application. With regard to the framework, the current study lacks a validity assessment of the framework. Here, our aim is to introduce the framework and present
an example of its application to India’s lockdown. A formal assessment of content and criterion validity needs to be conducted. Even so, to ensure content validity, we mapped several policy indicators to a given ethical principle with the aim to cover multiple facets covered across literature under that principle. Given that there is no ‘gold standard’ for comparison, assessment of criterion validity might be a challenge.

The presence of possible ceiling and flooring effects is an important limitation in the current application of the framework. These effects arise from the use of dichotomised indicators. Categorical indicators, such as dichotomised indicators, are used as they facilitate easy application, interpretation and comparison. In the future, discrete responses or ordinal responses with levels could replace the dichotomisation to avoid potential flooring and ceiling. Further, we used the arbitrary threshold of ‘at least half of the indicators being affirmative’ to decide whether the ethical principle was adhered to. In our analysis, although 23 out of 31 dichotomous indicators had ‘yes’ as an answer, the relative proportion of the indicators within the principles leads to the conclusion that several ethical principles were not completely or partially adhered to. Changing this threshold can lead to qualitatively different conclusions. Here, our attempt was to demonstrate a simple application of the framework hence we did not test the conclusions across different thresholds. Future studies could choose different thresholds deemed suitable for the scenario at hand or better yet, present a range of conclusions sensitive to the different thresholds. While it might increase analytical complexity, studies could also assign differential weights to the indicators or use different methods of aggregation better suited for the assessment at hand. Finally, we applied the framework to the national-level lockdown in India, which simplifies the subnational socioepidemiological heterogeneities and does not consider the variations in the state or junior local-level response measures. However, with more granular data, investigators and policymakers at any level in the administrative hierarchy can apply the framework to the administrative geographical unit (eg, state or district or municipality containment zone) of their interest. Such an application will need to use the policy indicators at the multiple decision-making levels, that is, state-level analyses would consider both national and state policies on movement restrictions.

CONCLUSION

We describe a framework bridging pragmatic policy indicators to the ethical principles that the movement restrictions imposed as PHI against pandemics should adhere to. The rigorous scope, easy interpretability, and flexible application of the framework make it suitable for use by health policymakers and planners for initiating a movement restriction, monitoring the developments, and post-implementation evaluation. As an example, we also showcased the framework’s application for evaluation of the nationwide lockdown in India to demonstrate its ethical soundness. We believe that our framework that systematically bridges ethics to policy can be in handy in the evolving COVID-19 pandemic and possible future outbreaks.

Acknowledgements We thank Dr Sweta Dubey for insightful discussions while developing the framework and everyone at ASAR for their support.

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**Step 2/7**
Cases: 3
Deaths: 0

Feb 15th
Started quarantining visitors arriving in India from 'high-risk' countries.

**Step 4/7**
Cases: 74
Deaths: 1

March 12th
Banned entry of foreigners for a month suspending all visas for travel to India from March 13th to April 15th.

**Step 6/7**
Cases: 137
Deaths: 3

March 17th
Government of India called for social distancing measures till March 31st.

**24th March 2020**
National Lockdown

**Step 1/7**
Cases: 3
Deaths: 0

Feb 4th
India cancelled existing visas for Chinese and foreigners from China.

**Step 3/7**
Cases: 31
Deaths: 0

March 6th
Started quarantining all international passengers at airports.

**Step 5/7**
Cases: 114
Deaths: 2

March 16th
Delhi Government ordered closure of all gymnasiums, spas, nightclubs and theatres until March 31st. Passenger land border crossing suspended.

**Step 7/7**
Cases: 360
Deaths: 7

March 22nd
14 hour voluntary lockdown called 'Janta Curfew' was observed in India.
Details on application of the framework to the Indian lockdown phases 1.0 and 2.0

Harm/Necessity: After the first outbreak of coronavirus disease 2019 (COVID-19) (December 2019) in China, the World Health Organisation (WHO) declared it a Public Health Emergency of International Concern (PHEIC) with 9826 confirmed cases and 213 deaths on the 30th January 2020. Subsequently, a pandemic was declared on the 11th March 2020, with 118,319 confirmed cases and 4292 deaths due to the virus. The 31st January 2020 WHO situation report pointed to the possible human-to-human viral transmission through droplets or contact thereby establishing harm due to high infectivity and the exponentially increasing cases and deaths. Although knowledge about the virus is being continually updated with scientific evidence, e.g., the possibility of aerosol transmission [1], there is a consensus within the scientific community about the harms posed by the pandemic. In India’s case, the numbers of cases and deaths, and crude case fatality rate (CFR) have been frequently used to demonstrate the harm in Ministry of Health and Family Welfare (MoHFW) press briefings. Hence, there was strong scientific evidence demonstrating the known harm of the virus with an indicator to measure the harm before the implementation of the Indian lockdown.

Justifiability: Multiple studies published since lockdown 1.0 (24th March 2020) have agreed upon the lockdown being an effective strategy to curb COVID-19 spread [2–6]. However, these studies have differing views as to how and when the lockdown should have been implemented. E.g., one study [3] advocated periods of sustained lockdown interspersed with periods of relaxation while two others [4,5] suggested that lockdown be restricted to locations with a high caseload. The MoHFW also conducted an independent statistical analysis stating that containment measures and lockdown were instrumental in limiting the number of cases to 7,447 till 11th April 2020 [7]. The analysis also estimated that the absence of all restrictive measures would have led to over 820,000 cases by 15th April 2020 and this number would have been 120,000 with the implementation of other containment measures without the lockdown. Previously, individual or small-group level quarantine and isolation have been used against the spread of infections, e.g., the 1918-19 swine influenza virus A (H1N1) pandemic [8] and the 2002 severe acute respiratory syndrome (SARS) epidemic [9]. However, this was the first in history for countries to implement nation-wide lockdowns. An expert group under COVID-19 task force head, National Institution for Transforming India (NITI) Ayog monitored the lockdown effectiveness by observing the risk of community transmission, reviewing literature published by public health experts, and advising the Government of India (GoI) [10]. Thus, based on the considered indicators, the lockdown was justifiable as demonstrated by evidence of the effectiveness of movement restrictions in not only the COVID-19 pandemic but also other pandemics in history.

Proportionality: The Oxford University’s COVID-19 Government Response Tracker (OxCGRT) developed a scaled stringency index (SI) (0-100, with a higher score depicting greater stringency) based on nine response indicators including school closures, workplace closures, and travel bans [11]. India had an SI value of 100 as of 22nd March 2020 when there were only 320 cases and 4 deaths due to COVID-19. India was quick to enforce a stringent lockdown even though cases and deaths were quite below other countries such as the United States (US) that had more than 6000 cases and 108 deaths before attaining their highest stringency index [12]. Apart from the US, Italy, and Spain enforced lockdowns only after crossing 1000 cases and 1000 deaths [13]. Based on the findings in an empirical analysis [14], measures were considered to be most effective if they were
instituted early, i.e., 7 days before the 1st case for travel restrictions and 14 days before the 100th case for lockdowns. Thus, although India’s lockdown was the most stringent relative to other countries, it might be argued to be disproportionate.

**Least Restrictive Means:** We considered the least restrictive measure to be the cancellation of visas for travelers from China (4th February 2020) while the most restrictive measure was the nationwide lockdown (24th March 2020). There were seven transition steps with a time interval of 49 days between the least and most restrictive measures (Supplementary Figure 1). While there is no normative standard for the number of increasingly restrictive measures to be tried out before imposing lockdown, we provide a comparison with the trajectories of other countries. For instance, compared to India’s national-level lockdown, China began with smaller city-level containments and then applied varying levels of lockdowns in other parts of the country. Similarly, the lockdown in Italy was imposed in stages and gradually extended nationally. India’s lockdown was drastic compared to China and Italy. Each restrictive measure needs to be tried out for a sufficient time interval before moving on to the next restrictive measure. While there are no normative thresholds for these time intervals, analysis of impact of stringency of restrictive measures on epidemiological parameters provides certain cut-offs specific to COVID-19 [15]. E.g., travel restrictions should be in place for at least 7 days before implementing the next restrictive measure (see Table 2 in the article). However, these time cut-offs were only available for 3 restrictions (travel restrictions, school/workplace closure, and the lockdown) in India’s case, of which 2 restrictions complied with the sufficient time interval standards. Thus, the least-restrictive means can be said to be somewhat followed though better cut-offs would help in reaching finer conclusions.

**Utility-Efficiency:** The benefits of the lockdown in the form of averted COVID-19 incidence and mortality should be weighed against its economic (loss of incomes, closure of business, etc.) and broader social (rise in suicides, migration-related accidents, domestic violence, food insecurity, etc.) costs. One such cost-benefit analysis by independent economists compared the cases and deaths averted by the lockdown as benefits and the unemployment and loss in production as costs to find that the net benefits of the lockdown were negative as compared to its costs [16]. While more evidence is needed for an assessment, the available study supports that lockdown did not satisfy utility-efficiency.

**Reciprocity:** GoI announced myriad relief measures to protect the economy and livelihoods of those affected by the lockdown (Supplementary Table 1). The subsidies amounted to INR 21.7 trillion, targeted 32.3% of the population [17], and included measures for food, shelter, healthcare security as well as direct monetary transfers. Concessions were given for tax and loan payments, while non-essential routine activities including the national-level exams were postponed [18]. Free helplines were set up early-on for mental health issues [19]. To tackle the anticipated discrimination faced by patients, high-risk communities, healthcare workers, etc. the government issued an advisory on 8th April 2020, asking the citizens to act more responsibly and to refrain from stigmatizing any community or area [20,21]. However, guidelines for mass media houses to prohibit any discriminatory narrative were lacking. Although there were surveys to assess awareness amongst people about mental healthcare needs during the lockdown [22], there were no surveys to assess people’s perceptions and understanding about the importance of avoiding stigmatization. Robust anti-discriminatory measures could have helped prevent the instances of discrimination and violence that were seen against certain communities, e.g., discrimination of
Muslims in the Talibhi Jamaat case, Northeast Indians [23], the social stigmatization of healthcare workers [24]. Along with the government initiatives, various organizations and private individuals rose to the task of helping those affected by COVID-19 and also the lockdown [25,26]. For instance, Mumbai’s premium hotel Taj made its rooms available for quarantining healthcare workers [27]. However, these mitigation measures of the GoI were insufficient in providing relief to the affected population [28–30]. For instance, the actual government spending was lower than the proposed spending (30) and more than 100 million people were excluded from the Public Distribution System (PDS) [28]. Thus, the response from the government was mostly reciprocal for economic losses but lacked in tackling the discrimination.

**Transparency:** Government press briefings in local languages were regularly released ([https://pib.gov.in/newsite/bulletinn.aspx](https://pib.gov.in/newsite/bulletinn.aspx)). The first two months of the lockdown saw daily press releases while later months saw infrequent updates [31]. The MyGov platform was launched to promote the engagement of citizens with content in multiple languages and sign language to ensure maximum participation and reach [32]. Television programs and audio podcasts through MyGovSamvaad on community radio stations were also used. The Prime Minister of India in his address to the nation on 24th March 2020 before the lockdown, explained the need for a complete national-level lockdown in Hindi [33]. A written record of the speeches could be easily accessed at the Press Information Bureau (PIB) website in local languages [34]. While the Prime Minister’s speech advertised the need for a lockdown, it failed to share with the public the rationale and evidence for choosing this over other less restrictive strategies. Press conferences wherein the journalists could question the decision-makers were limited during the lockdown. While the decision for the lockdown was communicated, the process of arriving at the decision was criticized for lacking transparency [35]. Thus, the communications about lockdown implementation were mostly transparent.

**Relevance:** Few public opinion polls have been conducted during the Indian lockdown [36,37]. Sentiment analysis of tweets from Twitter showed that a majority of the people were positive about the lockdown, trusted the government’s decision, and were committed to flatten the curve [36]. In another online poll conducted by Inshorts, 82% of Indians wanted the lockdown to be extended beyond 14th April 2020 [37]. However, these platforms collected views from relatively young, educated, and higher-socioeconomic groups thereby leaving out a major chunk of the population. GoI setup dedicated response teams called Empowered Groups that included Members of Parliament (people’s representatives), domain experts and specialists, state legislators among others from the NITI Aayog to coordinate COVID-19 response activities with the private sector, grassroots non-governmental organizations (NGOs), and international organizations [38]. Thus, the relevance of lockdown was justified due to the presence of public opinion polls and the presence of people’s representatives in the decision-making process of dedicated response teams.

**Equity:** GoI took various measures to provide food and shelter security to below poverty line (BPL) groups, the destitute, migrant workers, and pilgrims (Supplementary Table 2). The National Commission for Women launched an emergency helpline to assist women experiencing domestic violence. The Central Ministry of Women and Child Development used the ‘One Stop Centres’ under an existing program to assist women facing any kind of violence and harassment during the lockdown [39]. Karnataka launched a special scheme called ‘Santhwana’ to provide counseling, legal and medical aid for victim-survivors of domestic violence [40]. States had their helpline
numbers for domestic violence as listed by Oxfam India [41]. The MoHFW issued a health advisory for elderly people during lockdown which included a list of Do’s and Don’ts [42]. Among essential health services, the availability of drugs for chronic conditions faced logistic constraints during the nation-wide lockdown [43]. The measures presently taken by the government for the elderly during the lockdown were focused on financial security but mechanisms to ensure health service delivery to the elderly and chronically ill during the lockdown were needed. Thus, the equity-focus of the COVID-19 response was present in some areas such as food and shelter security for certain needy groups but missing in others such as health care access to chronically ill and elderly groups.

**Accountability:** To generate mechanisms for feedback, the Ministry of State for Personnel, Public Grievances and Pensions launched the ‘Feedback Call Centres on COVID-19 Public Grievances’ on 15th June 2020 to address the grievances filed between March to May 2020 [44]. Additionally, the Department of Administrative Reforms and Public Grievances (DARPG) in collaboration with Bharat Sanchar Nigam Limited (BSNL) operationalized feedback call centers in major cities with 1406 operators [44]. The MoHFW has also launched the ‘COVID India Seva portal’ for real-time grievance redressal on 21st April 2020 [45]. However, there were no dedicated public platforms to challenge the restrictions by directly approaching the concerned authorities. While the journalists were initially allowed to question the restrictions during press conferences, for televised press conferences, three out of twenty arbitrary questions would be chosen by the officials via a government WhatsApp group. The number of journalists attending subsequent press conferences was restricted to involve only PIB- accredited journalists from 2nd April 2020 [46]. During the lockdown, aggrieved parties were allowed to file an appeal against the adjudicating authority’s order before the appellate authority within three months from the date of the order under Section 107(1) of the Central Goods and Services Tax (CGST) Act (2017). On 23rd March 2020, the Honorable Supreme Court of India invoked Articles 142 and 141 to extend the limitation period of all appeals with effect from 15th March 2020 until further orders, due to the difficulties faced by the complainants in filing appeals during the lockdown [47]. The Court issued a Standard Operating Procedure on 15th April 2020 for filing and listing of urgent matters and conducting hearings through video conferences [48]. Though video conferencing would ensure the continued functioning of the judicial system during the lockdown, there were no norms as to what constituted ‘urgent matters’ and only a handful of advocates were beneficiaries of the virtual court system, which led to few cases successfully getting listed for a virtual court hearing. This led to delayed judgments even for urgent cases, such as the one filed on 17th April 2020 for the return of migrant workers back to their hometowns [49]. Mechanisms for demanding reparations due to loss of lives and livelihoods and violation of fundamental rights due to lockdown restrictions were lacking [50,51]. However, public interest litigations (PILs) were seen taking up these issues [50,51]. While India’s COVID-19 response ensured measures to affect public grievances and feedback, laws for filing appeals during the lockdown, and a fairly uninterrupted judiciary system, it lacked an efficient platform to challenge the restrictions and mechanisms to demand reparations due to loss of lives and livelihoods as a consequence of the lockdown thereby portraying a limited scope for accountability.

**Cost and Feasibility:** Lockdown implementation was made possible under Section 6(2)(i) of the Disaster Management Act (2005) that authorizes the National Disaster Management Authority (NDMA) headed by the Prime Minister to take steps for “the prevention of disaster, or the
mitigation, or preparedness and capacity building for dealing with the threatening disaster situation or disaster as it may consider necessary”. Section 38 [52] of the Act mandates states to follow NDMA’s directions. On the ground, the Central Armed Police Force (CAPF) were deployed to guard containment zones and ensure people maintain quarantine [53]. The State Governments set-up isolation wards in government-run hospitals, nodal centers, and some private hospitals for COVID-19 positive and symptomatic patients. On 8th April 2020, the Indian Railways converted 5000 train coaches to quarantine/isolation facilities [54]. For international travelers and asymptomatic individuals, hotels and schools were used for 14-days quarantine with permits for home-quarantine. However, home-quarantine and isolation faced challenges in high-density regions due to cramped living conditions [55]. The legal measures and disciplinary systems put in place to enforce the lockdown and the state governments’ resource utilization in the form of a police force and facility scale up to ensure compliance to restrictions sufficed the cost and feasibility considerations.
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Supplementary Tables

**Supplementary Table 1**: Relief measures by GoI during the lockdown corresponding to the policy indicators under the reciprocity principle.

<table>
<thead>
<tr>
<th>I. General Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 26th March 2020- The Finance Minister announced an Indian Rupee (INR) 1.70 trillion relief package under the Pradhan Mantri Garib Kalyan Yojana (PMGKY) for the poor [56].</td>
</tr>
<tr>
<td>2. 9th April 2020- GoI sanctioned INR 150 billion for India COVID-19 emergency response and health system preparedness package [57].</td>
</tr>
<tr>
<td>3. 15th May 2020- GoI and the World Bank signed a United States Dollar (USD) 750 million of the proposed USD 1 billion for accelerating India’s COVID-19 Social Protection Response Programme to support India’s efforts at providing social assistance to the poor and vulnerable households, severely impacted by the COVID-19 pandemic [58].</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>II. Employment-related measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Food-related</td>
</tr>
<tr>
<td>A. 31st March 2020- Army Wives Welfare Association (AWWA) provided 3700 food packets to the needy in Delhi [59].</td>
</tr>
<tr>
<td>B. 20th May 2020- Cabinet approved Atma Nirbhar Bharat Abhiyaan package to allocate foodgrains to the migrant workers and stranded migrants [60].</td>
</tr>
<tr>
<td>C. Starting 28th March 2020, the Indian Railways distributed 140,000 cooked meals to the needy during the lockdown [61].</td>
</tr>
<tr>
<td>2. Healthcare-related</td>
</tr>
<tr>
<td>A. 29th March 2020- PMGKY package was announced to provide an insurance cover of INR 5 million for 90 days to about 2.2 million public healthcare providers, including community health workers, who were at high risk for COVID-19 infection. It also included compensation for accidental loss of life on account of contracting COVID-19 [62].</td>
</tr>
<tr>
<td>3. Migrant worker related</td>
</tr>
<tr>
<td>A. 1st April 2020- Around 21,500 relief camps were set up for migrant workers. More than 0.675 million people were provided shelter, and around 2.5 million were provided meals [63].</td>
</tr>
<tr>
<td>B. 16th May 2020- Free food grains were distributed to 80 million migrant laborers and their families under the Atma Nirbhar Bharat Abhiyaan [64].</td>
</tr>
<tr>
<td>4. Direct Benefit Transfers related</td>
</tr>
</tbody>
</table>
| A. 31st March 2020- Ministry of Rural Development released INR 44.31 billion to States/Union Territories (UTs) towards Mahatma Gandhi National Rural Employment
Guarantee Scheme (MG-NREGS) wages & material arrears. The government hiked MG-NREGS wages in the wake of the COVID-19 pandemic, an average national increase of INR 202 per person focused on benefiting small marginal farmers, SC, ST, women-headed, and other poor households [56,65,66].

B. 30th March 2020- The government extended the benefit of 2% interest subvention to banks and 3% prompt repayment incentive to all farmers up to 31st May 2020 for crop loans up to INR 300,000 given by banks between 1st March and 31st May 2020 [67].

C. 2nd April 2020- The Ministry of Rural Development released the lump sum amounts at INR 500 per woman to Pradhan Mantri Jan-Dhan Yojana (PMJDY) account holders, and the same has been credited to the designated accounts of individual banks on 2nd April 2020 [68].

D. 13th April 2020- INR 0.17 trillion were released under Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Scheme to 83.1 million farmer families [69].

E. 18th April 2020- Compensation of INR 1 million was given to all postal employees succumbing to the disease while on duty [70].

F. 19th April 2020- More than INR 0.36 trillion transferred by using Direct Benefit Transfer (DBT) through Public Financial Management System (PFMS) in the bank accounts of 0.16 billion beneficiaries during COVID 2019 lockdown [71].

G. 20th April 2020- INR 4.8 billion disbursed to 40,826 members by exempted Provident Fund (PF) trusts under PMGKY [72].

H. 28th April 2020- INR 5 million compensation was declared for the port employees and workers in case of loss of life due to COVID-19 [73].

I. 16th May 2020- Union Power Ministry extended INR 0.9 trillion package under Atma Nirbhar Bharat Abhiyaan to assist stressed electricity distribution companies (DISCOMs) [74].

J. 21st May 2020- 68 million free liquefied petroleum gas (LPG) cylinders were distributed among the Pradhan Mantri Ujjwala Yojana (PMUY) beneficiaries so far [75].

K. Collateral-free loans of up to INR 200,000 were provided for 630,000 Self-help groups (SHGs) that helped 70 million households [76,77].

L. State governments were directed to use the welfare fund for assisting unorganized construction workers. The District Mineral Fund, worth about INR 0.31 trillion, was used to help construction workers who are facing economic disruption due to the lockdown [66,77,78].

M. 5th May 2020- Employees’ Provident Fund Organisation (EPFO) released INR 7.64 billion to its pensioners [79].

III. Economic stimulus measures

1. 27th March 2020- Reserve Bank of India (RBI) Governor cut the repurchasing option (repo) rate by 75 basis points to 4.4% and lending institutions were permitted to allow a 3-month moratorium on all payments of loan installments as of 1st March 2020 to boost economic growth and mitigate the impact of the lockdown [77,80,81].

2. 17th April 2020- The reverse repo rate was reduced from 4.0% to 3.75% to preserve financial stability by the Ministry of Finance [82].
IV. Tax and loan payment concessions

1. All lending institutions were permitted to allow a moratorium of three months on repayment of installments for term loans outstanding as of 1\textsuperscript{st} March 2020 [77,80].
2. The income tax return deadline for the 2018-2019 tax year was postponed to 30\textsuperscript{th} June 2020 from 31\textsuperscript{st} March 2020 [83].
3. The rate of interest was reduced for certain tax payments made by 30\textsuperscript{th} June 2020 and late-filing penalties were waived off [83].
4. Deadlines for filing of goods and services tax (GST) returns and related payments of GST were postponed [83].
5. The extension of the date for certain tax procedural actions was postponed to 30\textsuperscript{th} June 2020 [83].
6. A new tax dispute resolution scheme was introduced that allowed for subsidizing tax disputes at a reduced rate if the taxpayer settles before the fiscal year ends on 31\textsuperscript{st} March 2020 [84].
7. To provide immediate relief, the government directed to instantly issue all the unfinished income-tax refunds of up to INR 0.5 million [77,81,85].
**Supplementary Table 2:** Food and shelter security measures by the GoI during the lockdown corresponding to the policy indicators under the equity principle.

<table>
<thead>
<tr>
<th>I. Migrant workers and pilgrims</th>
</tr>
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<tbody>
<tr>
<td>1. The Ministry of Home Affairs (MHA) [86] approved the states to use the State Disaster Response Fund to line up relief camps and supply food and shelter to traveling pilgrims and migrant workers.</td>
</tr>
<tr>
<td>2. Provision of free foodgrains was announced for 80 million migrant workers and their families who did not have ration cards, for two months.</td>
</tr>
<tr>
<td>3. The ‘One Nation One Ration card’ policy was enforced to allow access to ration from any Fair Price Shop (FPS) in India [87]. Before the implementation of this policy, ration cardholders could buy foodgrains only from the assigned neighborhood FPS.</td>
</tr>
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<tr>
<th>II. Below Poverty line (BPL)</th>
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<tbody>
<tr>
<td>1. GoI directed states and union territories to ensure adequate arrangements of temporary shelters, provision of food, etc. for people in the BPL group stranded due to lockdown [40].</td>
</tr>
</tbody>
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<table>
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<tr>
<th>III. Homeless/Beggars and Destitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Ministry of Social Justice and Empowerment directed municipal corporations across 10 cities- Bengaluru, Chennai, Delhi, Hyderabad, Indore, Kolkata, Lucknow, Mumbai, Nagpur, and Patna to run feeding centers for beggars, homeless, and destitute till 15\textsuperscript{th} April 2020 [40].</td>
</tr>
<tr>
<td>2. The Ministry of Housing and Urban Affairs directed all states and union territories to provide three meals a day to all homeless persons living in shelters constructed under the scheme - Shelters for the Urban Homeless under the National Urban Livelihoods Mission [40].</td>
</tr>
<tr>
<td>3. The state governments additionally took steps to provide food and shelter to the BPL people [40].</td>
</tr>
</tbody>
</table>
Supplementary Figures

[Insert Supplementary Figure 1 here]

**Supplementary Figure 1:** Timeline of the movement restrictive Indian policies leading up to the national lockdown (most restrictive measure).