# The OPERATIONAL LOOPS of a PANDEMIC

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***Abstract*** **This article analyzes the visual operations of contagions and their material aftereffects. Data visualizations and diagrams have played a key role in the visual culture of the contagion, and this article explores especially two recurring themes: curves and simulations. The article addresses the data diagrams that describe and predict, advise and control actions during the pandemic. The authors argue that these curves and simulations are also crucial epistemic and aesthetic occurrences that produce the long tale of the epidemic as it pertains to a variety of actions from policy making to affective responses. Furthermore, the text investigates the theme of the operational loop to help us grasp statistical curves and simulations as part of a multiscalar logic of the epidemic image and to discuss the temporal modalities of these various images and diagrams. The article also includes David Benqué's speculative diagrams of contagion loops that present an artistic response to the theoretical theme.**

***Keywords*** **viral, contagion, media theory, diagram, COVID-19, simulation, curve, loop**

The recent encounters with planetary-scale contagions demonstrate just how entangled an epidemic is with the culture and politics of images. Although often couched in mainly biotic terms, epidemics or pandemics are not biologically compartmentalized, nor are they effects felt solely in biological registers; they involve complex, material, symbiotic foldings and unfoldings entangled with all aspects of societal, cultural, and sensible life, including visual representations, diagrams, and the power to produce and distribute them with differing aims. Hence, to understand the materiality of an

*Cultural Politics*, Volume 17, Issue 1, © 2021 Duke University Press
DOI: 10.1215/17432197-8797529

epidemic we have to pinpoint how biological factors become deeply entangled with, and assigned to, the "air, water, locales, life, work, nutrition, ethos, all conjoined to political questions" (Pias 2011: 44). These entanglements have been evident since *Corpus Hippocraticum* and continue to be apparent in the current context of complex globalized interactions, functioning across a multitude of scales. Indeed, since the mid-nineteenth century such entanglements can be seen in modern statistically fueled forms of epidemic modeling of modern urban and globalized societies. Along these lines, then, the experiences of COVID-19 seem to loop and twist between the invisible, insensible, and simulated, as well as the visible, sensible, and affirmed. While the viral agent and its impact, actual or projected, is often concretized in an image—a media representation, a scientific diagram, a data visualization, or a statistical graphic—it is only in recurring loops of operationality where such images begin to resonate with meaning, even if that meaning itself might be rapidly changing based on context and situation.

Consider the video montage *Transscalar Architecture of Covid-19* by Andrés Jaque and Ivan Munuera (2020). In their visual essay, a series of images define the spatial and visual politics of the recent pandemic. The fast-paced montage moves through scientific imaging, medical facilities, quarantine sites, makeshift hospital tents, masked faces, and much more. The aim is to offer a visual angle to "entanglement, cooperation, inventiveness, engagement, and emerging forms of togetherness." The video also shows the multiscalar loops that define the mediated logic of how an eclectic mix of different situations are serialized both as representations and as operative agents. These loops have particular effects in the material situations they act in, and they speak to, as Shannon Mattern (2020) points out, the trans-scalar logic of the epidemic:

> A particle merely 125nm in diameter, far below the "naked" eye's threshold for perception, has managed to render itself—or, rather, its effects—visible on bodies, in cities, across continents. Lungs, skin, streets, and atmospheric particulates manifest its transformative presence, as do electron microscopes, CT scanners, thermal guns, and satellite images. Medical illustrators wield 3D modeling software to style a COVID-19 "avatar" that will facilitate its public recognition. Maps, network diagrams, and QR codes ostensibly track its spread, while masks and walls and closed borders seek to impede its transmission. Biocontainment suits, biological hoods, and isolation tents create physical separation, but allow for visual access, between the infected and the hygienic.

In other words, viral particles reformat bodies, space, and cities in ways that are only partly captured as visible, even if what is captured is approached as an image. At least since John Snow's 1854 cartographic representation of cholera cases in London, demonstrating how contagion was clustered around drinking wells (Pias 2011: 44–45), diagrams have held a special place in understanding the spatial distribution of statistical patterns of disease spread. Furthermore, in addition to what historians of science have referred to as the "avalanche of printed numbers" (Hacking 1982) of statistics about populations, we can also refer to the imagery of waves (Jones and Helmreich 2020), curves, loops, and other visuals that become the later axis of image-mathematics of population-level operations.

We contend that the variety of scientific and policy practices that mobilize images become central to how subsequent actions and their possible futures get justified. For example, during the COVID-19 pandemic, calls to "flatten the curve" can be seen as one of a number of recurring themes that are repeated across multiple media platforms, via expert conferences and political briefings. These themes occur alongside data visualizations captured in statistical curves, graphs, or scientific animations. In addition to these visualizations, further examples of images—scientific and other—circulate in ways that also tell a revealing story about what we might call the contagion of contagion: in other words, the loops through which facts and fictions, hypothesis and statements, assumptions and guidance are cascaded, amplified, nullified, affirmed, and reaffirmed in ways that can have multiple political contexts, directions, and ideological resonances that are often, to say the least, contradictory.

In our text, we will further explore the spatiotemporal potentials of loops and twists by focusing on two recurring visuals of the epidemic: curves and simulations. As follows, we will address the data diagrams that describe and predict, advise and control actions during the pandemic. We argue that these curves and simulations are also crucial epistemic and aesthetic occurrences that produce the long tale of the epidemic as it pertains to a variety of actions from policy making to affective responses. While scientific visualizations and animations of the "spiky blob" and its designed brand color schemes (Giaimo 2020) have become one face for the biological invisibility of the viral agent of coronavirus, the epistemic function of such images is limited, in comparison to the way simulations offer ways to see the coronavirus as it unfolds across time, across space, across bodies.

Nonetheless, our focus on curves and models is, we contend, not enough. Our work here requires us to further explore the loops that enable the visual productions of an epidemic. To help us understand these ways of seeing image production, we will refer to a term used in the artistic work of Harun Farocki (2004: 17): *operational images*. In short, Farocki's images "do not represent an object, but rather are part of an operation" (17). In this context, and later employment of the term by Trevor Paglen (2014) and other visual artists and writers, *operational images* comes to refer to various automated systems that play a part in the production of images. Examples include the productions of facial recognition software and other machine vision technologies. However, we want to emphasize that operational images are not merely a designed part of a technical system. Instead, operational images are here treated as nonrepresentational productions that offer us a way of describing how a variety of diagrams, models, and simulations become incorporated in the potential becoming of agents in wide-scale institutional and policy situations. So, for example, a graph, a curve, a mathematical statistic, or other visual information that surfaces during a pandemic can act as a kind of residual expression of institutional power, belonging to a process involving a variety of other image productions, outside representational orders. This point also resonates with recent arguments about the centrality of data visualization in meaning-making in the midst of the COVID-19 pandemic. We further note the potential for a variety of creative and subaltern practices that have emerged during this period (Bowe, Simmons, and Mattern 2020).

As well as linking operational images to institutional power, we also focus on a relation between the data diagrams of curves and simulation (models) to operational contagion loops. We do this for at least two reasons. On one hand, then, operational loops help us grasp statistical curves and simulations as part of a multiscalar logics of the epidemic image. Loops can be considered as operational in the sense that multiple replays of a simulated epidemic coil around the invisibility and visibility of the pandemic. Which is to say, considered as loops, operational images allow us to comprehend the folds and thresholds between opaque data processing methods and data visuality (Mackenzie and Munster 2019). As follows, operational contagion loops bring into relation the inside and outside, visual and "invisual," including the impossibility of experiencing the entire visual field and the very real personal experiences with lockdown or the symptoms of the virus.

On the other hand, operational loops have significant temporal modalities. Like this, they can be used to think through the political and ethical temporality of scientific modeling, which has been similarly described as a ghostly potential or weird "gap" between the "future and future predictions" (Chun 2011: 107). Using the operational loop, we can further conceptualize the rerunning of tens of thousands of epidemic simulations in terms of a kind of "eternal recurrence" (Deleuze 1986: 23). Herein the folds between the probability of recurring invisual dice throws and the unfolding affirmations that are returned are also the points at which cultural, political, and ethical considerations intersect with Wendy Hui Kyong Chun's (2011) ghostly potentials. This is where policy actions take hold of preferred versions of the modeling process in ways that feed back into the world of infections. For example, we have seen how many governments seized on less cautious readings of a curve in their attempts to restart economic activities only to see further spikes of infection reoccur. In this way the operational image becomes a radically dynamic part of such probabilities, justifications, and future making.

Evidently, epidemic simulations are epistemic operations fueled by media techniques ranging from statistics to cartography to machine learning. They function alongside the various visual forms they become temporarily fixed to, like the curve. But such images also provide a "description of society" that asks serious questions for "government, control and power" (Pias 2011: 49). Hence the question is: how do diagrams present a description of society in ways that representational images do not? To some extent, then, we can assess these descriptions using familiar tools from the study of visual culture, including analysis of those technical images common to scientific and medical practices. Nonetheless, while visual cultures play a general role in this description, we argue that it is the operational loops of contagion modeling that occupy a specific place in a mode of such visual, albeit scientific, articulation of the statistical existence of an epidemic.

Before we begin to further explore operational images, we note that our text is accompanied by designer David Benqué's (n.d.) visual response: diagrams of contagion loops that present an artistic response to the theoretical theme (fig. 1). These experimental, speculative diagrams (Marenko and Benqué 2019) are visual articulations drawing on the operational power of the curve, the wave, and the model, but they also test the possibilities of the diagram format as it pertains to prediction as well as express how such diagrams bring aesthetic and epistemic registers together. Benqué's work also

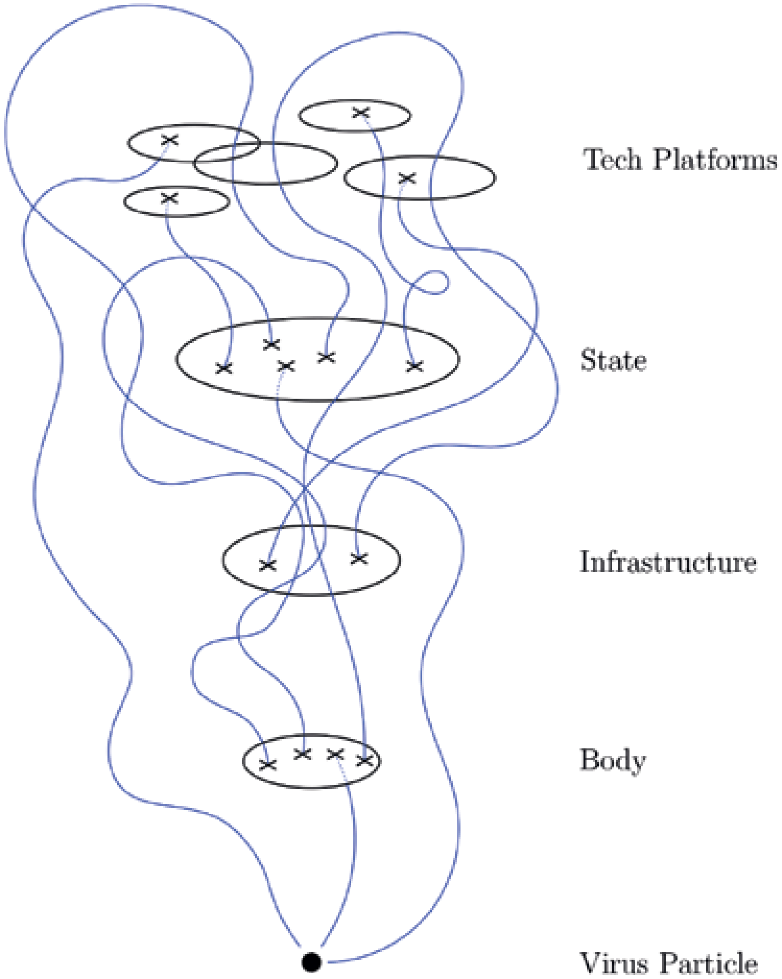

**Figure 1** Scalar relations produced by the SARS-CoV-2 virus. Inspired by Jaque and Munuera's *Transcalar Architecture of Covid-19* (2020). Image by David Benqué.

contributes to the recent calls for critical data visualization practices, a countermapping of subject positions (Bowe, Simmons, and Mattern 2020) in relation to the data-driven discourses concerning epidemics, populations, and how they loop in spatial and temporal terms.

### *The Curve*

The COVID-19 crisis has yielded many complex productions of images that propagate according to the accidental logic of the viral event itself. As rolling news coverage of the pandemic has demonstrated, the epidemic curve is the main go-to graphic that enables audiences to get a sense of the magnitude and frequency of new cases of the disease as it initially spreads from location to location over time. Like its earlier incarnation, the epidemic wave, the mathematical curve of epidemiology occupies a descriptive history of disease mapping. As David S. Jones and Stefan Helmreich (2020) propose, these epidemic images date back to the metaphors deployed by writers working for the "vast British imperial machine." These metaphors would often describe epidemics that were "inflicted on colonized populations as organic events" for which colonial powers had no responsibility. Indeed, the metaphor of the wave and the curve reappears from time to time as a representation of viral events that are out of control. Daryl Cagle's cartoon, "Coronavirus Tsunami," for example, depicts Donald Trump standing under the crest of a huge wave and saying, "We have it totally under control" (Jones and Helmreich 2020). Nonetheless, we contend that the mathematical curve exceeds its metaphorical appearances and can further be regarded in terms of a crossing from nonrepresentational zones of epidemic image production to the representational orders in which human perception registers the visuality of the pandemic. In other words, the curve is an image that is not simply visible or invisible but has constitutive operations and an infrastructure as well as visuality.

Reflecting on the curve as an operational loop requires us to reconsider the historical analysis of visual cultures such an image would normally be located in. This is because the simulated production of epidemiological curves detaches itself from both literary metaphors of an earlier colonial period and a history of image-making processes relating only to photography, cinema, and other technical procedures and stories of visual media. Instead, as part of the history of quantitative graphics, curves feature as the core part of data visualization as it pertains to an especially modern form of description of periodicity and tendency—both hypothetical curves and ones based on actual data (Beniger and Robyn 1978). Besides drawing population-level hypotheses and graphs, curves therefore tap into a variety of scales. To generalize, the curve is one part of the history of lines that have an epistemic value outside visual culture. This is well demonstrated by Henning Schmidgen's (2014) account of the Helmholtz curve in which, for example, the line becomes a graphical reference point for a particularly modern physio-technics, measuring the living dynamic body. Hermann von Helmholtz's instruments of experimental physiology involving blood circulation, respiration, and other movements of the body become inscribed on paper as periodic curves for analysis. Indeed, from the 1850s to 1880s, the curve becomes established as a foremost visual reference point for epistemic analysis, including, for example, Étienne-Jules Marey's motion studies.

Jones and Helmreich (2020) have charted the arrival of a mathematical curve that becomes a fundamental tool of epidemiology shortly before the devastating influenza of 1918–19. In 1915, Ronald Ross published an article in the *British Medical Journal* wherein he modeled a "Curve of New Cases" according to the number of births and deaths in a population alongside infection and recovery rates. In the late 1920s, mathematical epidemiology based on Ross's work was developed to try to understand why epidemic curves eventually begin to decline, leading to early theories of herd immunity. Importantly, Ogilvy Kermack and A. G. McKendrick produced a highly influential compartmental model in the late 1920s based on a now familiar equation comparing individuals as either susceptible to infection (S), infected (I), or recovered from infection (R). As Jones and Helmreich argue, what was once considered a description of an epidemic was now becoming a predictive tool, since the introduction of a calculated curve responded to certain parameters designed to reduce transmission rates. Along these lines, Kermack and McKendrick provided a "mathematical structure for the epidemic waves that previous scholars had fastened upon" (Jones and Helmreich 2020).

The British empire had developed its own global network of sites of research, which allowed both geographical comparison between different climatic regimes and awareness of alternative sorts of contexts of disease and contagion. This global network also included the increasing use of quantitative methods in analysis of environmental conditions in populations (Benson 2020: 48–77). In many ways, then, Kermack and McKendrick's calculated curve formalized in mathematical terms the earlier colonial metaphors of the epidemic wave described above. It is, indeed, important to note that the cultural politics of these predictive SIR curves were still very much coupled to the colonial imperialism from which the initial wave metaphors sprung. For example, in "A Contribution to the Mathematical Theory of Epidemics" published in 1927, Kermack and McKendrick draw on data they acquired while working as mathematicians for the Indian Medical Service, based at the Pasteur Institute at Kasauli (in the Punjab). Indeed, to quote Jones and Helmreich's apt summary of the emergence of an influential calculated curve:

> Armed with these equations and estimates of the parameters, [Kermack and McKendrick] tested them on data from an outbreak of plague that struck the island of Bombay from December 1905 until July 1906, a classic rise and fall over thirty weeks. This was a complicated case, involving the movement of the pathogen among rats, fleas, and humans, something that required assumptions about susceptibility and transmission. [Kermack and McKendrick] worried that these assumptions would compromise their analyses, yet they achieved good results, with the "calculated curve" approximating the observed data.

The predictive powers of the calculated curve are both aesthetic and epistemic, but they are also increasingly entangled with developing discursive formations of policy making. The curve harbors, as such, a potential insight into hypothetical future situations that are actioned in relation to current policy. The curved line produced thus maps onto population-level potentials as they become entangled with the biological virus, epidemiology, and political intervention. More specifically, then, the epidemic curve resulting from the COVID-19 outbreak in Wuhan, China, was a graphic representation of a rapid, steep spike in infections initially based on data from reported hospital admittances recorded in late 2019. Along these lines, the idea of flattening the curve refers to the cross-reading of rates of contagion with health-care capacity to ensure a population's exposure to the virus does not become stretched over time and therefore making the effects of the pandemic more manageable.

Like this, the management of a population's overall health becomes repeated in visual cultures of the pandemic. The curve crops up accordingly in PowerPoint presentations, public policy talks, online YouTube video guides, and other forms of public health communication, while also implying a relation to a range of further levels of population management in urban spaces (Mattern 2020). The curve also corresponds in this latest context to the availability (or lack) of personal protective equipment (PPE) and other safety measures that became of such crucial importance in the spring of 2020. Pointing out these contexts of the curve, we are again closely following the parallel argument by Jones and Helmreich (2020) about the epistemic rhetoric of the wave. For Jones and Helmreich, the visual representation of an epidemic has passed through (and overlapped) metaphorical description, mathematical prediction, and political prescription. As they put it, "Waves emerge first as a device of data visualization, then evolve into an object of mathematical modeling and causal investigation and finally morph into a tool of persuasion, intervention, and governance."

As an example of the contemporary effectiveness of the curve, we can draw attention to an article published in the *Economist* by the visual-data journalist Rosamund Pearce. Pearce writes that the flattening of the curve chart echoed the United States' (and surely many other countries') "pandemic preparedness training programs" of previous years (Roberts 2020). However, the increased level of media visibility it gained during the first few months of the pandemic meant that the curve became as iconic as some of the other images and memes of COVID-19, including, for example, images mocking Trump's suggestion to inject bleach.

Significantly, then, curves function across a range of visual registers, but they carry with them a particular operational quality too. The epidemiological curve is intimately associated with the production of simulation software, much of which is based on the calculated curves used in the early twentieth century. Indeed, it is this relation between calculated curve and modeling that further links the curve to instruments and operations of our loop concept. As follows, through its relation to simulation, the curve becomes attached to other dynamic histories, including those of biological viruses, and, as above, political decision making, but also quarantine and lockdown measures, financial and labor crises, and much more. As such, the curve persists as part of the operational loop of contagion, while also building on the temporal nature of simulations and models.

## *The Model*

What sets our analysis apart from Jones and Helmrich's thesis is the operational loops that produce data visualizations, predictions, and prescriptions. Indeed, in this context, we argue that epidemiological simulation modeling has become another crucial aspect in the visual production of the COVID-19 pandemic. Models are always to be taken as mediators in practice, in other words, as instruments that are useful only when in operation (Morrison and Morgan 1999).

The COVID-19 models produce curves and other insights that visualize large-scale patterns—including such possible patterns that have not yet taken place, and might not ever take place, even if they have a visual existence, for example, as a diagram. The productions are not simply the result of the epidemic itself but are instead the generation of multiple simulated reruns of epidemic events (potentially hundreds of thousands of them), leading to a multitude of possible futures as predicted by the compartmental SIR models in current mathematical epidemiology. What becomes visual does so because of the repetition of operations of mathematical calculations of various formulae, which estimate, for example, how the dependent variable of a susceptible population responds to independent variables of infection and recovery rates. We can think of these reruns as eternal returns or feedback loops. They are like a throw of an imperceptible dice as it unfolds as the numbering logic of a model; they offer the probability of certain changes to population flows having an influence on the future of the contagion. Importantly, these dice throws are not merely invisible calculations; they are multiple and entangled with cultural politics, since their application involves adjustments to biopolitical parameters of infected and removed bodies, intended to affect the variable of a suspectable population.

It would be interesting to follow the multiple histories of models and curves to show how they are placed in specific institutional situations and epistemological operations, but that is not the main intention of this short article. Instead, we want to argue that at the back of such scientifically and politically complex histories, including multiple elements of colonial medical science, we can also point at the role of complex causalities of loops as part of the contemporary form of operative imaging that emerges in such visual-mathematical contexts. To understand how these operational loops produce visualizations of possible futures, we need an effective set of tools that are neither satisfied with the blunt answer "it's all biopolitics" (Sarasin 2020) nor merely repeating the logic of representational orders and semiotic analysis. In place of the language of form with its own visual punctuation, representational orders, or the unraveling of symbolic meaning through signifying systems, operational loops twist in and out of the perceptible visual field of human experience. In short, SIR curves may well function as a spatial description, prediction, and prescription of an epidemic in the field of human perception, but its operational mode also has a temporal thickness that marks it out as what we might call a percipient event. In other words, this mode of imaging is radically temporalized to understand the image as it stretches across the compilation of data, as well as the political and epistemological dilemma of biased or bad datasets. It is this archiving and future-inhabiting function that is looped in the present, which is in itself complexified as a temporal pattern. As such, this idea also comes close to how Chun (2015: 678) describes models as hypo-real tools through which potential futures loop into the contemporary moment:

> This is especially important because, if models work properly as evidence, they become unverifiable: if we are convinced of their verisimilitude, we will act in such a way that their predicted results can never be corroborated by experience. Indeed, to wait for these models' calculations to be verified—for their accuracy to be proven—is to give up on the future by rewriting political problems as ones that science can (dis-)solve.

## *The Loop*

How can we conceive of the relation between models and curves? If we are to grasp the spatiotemporal shifts from invisuality to visuality and the ghostly potential to affirmation and justification, action and change, we need to explore some novel ways by which cultural production functions. This work would require us to not only analyze curves and models but also explore the loops that enable the operational productions of an epidemic. To this end, the conceptual tool bag of loops, including twists, foldings, unfoldings, and superfolds (set out below), is presented as one way to understand the operational modes of an image (fig. 2).

We can tentatively consider loops in a number of ways. Firstly, epidemiological

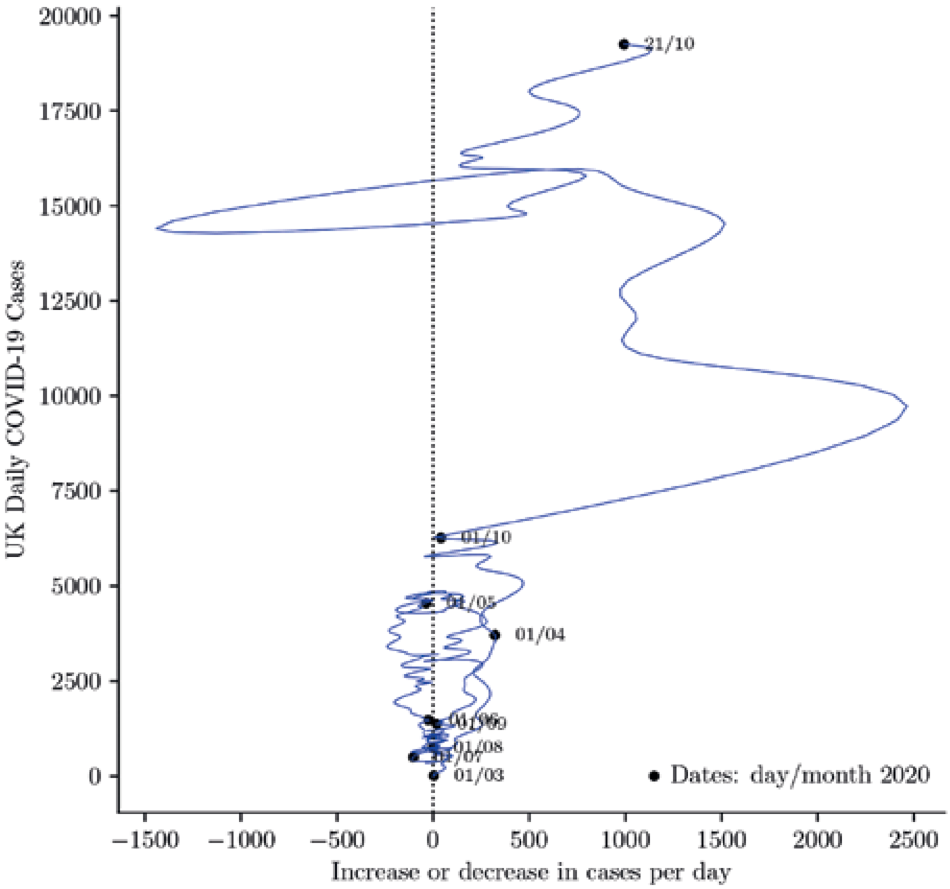

**Figure 2** "Phase portrait diagram" (visualisation method from Dorling 2020), showing daily number of COVID-19 cases and rate of change in the United Kingdom. Data from John Hopkins University, disease.sh API (accessed October 21, 2020). Image by David Benqué.

simulations have nested spatial and temporal modes of operation that run as loops, rerunning different scenarios that affect the visual production of the curve. From the outset, then, we need to grasp that the images of a pandemic have both a rich visual, but also temporal, viscosity. The production of these images of spreading phenomena has always been understood to be endemic, on one hand, meaning that the disease is, initially, in one location or contained in a certain community. From this initial location, the disease can, on the other hand, become an epidemic, since it is infecting new communities over time. Ultimately, then, the disease can go global, as is the case with the COVID-19 pandemic. The simulated production of a basic SIR curve is therefore always spatiotemporal. Along these lines, a statistical population's susceptibility is spatially grasped according to physical proximity and automatic social behaviors often referred to as habits or customs or imitations in the sense understood by Gabriel Tarde (1903). For example, a susceptible population will be affected by close contact, via social gatherings, shaking hands, kissing, sneezing, or sharing surfaces. This is also where the nonrepresentational status of affect and epidemiological modeling meet up (Thrift 2008: 230–31). Likewise, growth rates of an epidemic are very sensitive to changes in spatial parameters that can affect the probability of infection, so simulations might prompt the introduction of lockdown, quarantine, better hygiene measures in schools, changes to the number of locales frequently visited (e.g., supermarkets), surfaces touched (train doors), or restriction of people's movements between communities or countries. Nonetheless, ultimately, to calculate the potential recovery rate, the simulation has to calculate how many people will recover or die over time, so that they will no longer be infectious.

Second, simulated reruns are not deterministic throws of a dice that necessarily fix the unfolding of an epidemic. As follows, dynamic loops can be thought of as the unfolding of complications in computer simulations of epidemiological phenomena (Pias 2011: 46). These complications can produce highly sensitive perturbations in the loops. So, for example, in cases in which simulations rerun a program of test and quarantine, humans who slip through the testing process can affect the simulation outcome more so than those that are tested. Likewise, in cases of social distancing, a small percentage of people who cheat the rules can make a big difference to the infection rate. Significantly, these sociopolitical large-scale (population-affecting) interventions and human interactions with a simulation's reruns are only the dice that is thrown, not the affirmation of the dice that returns!

Third, the operational loops of contagion are changing. In contrast to the standard SIR models, which have had their own interactions with the worlds and policies of a pandemic (Jones and Helmreich 2020), there have been moves in epidemiology to use so-called loop analysis (Dinno 2007). In short, this kind of analysis "describes human experiences and environmental phenomena as a dynamic system, where each system variable directly or indirectly influences and is influenced by every other system variable" (2043). In loop analysis there is clearly some effort to put humans back "in the loop" of the epidemic so as to steer or intervene in hundreds of thousands of reruns. In this sense, then, software enables further entanglements with humans who play some extended role in the many ways the dice is thrown. Again, here we can evoke Tarde's microsociology of imitation and note how these entanglements seem to bring together every part or monad into a capricious and contagious material relation to each other.

Finally, it would seem that the visuality of the epidemiological curve helps us make sense of the accidents and chaos of a pandemic. But we need to be careful with how we grasp what kind of chaos this is and not mistake complexity with a lack of logic or organization. Despite the unfolding complications of a loop, clearly, the modeling of an epidemic, and the descriptive rendering of an infection rate as a curve, have nothing to do with a nihilist abandonment to chaos. On the contrary, these operational loops are a throw of the dice that affirms the capricious result of the throw itself. In other words, the curve is the subjugation of the becoming of the simulated rerun as such—an outcome that will affect a population by way of the political decisions and the futures it is supposed to inform. We therefore live in the consequences of the dice throw, or the "eternal recurrence" (Deleuze 1986: 26–27). This is one way of also describing the temporal stretch of time of an epidemic that is both a material and modeled unfolding. In other words, there is a specific time to an epidemic and its epistemic double. As follows, loops assign a decisive role to matter that is distributed across the various agents and agencies of a city, of a population, of a territory. These unfoldings of an epidemic event are, like the *Transscalar Architecture of Covid-19*, a compilation of image sequences, for example, shown to be germane to the event of the virus.

With every rerun, loops couple together the "transmittance of persons with the transmission of diseases" (Pias 2011: 48). What a theory of operational loops therefore considers is the ways in which these knowledges and descriptions of an epidemic are rendered in the becoming of the epidemic image. This is a dynamic site that also images its own epistemic conditions: not only the model, but the material site which is included in the image that feeds into the loop of the modeling, the curve, the various diagrammatic operations. Which is to say, through invisuality, chance, probability, and simulated reruns, the epidemic becomes a sensible affirmation (the being of becoming). This affirmation is arguably where the cultural politics of the operational loop becomes its most intense. In other words, as Alexander Campollo (2020) similarly contends, as the images produced by these models begin to circulate, "their parameters, assumptions, and underlying uncertainty may be concealed or even naturalized." In this way, simulations "may look more and more like observational records" (Campollo 2020). One problem here is that while our attention is driven toward the desire to "flatten the curve," we miss the opportunity to "critically assess" what is "*behind* or *under* the curve" (Bowe, Simmons, and Mattern 2020). This lack of criticality has prompted some artists, designers, data scientists, and public health officials to plot their own counter "curves and charts and maps" of the pandemic (Bowe, Simmons, and Mattern 2020). The affirmation of the operational loop is, nonetheless, more than a mere observation that can be grasped visually or indeed concealed in an ideological black box. It is an affirmation that acts on bodies and in turn prompts bodies to perform acts, all of which occur through ongoing spatiotemporal loops.

In conclusion, then, it is the consequences of living with this sensible affirmation or subjugation of becoming that may determine where we will all be after the lockdown. What's certain is that questions of public health as they are represented in statistical graphs and models cannot—or should not—be reduced to mortality rates only, especially ones that are based on the low-resolution focus of a nation-state. A multitude of other factors of material well-being of bodies—from mental health to questions of racialization in and through the pandemic—have to be taken into account. But these are not as easily included in the policy tools of mortality stats and curves. A different set of loops and discussions are also needed.

## Acknowledgments

The research for this article has been supported by the Czech Science Foundation, project 19-26865X, "Operational Images and Visual Culture: Media Archaeological Investigations."

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## *Filmography*

*Transscalar Architecture of Covid-19*. Directed by Andrés Jaque and Ivan Munuera. April 20. YouTube video, 14:08 min. www.youtube.com/watch?v=AD6khyFbBcQ.

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