Pandemic-proof cities

Creating resilient healthcare systems to prevent, prepare for and respond to future health shocks

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Pandemic-proof cities: creating resilient healthcare systems to prevent, prepare for and respond to future health shocks

Key takeaways

1. An effective response to emerging and endemic infectious disease lies in creating and maintaining a resilient public health-care system.
2. Building such a system on the scale of a city or city-region necessitates that all of the key actors come together in 'peacetime' to design and rehearse an integrated, multi-partner response to emerging infections that can be activated during 'wartime'.
3. Resilience planning requires the participation of community representatives as well as healthcare experts, to explore ways of integrating the unique knowledge possessed by each set of actors.
4. Regular stress-testing and updating of resilience plans is essential. This can be carried out by running simulation exercises at a sub-national level and encouraging the sharing of knowledge between cities and city-regions.
5. Local resilience plans should be benchmarked against international good practice, for example through the use of a resilience index consisting of key indicators.

1. The challenge of infectious disease threats

The COVID-19 pandemic has resulted in at least 7.7 million reported deaths and 18.6 million estimated deaths worldwide, of which the UK accounts for some 228,000 deaths or 340 deaths per 100,000 head of population (IHME, 2023; UK Coronavirus Dashboard, 2023). Whilst officially the crisis is over – on 5 May 2023 the World Health Organisation (WHO) declared "with great hope" an end to the public health emergency – it is clear that the socio-economic shocks from this pandemic will continue to reverberate around the world for many years to come. COVID-19 has been described as "both a profound tragedy and a massive global failure [to prepare and respond] at multiple levels" (Sachs *et al.,* 2022).

According to Dr Tedros Adhanom Ghebreyesus, WHO Director-General, the pandemic has **"exposed political fault lines, within and between nations … [and]** *eroded trust between people,*

governments and institutions, fuelled by a torrent of mis- and disinformation." The critical policy challenge is to learn from these failings so as to forestall the next pandemic.

This is more easily said than done, not least because preventing, preparing for, and responding to epidemics and pandemics is costly. Thus, the UK Government is estimated to have spent between £310 billion and £410 billion on public health measures during COVID-19, equivalent to between £4,600 and £6,100 per head of population (House of Commons, 2023). Globally the cost of this pandemic is estimated to be between £6.6 trillion and £12.9 trillion (WHO, 2020). Alongside the eye-watering costs, there is a pervasive sense of (post-) pandemic fatigue that blunts our willingness to mobilise now against what is undoubtedly coming – 'Disease X', an as-yet unknown infectious disease with epidemic potential, or perhaps a re-emerging pathogen (see WHO, 2022). In an era of polycrisis where

there are numerous important issues lining up to be addressed – wars, famine, repression, modern slavery, migration, climate change – which of these should governments prioritise?

It is natural to feel overwhelmed but that does not mean that doing nothing is an option. Outbreaks of novel viruses have occurred on an irregular basis over the past 100 years but disease spillovers from animals to human populations, accounting for about 60% of infectious diseases of humans, have been increasing in frequency since the early 1990's (e.g., Bernstein *et al.,* 2022). Hence, the threat from infectious disease is increasing not diminishing. In such a situation we have to choose optimism and hope; action over inaction. It is an established principle that prevention is better than cure, and on that basis the cost of 'pandemic-proofing' our society through measures such as better surveillance of pathogens, reducing deforestation and improving our management of the wildlife trade, is estimated to be less than 5% of the cost of lives lost to infectious diseases each year, and less than 10% of the economic costs of another pandemic (Bernstein *et al.*, 2022).

Alongside these primary prevention measures there is a need for secondary measures to make our towns and cities more resilient to emerging infections and pandemic threats. Resilience can be achieved through appropriate investments in preparedness for future health crises, to build strong public health-care systems grounded in principles of human rights and equality for all. But how should we go about doing this? And importantly, how will we know when we've arrived at our destination?

2. Building resilience in local and regional health systems

As we have seen during the COVID-19 emergency, the first line of defence against a pandemic is an effective health system – one that though essentially static (that is, designed principally to meet every-day health and social care needs) can maintain its core functions and respond in dynamic fashion when subjected to health shocks. Responses, including testing, contact-tracing and treatment, need to be scalable: a major management challenge. We know that health shocks can be sudden, as when the spread of an infectious disease accelerates rapidly to become an epidemic, or slow-moving – for example, when antimicrobial resistance starts to place limits on choices for infection control. If a health system is not to collapse when faced with such shocks, it needs to have resilience built in from the outset. Thus, the key characteristics of a resilient public health system are that it should (after Kruk *et al.,* 2017):

1) be aware of its own strengths and weaknesses;
2) be conscious of external threats (fast or slow-moving);
3) be able to respond to a range of health and social care needs;
4) be able to draw upon necessary expertise from outside itself;
5) be integrated across different functions; and
6) be adaptive (agile), e.g., able to call upon surge capacity as the situation requires.

Experience tells us that these qualities do not arise spontaneously but require exhaustive design, planning and testing (in advance of, not during a crisis), and ongoing cultivation. This in turn requires a skilled and committed health-care

workforce, sustained investment in public health infrastructure and strong health leadership at national, regional and local level. These things do not come cheaply but as noted above, taking preventative action now will be many hundreds of times less expensive – in both human and economic terms – than allowing another pandemic to rip through the UK population in the next few years.

At the heart of a resilient health system is its workforce and the diverse communities it serves. This workforce, whether in hospitals or community settings, needs to be thoroughly trained, well paid, well supported and equipped with appropriate personal protective equipment (recalling that the lack of stockpiled, usable PPE was a major gap in the UK's preparedness for COVID-19). Community groups including local civil society organisations and faith-based groups must be encouraged and given appropriate agency to contribute in a meaningful way to health-care system strengthening initiatives, for example by employing community champions to support local vaccination campaigns. This is something that will pay dividends not simply during a major health emergency such as a pandemic, but also help to reduce health inequalities in 'peacetime'. Equitable access to high quality care must lie at the heart of our preparedness for the next pandemic.

3. Next steps for UK cities

It is logical to argue that the goal of pandemic-proofing the UK's cities cannot be realised through a conventional single-discipline approach. Instead, it requires new thinking across multiple fields of research and its convergence with community voices; in other words, a holistic approach to disease detection, response and containment. This means bringing together at sub-national level, groups of civic actors, health-care practitioners, academic experts and representatives from civil society to form pandemic prevention, preparedness and response (PPR) taskforces. The first job for each taskforce is to measure critical capacities within local health systems through triangulating epidemiological, clinical, laboratory, socio-economical, and behavioural data.

Thereafter, the taskforce's role is to collect evidence on good practice – what works locally – and make recommendations to national government to guide policymaking, planning and implementation of health-care interventions in advance of the next epidemic or pandemic. This would lead to a pandemic resilience plan for each UK Core City[1] or city-region (it is a moot point as to which of these geographies makes most sense from an implementation perspective, but the devolution agenda clearly favours the latter, e.g., recent 'Trailblazer' deals for Greater Manchester and the West Midlands that offer the prospect of local decision-making for health services). This pandemic resilience plan could be refreshed every few years after having been stress-tested to see if it works in a simulated public health emergency.

We propose that each PPR taskforce should report into a Local Resilience Forum. Thirty-eight such Forums were established in England and four in Wales under the Civil Contingencies Act 2004, with a remit that includes community risk assessments, emergency planning and certain aspects of emergency response and recovery (Cabinet Office, 2011). Note

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[1] Core Cities UK is an alliance of 11 cities: Belfast, Birmingham, Bristol, Cardiff, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield.

that slightly different arrangements apply in Scotland and Northern Ireland – see links in Cabinet Office (2011). Whilst Local Resilience Forums are not without their critics (e.g., McClelland and Shaw, 2023), strengthening their role by giving them oversight of pandemic resilience planning is a logical development in the wake of COVID-19 (see Case Study) and consistent with a 'whole of society' approach to resilience, as advocated in the UK Government Resilience Framework (2022).

What are the steps that need to be taken to create a PPR taskforce in each UK Core City or city-region? The starting point will be for the Department of Health and Social Care (UK Health Security Agency) to offer a small amount of funding under the auspices of its Centre for Pandemic Preparedness and nascent Health and Care Research Framework for Pandemic Preparedness and Response. This funding would be used to bring together in each city, community representatives, civic actors such as representatives from local authorities and mayoral combined authorities, health-care professionals working in hospitals and the community, and academics from diverse disciplines, such as data science and modelling, epidemiology, virology and other biomedical sciences, clinical trials, social, political and behavioural sciences, the arts and humanities, and environmental sciences.

To our knowledge such an approach has not been tried before in a UK healthcare context. It offers the potential to produce exciting breakthroughs in thinking and practice at a relatively modest cost, that could not have been achieved if pursued through the methodological framework of a single discipline. When convening such a PPR taskforce, the aim is to provide a 'safe space' for the exchange of knowledge from different spheres that in the past may not have worked. This safe space will support: 1) citizen empowerment in terms of local health-care decision-making, as envisaged in the UK Government Resilience Framework (2022); 2) integration of distinct disciplinary (academic and clinical) perspectives; and 3) creation of intersectoral teams to work together on the design of a resilient, equitable and inclusive health-care system for a given Core City or city-region.

We envisage that for the safe space to live up to its name, exceedingly good facilitation will be required to accommodate different experiences, expectations and capabilities, ultimately leading to agreement on new approaches to health-care system resilience. Training of such facilitators will be a prerequisite to getting the taskforces up-and-running. Achieving agreement between the different actors in each co-ordination taskforce will undoubtedly be challenging at times. But it is a necessary step in building a more robust public health system in the UK, thereby enhancing national pandemic preparedness, prevention and response ahead of a new emergency.

4. Case Study – Liverpool City Region

Assembling an interdisciplinary infectious disease research capability at city-regional level makes good sense if we are to implement key lessons from the COVID-19 pandemic. Liverpool City Region, a mayoral combined authority area characterised by large health inequalities, is an ideal place in which to prove the efficacy of this approach, having demonstrated its ability during the pandemic to think and act across disciplinary boundaries, at scale and at

speed. In the most challenging of circumstances, Liverpool City Council led the way nationally in designing an effective public health response to the novel coronavirus SARS-CoV-2, resulting in the world's first city-wide, voluntary COVID-19 rapid antigen testing pilot in November 2020. This was followed in December 2020 by early roll-out across Liverpool City Region of the national COVID-19 community testing scheme.

Co-ordination between health and civic partners in Liverpool's COVID testing programme was facilitated by CIPHA (Combined Intelligence for Population Health Action), an integrated data and shared analytics system established in only 12 weeks. At the same time, local authority directors of public health and their teams worked tirelessly to raise awareness about the benefits of asymptomatic testing and counter misinformation around test performance, resulting in extraordinarily high levels of public engagement. Some 283,338 people, equivalent to 57% of residents, took at least one lateral flow test between November 2020 and April 2021. CIPHA data showed that positive tests for COVID-19 were spatially clustered in economically deprived areas, whilst revealing that take-up and repeat testing were lower in areas of high social deprivation, areas furthest away from test sites and areas containing populations less confident in using Internet technologies. This experience provides a powerful incentive to build a more equitable and inclusive health-care system in peacetime, to ensure that infectious disease testing and support to isolate is made more accessible to economically vulnerable communities likely to be most impacted by the next pandemic.

5. Measuring the resilience of health-care systems

Cities and city-regions are a particularly important scale at which to take forward the necessary pandemic-proofing preparations described here. The setting up of a PPR taskforce for each UK Core City or city-region would represent a major step forward in national resilience planning for epidemics and pandemics and allow benchmarking of city-regions against a resilience index such as that proposed by Kruk *et al.* (2017) (see Table 1).

This index is prospective, i.e., it can be used in advance of a crisis and has the advantage that its validity in a UK health-care context can be tested against actual performance during recent health shocks such as COVID-19. Once a baseline is established for each Core City or city-region, gaps can be identified and improvements in key metrics can be tracked over time. This approach to pandemic resilience could be adopted by the UK Government as part of its plan (see UK Government Resilience Framework (2022), paragraphs 98-100) to introduce new standards and frameworks that will strengthen national resilience in the face of civil contingency risks.

Table 1: A resilience index for public health-care systems, after Kruk et al. (2017).

Characteristics	Aims	Measures
Aware	Know health system capacity	1. Distribution of health system assets and weaknesses
		2. Health service utilisation trends
	Know risks and population	3. Presence of active epidemiologic surveillance system
		4. Functioning civil registration and vital statistics system
	Communicate	5. List of decision makers in key sectors
		6. Breadth of functioning communication channels
Diverse	Effectively respond to range of health needs	7. Scope of health services available in primary care
		8. Quality of care for sentinel conditions in basic package
	Adequately finance health systems; prevent financial harm	9. Financing of healthcare: adequacy of government health expenditure and financial protection
Self-regulating	Isolate threat and maintain core function	10. Memorandums of understanding with non-state providers
		11. Database of service delivery alternatives for affected and unaffected populations
	Leverage outside capacity	12. Collaboration agreements with regional and global actors
Integrated	Co-ordinate with non-health actors (education, transport, police, media, private enterprise)	13. Existence of a national emergency co-ordination system and leaders
		14. Frequency of joint planning sessions and drills
		15. Process for development of a One Health strategy
	Engage citizens and communities to build trust	16. Index of [Department of Health and Social Care] and government responsiveness to community need
		17. Population trust in health system
		18. Platforms for dialogue with community leaders
		19. In-country social scientists with experience working with health departments
	Link healthcare provision to public health	20. Availability of district health staff with public health training
	Co-ordinate primary and referral care	21. Agreement on roles and referral protocols for facilities
Adaptive	Shift resources to meet need	22. Formal provisions to reallocate funds in emergency
	Promote rapid local decision making	23. Management capacity of district or local health teams
		24. Agreements on delegation of authority and funding in crises
	Evaluate to improve	25. Mechanisms for, and capacity to, track progress and evaluate health system performance in crisis and in times of calm

6. Summary and conclusions

We have argued here that inaction in the light of all that we have learned from COVID-19 is not a viable option if the UK is to avoid another staggering death toll from a future epidemic or pandemic. Yet, by all accounts we are far from ready for the next 'big one'. There remains much work to be done in the coming months and years, not least around improvements in infectious disease surveillance (DHSC, 2023; WHO, 2023). We do not know when or where an epidemic or pandemic will strike, so it is essential that we establish PPR taskforces as soon as possible. We will know that we have arrived at our destination of pandemic-proof cities when all of the preparedness gaps have been filled to the best of our ability, to the lasting benefit of citizens and communities.

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