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Independent report

Chapter 7: contact tracing and isolation

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Introduction

Contact tracing is a recognised public health activity used to identify and break chains of transmission to help reduce the spread of infectious diseases. It has been used for many decades in the response to infectious disease outbreaks and epidemics, usually alongside other public health activities and control measures. Its purpose, to identify people with an infection or potentially infected and isolate them before they infect others, is widely accepted and works in many, but not all, infectious diseases to a greater or lesser degree. It is routine practice in managing many sexually transmitted infections in the UK, and was used effectively, including by UK public health personnel in support of the Government of Sierra Lerone during the 2014 Ebola virus epidemic in West Africa.

However, the scale of contact tracing needed in COVID-19 was unprecedented in the UK. Contact tracing was used during the H1N1 influenza pandemic of 2009, to guide post-exposure prophylaxis – but this was only implemented for 3 months, with far lower case numbers, and even with those lower case numbers pressures on existing systems rapidly became unsustainable. The experience of implementing contact tracing at such scale during this pandemic, and the operational challenges in doing this, are therefore important to reflect on. Although, as now, it is unlikely that future CMOs and GCSA will have operational responsibility for contact tracing, some of the experience from this pandemic may be useful background for them and we have added some of the experience from the 4 nations in brief below.

In the UK, a key part of the pandemic response included the tracing of contacts of COVID-19 cases and timely provision of self-isolation and other public health advice. SARS-CoV-2 is highly transmissible, and COVID-19 often presents with non-specific or no symptoms, which introduced 2 issues.

First, without timely and adequate testing provision, infected people might not be rapidly identified and contact tracing initiated. As contact tracing was dependant on timely confirmation of cases through laboratory testing, this proved to be a limiting factor when testing capacity did not meet demand.

Second, the high transmissibility of SARS-CoV-2 meant that a high percentage of contacts need to be reached for each case within a short timeframe if contact tracing was to identify sufficient contacts in time to stop infection spreading further. This was in contrast with some previous epidemics such as SARS-CoV-1 or MERS-CoV, which showed an epidemic trajectory characterised by less rapid increase in case numbers and therefore less need for large-scale contact tracing from an early stage.

Contact tracing and self-isolation certainly played a useful role in helping reduce transmission and reducing reliance on other non-pharmaceutical interventions (NPIs). The Welsh Government Technical Advisory Group undertook 2 modelling studies on the impact of the Test, Trace, Protect (TTP) system in Wales in 2021, both of which indicated that the TTP programme had significantly reduced the effective reproduction (R) number.[footnote 1] [footnote 2] However, it is not yet clear what the impact of contact tracing has been in different contexts, and evidence on its impact on the pandemic is still emerging.

There has been important learning from this pandemic on effective ways to deploy contact tracing at scale for an extended period. These include technical issues such as:

- the use of combined digital and telephone approaches and when to switch between them
- the potential uses of apps for automated and anonymised contact tracing

Operational issues included:

- the role of national and local teams
- ways to communicate effectively across different communities
- the importance of supportive packages alongside self-isolation
- the infrastructure requirements to run contact tracing at scale

It has also been a chance to test new approaches and technologies, such as web-based self-serve contact tracing and mobile phone alerts warning people when they had been within 2 metres of a case.

This chapter explores these issues in brief, first setting out the evolution of contact tracing approaches during this pandemic and what this meant for operations, and then bringing together our reflections on contact tracing.

Evolution of contact tracing during this pandemic

In the early 'contain' phase of January to March 2020, there were relatively small numbers of cases, and the aim of contact tracing was to identify and manage all contacts using existing structures and testing capacity available at that stage. Contact tracing and self-isolation focused on delaying the establishment of community transmission of COVID-19 in the UK.

At this point, when case numbers were small, tracing of cases could potentially have significant impact on the course of the epidemic and indeed a realistic chance of delaying community transmission. Contact tracing produced important evidence at this stage – for example, on the risk of transmission on flights, in settings such as schools and workplaces, and in population groups with the highest risk of infection.[footnote 3] At this point, contact tracing was conducted within existing public health structures and systems and it followed existing

guidance and protocols for managing high consequence infectious diseases and undertaking large-scale contact tracing.

As community transmission picked up following widespread incursions in February 2020 from multiple countries, 2 linked issues arose. First, testing capacity was insufficient to flag all cases needing contact tracing.[footnote 4] Available tests had to be prioritised for clinical care and in settings with vulnerable people such as hospitals and care homes. This of course impacted contact tracing, as only a limited proportion of true cases in the community were being picked up through testing. Second, the existing contact tracing workforce, resources and systems were not able to handle such a large spike in demand.

As the first wave grew, the relative impact of contact tracing to pandemic control reduced as lockdown was implemented (see Chapter 8: non-pharmaceutical interventions (NPIs) for more on lockdown). There remained, however, an important role for contact tracing to:

- promptly identify as many contacts of confirmed COVID-19 cases as possible to prevent or reduce onwards transmission from secondary cases
- offer advice to cases including signposting to clinical support (for example, where cases may have deteriorated while in the home)
- inform national and local surveillance
- support ongoing research into the epidemiology of the disease and transmission dynamics
- gather information on outbreaks to support rapid local response, including in hospitals
- identify sources and settings of transmission by including the pre-symptomatic period in the contact tracing journey ('backwards contact tracing'). This was important as a small number of cases in particular settings (such as those with crowding or enclosed space) could account for a disproportionately large number of transmission and secondary cases. It helped identify settings with a high or higher risk of transmission so appropriate policy and public health measures could be implemented, though it can be resource-intensive[footnote 5], [footnote 6], [footnote 7]

Fulfilling the above aims required rapid completion of key steps by contact tracing teams that included:

- contacting cases
- gathering relevant information
- giving public health advice
- signposting to further support where needed
- sharing this data with surveillance teams so that potential clusters, outbreaks and sources of transmission can be identified

The scale of the task was underpinned by a recommendation by the Scientific Advisory Group for Emergencies (SAGE) in May 2020 that at least 80% of contacts for an index case needed tracing for the system to be maximally effective.[footnote 8] Undertaking these steps using existing resources and systems during a rapidly growing epidemic proved to be challenging, and so all 4 nations of the UK established large-scale testing and contact tracing systems. This required significant funding, technology and staffing and was not fully scaled up until summer 2020.

These large-scale contact tracing systems continually adapted as subsequent waves led to further surges in contact tracing demand. The arrival of new and more transmissible variants and changes in the epidemiology necessitated continual reviews and updates to the protocols. For contact tracing to be effective, the public needed to have:

- up-to-date knowledge and understanding of the symptoms of COVID-19
- ways to access testing
- the advice to self-isolate
- available support services

For cases and contacts who were advised to self-isolate, provision of support – both financial and practical – was an important consideration to improve adherence, although there is not yet clear evidence on what types of support were most effective in achieving higher adherence rates. Contact tracing approaches and communications adapted to changing policies such as testing and self-isolation support policies.

There were several shared challenges across the 4 nations:

- a need to rapidly develop and continually improve digital infrastructure to support contact tracing
- a large and flexible workforce of adequately trained professionals to deliver contact tracing
- ongoing review and adaptation of scripts and protocols to communicate effectively and incorporate parallel policy changes (such as support payments for self-isolation)

There were also similar technological needs:

- online self-serve options for the public
- call handler-facilitated contact tracing systems
- apps to alert mobile phone users when they had been within 2 metres of a case

Apps were particularly helpful in tracing without exposing sensitive information where a case may have unknown contacts (for example, from public spaces). App development can often be complex, particularly when personal data is involved and it is taking place at scale, and there were challenges in setting this up. Industrial expertise can be useful here, as can an overall principle of building on existing infrastructure and expertise.

While the underlying principles for contact tracing were the same, operations differed slightly across the 4 nations of the UK. These are set out below.

Cross-UK operational differences and similarities

Key differences

Contact tracing set-up and model

There were differences across the 4 UK nations' approach to contact tracing in terms of local, regional and national responsibilities and utilisation of new versus existing systems. Broadly, England set up a new national system whereas Scotland, Wales and Northern Ireland adapted existing structures for large-scale contact tracing. The strengths of national, regional and local approaches are considered below under 'Reflections'.

England

In England, a new national large-scale contact tracing system, NHS Test and Trace, was set up in May 2020, without a local delivery arm at that time, while existing Public Health England (PHE, subsequently the UK Health Security Agency (UKHSA)) health protection teams continued to manage complex or high-risk settings and outbreaks.

By summer 2020, however, feedback from local authorities and the public indicated that the centralised, national contact tracing model did not always make best use of local expertise, and the focus of national tracing teams might have constrained the timely identification and management of local clusters and outbreaks. The national contact tracing service therefore partnered with local authorities from summer 2020 onwards, bringing local authority public health teams into tracing 'hard to reach' cases and, from spring 2021, enabling them also to manage local outbreaks.

An early evaluation of the local tracing partnerships showed that the introduction of local authority teams had a small positive impact but the effectiveness and timeliness of local contact tracing varied.[footnote 9] Case studies from some local authority areas showed that local contact tracing was more acceptable and helped to trace 'hard to engage' cases and provide locally relevant information and services to cases and contacts, but again it is not known whether this was a consistent outcome for all local areas.[footnote 10] Educational establishments, healthcare settings and elite sports had separate contact tracing arrangements that were supported by the national trace service and PHE (subsequently UKHSA) health protection teams and national specialist professionals.[footnote 11],[footnote 12]

Wales

In Wales, the population-wide contact tracing service used existing public sector structures and had a focus on joint local–regional–national working across:

- the Welsh Government
- Public Health Wales
- all 7 health boards and 22 local authorities
- NHS Wales Informatics Service (subsequently Digital Health and Care Wales)

The Welsh Government provided national oversight, Public Health Wales provided technical expertise and experience (for example, writing an operating framework for regional teams and writing scripts), and health boards and local authorities delivered the contact tracing service using their local intelligence and knowledge.

Scotland

In Scotland, the overall approach was to use existing organisations and partnerships and pivot rather than set up new services. Test and Protect, a Scottish Government-led partnership between the 14 territorial NHS health boards, Public Health Scotland and NHS Scotland, was established in May 2020. This allowed work to begin rapidly as a solid understanding of ways of working was already in place and there was limited need for new financial or contractual arrangements. The operational delivery was through a local–national partnership: each local health board was resourced to recruit a contact tracing team, and a large-scale national contact centre was set up in partnership between Public Health Scotland and National Services Scotland.

Northern Ireland

In Northern Ireland, the contact tracing service was established and delivered by the Public Health Agency (PHA) working closely with the Department of Health. The service operated initially as a short pilot project involving contacting a sample of people who had a confirmed positive test result before a full operational contact tracing service was implemented from May 2020.

An evolved contact tracing model was introduced in November 2020 involving an increased focus on digital solutions to deliver early messages to contacts and cases, while at the same time enabling professional staff to risk assess and deal with the more complex cases and clusters and outbreaks.

PHA also worked with partner organisations such as the Department for Communities to ensure that citizens were able to access financial and practical support when required.

Staffing and prioritisation during surges in demand

There were differences in staffing models across the UK nations (outlined below), but all nations:

- applied risk stratification to prioritise high-risk cases and complex outbreaks during times of surging demand
- offered digital self-serve to manage demands on contact tracing capacity
- needed to recruit further contact tracers (though they took different routes to do this)
- operated some form of mutual aid

There were earlier publicly stated aims to call every case, but across the UK all contact tracing systems faced the challenge of delivering this in times of extremely high demand and had to adapt accordingly. There were 2 important lessons from this:

- first, rather than switching between these modes of operation, a 'steady state' should be sought that sets realistic expectations of the system
- second, as far as possible, digital self-tracing should be the norm, with human resource focused on complex situations or outbreaks (or situations where digital self-trace is not possible)

A focus on local–national partnership also enabled local teams to flex their approach according to their assessments of risk and need.

England

In England, the online contact tracing approach was complemented with a phone-based service, to facilitate contact tracing of citizens who do not use digital services, and improve and accelerate citizen compliance. A national call centre service was set up, commissioned through external suppliers, and a data feed was developed between the contact tracing web platform and a third-party telephony system.

The national call centre was staffed by 2 main types of workforce:

1. Call handlers contracted via third party suppliers. These staff were trained to undertake contact tracing phone calls using scripted guidance and bespoke FAQs.
2. NHS Professionals (NHSP), a private sector staffing provider who provides staff from across the NHS in England. NHSP staff provided clinical expertise across the call centre service with numbers of agents highest in 2020, eventually reduced to only a small number of specialist clinicians retained for escalations and the quality assurance function.

The national call centre was enhanced by a local phone-based tracing workforce when the contact tracing service partnered with local authorities.

The efficiency of the online self-serve versus call handler-facilitated contact tracing approach varied as the pandemic evolved and the demand rapidly changed. There were periods when the national call centre was responsible for approximately 40% of all successful trace attempts, with the remainder being picked up by the digital self-serve or local channels. However, at the highest peaks of the pandemic the phone-based service became saturated, and the use of digital self-serve was expanded.

Given the scale of contact tracing and the number of unknown variables in the pandemic response – such as lockdown and other control measures, new variants and transmission variability of SARS-CoV-2 – the phone-based service had to:

- be simplistic in nature to follow (both for call handlers and citizens)
- be scalable (ramp up or ramp down) at short notice
- interact and integrate with existing systems and structures where possible
- be able to flex and respond to changes in policy and guidance

Wales

In Wales, during the first wave, staff from within health boards and local authorities were redeployed to contact tracing teams from other services that were on pause due to various closures during lockdown. However, by late summer 2020 it had become clear that contact tracing capacity would have to be significantly and rapidly expanded in order to cope with demand. Health boards and local authorities thus recruited additional staff, particularly during the autumn of 2020.

In common with other UK nations, local teams operated 'mutual aid' to share cases between regions if one region was experiencing pressures. In addition, the Welsh Government set up an all-Wales national team in November 2020 to help regions with daily surges in case numbers, introduced e-forms in early 2021 and, at times of overwhelming demand such as at the start of the Omicron wave, introduced a prioritisation framework.

Scotland

In Scotland, a system of mutual aid was established so the national contact centre and boards could support each other as demand varied over time. As case numbers grew rapidly in June, August and December 2021, 'higher risk' cases (such as care home workers) were identified (either from testing data or self-identification) and were prioritised for phone calls, while others were sent SMS self-completion forms only.

Northern Ireland

In Northern Ireland, the service was mostly staffed by healthcare professionals such as nurses. As case numbers rose in spring 2020, staff from other backgrounds were recruited and existing PHA staff were redeployed and trained as contact tracers.

High-risk settings and large outbreaks were risk assessed by the clinical team and overseeing public health consultant, with more complex situations managed by the core health protection service. Separate teams within PHA supported care homes, schools, early years and some other settings, working with the contact tracing service as required. This approach of stratified responsibilities and rapid surge training enabled contact tracing during the peaks in demand, though this had to be balanced with demands from other work under the PHA's remit. It will be important to maintain core skills in case of possible future surges (for COVID-19 or another disease).

Another approach to manage high case numbers was to promote the digital self-trace platform to the public which, once details were completed, sent automated SMS messages with public health advice to cases and contacts. Other contingency measures deployed during periods of peak case numbers included:

- reducing the number of attempts to contact positive cases
- redeployment of existing PHA staff
- pausing enhanced contact tracing

Use of private sector contractors to manage some elements of contact tracing

In England, NHS Test and Trace contracted commercial providers to run the call centre and provide the call handler-facilitated contact tracing service, to call or visit cases and contacts linked to international travel, to improve compliance with self-isolation and reduce the risk of transmission of imported SARS-CoV-2 variants of concern. While the web-based contact tracing tool was initially developed in-house by PHE (latterly UKHSA), a commercial company was contracted to maintain and further develop the platform.

In the rest of the UK, public sector providers were used to deliver the core contact tracing service, and in Scotland private support for operational delivery was only for surge flexibility when needed.

Legal enforcement

In both England and Wales, cases and their contacts had a legal duty to self-isolate and breaching their self-isolation could result in fines. This was changed to guidance in spring 2022.

In Scotland and Northern Ireland there was not a legal duty to self-isolate for domestic cases and contacts, though isolation after international travel was legally required in Northern Ireland and Scotland. There were existing powers to restrict or exclude under public health legislation, but these were not used for COVID-19 cases.

It is difficult to assess the impact of legal enforcement (as opposed to guidance) on isolation compliance, in part because social norms around isolation evolved throughout the pandemic and in response to changing epidemiology. There is a study noting self-reported isolation compliance in Scotland to be similar to that recorded in England, but this is not conclusive evidence that either approach is preferable. It is also complicated by possible 'cross-contamination' across nations where the public may not be fully aware whether legal enforcement was in force or not due to media reporting across the UK.[footnote 13] Besides its epidemiological impact, the decision to legally enforce isolation also has a number of legal and practical considerations that will no doubt be important in a future pandemic and may look different across the UK's 4 nations.

Similarities

Isolation support

In all UK nations there was some form of financial support for isolation, although the routes to access this and eligibility varied across the UK. All nations required a person to have tested positive for COVID-19 or been advised to isolate by relevant services in order to access financial support for isolation, though other eligibility criteria also applied (such as being on a low income in England).

Case and contact information management systems with regular data summaries
England

In England, a bespoke contact tracing and advisory tool was developed as a web-based application to facilitate large-scale contact tracing in England. The application received data on positive COVID-19 cases from the existing English laboratory surveillance system and the newly developed COVID-19 Real Time Testing Service. The application was used by the citizens to self-complete contact tracing online, and by both national and local contact tracers to collect and record contact tracing information from cases and their close contacts, and advise on self-isolation and support.

The platform was adopted as the main contact tracing database which was used to regularly extract contact tracing data, undertake analyses and report on contact tracing performance and metrics. The tool has become fundamental to the whole contact tracing infrastructure and was interlinked with other systems deployed during the pandemic response.

Alongside the bespoke contact tracing tool, PHE (subsequently UKHSA) health protection teams continued to use the existing case management system to manage complex cases and outbreaks. However, this system was not designed to record contact tracing information in a consistent way. There were challenges with using 2 separate systems: on the one hand it was not possible for health protection teams to move away from their case management system, and on the other hand it was resource intense to operate 2 systems that were not integrated.

Wales

In Wales, a national case information management system was built and deployed in 6 weeks and linked to the Welsh laboratory information system, enabling regional teams to share details of those who needed support to self-isolate with local authority teams, who linked with third sector support. Management information and performance metrics were extracted to report contact tracing performance to ministers on a weekly basis. Performance information was also published on a weekly basis.

Scotland

In Scotland, there was a single digital case management system logging case, contact and cluster information for use by contact tracers and health protection teams. This single digital case management system was the first unified national health protection database in Scotland that allowed full national access to the data.

Allowing local health protection teams access to all data, including cases outside their own local area, enabled them to agree with national contact centre and each other how they would divide up work. Variation in contact tracing practice between areas was acceptable to fit the local epidemiology (such as capacity to trace contacts in school classrooms), but this caused some public confusion and operational challenge.

Overall, the benefits of local flexibility within a national guidance framework were felt to outweigh the disadvantages.

Northern Ireland

In Northern Ireland, the contact tracing service used an existing digital platform which also supported epidemiological investigation as well as management of cases and contacts. This integrated approach was an important strength of the system, allowing early identification of clusters and outbreaks as well as monitoring spread across Northern Ireland.

Separately, an existing health protection case management software was used for outbreaks and complex cases managed by the health protection team. Use of multiple systems could be challenging at times. The PHA published weekly contact tracing data from these systems including on cases, clusters and outbreaks.

Sharing information

Regular data summaries were used to share information across the UK, as well as with World Health Organization (WHO) member states to support global monitoring and surveillance. Weekly summaries of contact tracing activity were published and daily and/or weekly summaries of key contact tracing indicators were also shared with key stakeholders.

Digital self-trace options

All nations introduced a digital self-trace option for cases to self-complete a contact tracing questionnaire online, complementing the telephone-based approach, and an SMS text follow-up was available to provide information to contacts. Phone lines were available to assist people who were unable or did not wish to use the digital platforms, and provided information, guidance and support for people to check symptoms, book tests or find advice on self-isolating.

Generally, take-up of digital self-trace was between 30% to 50% and the quality of data supplied was low.

Check-in and automated tracing apps

In England and Wales, from September 2020, there was an NHS COVID-19 app (separate to the NHS app which supported vaccine recording, among other things). This enabled automated digital tracing using Bluetooth processing algorithms to log nearby app users and alert those who were likely to have been exposed to SARS-CoV-2. It was downloaded on 21 million unique mobile devices and used by at least 16.5 million citizens at its peak in late 2020. To date, there have been over 30 million downloads registered.

The app uptake was variable, with increased app use associated with more rural areas and less poverty. The use also changed over time and across geographies.

The app also allowed users to 'check in' to venues, record their symptoms and test results, and count down periods of self-isolation. Modelled analyses of its effectiveness found that approximately one COVID-19 case was averted for each case consenting to notification of their contacts, with one estimate that for every percentage point increase in app uptake, the number of cases could be reduced by 0.8% (using modelling) or 2.3% (using statistical analysis).[footnote 14]

In addition, particular venues were required to support contact tracing by either collecting information directly on attendees (with relevant data security processes) or by using a check-in NHS quick response (QR) code which linked to the COVID-19 app.

In Scotland, NHS partners developed bespoke tools during this pandemic, including a proximity app and a separate check-in app. An independent proximity app, Protect Scotland, was developed and launched in

Scotland in September 2020 following privacy concerns over the England NHS COVID-19 app (outlined above), due to the centralised nature of its data collection. Protect Scotland was based on a decentralised model. The app became interoperable with English and Welsh apps in November 2020 with notification possible when an England app user was in contact with a Scottish app user. Development of separate apps would ideally be avoided in future pandemics with a single UK application with decentralised data the preferred model.

Check In Scotland was Scotland's location check-in digital intervention, using QR codes to log attendance at venues to allow alerts to be sent where a person was at an event or venue at the same time as a case. This was widely used by the public to check in, but poorly used by health protection teams who sent a very small number of alerts. The additional 'call to action' following an alert was minimal once asymptomatic self-testing was recommended for everyone twice weekly.

In Northern Ireland, the StopCOVID NI proximity app sent anonymous alerts to people via Bluetooth when they had been in close contact with a case. There were approximately 685,000 downloads of the app at its peak, but there is not (as yet) a comprehensive evaluation of its effectiveness. The app was interoperable with other UK regions and Ireland. The app did not have a 'check in' functionality for attendance at venues.

In Northern Ireland, similar to the other UK nations, venues also gathered relevant information on staff and attendees in order to support contact tracing. However, QR codes were less routinely used in Northern Ireland to support contact tracing than other UK nations.

In Wales, the NHS COVID-19 app developed by England was adopted. Users were asked to enter their postcode district area and select their local authority after downloading so that all information and user journeys were accurate for Wales and in line with Welsh policy. A contact tracing app interoperability group met weekly at its peak to discuss and agree actions on critical interoperability issues between Wales, England, Scotland, Northern Ireland, Jersey and Gibraltar. The app was not available in Welsh at the outset but a fully bilingual version was available by November 2020.

In Wales, too, venues were required to collect information supporting contact tracing. The use of a QR code to support this was optional. QR code information did not link directly to Test, Trace and Protect systems, though it did enable 'push notifications' to those who had scanned the QR code if, for example, they may have come into contact with a positive case at a given venue.

Backwards contact tracing

In summer and autumn 2020, all nations set up 'backwards' or 'enhanced' contact tracing (outlined above) to provide intelligence and alerts to local authorities and health protection teams on suspected clusters and outbreaks, though this was resource-intensive and increasingly difficult when case numbers were high.[footnote 15], [footnote 16]

Piloting and proof of concept

Piloting and proof of concept was used to test all nations' contact tracing systems:

- in England there was a proof of concept prior to the first lockdown for web-based and phone-based contact tracing and a digital management platform
- in Northern Ireland contact tracing systems were also piloted before implementation
- in Wales, contact tracing pilots were run in 4 local authority areas for 2 weeks in May 2020 to test many of the key aspects of contact tracing, including:
  - likely volumes, workforce roles and training requirements
  - data capture and information flow
  - potential legal issues
  - scenario planning
  - high-risk contact requirements
- in Scotland there were phased introductions of contact tracing but there was limited time for pilots with formal evaluations

In all UK nations, learning and development could have been more routinely built into contact tracing systems. Ways to achieve this include:

- better feedback mechanisms from both the public and professionals involved in contact tracing
- more translational research (for example, though partnerships with academics)
- dedicated improvement roles in contact tracing teams
- routine publication of data on contact tracing performance to support third-party analysis

Scale of operations

In all nations, the scale of contact tracing operations was unprecedented: from inception to winding down in 2022, respective contact tracing systems traced:

- 15.8 million cases and 31.3 million contacts in England
- 1.04 million cases and 1.68 million contacts in Wales
- 2.07 million cases and 3.22 million contacts in Scotland

- 0.6 million cases and 0.95 million contacts in Northern Ireland

Reflections and advice for a future CMO or GCSA

Point 1

It is important, but not always easy, to be clear with decision-makers and the public about what contact tracing and self-isolation can and cannot achieve in different circumstances.

The role and impact will vary depending on:

- the pathogen and disease being managed
- the stage of the pandemic response, prevalence and incidence
- wider pandemic control strategies

Point 2

Pre-symptomatic and asymptomatic transmission, in the absence of routine mass asymptomatic testing, are a huge challenge for even a highly effective contact tracing system and place a premium on short turnaround times.

Contact tracing is an effective public health tool particularly in situations where case numbers are relatively low, or the focus is on rapid detection of clusters and outbreaks. Backward contact tracing can be effective to identify sources or risk factors in clusters and outbreaks.

Point 3

The scientific and public health principles of contact tracing and self-isolation are well established, and most of the challenges in this pandemic were operational, and not directly within the remit of CMOs or GCSA.

However, if contact tracing at this scale is needed again, operational planning and experience on scaling up across the 4 nations will be helpful.

Point 4

Large-scale contact tracing should wherever possible build on existing systems and expertise.

Local teams may have important intelligence about their communities that can guide the response to ensure it meets local needs. They may also be effective in building rapport and tailoring support for individual cases and contacts.

Regional teams can bring together epidemiological signals from across their patch and can also support pooling of resource to adapt operations to a fast-moving epidemic.

National teams have an important role in:

- pooling resource
- rapidly scaling up unified systems such as digital platforms and data sharing systems
- providing scientific advice
- producing guidance to support local and regional contact tracing teams

Point 5

Preparedness plans should include the need for large-scale digital platforms.

Early development and use of a digital platform enabling contact management, rapid epidemiological data reporting, and management information was needed but took time to design and implement.

Developing disease-agnostic case and contact management platforms ahead of another pandemic should enable a faster response to deliver a large-scale contact tracing service.

Digital self-service platforms for cases to enter contacts' details were also an important innovation that helped manage the demands on the telephone-based contact tracing service.

Point 6

> The rapid design and execution of pilots and research studies was needed to support dynamic evaluation of contact tracing and to address evidence gaps.

Gaps in the evidence base included effective methods and approaches to contact tracing in different settings, different stages of the response and in different population sub-groups. Other gaps were addressed through rapid research; for example, a randomised control trial of daily contact testing as an alternative to self-isolation for contacts showed that daily contact testing was non-inferior to self-isolation.[footnote 17]

Point 7

> The health equity dimension to contact tracing is important but was not always fully addressed.

Digital-first approaches can exclude, for example, people with visual, hearing, and other disabilities – and so it was important to provide phone and other support alongside this. Some people were not closely engaged with formal information sources and were disengaged from systems delivering elements of the pandemic response.

Long-term engagement with all communities is important in reducing the risk that people become disengaged or misinformed. Digital and other technological solutions deployed to support the delivery of contact tracing should proactively address accessibility and other health equity gaps identified from impact assessments and by local partners.

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