Tracking aspects of healthcare activity during the first nine months of COVID-19 in Ireland: a secondary analysis of publicly available data [version 2; peer review: 1 approved with reservations]

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Abstract

Background: Sláintecare aims to introduce universal healthcare in Ireland. The COVID-19 pandemic poses both challenges and opportunities to this process. This study explored the impact of COVID-19 on aspects of Irish healthcare during the first nine months of the pandemic and considers the implications for Sláintecare implementation.

Methods: Secondary analysis was undertaken on publicly available data on three key domains of the Irish healthcare system: primary care, community-based allied healthcare, and hospitals. Descriptive statistics were computed using Microsoft Excel 2016.

Results: Up to March 2021, 3.76 million COVID-19 tests were performed by Ireland’s public healthcare system, 2.48 million (66.0%) of which were referred from the community. General practitioners delivered 2.31 million telephone triages of COVID-19 symptoms, peaking in December 2020 when 416,607 consultations occurred. Patient numbers across eight allied healthcare specialties fell by 35.1% versus previous years, with the greatest reductions seen in speech and language therapy (49.0%) and audiology (46.1%). Hospital waiting lists increased from 729,937 to 869,676 (or by 19.1%) from January 2019 to January 2021. In January 2021, 629,919 patients awaited a first outpatient clinic appointment, with 170,983 (27.1%) waiting longer than 18 months. The largest outpatient lists were observed in orthopaedic surgery (n=77,257); ear, nose and throat surgery (n=68,073); and ophthalmology (n=47,075). The proportion of patients waiting more than 12 months for a day-case gastrointestinal endoscopy rose from 6.0% in January 2020 to 19.0% in January 2021.

Conclusions: Healthcare activity has been significantly disrupted by COVID-19, leading to increased wait times and greater barriers to healthcare access during the pandemic. Yet, Ireland’s health system

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University of Limerick, Limerick, Ireland

Any reports and responses or comments on the article can be found at the end of the article.
responses also revealed strong willingness and ability to adapt and to implement novel solutions for healthcare delivery, rapidly and at scale. This has demonstrated what is achievable under Sláintecare and provides a unique opportunity to ‘build back better’ towards sustainable recovery.

**Keywords**
Health reform, health system, health policy, Sláintecare, COVID-19, implementation, Ireland.

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Introduction

The COVID-19 pandemic has had a profound negative impact on societies worldwide (World Health Organisation, 2020a). Ireland is no exception to this, experiencing more than 250,000 cases of COVID-19 as of May 2021, over 4,900 deaths, and widespread disruption of non-COVID healthcare (Government of Ireland, 2020a; Rosenbaum, 2020). The pandemic occurs within a period of strategic change within Irish healthcare (Burke et al., 2018; Department of Health/Sláintecare Implementation Office, 2018). Historically, Ireland’s health system has been undermined by flaws relating to capacity, equity, long wait times for scheduled hospital care, and fragmentation of services (Burke et al., 2016; Department of Health/Sláintecare Implementation Office, 2019; Organisation for Economic Co-Operation and Development, 2019). The Sláintecare reform process aims to transform Irish healthcare over a ten-year period, to a universal system of care that is equitable, timely and transitioned, where possible, to the community setting (‘right care, right place, right time’) (Department of Health/Sláintecare Implementation Office, 2019; Houses of the Oireachtas, 2017).

The adverse effects of widespread cancellation of healthcare are self-evident. However, it has also been observed that certain strategic priorities of the national pandemic response may align with those of Sláintecare, particularly those relating to the transition of care out of hospitals; technological innovation; and removal of barriers to healthcare access (Burke et al., 2020; Health Service Executive, 2020a; Health Service Executive, 2021a; Health Service Executive, 2021b; National Public Health Emergency Team, 2020a). For example, while Ireland is currently the only country in Western Europe without universal access to primary care (Organisation for Economic Co-Operation and Development, 2019), all COVID-related healthcare has remained free at the point of use during the pandemic, though a significant proportion of the population may be unaware of this (Brick et al., 2020).

The rapid adoption of agile responses, such as telemedicine, also provided universal access to remote general practitioner (GP) care for those presenting with COVID-19 symptoms (Burke et al., 2020). Moreover, insofar as the importance of allied health professionals (AHPs) to in-hospital care of COVID-19 patients has been recognised (Coto et al., 2020; Thomas et al., 2020), significant numbers of AHPs were redeployed from their primary work to other activities, such as contact-tracing and testing (Raidió Teilifís Éireann, 2020a; Raidió Teilifís Éireann, 2020b).

However, the impact of the pandemic has also prompted several changes in the healthcare system that may inhibit or pose challenges for the roll-out of Sláintecare in the longer-term. First, each ‘wave’ of the pandemic has resulted in extensive curtailment of elective activity in hospitals (Government of Ireland, 2020b; National Public Health Emergency Team, 2020b). Second, among the healthcare workforce, there have been increased rates of infection (Health Service Executive, 2020a; Health Service Executive, 2021c; Riley et al., 2020) as well as altered behaviour patterns in terms of increased absences from work (Gohar et al., 2020; Nabe-Nielsen et al., 2021). And third, altered patterns of GP referral and of patient self-referrals to hospital have emerged, which may impact hospital workloads and waiting lists (Brick et al., 2020; Heneghan & Jefferson, 2020; Lazzerini et al., 2020; Marron et al., 2021; NHS England, 2020).

This emerging body of literature has provided important insights into how the pandemic has affected healthcare activity in the Irish context, but, to date, the potential implications for healthcare reform have not been fully interrogated. As a consequence, this research focused on how we can harness the learnings from the Irish health system responses to COVID-19 to transform patient access, experience and outcomes as we start to think about the ‘bigger picture’ of implementing universal healthcare in Ireland.

This research is a component of a broader research project that sets out to examine the impact of COVID-19 on the Sláintecare implementation process (for a detailed overview of this study see Burke et al., 2020). In this paper, we draw on publicly available data to explore the effect of the pandemic on three key areas of care in the Irish context – primary care, community-based allied healthcare, and hospitals – during the first nine months of the pandemic. A core objective was to identify potential early lessons that may be relevant for the implementation of Sláintecare in 2021 and beyond.

Methods

Study design

Secondary analysis was undertaken on existing published and publicly available data that were: 1) related to primary care, community-based healthcare and hospital care in Ireland; 2) considered relevant for addressing this study’s research objectives; and 3) reported during the first nine months of the pandemic. Secondary analysis is a process whereby data collected by one or more researchers or administrative systems are re-analysed to pursue an alternative perspective on the same topic or a new research interest entirely.
Data sources
1. **Primary care**

There is a dearth of publicly available data on GP activity in Ireland. Prior to COVID-19, the need for a centralised data registry for GPs was recognised (Health Service Executive, 2015; Walsh et al., 2019). To describe GP activity nationally, this paper drew on selected data retrieved from:

   I. The Primary Care Reimbursement Service (PCRS) (Primary Care Reimbursement Service, 2021);

   II. Health Service Executive (HSE) monthly Performance Reports (Health Service Executive, 2018a; Health Service Executive, 2018b; Health Service Executive, 2018c; Health Service Executive, 2018d; Health Service Executive, 2018e; Health Service Executive, 2018f; Health Service Executive, 2018g; Health Service Executive, 2018h; Health Service Executive, 2018i; Health Service Executive, 2018j; Health Service Executive, 2018k; Health Service Executive, 2019a; Health Service Executive, 2019b; Health Service Executive, 2019c; Health Service Executive, 2019d; Health Service Executive, 2019e; Health Service Executive, 2019f; Health Service Executive, 2019g; Health Service Executive, 2019h; Health Service Executive, 2019i; Health Service Executive, 2019j; Health Service Executive, 2019k; Health Service Executive, 2019l; Health Service Executive, 2019m; Health Service Executive, 2019n; Health Service Executive, 2019o; Health Service Executive, 2020a; Health Service Executive, 2020b; Health Service Executive, 2020c; Health Service Executive, 2020d; Health Service Executive, 2020e; Health Service Executive, 2020f; Health Service Executive, 2020g; Health Service Executive, 2020h; Health Service Executive, 2020i; Health Service Executive, 2020j).

   III. An open-access data source published by Ordnance Survey Ireland (Ordnance Survey Ireland, 2021).

2. **Community-based healthcare**

Waiting list and activity data were extrapolated from HSE monthly Performance Reports and quarterly Performance Profiles (Health Service Executive, 2018a; Health Service Executive, 2018b; Health Service Executive, 2018c; Health Service Executive, 2018d; Health Service Executive, 2018e; Health Service Executive, 2018f; Health Service Executive, 2018g; Health Service Executive, 2018h; Health Service Executive, 2018i; Health Service Executive, 2018j; Health Service Executive, 2018k; Health Service Executive, 2018l; Health Service Executive, 2018m; Health Service Executive, 2018n; Health Service Executive, 2018o; Health Service Executive, 2019a; Health Service Executive, 2019b; Health Service Executive, 2019c; Health Service Executive, 2019d; Health Service Executive, 2019e; Health Service Executive, 2019f; Health Service Executive, 2019g; Health Service Executive, 2019h; Health Service Executive, 2019i; Health Service Executive, 2019j; Health Service Executive, 2019k; Health Service Executive, 2019l; Health Service Executive, 2019m; Health Service Executive, 2019n; Health Service Executive, 2019o; Health Service Executive, 2020a; Health Service Executive, 2020b; Health Service Executive, 2020c; Health Service Executive, 2020d; Health Service Executive, 2020e; Health Service Executive, 2020f; Health Service Executive, 2020g; Health Service Executive, 2020h; Health Service Executive, 2020i; Health Service Executive, 2020j; Health Service Executive, 2020k; Health Service Executive, 2020l; Health Service Executive, 2020m).

With those reported in 2018 and 2019. We present analysis on the following:

I. Eight community-based healthcare specialities, including:
   - Physiotherapy
   - Occupational therapy
   - Speech and language therapy
   - Audiology
   - Psychology
   - Podiatry
   - Community ophthalmology
   - Dietetics

II. Infants receiving developmental screening checks at 10 months of age from community-based public health nurses (PHNs) (Health Service Executive, 2018a; Health Service Executive, 2018b; Health Service Executive, 2018c; Health Service Executive, 2018d; Health Service Executive, 2018e; Health Service Executive, 2018f; Health Service Executive, 2018g; Health Service Executive, 2018h; Health Service Executive, 2018i; Health Service Executive, 2018j; Health Service Executive, 2018k; Health Service Executive, 2018l; Health Service Executive, 2018m; Health Service Executive, 2018n; Health Service Executive, 2018o; Health Service Executive, 2019a; Health Service Executive, 2019b; Health Service Executive, 2019c; Health Service Executive, 2019d; Health Service Executive, 2019e; Health Service Executive, 2019f; Health Service Executive, 2019g; Health Service Executive, 2019h; Health Service Executive, 2019i; Health Service Executive, 2019j; Health Service Executive, 2019k; Health Service Executive, 2019l; Health Service Executive, 2019m; Health Service Executive, 2019n; Health Service Executive, 2019o; Health Service Executive, 2020a; Health Service Executive, 2020b; Health Service Executive, 2020c; Health Service Executive, 2020d; Health Service Executive, 2020e; Health Service Executive, 2020f; Health Service Executive, 2020g; Health Service Executive, 2020h; Health Service Executive, 2020i; Health Service Executive, 2020j; Health Service Executive, 2020k; Health Service Executive, 2020l; Health Service Executive, 2020m).

It is important to note that in both cases, these figures relate only to the public (State-run) health services. To this end, data on access, wait times and activity levels in the private sector remain unavailable and thus excluded from this research.

3. **Hospital care**

Hospital waiting list data were extracted from reports published by the National Treatment Purchase Fund (NTPF) (National Treatment Purchase Fund, 2021). There are three major waiting list categories defined by the NTPF Waiting List Management Protocol (National Treatment Purchase Fund, 2017):

I. Outpatient Waiting Lists. This category refers to patients awaiting their first appointment at a consultant-led outpatient clinic.

II. In-patient/day-cases (IPDCs). This category refers to patients awaiting admission on an elective basis for care or treatment. Many surgical procedures fall into this category, such as elective hip or knee replacements, as well as investigative procedures such as gastrointestinal (GI) endoscopy. ‘In-patient’ admissions refer to those patients who will require use of a hospital bed overnight following their treatment, while ‘day-case’ admissions refer to those discharged home on the same day.

III. Planned procedures (PPs). This category refers to patients who have already had an initial episode of care and require further treatment. Common day-case PPs include second-eye cataract surgery, skin grafts, and follow-up GI endoscopy.

Within each of these categories, hospital waiting lists are subdivided into ‘active’ (those awaiting a treatment appointment.
date), ‘suspended’ (those who are ‘temporarily unfit or unable to attend due to clinical or personal/social reasons’), and ‘to come in (TCI)’ (those who have received an appointment for their treatment) (see Table 3). The complexity of these numerous subcategories creates difficulty both in capturing the full burden of patient wait times and in enabling comparisons with other jurisdictions (Brick & Connolly, 2021).

Analysis
Once these selected data were extracted, cleaned and prepared for analysis, descriptive statistics were computed using Microsoft Excel 2016.

Results
Primary care
Eligibility categories. As shown in Figure 1, the proportion of the Irish population eligible for free-at-point-of-use GP care, due to their medical card or GP Visit Card, was analysed from PCRS data for 2019, 2020, and the months of 2021 for which data were available.

For all months studied, the proportions of the population eligible for a GP visit card or a medical card remained stable, between 10.3–10.6% and 31.0–31.9% respectively. Accordingly, the proportion of the population entitled to GP care without charge remained between 41.6% and 42.4% across the study period, including after onset of the pandemic in 2020.

Out-of-hours GP care. Data on patients accessing out-of-hours (OOH) GP care are published at monthly intervals. As seen in Figure 2, the number of patients availing of OOH GP care in the early months of 2020 is similar to those seen in 2018 and 2019. However, a sharp decline emerged in April 2020, when 57,945 patients were seen nationally by an OOH GP service compared to 92,369 in April 2019 – a reduction of 37.3%, or 34,424. This decline was maintained until July 2020. In August and September 2020, OOH GP care activities returned to pre-pandemic levels.

It should be noted that these data may under-state the full extent of activity as reported to the HSE, particularly for private patients paying out of pocket at the time of the consultation.

COVID-19 telephone consultations. Since the onset of the pandemic, GPs have been reimbursed by the HSE via the PCRS to conduct telephone-based triaging consultations with patients with possible COVID-19 symptoms. These consultations are provided without financial charges for patients. Figure 3 presents the monthly number of telephone triages at the national level (left axis), alongside national case totals (right axis).

As shown, there were three distinct peaks in COVID-19 telephone consultation activity by GPs: in March, September and December 2020. These peaks preceded the national peaks in COVID-19 cases, seen in April 2020, October 2020, and January 2021, respectively.

In March 2020, the ‘spring peak’ manifested as 219,548 telephone consultations by GPs triaging COVID-19 symptoms nationally. Activity level then fell during the summer months, before reaching the ‘autumn peak’ of 260,329 COVID-19 telephone triages in September 2020. This was exceeded in December 2020, when 416,607 telephone triages occurred. This high-point preceded the surge in case numbers seen in January 2021, when 103,015 new cases of COVID-19 were identified and the national incidence was temporarily the highest in the world (Ritchie et al., 2020). In total, from February 2020 to February 2021, 2.31 million of these consultations occurred.

Figure 1. Share of population eligible for either medical card or GP Visit Card, per month (2018-2021) (from Primary Care Reimbursement Service).
COVID-19 testing by GPs. Figure 4 presents the number of COVID-19 PCR tests conducted for the hospital sector and the community.

As of March 2021, 3.76 million COVID-19 tests were performed by Ireland’s public healthcare system, 2.48 million (66%) of which were referred from the community. The largest monthly number of COVID-19 tests was seen in January 2021, with 705,531 performed, of which 491,772 (69.7%) arose from the community.

As shown by the red line in Figure 4, the proportion of tests in which GPs played at least some role – that is, ordering them, following up on them, or both – was between 60% and 70% for most months of the pandemic, averaging 66%, with a peak of 73.8% in October 2020.
Of note, for the purposes of this study and in the absence of more robust data, it is assumed that COVID-19 tests performed in hospitals were ordered by a hospital-based clinician, while those performed outside of hospitals were either ordered by GPs, followed up by them, or both. However, a small proportion of out-of-hospital COVID-19 tests may have originated from other sources, such as from public health doctors referring close contacts of confirmed cases for testing, as part of a response to a specific outbreak or cluster. As such, these data may over-state GPs’ role in referrals for testing.

In addition, these data do not include COVID-19 tests performed in the private sector or in ‘walk-in’ testing centres which began to operate in early 2021.

Community-based healthcare specialties

Activity levels. As mentioned earlier, analysis on activity levels and waiting lists was undertaken using data on eight community-based healthcare specialties, including: physiotherapy; occupational therapy; speech and language therapy; audiology; psychology; podiatry; community ophthalmology; and dietetics.

As shown in Figure 5, there was a 35% reduction in publicly provided care across all eight allied health specialties in the community when the first nine months of 2020 are compared to the same period in 2018 and 2019, suggesting a significant impact of COVID-19 on these essential services. The divergence appeared in March 2020, when the HSE introduced widespread restrictions on non-urgent healthcare.

By September 2020, 771,322 patients were seen by all eight specialties, compared to 1,157,154 and 1,187,734 patients by the same date in 2018 and 2019, respectively. This 2020 figure represents a reduction of 416,412 (35.1%) compared to 2019 (data for the last three months of 2020 are unavailable at time of writing).

There was heterogeneity observed between specialties regarding the degree of reduction of activity seen in 2020 when compared to the 2019 figures (see Table 1). The greatest reductions in patient numbers were seen in speech and language therapy (49.0%) and audiology (46.1%), while dietetics (13.6%) and psychology (18.1%) exhibited the lowest proportional increase over the observation period.

Community waiting lists. Waiting lists for the eight community specialties were also analysed at three-month intervals from 2018 to 2020. These are represented in Table 2 and Figure 6.

As shown, this period was characterised by three phases. First, there was a gradual, sustained increase in waiting list numbers across the specialties in 2018 and 2019. Second, an abrupt decline in the waiting list numbers for all specialties combined was reported in the first quarter of 2020, falling from 162,629 in December 2019 to 100,708 in March 2020, a reduction of 61,921 or 38.1%. Thirdly, a marked increase was seen in waiting list numbers from March to September 2020 for all specialties, offsetting the decline seen earlier that year.

As shown in Table 2, while waiting lists for all specialties increased markedly in the period from March to September 2020, speech and language therapy and dietetics recorded the greatest increases during this time, rising by 176.8% (11,129 to 30,810) and 95.3% (8,498 to 16,593), respectively.

(Of note, distinct waiting lists for assessment and treatment are published by the HSE for speech and language therapy...
Table 1. Patients seen in eight community-based specialties on a cumulative basis (year-to-date (YTD) to September, 2018-2020) (from HSE Performance Reports).

<table>
<thead>
<tr>
<th>Specialty</th>
<th>September 2018 YTD</th>
<th>September 2019 YTD</th>
<th>September 2020 YTD</th>
<th>Absolute reduction</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapy</td>
<td>430,424</td>
<td>427,806</td>
<td>283,745</td>
<td>144,061</td>
<td>-33.7</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>264,591</td>
<td>286,572</td>
<td>207,944</td>
<td>78,628</td>
<td>-27.4</td>
</tr>
<tr>
<td>Speech &amp; Language Therapy</td>
<td>209,010</td>
<td>207,710</td>
<td>105,878</td>
<td>101,832</td>
<td>-49.0</td>
</tr>
<tr>
<td>Psychology</td>
<td>31,201</td>
<td>33,900</td>
<td>27,751</td>
<td>6,149</td>
<td>-18.1</td>
</tr>
<tr>
<td>Podiatry</td>
<td>62,360</td>
<td>62,181</td>
<td>36,910</td>
<td>25,271</td>
<td>-40.6</td>
</tr>
<tr>
<td>Community Ophthalmology</td>
<td>74,154</td>
<td>75,809</td>
<td>41,564</td>
<td>34,245</td>
<td>-45.2</td>
</tr>
<tr>
<td>Audiology</td>
<td>38,004</td>
<td>41,473</td>
<td>22,368</td>
<td>19,105</td>
<td>-46.1</td>
</tr>
<tr>
<td>Dietetics</td>
<td>47,410</td>
<td>52,283</td>
<td>45,162</td>
<td>7,121</td>
<td>-13.6</td>
</tr>
<tr>
<td>All Specialties</td>
<td>1,157,154</td>
<td>1,187,734</td>
<td>771,322</td>
<td>416,412</td>
<td>-35.1</td>
</tr>
</tbody>
</table>

Figure 5. Cumulative patient numbers seen across eight allied healthcare specialties. Totals for September 2018 (middle figure), 2019 (top) and 2020 (bottom) are labelled. (from HSE Performance Reports).
Table 2. Waiting list numbers for eight community specialties (2018-2020), with proportions waiting more than one year (from HSE Performance Reports).

<table>
<thead>
<tr>
<th></th>
<th>Physiotherapy</th>
<th>Occupational Therapy</th>
<th>Speech &amp; Language Therapy</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% Waiting &gt;1yr</td>
<td>Total</td>
<td>% Waiting &gt;1yr</td>
</tr>
<tr>
<td>Mar-18</td>
<td>33,358</td>
<td>5.0</td>
<td>31,296</td>
<td>22.8</td>
</tr>
<tr>
<td>Jun-18</td>
<td>34,161</td>
<td>5.2</td>
<td>31,934</td>
<td>23.6</td>
</tr>
<tr>
<td>Sep-18</td>
<td>36,664</td>
<td>6.0</td>
<td>30,880</td>
<td>25.1</td>
</tr>
<tr>
<td>Dec-18</td>
<td>36,706</td>
<td>5.7</td>
<td>31,867</td>
<td>25.6</td>
</tr>
<tr>
<td>Mar-19</td>
<td>37,392</td>
<td>5.9</td>
<td>31,776</td>
<td>26.8</td>
</tr>
<tr>
<td>Sep-19</td>
<td>40,794</td>
<td>6.9</td>
<td>33,434</td>
<td>27.8</td>
</tr>
<tr>
<td>Dec-19</td>
<td>38,177</td>
<td>8.0</td>
<td>34,343</td>
<td>29.2</td>
</tr>
<tr>
<td>Mar-20</td>
<td>25,063</td>
<td>12.4</td>
<td>22,591</td>
<td>29.0</td>
</tr>
<tr>
<td>Jun-20</td>
<td>3,972</td>
<td>22.0</td>
<td>20,707</td>
<td>41.5</td>
</tr>
<tr>
<td>Sep-20</td>
<td>3,752</td>
<td>25.6</td>
<td>21,149</td>
<td>41.0</td>
</tr>
<tr>
<td></td>
<td>3,594</td>
<td>26.6</td>
<td>19,411</td>
<td>41.0</td>
</tr>
<tr>
<td></td>
<td>3,174</td>
<td>31.0</td>
<td>18,806</td>
<td>38.8</td>
</tr>
<tr>
<td></td>
<td>3,621</td>
<td>28.9</td>
<td>17,850</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td>3,900</td>
<td>21.6</td>
<td>17,044</td>
<td>33.4</td>
</tr>
<tr>
<td></td>
<td>4,001</td>
<td>24.6</td>
<td>16,690</td>
<td>31.8</td>
</tr>
<tr>
<td></td>
<td>3,504</td>
<td>27.7</td>
<td>15,119</td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td>3,365</td>
<td>30.0</td>
<td>9,833</td>
<td>34.3</td>
</tr>
<tr>
<td></td>
<td>4,633</td>
<td>35.5</td>
<td>17,425</td>
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</tr>
<tr>
<td></td>
<td>5,800</td>
<td>40.4</td>
<td>13,104</td>
<td>38.8</td>
</tr>
</tbody>
</table>

Podiatry | Community Ophthalmology | Audiology | Dietetics
<table>
<thead>
<tr>
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<td>3,621</td>
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</tr>
<tr>
<td>Jun-20</td>
<td>4,633</td>
<td>35.5</td>
<td>17,425</td>
</tr>
<tr>
<td>Sep-20</td>
<td>5,800</td>
<td>40.4</td>
<td>13,104</td>
</tr>
</tbody>
</table>

Health Service Executive, 2020g; Health Service Executive, 2020h; Health Service Executive, 2020i; Health Service Executive, 2020j; Health Service Executive, 2020k; Health Service Executive, 2020l; Health Service Executive, 2020m; these are combined in this section.

Developmental screening checks. The proportion of infants receiving developmental screening checks on time – that is, by 10 months of age – from a PHN is shown at monthly intervals in Figure 7 (data after September 2020 were unavailable at time of writing).

As can be seen, throughout 2018 and 2019, the proportion of children receiving this screening check on time was consistently between 90% and 94%. There was a marked decline in achieving this target in the first half of 2020, reaching a nadir of 25.5% in May 2020 before recovering slightly to 54.8% in September 2020, the latest month for which data are available.

Hospital care
In January 2021, there were 869,676 people waiting on some form of Irish public hospital waiting list across all NTPF waiting list categories, as shown in Figure 8 and in greater detail in
Table 3. This total refers to the number of patients across the three major hospital waiting list categories – outpatients, in-patient/day-case admissions and planned procedures – including those grouped as ‘TCI’ or ‘suspended’.

All three categories underwent an increase during this two-year period. Outpatient waiting lists increased by 20.4%, reaching 629,919 in January 2021; in-patient and day-case waiting lists increased by 13.5%, reaching 146,680; and planned procedure waiting lists increased by 20.1%, reaching 93,077. In total, the national hospital waiting list figure was 139,739 in January 2021, 19.1% higher than two years prior.

**Outpatient waiting lists.** Figure 9 and Table 4 present national outpatient hospital waiting list data at three-month intervals from January 2019 to 2021, by length of wait. Most notably,
Figure 8. National hospital waiting list numbers from January 2019 to January 2021, by category (from National Treatment Purchase Fund).

Table 3. Overview of all waiting list categories at three-monthly intervals from January 2019 to January 2021 (National Treatment Purchase Fund, 2021).

<table>
<thead>
<tr>
<th>Category (i) – Outpatients</th>
<th>Jan-19</th>
<th>Apr-19</th>
<th>Jul-19</th>
<th>Oct-19</th>
<th>Jan-20</th>
<th>Apr-20</th>
<th>Jul-20</th>
<th>Oct-20</th>
<th>Jan-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>523,225</td>
<td>551,965</td>
<td>564,829</td>
<td>567,221</td>
<td>556,770</td>
<td>567,329</td>
<td>601,362</td>
<td>612,817</td>
<td>622,963</td>
</tr>
<tr>
<td>Suspended</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6,956</td>
</tr>
<tr>
<td>Category (i) Total</td>
<td>523,225</td>
<td>551,965</td>
<td>564,829</td>
<td>567,221</td>
<td>556,770</td>
<td>567,329</td>
<td>601,362</td>
<td>612,817</td>
<td>629,919</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>72,027</td>
<td>70,295</td>
<td>68,807</td>
<td>67,511</td>
<td>67,303</td>
<td>86,343</td>
<td>80,283</td>
<td>74,860</td>
<td>81,456</td>
</tr>
<tr>
<td>‘To Come In’</td>
<td>17,975</td>
<td>19,289</td>
<td>19,886</td>
<td>19,649</td>
<td>20,033</td>
<td>5,806</td>
<td>11,377</td>
<td>8,711</td>
<td>11,607</td>
</tr>
<tr>
<td>Suspended</td>
<td>7,427</td>
<td>7,344</td>
<td>8,542</td>
<td>9,879</td>
<td>10,984</td>
<td>8,508</td>
<td>7,637</td>
<td>10,984</td>
<td>11,607</td>
</tr>
<tr>
<td>Subtotal – Excluding Endoscopy</td>
<td>97,429</td>
<td>96,928</td>
<td>97,235</td>
<td>97,039</td>
<td>98,320</td>
<td>100,657</td>
<td>99,297</td>
<td>98,316</td>
<td>101,151</td>
</tr>
<tr>
<td>GI Endoscopy, Active</td>
<td>19,748</td>
<td>22,220</td>
<td>22,592</td>
<td>21,979</td>
<td>22,231</td>
<td>34,110</td>
<td>34,983</td>
<td>34,116</td>
<td>36,065</td>
</tr>
<tr>
<td>GI Endoscopy, ‘To Come In’</td>
<td>9,335</td>
<td>9,810</td>
<td>9,608</td>
<td>9,275</td>
<td>8,882</td>
<td>1,732</td>
<td>5,045</td>
<td>6,143</td>
<td>3,919</td>
</tr>
<tr>
<td>GI Endoscopy, Suspended</td>
<td>2,731</td>
<td>2,452</td>
<td>2,822</td>
<td>4,190</td>
<td>4,646</td>
<td>4,819</td>
<td>3,436</td>
<td>4,191</td>
<td>5,545</td>
</tr>
<tr>
<td>Subtotal – GI Endoscopy Only</td>
<td>31,814</td>
<td>34,482</td>
<td>35,022</td>
<td>35,444</td>
<td>35,759</td>
<td>40,667</td>
<td>43,464</td>
<td>44,450</td>
<td>45,529</td>
</tr>
<tr>
<td>Category (ii) Total</td>
<td>129,243</td>
<td>131,410</td>
<td>132,257</td>
<td>132,483</td>
<td>134,079</td>
<td>141,318</td>
<td>142,761</td>
<td>142,766</td>
<td>146,680</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category (iii) - Planned Procedures</th>
<th>Jan-19</th>
<th>Apr-19</th>
<th>Jul-19</th>
<th>Oct-19</th>
<th>Jan-20</th>
<th>Apr-20</th>
<th>Jul-20</th>
<th>Oct-20</th>
<th>Jan-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>13,815</td>
<td>14,170</td>
<td>14,735</td>
<td>14,777</td>
<td>15,202</td>
<td>15,092</td>
<td>14,749</td>
<td>14,809</td>
<td>16,881</td>
</tr>
<tr>
<td>Suspended</td>
<td>82</td>
<td>79</td>
<td>110</td>
<td>155</td>
<td>108</td>
<td>203</td>
<td>117</td>
<td>.99</td>
<td>.220</td>
</tr>
<tr>
<td>Subtotal – Excluding Endoscopy</td>
<td>13,897</td>
<td>14,249</td>
<td>14,845</td>
<td>14,932</td>
<td>15,310</td>
<td>15,295</td>
<td>14,866</td>
<td>14,908</td>
<td>17,101</td>
</tr>
<tr>
<td>GI Endoscopy, Active</td>
<td>61,360</td>
<td>62,882</td>
<td>64,154</td>
<td>65,992</td>
<td>68,042</td>
<td>70,320</td>
<td>71,238</td>
<td>72,295</td>
<td>73,991</td>
</tr>
<tr>
<td>GI Endoscopy, Suspended</td>
<td>2,212</td>
<td>2,169</td>
<td>2,371</td>
<td>2,352</td>
<td>2,298</td>
<td>2,341</td>
<td>2,216</td>
<td>1,933</td>
<td>1,985</td>
</tr>
<tr>
<td>Subtotal – GI Endoscopy Only</td>
<td>63,572</td>
<td>65,051</td>
<td>66,525</td>
<td>68,344</td>
<td>70,340</td>
<td>72,661</td>
<td>73,454</td>
<td>74,228</td>
<td>75,976</td>
</tr>
<tr>
<td>Category (iii) Total</td>
<td>77,469</td>
<td>79,300</td>
<td>81,370</td>
<td>83,276</td>
<td>85,650</td>
<td>87,956</td>
<td>88,320</td>
<td>89,136</td>
<td>93,077</td>
</tr>
</tbody>
</table>

| Total – All Categories             | 729,937| 762,675| 778,456| 782,980| 776,499| 796,603| 832,443| 844,719| 869,676|
outpatient waiting list numbers rose nationally from 523,225 in January 2019 to 629,919 in January 2021, representing an increase of 106,694, or 20.4%.

In addition, the proportion of patients experiencing very long waits for care increased during this time, with 170,983 (27.1%) of those on the outpatient waiting list waiting longer than 18 months as of January 2021 (Table 5). The hospital specialties with the longest outpatient waiting lists in January 2021 were orthopaedic surgery (77,257); ear, nose and throat surgery (68,073); and ophthalmology (47,075), comprising 30.5% of the total national outpatient waiting list (Table 6).

**In-patient/day-case waiting lists.** Waiting lists for the IPDC admissions were analysed with respect to length of wait and are presented in Figure 10. As stated, this category refers to patients awaiting admission on an elective basis for care or treatment, some of whom require overnight admission after their treatment (in-patient admissions), together with those who do not (day-cases). Of note, NTPF figures for the IPDC and planned procedure waiting list categories are published with patients awaiting endoscopy considered separately; as shown in Figure 10 and Figure 11, data in this paper are depicted in the same manner.

As shown, there was a marked increase in both endoscopic and general IPDC waiting lists in the early months of 2020 (January to April), coinciding with the ‘first wave’ of COVID-19 and attendant disruptions in planned routine healthcare. From January 2019 to 2020, the number awaiting an IPDC admission rose by 3.7% from 129,243 to 134,079; from
Planned procedures. As mentioned earlier, planned procedures refer to those patients who have had an initial episode of care and require recall for further treatment subsequent to that episode. Patients in this category include those awaiting second-eye cataract surgery, follow-up skin grafts, or follow-up GI endoscopy. As shown in Figure 11, patients awaiting GI endoscopy constitute the majority of this category.

Endoscopy. Notably, as shown in Figure 10 and Figure 11, both the IPDC and planned procedure waiting list categories include a cohort of patients awaiting GI endoscopy. These cohorts are combined in Figure 12, to provide an estimate of total national patient numbers awaiting GI endoscopy.

Of 121,505 patients awaiting GI endoscopy in January 2021, 45,529 (37.5%) were in the IPDC category, and 75,976 (62.5%) were in the planned procedure category. This total represents a 27.4% increase from January 2019, when the number of those awaiting an endoscopy was 95,386. An increase was seen every three months over the two-year period, with the largest single increase recorded from January 2020 to April 2020, a period coinciding with the first national ‘lockdown’, when 7,223 patients were added to the list.

As well as increasing in absolute terms, the proportion of patients in the ‘active’ IPDC waiting list category waiting long periods for an endoscopy rose in the two-year period analysed (Figure 13), in particular after the onset of the pandemic. Having been relatively stable in 2019, the proportion of those on the IPDC endoscopy waiting list waiting more than 12 months rose from 6.0% in January 2020 to 19.0% in January 2021, and the proportion waiting more than 18 months from 1.2% to 5.6% in the same period.

Notably, at time of writing, length-of-wait data for endoscopy were only available for patients in the IPDC category and classified as ‘Active’, and not for patients in the planned procedure category. As such, the length of wait for around 70% of patients awaiting a scope nationwide remains uncharacterised. This constitutes a limitation of the data in this section.

Discussion
This research set out to document trends in publicly available data on healthcare activity during the first nine months of the COVID-19 pandemic. Analysis was presented on three key areas of the Irish health system – primary care, community-based healthcare and the hospital. In this section, we discuss the potential implications of these findings for the implementation of Sláintecare.

Primary care
The findings indicate that GPs played an instrumental role in Ireland’s COVID-19 response given that a majority (two-thirds) of all COVID-19 PCR tests were either referred by GPs, followed up on by GPs, or both. Moreover, the figures show that large numbers of telephone-based consultations were held with patients presenting with COVID-19 symptoms, with three peaks in this activity, each preceding the successive ‘waves’ of COVID-19. However, the number of patients availing of out-of-hours GP care fell significantly in 2020 coinciding with the first ‘lockdown’. This reflects other Irish and international literature that has highlighted changes in care-seeking activity during the pandemic, such as in emergency departments (Brick et al., 2020; Lazzerini et al., 2020; Marron et al., 2021).

Table 5. Patients waiting longer than 18 months for a first hospital outpatient appointment (2019–2021) (National Treatment Purchase Fund, 2021).

<table>
<thead>
<tr>
<th></th>
<th>Number waiting &lt;18 months</th>
<th>% of OPD list</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2019</td>
<td>96,243</td>
<td>18.4</td>
</tr>
<tr>
<td>April 2019</td>
<td>103,973</td>
<td>18.8</td>
</tr>
<tr>
<td>July 2019</td>
<td>104,245</td>
<td>18.5</td>
</tr>
<tr>
<td>October 2019</td>
<td>106,460</td>
<td>18.8</td>
</tr>
<tr>
<td>January 2020</td>
<td>29,920</td>
<td>5.4</td>
</tr>
<tr>
<td>April 2020</td>
<td>30,642</td>
<td>5.4</td>
</tr>
<tr>
<td>July 2020</td>
<td>41,882</td>
<td>7.0</td>
</tr>
<tr>
<td>October 2020</td>
<td>45,674</td>
<td>7.5</td>
</tr>
<tr>
<td>January 2021</td>
<td>170,983</td>
<td>27.1</td>
</tr>
</tbody>
</table>

Table 6. Two-year trends of the ten hospital specialties with longest outpatient waiting lists (National Treatment Purchase Fund, 2021).

<table>
<thead>
<tr>
<th></th>
<th>Jan-19</th>
<th>Jan-20</th>
<th>Jan-21</th>
<th>% Change (2019 to 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopaedics</td>
<td>64,789</td>
<td>64,907</td>
<td>77,257</td>
<td>+19.2</td>
</tr>
<tr>
<td>ENT</td>
<td>67,520</td>
<td>64,229</td>
<td>68,073</td>
<td>+0.8</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>40,443</td>
<td>40,777</td>
<td>47,075</td>
<td>+16.4</td>
</tr>
<tr>
<td>Dermatology</td>
<td>43,544</td>
<td>43,363</td>
<td>46,010</td>
<td>+5.7</td>
</tr>
<tr>
<td>General Surgery</td>
<td>31,572</td>
<td>32,860</td>
<td>43,506</td>
<td>+37.8</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>30,720</td>
<td>44,116</td>
<td>43,430</td>
<td>+41.4</td>
</tr>
<tr>
<td>Urology</td>
<td>29,670</td>
<td>30,911</td>
<td>33,528</td>
<td>+13</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>28,029</td>
<td>27,220</td>
<td>30,180</td>
<td>+7.7</td>
</tr>
<tr>
<td>Cardiology</td>
<td>20,142</td>
<td>26,378</td>
<td>29,034</td>
<td>+44.1</td>
</tr>
<tr>
<td>Neurology</td>
<td>20,950</td>
<td>22,260</td>
<td>22,501</td>
<td>+7.4</td>
</tr>
</tbody>
</table>

January 2020 to 2021, it rose by 9.4% from 134,079 to 146,680. As of January 2021, the three specialties with the largest IPDC waiting lists were general surgery (13,537 waiting), orthopaedic surgery (11,092) and urology (10,348).
Ireland’s primary care system has been described by international observers as inequitable (Organisation for Economic Co-Operation and Development, 2019; Thomson et al., 2014). Yet these trends represent significant changes in routes of access to healthcare, including in primary care, and speak to the extraordinary dedication and professionalism of healthcare workers. They also demonstrate the potential of the Irish healthcare system successfully to implement entirely novel approaches to healthcare at scale that are underpinned by universalism: the foundation stone of Sláintecare. Critically, all COVID-related healthcare in Ireland has remained free at the point of use (Brick et al., 2020); the public health benefit of minimising monetary barriers to healthcare access has been emphasised (World Health Organisation, 2020b).
Community-based healthcare

The analysis revealed that activity declined significantly in 2020 across multiple allied healthcare professions in the public system. Notably, the extent of the decline in activity varied between specialties. There may be several factors causing this variance, such as differences in adaptability to video-based or tele-consultations (Tack et al., 2021); workforce redeployment to tasks such as contact tracing (Raidió Teilifís Éireann, 2020a; Raidió Teilifís Éireann, 2020b); and socioeconomic effects of the pandemic such as those related to childcare, particularly given that a majority of allied healthcare workers are women (Del Boca et al., 2020; Shannon et al., 2019; U.S. Bureau of Labor Statistics, 2021).

Moreover, the proportion of infants receiving 10-month developmental screening checks on time from their PHN...
fell significantly in 2020. Further research documenting the long-term impact of the disruption to this element of early-childhood healthcare would be of value.

In addition to reduced activity, the findings point to significantly increased waiting list figures for the eight allied health specialties examined during the early months of the pandemic. Notably, these increases were immediately preceded by a significant reduction in total waiting list numbers in the first quarter of 2020 (see Figure 6). The reason for this decline is not clear. It may represent a true decline in numbers awaiting treatment, a statistical artefact arising from methodological change in list management, or a combination of both.

The pandemic appears to have compounded a pre-existent crisis in community services. In 2018, a quarter or more patients were waiting longer than a year to be seen by several allied health specialties (see Table 2). During the pandemic, activities were cancelled and an unquantified number of allied health professionals were redeployed to other areas. The ramifications of this remain to be seen.

A core tenet of Sláintecare is the transition of healthcare from the acute hospital to the community. The reduced activity levels and increased waiting list figures documented here suggest that COVID-19 had a substantially negative impact on the levels of community-based healthcare delivered by the public healthcare system in Ireland in 2020. This lends considerable support to the assertion that the capacity for community-based healthcare should be bolstered and enhanced now and in the future; however, it also makes a strong case for ensuring that specialists are enabled, where possible, to remain in community settings if another wave of COVID-19 (or, indeed, a new health system crisis entirely) occurs in the future.

Hospital care

The findings point to a significant disruption of scheduled hospital care during the COVID-19 pandemic, manifesting as increased waiting lists and longer wait times in the Irish healthcare system. The harms incurred to those experiencing exceptionally long waits for healthcare, in terms of delayed diagnosis and worsened health outcomes, have long been recognised as a policy concern globally (Organisation for Economic Co-Operation and Development, 2019; Siciliani et al., 2014; Wren, 2003). Indeed, reducing public hospital waiting list numbers in Ireland has been a stated priority of healthcare policy for decades and is a key imperative of Sláintecare (Besley et al., 2009; Burke et al., 2019; Health Service Executive, 2021a; Health Service Executive, 2020a; Siciliani et al., 2014).

However, this research indicates that the onset of COVID-19 has exacerbated already long hospital waiting lists for essential care in the Irish context, emphasising existing deficits in the current healthcare system that will need to be considered and addressed by policymakers. There are likely several factors at play here: most obviously, service suspensions leading to cancellations (Government of Ireland, 2020b; National Public Health Emergency Team, 2020b), but also staff absences due to exhaustion and burn out (Riley et al., 2020), challenges to providing surgical care (Bresadola et al., 2020) and altered health-seeking behaviour patterns within the population, such as reduced rates of presentation to hospital related to fear of contracting the virus (Brick et al., 2020; Marron et al., 2021).

It appears that the health system sustained a ‘double hit’. Waiting lists grew during 2020, due to curtailed activity in hospitals. However, referral rates in real terms probably dropped, because of reduced availability of preventative care from GPs. This points to significant unmet need at community level. This has important policy implications.

If the implementation of Sláintecare is to be successful, measures to counteract or reduce the impact of these adverse effects in the longer-term, as well as protective mechanisms to prevent or mitigate similar consequences in the future, will need to be conceptualised, developed and put in place.

Limitations and directions for future research

As mentioned at the outset, we performed a secondary analysis of publicly available data to examine trends in healthcare activity in Ireland during the first nine months of the COVID-19 pandemic. While secondary data analysis has clear value, this approach is not without limitations, the most notable of which is that researchers have to ‘make do’ with what they have (or what is available), rather than being able to gather tailored data.

Because of this, the findings presented here only represent activity in the public health system and not the private sector. Furthermore, as stated accordingly throughout, the findings likely provide an incomplete picture of healthcare activity as it relates to GPs, GI endoscopy waiting lists and community-based COVID-19 tests. In particular, the data pertaining to general practice mostly describe COVID-19-related work, while data from other community-based services largely describe non-COVID-related work. This is because the PCRS reimbursement system – by which GPs were paid for COVID-related services such as testing – does not capture many other elements of general practice.

Moreover, it is likely that gaps exist between our presented figures on COVID-19 consultations and COVID-19 testing referrals. For example, Figure 3 shows that GPs were reimbursed for 413,000 telephone consultations in December 2020 and 174,000 consultations in January 2021. Meanwhile, GPs were responsible for more than 300,000 tests in December 2020 and 500,000 tests in January 2021 (Figure 4). It is difficult to identify where the ‘additional’ patients originate. Of note, out-of-hours GP care was reimbursed and recorded differently during this period. This is an important avenue for future research.

It also appears likely that the NTPF data used to describe the hospital sector contains flaws. For example, in Figure 9, a sudden jump in patients in the 15-18 month category in January 2020 seems inconsistent with trends from preceding three-month periods. Patients may have been reclassified. A clearer
Nevertheless, critical insights have been gleaned that warrant further research to improve our understanding of the impact of COVID-19 on Ireland’s health services and the potential implications for the implementation of Sláintecare.

Finally, certain consequences of the pandemic may take years to manifest fully. Moreover, the data utilised by this research were collected before several public health developments took effect, such as the introduction of walk-in COVID-19 testing centres and the roll-out of the national vaccination campaign. Further analyses of Irish healthcare activity should therefore endeavour to incorporate a longer observation period to enable stronger inferences to be made about the effect of the pandemic in the longer-term.

Conclusion
The effect of the pandemic on the Irish health system has been profound. In hospitals and in the community, healthcare activity has been significantly disrupted. Moreover, the crisis is occurring in a context in which Ireland’s public health system has longstanding and complex issues regarding access to care and long wait-times that place us well behind the norm in other European and OECD countries (Organisation for Economic Co-Operation and Development, 2019; Siciliani et al., 2014; Wren, 2003). Many people have died of COVID-19, and the health toll of delayed and disrupted non-COVID care remains to be calculated. However, it is clear that reduced healthcare activity combined with increased waiting lists across the health system directly worsened access to healthcare during the pandemic. This contrasts with the Sláintecare aim of improved access to care.

A major lesson from the pandemic has been the importance of data. Publicly available sources of timely, accurate health data are instrumental for policymakers as well as empowering for the public. The need for a central data registry in primary care has been noted. Similarly, hospital waiting list data should be collated and published in a way that is intuitive, transparent and forward-facing.

Yet, Ireland’s health system responses to COVID-19 have also demonstrated a strong willingness to change, to adapt at speed and to implement novel solutions for healthcare delivery at scale. These advances carry the potential to improve healthcare access and provide a sense of what is achievable under Sláintecare’s vision for reform. To sustain this momentum will require continued emphasis on public health, the empowerment of individuals and communities, and support for those across the front-line of the health system. Prior to the pandemic, progress on Sláintecare implementation had slowed. However, the crisis has presented the Irish health system with a rare opportunity to harness the key lessons and progress of the pandemic and to ‘build back better’ toward a sustainable recovery post-COVID-19.

Data availability
Underlying data
This study undertook a secondary analysis of publicly available data, meaning that no primary data were collected as part of this research. Each data source is referenced throughout the paper with online websites and sources detailed. The main websites are also listed below:

- https://www.sspcrs.ie/portal/annual-reporting
  This is an open-source data portal operated by the Primary Care Reimbursement Service (PCRS). Data obtained from this portal include figures on monthly eligibility levels for medical cards and GP visit cards. Figures on the number of COVID-19 telephone triages for which general practitioners submitted claims were also obtained from this portal.

  This provides access to the monthly performance reports published by the HSE in 2020. These reports contain data on community-based healthcare as well as out-of-hours GP care.

  This provides access to the monthly performance reports published by the HSE in 2019.

  This provides access to the monthly performance reports published by the HSE in 2018.

- https://data.gov.ie/dataset/laboratorylocaltimeserieshistoričview1
  This resource is published by Ordnance Survey Ireland and contains data concerning national COVID-19 testing figures.

- National Treatment Purchase Fund: https://www.ntpf.ie/home/nwld.htm
  This database contains the national waiting list data.

Acknowledgements
For providing valuable feedback on earlier drafts of this work, the authors wish to thank Ms. Laura Magahy, Department of Health; Dr Paul Kavanagh and Dr Louise Marron, Health Service Executive; and Dr Sarah Barry, Professor Steve Thomas and Dr Padraic Fleming, Centre for Health Policy and Management, Trinity College Dublin.
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Thank you to the authors for their consideration of my feedback. I have considered their response and better understand the limitations of the datasets they were working with. I believe the article, particularly with the modified discussion and substantial limitations section, now better reflects the authors’ findings.

Just one issue I’d ask the authors to consider- in the Discussion paragraph: 
"It appears that the health system sustained a 'double hit'. Waiting lists grew during 2020, due to curtailed activity in hospitals. However, referral rates in real terms probably dropped, because of reduced availability of preventative care from GPs. This points to significant unmet need at community level. This has important policy implications."

This is a very important point. However, I think the authors have the data in Table 4/Figure 9 to say with more certainty that referral rates dropped i.e. that numbers of patients in the 0-3 month category falling considerably (from 156k in Jan 2020 to 119k in Jul 2020) in the early stages of the pandemic was most likely due to the lack of new referrals entering the system. i.e. it is unlikely that the numbers dropped considerably as patients in the 0-3mth category were suddenly prioritised over those waiting years etc. This sticks out as a trend not seen elsewhere in these data. Patients clearly are leaving this 0-3mth category to enter the 3-6mth category (with a small number perhaps being seen/removed from the waiting list over the period in question), but are not being replaced as per usual.

The reasons as to why are most likely due to "reduced availability" of GP services, although mention of reduced healthcare seeking behaviour from patients is also likely to be more reflective of the complete picture.

Finally, the ordnance survey reference I mentioned in my previous report now doesn’t have a Reference Source link. Perhaps this was the authors' own analyses based on data provided by OSI? Or the CSO perhaps? If so this should be clearly stated in the References section. As the source material for Figure 4 this should be rectified.
In conclusion, I couldn’t agree more with the authors’ assertions that better data collection and use of said data is critically important for improving research and service delivery (for pandemic related issues and for healthcare in general), I hope this study contributes to the growing calls for this.

Kind regards,
Dr Mike O’Callaghan 3/5/23

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: general practice, eHealth, open data, healthcare utilisation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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This is an interesting and novel study that uses open data to describe some aspects of the Irish national response to COVID-19, from HSE-held data derived from general practice, allied healthcare in the community, and national treatment purchase fund reports.

While the authors have had to go to considerable lengths, particularly for the NTPF data, to contextualise and explain what exactly it is they are presenting, this article, in my view, requires a major revision.

My primary issue is that the data concerned with general practice mainly concentrate on COVID-19 related work, while the other areas (allied healthcare in the community and waiting list data) pertain to non-COVID work.

GP DATA
For these GP-related data, out-of-hours data is very interesting. Also, the finding that there is a flurry of activity Re: COVID telephone consultations before COVID-19 peaks is interesting (if what one might expect!).

However, it is not clear where the data relating to referrals for COVID-19 testing is originating from. I'm afraid the reference link for Ordnance Survey Ireland is not working as of 22-5-22. Perhaps this is now data held by the CSO data hub? In any case, it is difficult to say how many referrals for testing came from general practice, as public health and GP referrals seem to both be recorded as “community” referrals (as noted by the authors in Page 6 – “may over-state GPs’ role in referrals for testing”).

How much this issue affects the overall conclusions is uncertain. However, from data presented in the article GPs made claims for 413k COVID calls in Dec 20 compared to 174k in Jan 21 (Figure 3). For the same 2 months, from Figure 4, GPs seem to be responsible for 300k tests in Dec 20 and ~500k tests in Jan 21. This does not make sense entirely as if GPs had sent 500k people for tests in Jan 21 they would have claimed in excess of this number. While PCRS may not always receive or process GP claims rapidly, eReferrals for testing presumably can be handled more quickly than old paper-style claims. In any event, I don't see a large number of old claims being processed in early 2021 that might explain this discrepancy. Of note out-of-hours GP services have been reimbursed very differently during the pandemic (e.g. no longer being paid per patient, thereby, unfortunately, making comparisons with previous years via PCRS reports for OOH claims impossible), so referrals for testing from these important services might not feature in Figure 3. As the authors note, GPs have been able to make claims for telephone consultations relating to COVID-19 symptoms (using the code “CB”) since the early stages of the pandemic. We have also been able to claim for in-house respiratory consultations (using the code “CA”). Access to these data, if possible, could allow more definitive description of both of these aspects of the general practice's response to the pandemic.

Furthermore, perhaps PCRS data, which pertains to both COVID and non-COVID work could be used to explore how much regular daytime general practice continued while allied healthcare in the community and NTPF data suggest other aspects of the public healthcare system in Ireland faltered.

If there is a large difference in the volume of work general practice, in keeping with that seen in the other settings mentioned, then that is an important finding.

However, if it is shown that general practice experienced less of a dip than other areas, then that, in my view is an even more important finding i.e. why was general practice different? This might allow the authors to build their discussion around Sláintecare proposals that seek to harness what it is that works in primary care in Ireland.

While I appreciate it is difficult to access data from general practice EMRs (and that both GPs and academic depts/colleges/researchers need to do more to encourage this), there are other data sources publicly available that may be of interest e.g. vaccine rates for the under 2s from DOH key trends [Table 4.9 https://www.gov.ie/en/publication/350b7-health-in-ireland-key-trends-2021/], PCRS payments to pharmacists (largely from GMS prescriptions which are only issued by GMS GPs), in addition to important datasets held by the HSE including chronic disease management data, COVID-19 vaccine data, that may illustrate some of the overall activity in general practice
settings in RoI in the past 2 years.

**ALLIED HEALTH DATA**

I believe this is the strongest section presented. Allied health data in the community sections are presented well and unfortunately for the Irish Health service, are a clear description of yet another inadequate, unfair, and worsening waiting list situation the Irish public without healthcare insurance or the means to pay privately must endure. It is noted from Table 2 in this Section that many allied healthcare professional waiting lists experienced a sharp decrease in early 2020, again perhaps to “waiting list validation” exercises.

**NTPF**

NTPF data presented from page 10 to 13 is similarly troubling in terms of overall trends, e.g. Table 6. However, unfortunately, it is difficult to appraise what is happening to patients who have been referred, and when it happens, from NTPF data presented.

I don't believe this is the author's fault, it merely represents some of the inadequacies of the data sources examined. Table 4 deserves particular mention here, where NTPF data presented are in need of clarification, presumably by the NTPF themselves. Specifically, the jump seen in the number in the “15-18 months” category between Oct-19 and Jan-20 is unusual. If bands are contiguous, then the overall number of “new people” spilling into a 3 month waiting list category (15-18mths) over a 3 month gap surely cannot exceed that in the preceding waiting list category (12-15mths), unless a huge number of patients are “found” by being reclassified elsewhere? At several points in this article, including for the Allied healthcare data, big changes happen at the end of 2019 in many waiting lists, which requires more in terms of discussion, in my opinion.

In fairness to the authors, they allude to potential “statistical artefact” in Page 16 Paragraph 2. However, the issues outlined here, coupled with the lack of data on procedures being carried out on the NTPF, the lack of disclosure on “waiting list validation” exercises, etc., and other matters such as the use of the cross-border directive, etc., lead me to believe NTPF data output is not researcher-friendly in its current form.

While the authors note the significant limitations and complexities of NTPF data (page 4, second last paragraph), I wonder if an approach to concentrate on a smaller subset of NTPF data +/- inclusion of more acute hospital data might allow more definitive statements to be made on the effect of COVID-19 on public secondary healthcare in Ireland.

With that said, I do find it interesting that numbers in the 0-3mth category in Table 4 decreased considerably in mid 2020. This would be consistent with people not being referred in by general practice, as noted by the authors (Page 3, 4th paragraph). While I have stated above my reservations about making firm conclusions about the other data presented in Table 4 (i.e. the longer wait times), it is abundantly clear that the number of waiting lists still grew considerably overall during 2020. This is something of a double-hit issue, where there is a large unmet need in the community (as they're not coming in to be referred) and in those currently on the waiting list for older issues that are not being dealt with by the public system or the NTPF, which does not
bode well for the waiting list numbers in the near future.

**DISCUSSION**

Points on GP OOH and "Universalism" are well made.

The point on keeping allied healthcare professionals in their posts in the future is interesting, though it would be stronger if we knew how many were redeployed. Highlighting the need for bolstering the existing workforce in allied healthcare professionals could be made stronger by referencing the pre-pandemic situation described by Table 2- (i.e. many specialties with a quarter or more patients on the waiting list being on it > 1yr).

Discussion on hospitals could allude to the unmet need mentioned in the paragraph above ("double-hit issue"), though perhaps the authors would need to gather more evidence before this could be described with more conviction.

**REVIEWER CONCLUSION**

This is a well written article that is considerable in its scope. However, I feel it needs some work to more clearly define data sources, which will strengthen the discussions/conclusions considerably. I hope the authors will agree with at least some of the points I have made and I hope they will be agreeable to redrafting the article +/- a response in the near future. Work to highlight how far we need to go as a country with respect to publicly available sources of healthcare data is critical in my view.

Many thanks,
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**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

**Is the study design appropriate and is the work technically sound?**
Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**
Partly

**If applicable, is the statistical analysis and its interpretation appropriate?**
Partly

**Are all the source data underlying the results available to ensure full reproducibility?**
Partly

**Are the conclusions drawn adequately supported by the results?**
Partly
**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** general practice, eHealth, open data, healthcare utilisation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.