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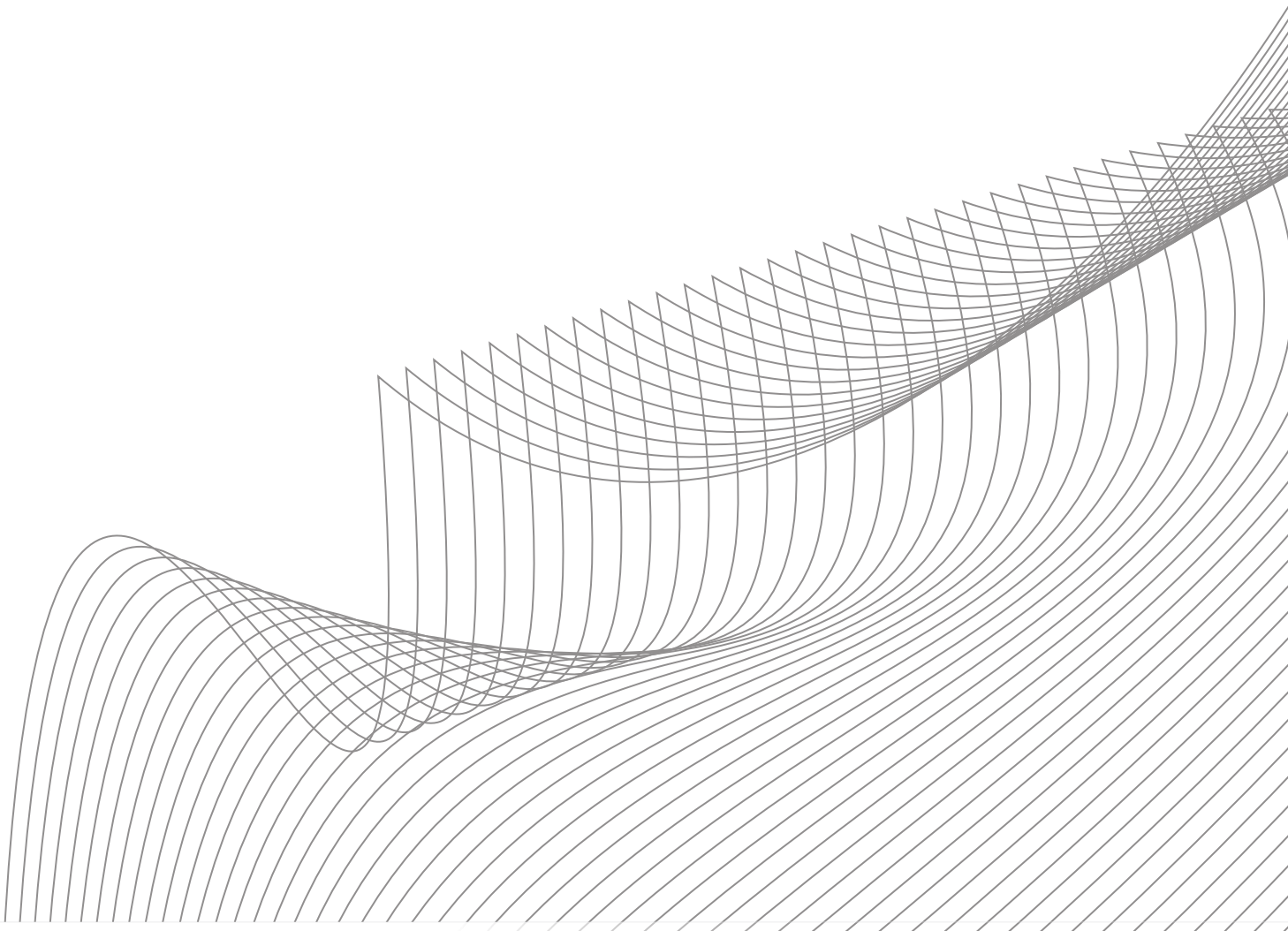

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Short report

Using silent area analysis to inform a COVID-19 public health response in Hunter New England, regional New South Wales

Michelle Butler, Benjamin Elton, David Durrheim

Abstract

In 2020 and 2021, in the context of nationwide efforts to suppress SARS CoV-2 virus transmission while awaiting a vaccine, public health teams were responsible for finding and isolating all cases and quarantining their contacts. The success of this strategy required very high case ascertainment and thus, by inference, ready access to PCR testing, even in large rural areas such as Hunter New England in New South Wales.

'Silent area' analysis entailed the scheduled regular comparison of case and testing rates at local-government-area resolution against larger area and state-wide rates. This analysis provided an easily understood metric for identifying areas with lower testing rates, and for direction of surging of local testing capacity in such areas, by the local health district in partnership with public health services and private laboratory services. Complementary intensive community messaging was also utilised to promote increased testing in identified areas.

Keywords: Silent areas; SARS CoV-2; COVID-19; population; testing rates

Background

Hunter New England (HNE) is one of 15 health districts in New South Wales (NSW). It serves a regional/rural population of close to 950,000 people across 132,000 square kilometres. Almost seven percent of the population identify as Aboriginal or Torres Strait Islander and 18% of the population were born overseas. The local health district (LHD) encompasses 25 local government areas (LGAs) including the 'major city' and 'inner regional' areas of Newcastle and Lake Macquarie (Figure 1).

The first HNE coronavirus disease 2019 (COVID-19) case was identified on 6 March 2020. The case infected a number of their family members whose places of residence were spread between two LGAs: the Mid Coast LGA (coastal but classified as outer regional/remote) and Newcastle LGA (coastal but classified as inner regional) (Figure 1). It was immediately apparent that this disease would not only be focused in population-dense metropolitan areas.

Of the first 30 cases identified in HNE, 14 were in Lake Macquarie and Newcastle LGAs (inner regional) with the other 16 spread across five LGAs that were classified as outer regional or rural (Figure 2). These regional and rural LGAs are large expanses of land with relatively small populations. They are often serviced by community health services and multipurpose services rather than hospitals.

By 17 March 2020, within two weeks of the first HNE case detection, COVID-19 had reached the most northern rural LGAs (Tenterfield and Glen Innes Severn; Figure 2).

Figure 1: The location of the Hunter New England Local Health District (HNELHD) within New South Wales

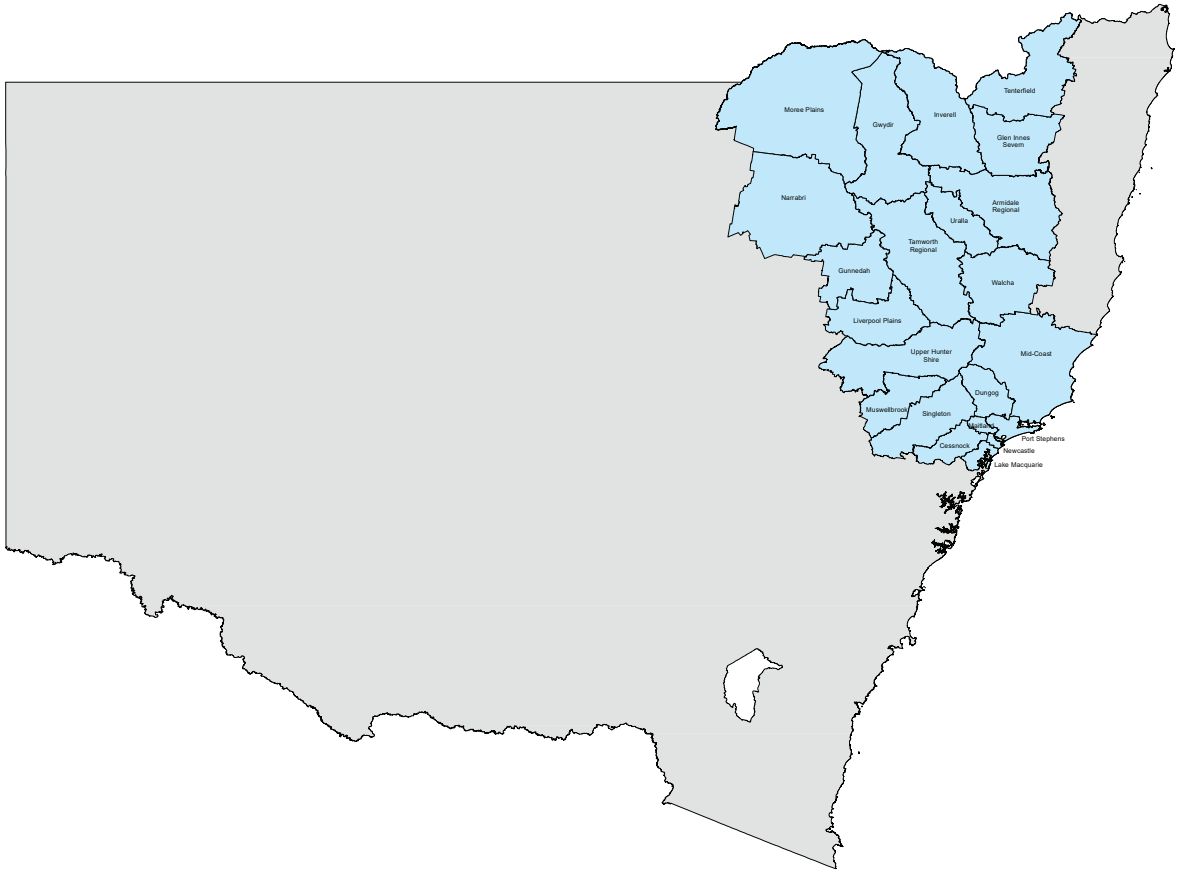

Figure 2: Locations of the first 30 cases of COVID-19 in HNELHD based on local government area (LGA)

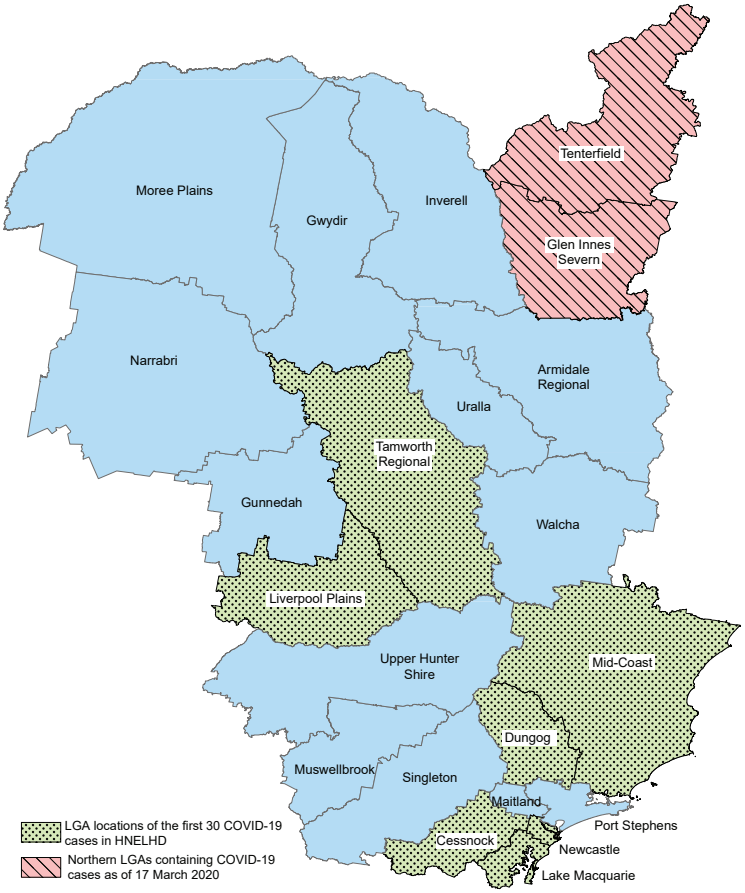

Figure 3: Map showing division of HNELHD into health service sectors

Due to the large size of HNELHD and the distribution of existing health services, access to testing and treatment for COVID-19 was going to prove difficult in outer regional, rural and remote areas; as such, careful and constant surveillance of these areas was needed so resources could be moved and increased in the areas that needed them most.

Team members from HNE have previously contributed to enhancing acute flaccid paralysis (AFP) surveillance in Australia, a backbone to poliomyelitis surveillance. This entailed applying the World Health Organization (WHO) AFP detection rate threshold at LGA level across Australia to identify areas that were 'silent' for AFP detection.[1] It was thought that the same principle might be applied to COVID-19 surveillance and detection, as with the focus on attempting to eliminate/maximally suppress COVID-19 in NSW, it was imperative that all cases were identified early so they could be isolated and their contacts quarantined.

Methods

Community members in HNE were encouraged to be tested if experiencing any COVID-19 compatible symptoms. This raised questions about access to testing in outer regional, rural and remote areas. The COVID-19 surveillance and detection process could not afford to miss more than a few cases to best suppress the transmission of SARS-CoV-2. Equitable access to medical care also relied on timely and complete case detection.

A silent area analysis was introduced to evaluate testing rates in HNELHD.

HNE's LGAs are administratively grouped into health service sectors for health service provision and this was the first resolution level for analysis (Figure 3). Within each such sector, testing rates per 100,000 population were compared to NSW average testing rates. Where sector testing rates fell below the NSW overall average testing rate, a more granular analysis was conducted to identify local 'silent areas'. Sector level in HNE was still too large a geographic and population area to pinpoint areas requiring enhanced testing efforts, hence there was a need for more granular analysis.

Once a sector was identified as falling short of the NSW testing rate, the testing rates for all LGAs within that sector were calculated. Once a particular 'silent' LGA was identified, then the demographics of those being tested compared to the NSW and HNE rates would be explored. Confidence in the accuracy of postcode population data was low and thus finer geographical resolution could not be investigated. Underrepresentation by age-group or ethnic group prompted in-depth discussion between the local Incident Command System team, including public health, medical services, Aboriginal Health and communications, on how to best surge and promote local testing in the 'silent area' to increase representative testing.

This analysis was conducted routinely every Monday and Thursday throughout 2020. In 2021, it was continued until negative test results were no longer captured in the NSW dataset on 16 December 2021.

Ethics was not required as this was analysis of data collected under the *Public Health Act 2010* to help inform the public health pandemic response.

Results

Between 1 February 2020 and 10 September 2020 (the period of maximal suppression/elimination focus within NSW), there was a strong correlation between testing rates and case rates (Pearson $r = 0.982$), supporting the need to ensure optimal testing rates to find cases. The results presented here are illustrative of this approach and include this entire time range; but in real time, we considered weekly, fortnightly and monthly time frames for public health action.

Table 1 shows that during this entire time period, testing rates ranged between 14,000 and

Table 1: Example of testing rates for HNE sectors and NSW, 1 February 2020 – 10 September 2020

Sector	Cases	Tested & excluded	Total tested	2019 population	Tests per 100,000 residents	Percent positive	Cases per 100,000 residents
Greater Newcastle	161	124,011	124,172	444,953	27,907	0.13%	36
Hunter Valley	8	12,332	12,340	54,018	**22,844**	0.06%	15
Lower Hunter	60	37,647	37,707	154,574	**24,394**	0.16%	39
Lower Mid North Coast	40	15,265	15,305	93,836	**16,310**	0.26%	43
Mehi	1	4,499	4,500	31,749	**14,174**	0.02%	3
Peel	16	18,579	18,595	86,259	**21,557**	0.09%	19
Tablelands	13	12,032	12,045	69,146	**17,420**	0.11%	19
Total (all HNE sectors)	**299**	**224,365**	**224,664**	**934,535**	**24,040**	**0.13%**	**32**
Total (all NSW LGAs)	**3,999**	**2,000,828**	**2,004,281**	**8,088,791**	**24,778**	**0.20%**	**49**

28,000 per 100,000 population across the seven HNE sectors. In six of the seven sectors, testing rates were below the NSW average (highlighted in red), despite the similarity of the overall HNE rate (24,040/100,000 population) to the overall NSW rate (24,778/100,000 population). These sectors were then considered in finer detail.

Using Hunter Valley sector, with a testing rate of 22,844/100,000 residents as an example, we considered the rates in the three LGAs making up this sector (Table 2).

The LGA-level analysis showed that the LGA with the largest population in the Hunter Valley sector was testing above the NSW average rate while the two less-populous LGAs tested below the NSW average rate. The ABS remoteness classification[2] indicated that Singleton was primarily 'inner regional', with both Muswellbrook and Upper Hunter Shire primarily 'outer regional'. Similarly in the Lower Hunter sector, testing rates were minimally lower than NSW despite a relatively high case rate in comparison to the rest of HNE, which usually prompts greater testing. Once again one LGA, Maitland, concealed much lower testing rates in other local LGAs in the sector (Table 3).

Table 2: Example of testing rates for local government areas (LGAs) in the Hunter Valley sector and NSW, 1 February 2020 – 10 September 2020

Sector	Local government area	Cases	Tested & excluded	Total tested	2019 population	Tests per 100,000 residents	Percent positive	Cases per 100,000 residents
Hunter Valley	Muswellbrook (A)	1	3,189	3,190	16,377	19,479	0.03%	6
	Singleton (A)	5	6,360	6,365	23,461	27,130	0.08%	21
	Upper Hunter Shire (A)	2	2,783	2,785	14,180	19,640	0.07%	14
Total (all HNE sectors)		**299**	**224,365**	**224,664**	**934,535**	**24,040**	**0.13%**	**32**
Total (all NSW LGAs)		**3,999**	**2,000,828**	**2,004,281**	**8,088,791**	**24,778**	**0.20%**	**49**

Table 3: Example of testing rates for local government areas (LGAs) in the Lower Hunter Sector, 1 February 2020 – 10 September 2020

Sector	Local government area	Cases	Tested & excluded	Total tested	2019 population	Tests per 100,000 residents	Percent positive	Cases per 100,000 residents
Lower Hunter	Cessnock (C)	24	10,602	10,262	59,985	17,108	0.23%	40
	Dungog (A)	5	1,546	1,551	9,423	16,460	0.32%	53
	Maitland (C)	31	25,499	25,530	85,166	29,977	0.12%	36
Total (all HNE sectors)		**299**	**224,365**	**224,664**	**934,535**	**24,040**	**0.13%**	**32**
Total (all NSW LGAs)		**3,999**	**2,000,828**	**2,004,281**	**8,088,791**	**24,778**	**0.20%**	**49**

Discussion

Maps have proven vital for visualizing the COVID-19 pandemic, from identifying local disease and vaccination patterns to understanding global trends.[3] At local level, their utility for public communication and directing clinical surge has also been recognised.[4] In HNE, when local under-testing ('silent') areas were identified, engagement with private pathology providers resulted in prompt deployment of further testing options and prompted active community testing messages targeted to promote existing and new testing services.

The data used in this analysis was not probability-based with carefully designed statistical analysis. Instead, the analysis was a regular data-driven process from routinely available data that helped inform decisions on when and where to add testing facilities (hospital, pop-up clinics, mobile testing), with these decisions able to be defended if questioned. It facilitated delving into the attributes of smaller area population testing rates and permitted crafting of the appropriate messaging and selection of message bearers or media forms for promoting testing.

Our application of this practical tool at local level ensured that lower testing rates in smaller populations were not 'hidden' by larger population centres, while its simplicity facilitated communication and an immediate public health response.

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