

Working Paper 2020/12

An analysis of the responses to the 'Open Letter to District Health Boards (dated 25 March 2020)'

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Contents

1.0	Introduction	5
1.1	Purpose	5
1.2	Purpose of Project: <i>PandemicNZ</i>	6
2.0	Methodology	7
Step 1	Determining the supply chain risks of pandemic-related medical items	7
Step 2	OIA request (our OIA 2020/02)	7
Step 3	Collecting responses and other relevant correspondence	7
Step 4	Analysing the data set	8
3.0	Analysis of time taken for DHBs to respond	10
3.1	Introduction	10
3.2	Results	10
3.3	Key findings	13
4.0	Analysis of stock held by each DHB by range	14
4.1	Introduction	14
4.2	Key findings	14
5.0	Analysis of stock held by each DHB by volume	15
5.1	Introduction	15
5.2	Results	15
6.0	Observations	22
6.1	Summary	22
6.2	Three major suggestions for consideration	22
	References	34

List of Appendices

Appendix 1: 'OIA 2020/02: Open Letter to District Health Boards'	23
Appendix 2: DHB research data (medical items required for pandemics held by district health boards)	24
Appendix 3: Graph of masks per person by DHB over the time it took DHBs to respond	25
Appendix 4: Analysis of PPE volumes with respect to DHB staff and DHB populations	26
Appendix 5: Graphs relating to mask analysis by demographic	32

List of Figures

Figure 1:	Deprivation and geographic differences between DHBs	9
Figure 2:	Timeliness of DHB responses	13
Figure 3:	Total number of different products held by each DHB	14
Figure 4:	Average masks per person by DHB	15
Figure 5:	Average gloves per person by DHB	16
Figure 6:	Average goggles per person by DHB	16
Figure 7:	Average gowns per person by DHB	17
Figure 8:	Ventilators per person by DHB	17
Figure 9:	CT scanners per person by DHB	18
Figure 10:	Oxygen tanks per person	18
Figure 11:	Masks per person for by the percentage of the DHB's population living in high deprivation areas	19
Figure 12:	Masks per person by the percentage of the DHB's population that is of Māori descent	20
Figure 13:	Masks per person by the percentage of the DHB's population that is over 65 years old	20
Figure 14:	Masks per person by the percentage of the DHB's population living in rural areas	21

List of Tables

Table 1:	DHB responses as at 17 September 2020	10
Table 2:	Status of DHB responses as at 17 September 2020	11

List of Tables in Appendices

Table 4.1:	Stock by DHB Staff	26
Table 4.2:	Stock by DHBs population	28

1.0 Introduction

1.1 Purpose

This research aims to analyse and compare stock levels and types of personal protective equipment (PPE) held across district health boards (DHBs) with respect to characteristics associated with DHB populations. Populations differ by scale, density, ethnicity, age profile and deprivation (Simpson, 2020). Through comparison of DHBs and associated demographics, it is clear that there is a correlation between deprivation and poor health status (Simpson, 2020).

This analysis aims to identify what type of PPE-related shortages exist, in the hope that this will help with preparations for future city/regional lockdowns. Overall, the research aims to explore the current status of PPE practices and stock that exist across DHBs and how it could adversely impact New Zealand during future viral outbreaks.

Since mid-January 2020, the Institute has been trying to ascertain stock levels of PPE, as well as other pandemic-related medical items (e.g. CT scanners, ventilators, oxygen tanks) held by DHBs and the Ministry of Health (MOH). The Institute is particularly interested in the impact that pandemics may have on the availability, accessibility and distribution of PPE and other pandemic-related medical items throughout New Zealand, especially in response to COVID-19. Our interest is in the identification and management of supply-chain risks for future pandemics and the extent to which the current systems are working effectively and align with the 2017 New Zealand Influenza Pandemic Plan, in particular page 13. (MOH, 2017a).

Of key importance is the National Health Emergency Plan, which details the responsibilities of the Ministry and DHBs in managing and using these significant national resources.

1.1 Background

The Ministry manages and/or controls a number of national reserve emergency supplies. Some of these are held in DHB stores, and others in bulk stores off DHB sites.

National reserve supply items	Stored by DHBs	Stored by Ministry
P2 respirators and general purpose masks	✓	✓
Personal protective equipment (aprons, gloves, eye protection)	✓	
Clinical equipment (syringes, giving sets, IV fluids, etc)	✓	
Tamiflu (each DHB holds 200 courses)	✓	✓
Pandemic antibiotics	✓	
H5N1 pre-pandemic vaccine		✓
Vaccination supplies		✓
Body bags		✓
Not available at this time		
Pandemic vaccine	N/A	N/A

1.2 National reserve supplies – purpose

National reserve supply stocks have been developed to ensure that as far as is possible, DHBs and the wider health sector have continued access to essential supplies during large or prolonged emergencies that generate unusual demands on normal health service stocks or supply chains.

DHB 'business as usual' supplies and supply chain capacity should be managed at a level able to ensure all reasonably predictable local events can be supported without requiring additional resources from national reserves.

During the pandemic, the Institute has been requesting information through the Official Information Act (OIA) about stocks of PPE and other pandemic-related medical items, as well as about how these stocks are being managed and who is responsible/accountable for that management. In relation to COVID-19, the Institute sent a number of OIA requests to government, including an OIA to DHBs on 25 March 2020 (see Appendix 1), with the intention of gathering information to understand New Zealand's current stock levels and stock types. The response by each DHB can be found on the Institute's publications page, under correspondence/OIAs.

In April 2020, the OAG agreed with the Ministry of Health to independently review the Ministry's management of PPE during the early stages of the country's response to COVID-19. The aim was to do a relatively rapid review given the high level of public interest in PPE. John Ryan, Controller and Auditor-General, outlined what OAG found in their rapid review:

The Ministry did not regularly review DHBs' plans to ensure that they were kept current and that they were well aligned with the Ministry's overall plans. We found some misalignment in the plans about roles and responsibilities for both planning for, and providing PPE in a pandemic, which led to confusion.

The gaps in the planning also meant that the Ministry was not well positioned to ensure that PPE was available in enough quantities throughout the country to meet the demand caused by the pandemic.

The health and disability system is semi-devolved, with distributed responsibilities and often complex arrangements between the Ministry, DHBs, and other organisations. The Ministry is responsible for monitoring and forecasting usage of the national reserve of PPE, and prioritising and allocating supplies when needed.

However, in early February 2020, the Ministry did not know what PPE stock the DHBs held in their reserve supplies or have a system to forecast demand. The devolved system of managing and distributing PPE stock for operational use was not able to manage the increased flow of stock needed during the Covid-19 response, and DHBs identified that some of the national reserve stock DHBs held had expired. (OAG, 2020)

The purpose of this working paper is to add to this narrative and highlight not only the data evidenced at that point of time but what a better system might look like. Given the importance of this work and the wide public interest in PPE during times of a pandemic, the Institute may repeat this work in the future to see if better alignment in the plans about roles and responsibilities have occurred and whether a better system of stock management across DHBs has been implemented. Thank you for your interest in this research.

1.2 Purpose of Project: *PandemicNZ*

This working paper forms part of Project PandemicNZ, which aims to help New Zealand prepare for future pandemics, as well as manage and learn from the current COVID-19 pandemic. Project PandemicNZ draws together early Institute publications as well as an increasingly comprehensive suite of research and publications relating to the COVID-19 pandemic.

This working paper follows on from previous PandemicNZ publications/initiatives that focus on COVID-19. The first publication in this project was *2006/01 - Managing the Business Risk of a Pandemic: Lessons from the Past and a Checklist for the Future* (2006) followed by *Lessons from the West African Ebola Outbreak in Relation to New Zealand's Supply Chain Resilience* (2015). To learn more about recent research, please see our PandemicNZ project page on our website. Recent initiatives include:

- *SupplyNZ: Winning the war against COVID-19 is a sub-project of PandemicNZ, and aims to connect makers, suppliers and purchasers of important equipment in the battle against COVID-19.*
- *An analysis of the 2020 NZNO PPE Survey.*

2.0 Methodology

Given that the Institute is independent of government and therefore only has access to publicly available information, our approach has been to request information directly from DHBs under the OIA. The Institute believes that timely, complete and accurate information is necessary to inform not only decision makers, but the wider public service and interested citizens. This information is critical: if we know we do not have the required PPE and other essential pandemic-related medical items to manage a large outbreak, the country's only alternative is a lockdown at the border. Collecting and sharing information about our healthcare system's lack of preparedness for a pandemic is an important part of shaping public behaviour and gathering support for lockdowns during this pandemic. We hope the collected information will help New Zealand navigate this pandemic in other ways as well and, crucially, redesign the health system in preparation for future pandemics. This point is discussed further in the Observations section (see page 22).

Our method involves four steps:

Step 1: Determining the supply chain risks for pandemic-related medical items

The Institute has identified three types of audiences that are interested in stocks of key medical items that are essential to manage outbreaks of COVID-19:

- a. health care workers, enabling them to stay safe while treating patients (e.g. PPE);
- b. patients, enabling them to get the best medical care while keeping family and caregivers safe (e.g. ventilators); and
- c. the wider population, differentiating between people that are infected and not infected (e.g. testing equipment).

A list of the resulting medical stock is contained in our first OIA request (see Appendix 1).

Step 2: OIA request (our OIA 2020/02)

On 25 March 2020, the Institute sent an 'Open Letter to District Health Boards' requesting quantifiable data relating to PPE stock levels. The research presented in this work has resulted from stock levels included in the DHB responses to the OIA request. The request was published on the McGuinness Institute website as an open letter (see Appendix 1).

Step 3: Collecting responses and other relevant correspondence

DHB responses and correspondence were processed as they were received. Soft and hard copy folders were made for each OIA.

- All correspondence was then aggregated and uploaded to the McGuinness Institute website where it could be viewed publicly as part of our online OIA schedule found on the McGuinness Institute website under McGuinness Institute Correspondence/OIAs. The correspondence schedule contains all necessary information related to our OIA 2020/02, such as title, subject matter, affiliated party/recipient, date sent, date received, reference number and status.
- All data from that correspondence was compiled on an excel and is available as an additional document on the McGuinness Institute website under Working Papers – Working paper 2020/12. The excel contains all the actual stock levels that were obtained from the responses by DHBs. A small image of the excel is contained in Appendix 2.

Note:

1. Auckland DHB and Tairāwhiti DHB (and their associated populations) have been excluded from Step 4 as they did not provide the Institute with any data.

2. Canterbury DHB and West Coast DHB reported their stock levels together as West Coast DHB draw all their stock from Canterbury DHB. Given this, we reduced Canterbury DHB numbers by West Coast DHB numbers to ensure there was no double counting.

Step 4: Analysing the data set

The data used for this analysis was gathered from DHB responses to the OIA request. DHBs responded to the OIA at different times, which impacted the ability to meaningfully compare stock levels. Because of this, all DHB-specific observations from this analysis have been made based off stock levels as they were received. Therefore, as our analysis does not use stock levels at a specific point in time, the data cannot be easily compared between DHBs and as such should not be used to make specific decisions for any one DHB. Instead, the value of this type of analysis is the story it tells about the management of stock between April and September across New Zealand.

To compare volumes of stock held across each DHB, the Institute collated the individual types (and amounts) of stock into larger groups. For example, various types of masks (surgical, N95, etc.) and their respective quantities were grouped together under 'total masks'. This was necessary because we found that there was not a clear product code for items across the DHBs. Note that grouping was applied in all instances where it was possible.

The next step was to then analyse and compare data between DHBs. Section 3.2 includes analysis on the range and volume of PPE stock held across DHBs. The analysis takes into account the number of staff employed at each DHB as well as the populations serviced by each district.

It is important to appreciate the length of time it took for all responses to come in – five months and 19 days in total. We received the first response on 28 April 2020 and the last on 17 September (see Figure 1). As mentioned, we considered this when gathering the data and realised that this enabled us to see a clear trend of stock decreasing over time. This implied that any restocking of the DHBs was either too small or not happening at all (see Appendix 3).

Figure 1: Deprivation and geographic differences between DHBs

Source: New Zealand Health and Disability System Review (published March 2020).

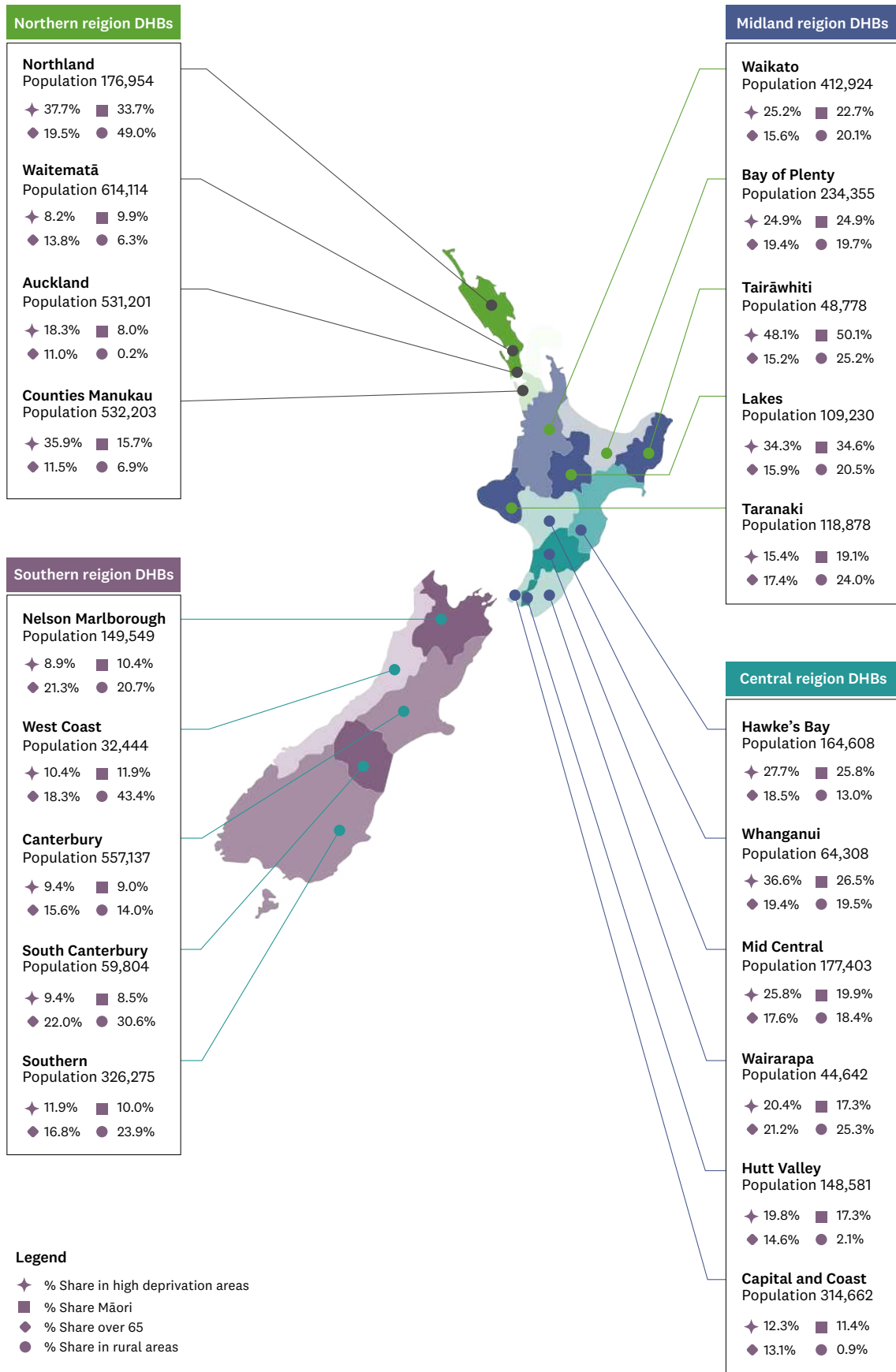


Figure 1 taken from Health and Disability System Review (published March 2020) illustrates deprivation and geographic differences between New Zealand's DHBs. The Institute has used these figures alongside the data received from OIAs to frame our analysis.

3.0 Analysis of time taken for DHBs to respond

3.1 Introduction

This section provides an analysis of the response timeframes for each DHB, throughout the total six-month research period. This was important to analyse as it indicated the challenges DHBs faced to provide this information. We had expected this information would be easy for DHBs to provide given they were required to keep a record of stock for accounting purposes and the MOH had to review stock usage and availability, such as ‘Local and regional supplies usage reporting and forecasting’ under the *National Health Emergency Plan: National Reserve Supplies Management and Usage Policies* (MOH, 2013, p. 2, 9).

The process of collecting responses and gathering data was challenging. Over this research period, DHBs either:

- a. completed the full request;
- b. extended the response period (under s 15A of the Official Information Act 1982);
- c. transferred the request to the MOH or regional health centre (under s 14 of the Official Information Act 1982);
- d. refused to respond (under s 18(f) of the Official Information Act 1982); or
- e. failed to respond.

All DHBs that initially rejected the request were able to provide the Institute with at least partial information. One DHB, however, acknowledged the request, but did not provide any information. Table 1 (below) illustrates the different responses by each DHB and Table 2 illustrates the request status as at 17 September 2020 (the final date that the Institute received correspondence).

3.2 Results

Table 1: DHB responses as at 17 September 2020

District health board	1st response	2nd response	3rd response
Auckland DHB (ADHB)	Extended under s 15A (31 March 2020)	Transferred to MOH under s 14 (7 May 2020)	
Bay of Plenty DHB (BOPDHB)	Completed full request (28 April 2020)		
Canterbury DHB (CDHB)	Completed full request (4 June 2020)		
Capital & Coast DHB (CCDHB)	Rejected under s 18(f) (1 May 2020)	Completed full request (20 August 2020)	
Counties Manukau DHB (CMDHB)	Rejected under s 18(f) (6 April 2020)	Completed partial request (8 May 2020)	Transferred to the Northern Region Health Coordination Centre under s 14 (7 August 2020)
Hawke's Bay DHB (HBDHB)	Completed full request (20 August 2020)		
Hutt Valley DHB (HVDHB)	Rejected under s 18(f) (1 May 2020)	Completed full request (17 September 2020)	
Lakes DHB	Completed full request (1 May 2020)	Completed full request (3 August 2020)	
MidCentral DHB (MDHB)	Rejected under s 18(f) (27 March 2020)	Completed partial request (20 May 2020)	Completed full request (11 August 2020)
Nelson-Marlborough DHB (NMDHB)	Extended under s 15A (24 April 2020)	Completed partial request (30 April 2020)	Completed full request (28 May 2020)

District health board	1st response	2nd response	3rd response
Northland DHB (NDHB)	Rejected under s 18(f) (30 March 2020)	Completed partial request (6 May 2020)	Completed full request (20 August 2020)
South Canterbury DHB (SCDHB)	Completed partial request (8 May 2020)	Completed full request (17 September 2020)	
Southern DHB (SDHB)	Rejected under s 18(f) (3 April 2020)	Completed partial request (28 May 2020)	
Tairāwhiti DHB (TDH)	OIA acknowledged (27 August 2020)		
Taranaki DHB (TDHB)	Rejected under s 18(f) (30 March 2020)	Completed partial request (7 May 2020)	Completed full request (31 July 2020)
Waikato DHB	Rejected under s 18(f) (17 April 2020)	Accepted and logged (24 July 2020)	Completed full request (27 August 2020)
Wairarapa DHB (WRDHB)	Completed partial request (8 May 2020)	Completed full request (17 August 2020)	
Waitematā DHB	Rejected under s 18(f) (30 March 2020)	Completed partial request (11 May 2020)	Transferred to the Northern Region Health Coordination Centre under s 14 (7 August 2020)
West Coast DHB (WCDHB)	Completed full request (4 June 2020)		
Whanganui DHB (WDHB)	Completed partial request (1 March 2020)	Completed full request (22 May 2020)	

Note: The process of receiving responses from all DHBs was challenging. Because of this, the Institute generated two additional requests that were related to the first OIA. These were:

(i) **Specific request on masks** (sent 30 April 2020): Requested DHBs that rejected the OIA under s 18(f) of the Official Information Act 1982 to disclose the approximate number of (a) P2 (or equivalent) masks and (b) surgical masks held within their respective stores and the date of the most recent stocktake. The aim was to at least gain an understanding of mask stocks across all DHBs.

(ii) **Reminder request** (sent 17 July 2020): Reminded DHBs that had not provided a full answer to the original OIA (dated 25 March 2020) to complete it as soon as possible. The Institute included an empty Excel spreadsheet template based off of the response from BOPDHB to aid responses.

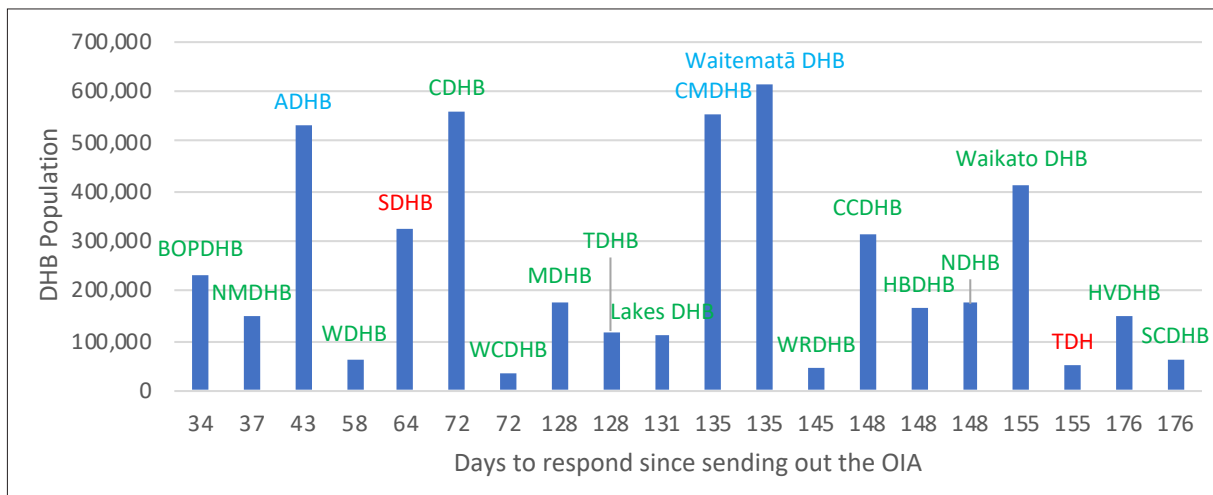
Table 2: Status of DHB responses as at 17 September 2020

District health board	Date of response from DHB to partial request (masks only)	Date of response from DHB to full request	Date of most recent correspondence	Comments in regard to DHB responses	Status
Auckland DHB (ADHB)			7 May 2020	OIA transferred to MOH (under s 14)	Transferred
Bay of Plenty DHB (BOPDHB)	28 April 2020	28 April 2020	28 April 2020	OIA comprehensively answered	Completed
Canterbury DHB (CDHB)	26 May 2020	4 June 2020	4 June 2020	OIA comprehensively answered	Completed

District health board	Date of response from DHB to partial request (masks only)	Date of response from DHB to full request	Date of most recent correspondence	Comments in regard to DHB responses	Status
Capital & Coast DHB (CCDHB)	1 May 2020	20 August 2020	27 August 2020	OIA comprehensively answered	Completed
Counties Manukau DHB (CMDHB)	8 May 2020		7 August 2020	OIA transferred to the Northern Region Health Coordination Centre (NHRCC) (under s 14)	Transferred
Hawke's Bay DHB (HBDHB)	30 April 2020	20 August 2020	20 August 2020	OIA comprehensively answered	Completed
Hutt Valley DHB (HVDHB)		17 September 2020	17 September 2020	OIA comprehensively answered	Completed
Lakes DHB	1 May 2020	3 August 2020	3 August 2020	OIA comprehensively answered	Completed
MidCentral DHB (MDHB)	20 May 2020	11 August 2020	11 August 2020	OIA comprehensively answered	Completed
Nelson-Marlborough DHB (NMDHB)	30 April 2020	28 May 2020	28 May 2020	OIA comprehensively answered	Completed
Northland DHB (NDHB)	6 May 2020	20 August 2020	20 August 2020	OIA comprehensively answered	Completed
South Canterbury DHB (SCDHB)	8 May 2020	17 September 2020	17 September 2020	OIA comprehensively answered	Completed
Southern DHB (SDHB)	28 May 2020		28 May 2020	OIA partially answered	Incomplete
Tairāwhiti DHB (TDH)			27 August 2020	OIA acknowledged, but nothing more	Incomplete
Taranaki DHB (TDHB)	7 May 2020	13 August 2020	13 August 2020	OIA comprehensively answered	Completed
Waikato DHB		27 August 2020	27 August 2020	OIA comprehensively answered	Completed
Wairarapa DHB (WRDHB)	8 May 2020	21 August 2020	21 August 2020	OIA comprehensively answered	Completed
Waitematā DHB	11 May 2020		7 August 2020	OIA transferred to the Northern Region Health Coordination Centre (NHRCC) (under s 14)	Transferred

District health board	Date of response from DHB to partial request (masks only)	Date of response from DHB to full request	Date of most recent correspondence	Comments in regard to DHB responses	Status
West Coast DHB (WCDHB)	26 May 2020	4 June 2020	4 June 2020	OIA comprehensively answered	Completed
Whanganui DHB (WDHB)	1 May 2020	22 May 2020	22 May 2020	OIA comprehensively answered	Completed

Figure 2: Timeliness of DHB responses



Key: Completed OIA Transferred OIA Incomplete OIA

Figure 2 illustrates the time period of correspondence between the Institute and each DHB. The graph compares the days it took (x-axis) and the size of each DHB's respective population (y-axis). This indicates whether the size of the DHB had an impact on the time it took to respond to the OIA. It is important to note that the dates presented on Figure 2 are either (i) when the Institute received the completed OIA request, or (ii) when the Institute received the latest correspondence (in the case where the OIA request was not completed). The types of responses (complete, transferred or incomplete) are distinguished by colour (see key).

3.3 Key findings

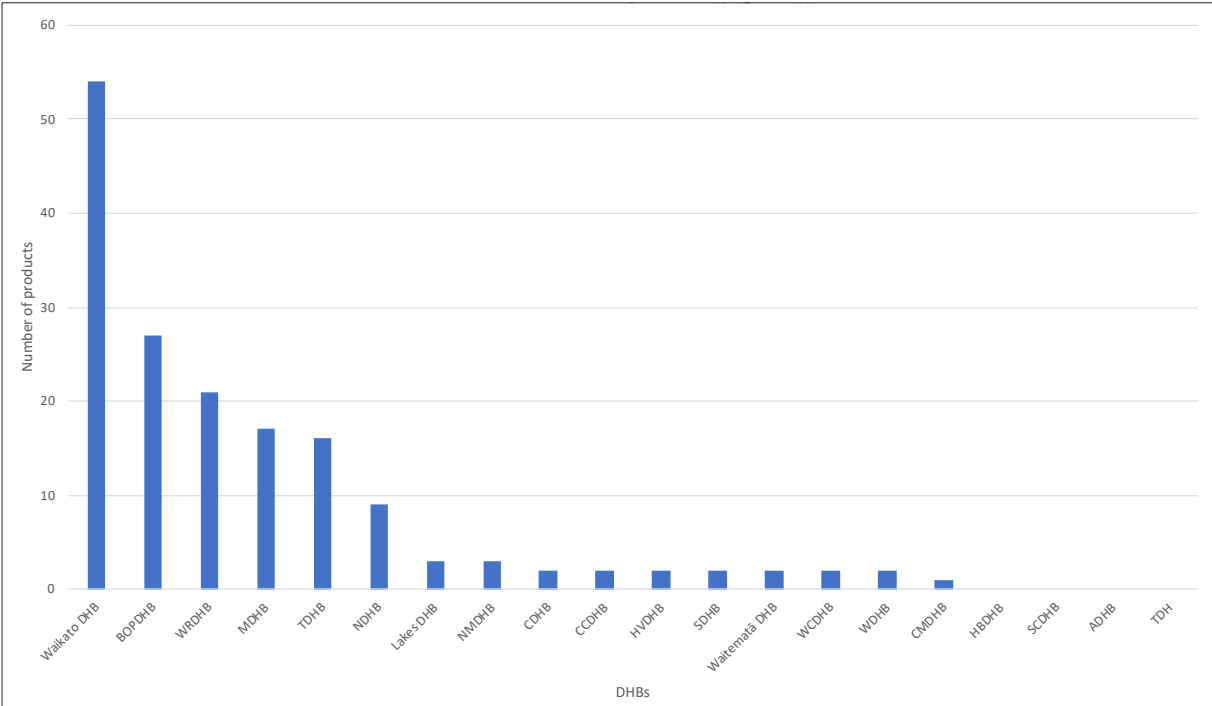
- Two DHBs (SDHB and TDH) did not complete the OIA request. Their responses took 64 days (when a rejection was received) and 155 days (when an acknowledgement was received but nothing more), respectively.
- A district's population size did not have an impact on the DHB's ability to respond.
- The average number of days for those that did complete a response was 114 days.
- BOPDHB, NMDHB and WDHB took the least time to complete the request – 34, 37, and 58 days respectively.
- Waikato DHB, HVDHB, SCDHB took the most time to complete the request – 155, 176 and 176 days respectively.

4.0 Analysis of stock held by each DHB by range

4.1 Introduction

From the comparison of the range of PPE stock held between DHBs, the Institute has been able to identify which DHBs have the largest range of PPE stock and what products are most commonly held between DHBs. We also found that a lot of the DHBs had different product codes as ways of identifying the same items. To give an example of this, *Mask Procedure Ear Loop Adult Blue 4-ply ASTM Level 2 Help-It* was given the code 301325 by BOPDHB, 00010199 by CCDHB and 1000628 by HBDHB. Of the 12 DHBs that responded with a product code, there were six different codes used, with the majority being the same as BOPDHB’s response. In this study, we used BOPDHB’s codes as they were the first to respond and their products seemed to be most commonly used throughout the DHBs.

Figure 3: Total number of different products held by each DHB



4.2 Key findings

- Waikato DHB, BOPDHB and WRDHB held the highest range of PPE products at the time stocks were taken – 54, 27 and 21 items, respectively.
- CMDHB and seven other DHBs held the lowest range of PPE products at the time the stocks were taken – 1 and 2 items, respectively.
- HBDHB and SCDHB were the only DHBs that completed the request yet held zero PPE products. However, this outcome resulted from inconsistent product codes and consequently the inability to complete the stock take in the format the Institute provided.
- The most commonly held products were:
 - *Handwash Gel 500mL Ethyl Alcohol 70% Microshield Angel Clear Schulke* – held by 12 DHBs,
 - *Mask Respirator Particulate N95 Regular Flat-Fold Fluidshield Halyard* – held by 7 DHBs, and
 - *Wipe Surface Disinfection 33x22cm Reynard* – also held by 7 DHBs.

5.0 Analysis of stock held by each DHB by volume

5.1 Introduction

PPE stock volumes presented in this section have been analysed with respect to three different variables. Firstly, with respect to populations serviced by each DHB, and secondly, with respect to DHB staff numbers, and thirdly, with respect to demographics across districts. Analysing data with respect to the above variables allows for a deeper understanding of how PPE stocks compare on micro (staff) and macro (population and demographic) scales. The staff number figures used were based off those provided by the MOH dated March 2017, while the population statistics were based off figures provided in the New Zealand Health and Disability System Review published March 2020 (see Figure 3).

Note: Analysis of PPE stock for DHB staff excluded ventilators, CT scanners and oxygen tanks as staff do not require these products to protect themselves against COVID-19.

5.2 Results

The results have been separated into three different categories: population, staff numbers, and demographics.

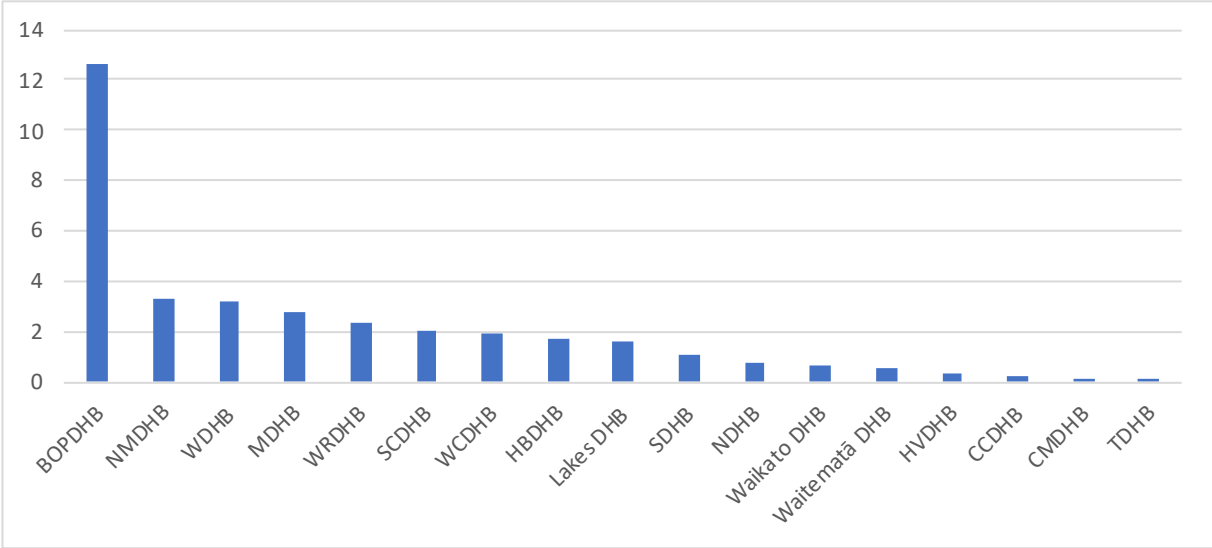
(a) Stock by the number of citizens serviced by each DHB

Please see Appendix 4 to view the data that the following observations have been based off.

(i) Analysis of Masks

- The stock of masks per capita of each DHB diminished over time; this is evidenced by the fact that the later a DHB provided stock levels (in response to our OIA) the fewer masks were in stock per capita. Put another way, the earlier data was provided, the more masks were available. See Appendix 3.

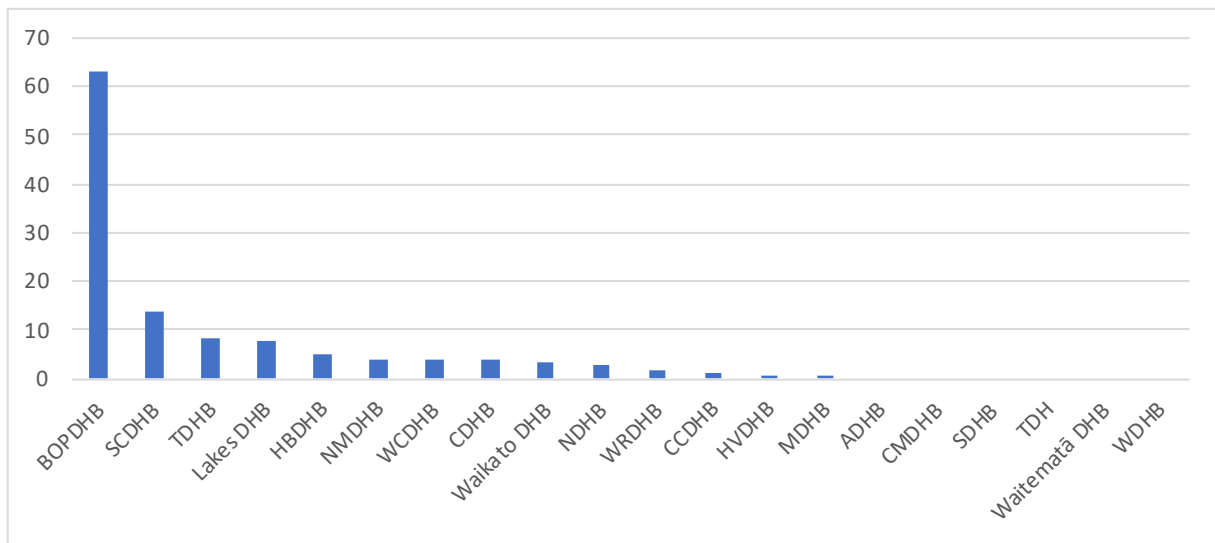
Figure 4: Average masks per person by DHB



- BOPDHB had the highest proportionate number of masks (12.6 masks per person). In contrast, TDHB had the lowest proportionate number of masks (0.04 masks per person). See graph above.

(ii) Analysis of Gloves

Figure 5: Average gloves per person by DHB

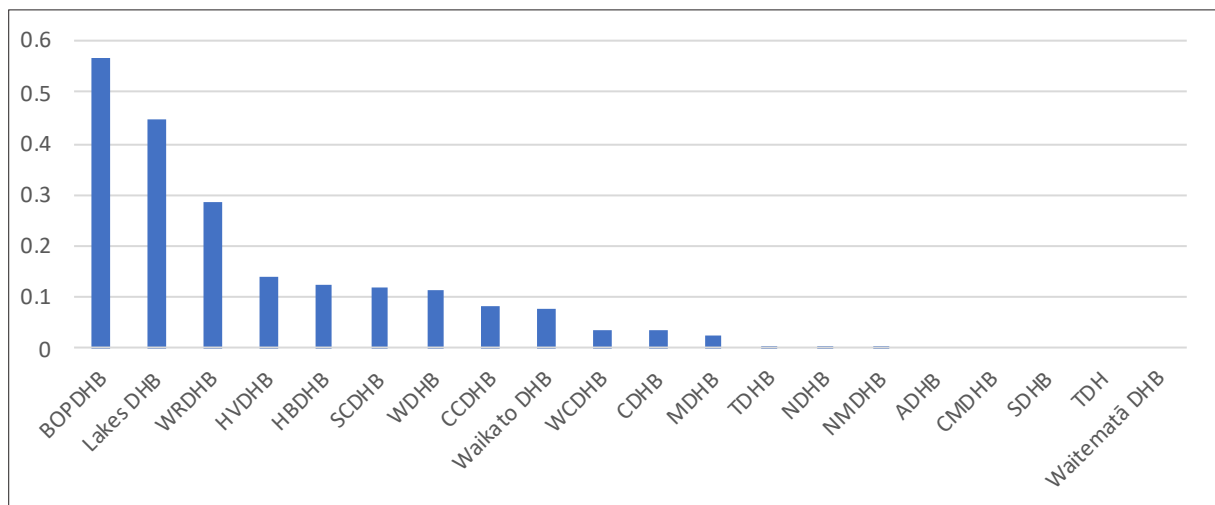


- BOPDHB had the highest proportionate number of gloves (63.1 gloves per person). In contrast, MDHB had the lowest proportionate number of gloves (0.04 gloves per person).

Note: WDHB gave their number of gloves in terms of how many boxes, and did not specify how many gloves in each box.

(iii) Analysis of Goggles

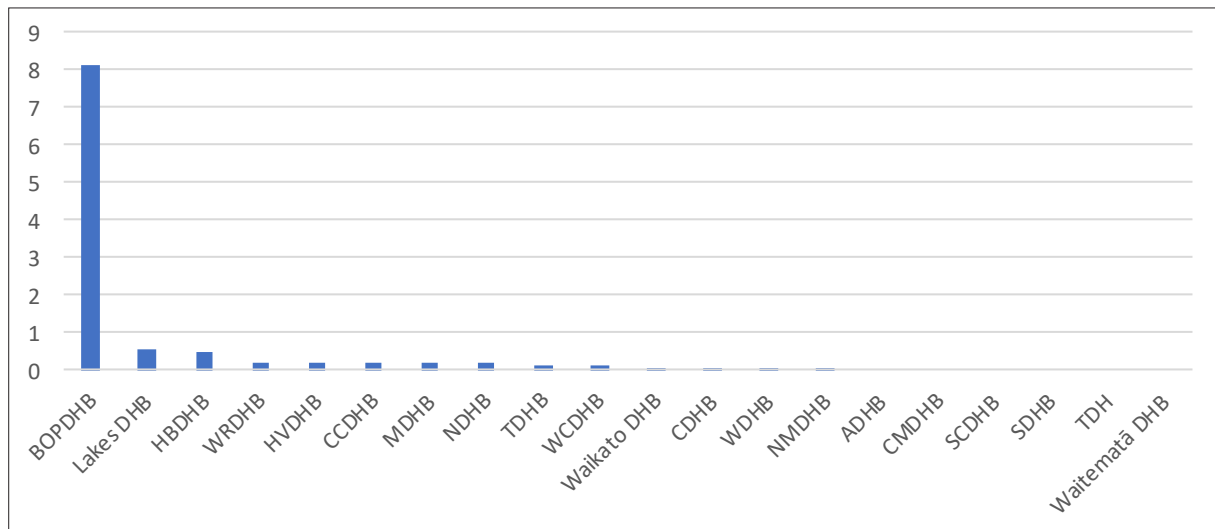
Figure 6: Average goggles per person by DHB



- BOPDHB had the highest proportionate number of goggles (0.6 goggles per person). In contrast, NMDHB had the lowest proportionate number of goggles (0.0007 goggles per person).

(iv) Analysis of Gowns

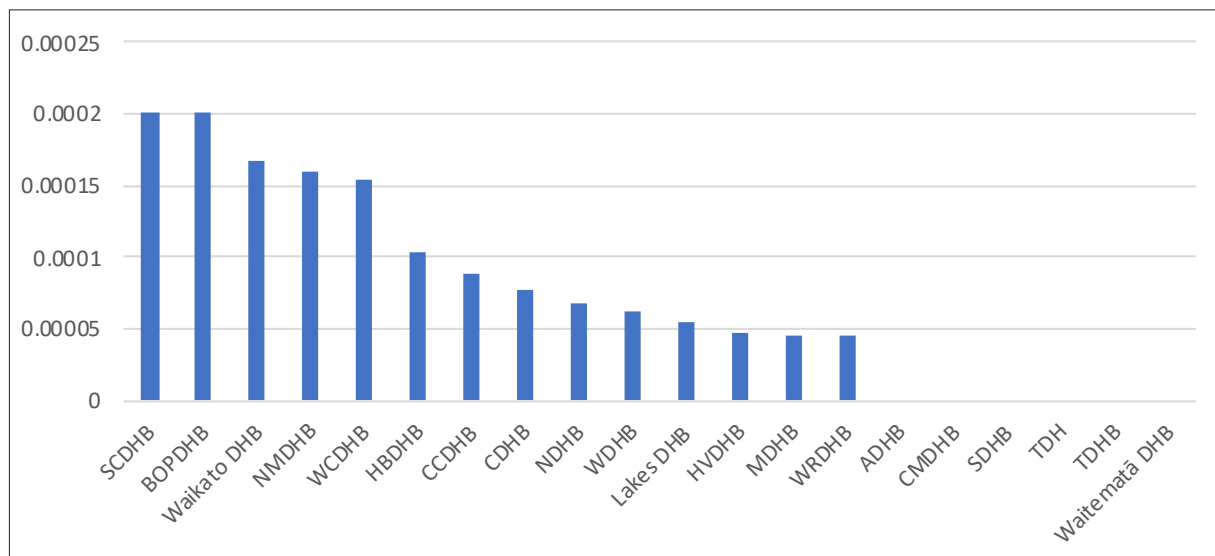
Figure 7: Average gowns per person by DHB



- BOPDHB had the highest proportionate number of gowns (8.1 gowns per person). In contrast, NMDHB had the lowest proportionate number of gowns (0.07 gowns per person).

(v) Analysis of Ventilators

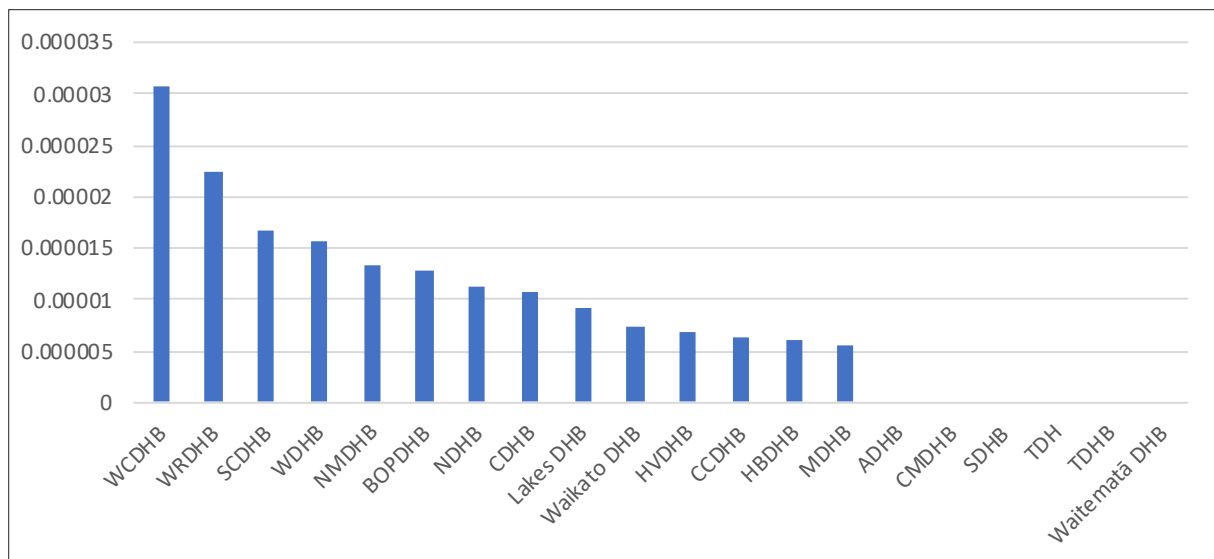
Figure 8: Ventilators per person by DHB



- Waikato DHB held the single highest number of ventilators (69). However, SCDHB and BOPDHB had the most ventilators per person (1 for every 5,000 people). MDHB and WRDHB had the least number of ventilators per person (1 for every 22,000 people).

(vi) Analysis of CT Scanners

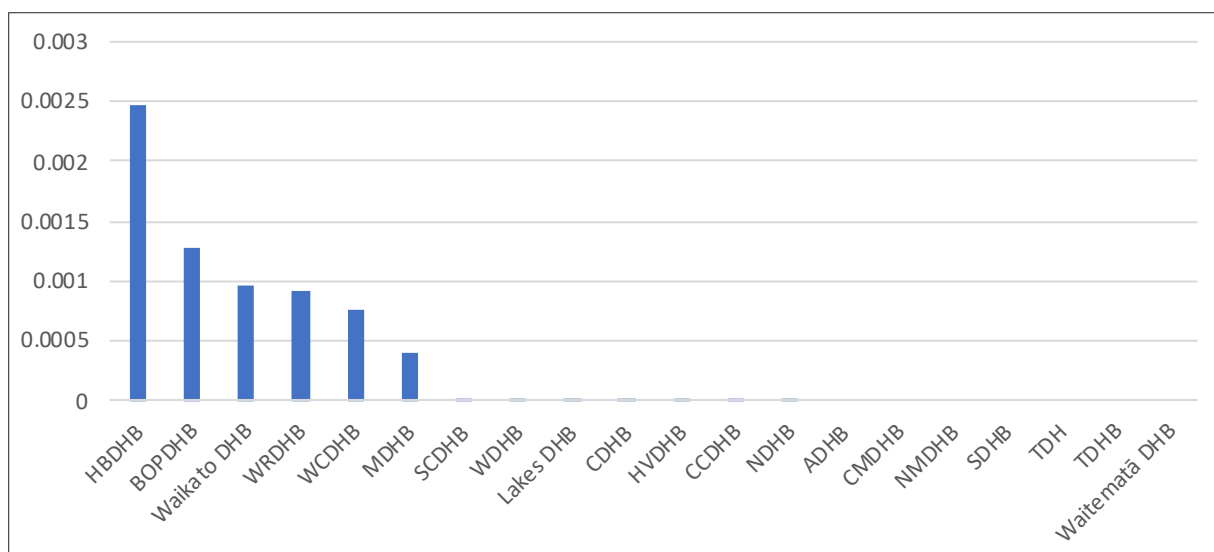
Figure 9: CT scanners per person by DHB



- CDHB held the single highest number of CT scanners (6). However, WCDHB had the most CT scanners per person (1 for every 32,444 people). MDHB had the least number of CT scanners per person (1 for every 177,403 people).

(vii) Analysis of Oxygen Tanks

Figure 10: Oxygen tanks per person



- HBDHB held the single highest number of oxygen tanks (406), and also had the most oxygen tanks per person (1 for every 405 people). NDHB had the least number of oxygen tanks per person (1 for every 176,954 people).

(b) Stock by DHB staff numbers

Please see Appendix 4 to view the data that the following observations have been based off.

- BOPDHB had the highest proportionate number of masks. At the time stock was taken, BOPDHB was able to supply 2515 masks per staff member. In contrast, TDHB had the lowest proportionate number of masks – able to supply only 8.1 masks per staff member.

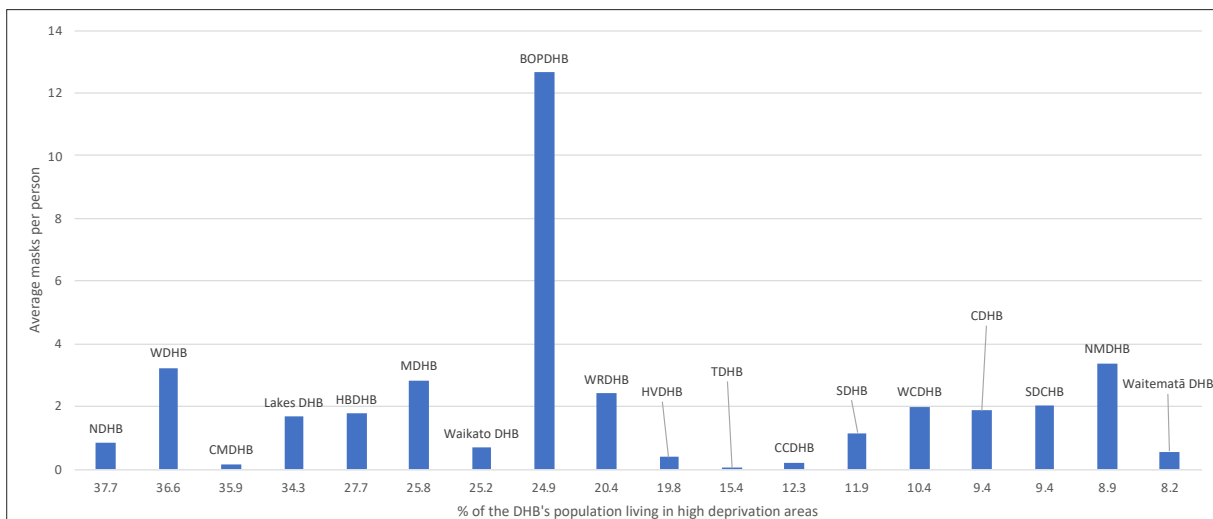
- BOPDHB had the highest proportionate number of gloves. At the time stock was taken, BOPDHB was able to supply 12,559 gloves per staff member. In contrast, MDHB had the lowest proportionate number of gloves – able to supply only 7.7 gloves per staff member.
- BOPDHB had the highest proportionate number of goggles. At the time stock was taken, BOPDHB was able to supply 113 goggles per staff member. In contrast, NMDHB had the lowest proportionate number of goggles – able to supply only 0.2 goggles per staff member.
- BOPDHB had the highest proportionate number of gowns. At the time stock was taken, BOPDHB was able to supply 1614 gowns per staff member. In contrast, WDHB had the lowest proportionate number of gowns – able to supply only 12.9 gowns per staff member.

(c) Analysis of Volume of Masks by Demographics

- As masks are arguably the single most important PPE product, the Institute believed that it was necessary to undertake specific analysis in this regard. The analysis had a primary focus on the number of masks available (per person) with respect to minority groups for each DHB. The population characteristics of interest were residents living in areas of high deprivation, residents who identify as Māori, residents aged 65 years and older and residents living in rural areas. The population characteristics were taken from the *New Zealand Health and Disability System Review* published March 2020 (see Figure 1). For more data on this please see Appendix 5.

(i) Population with high deprivation

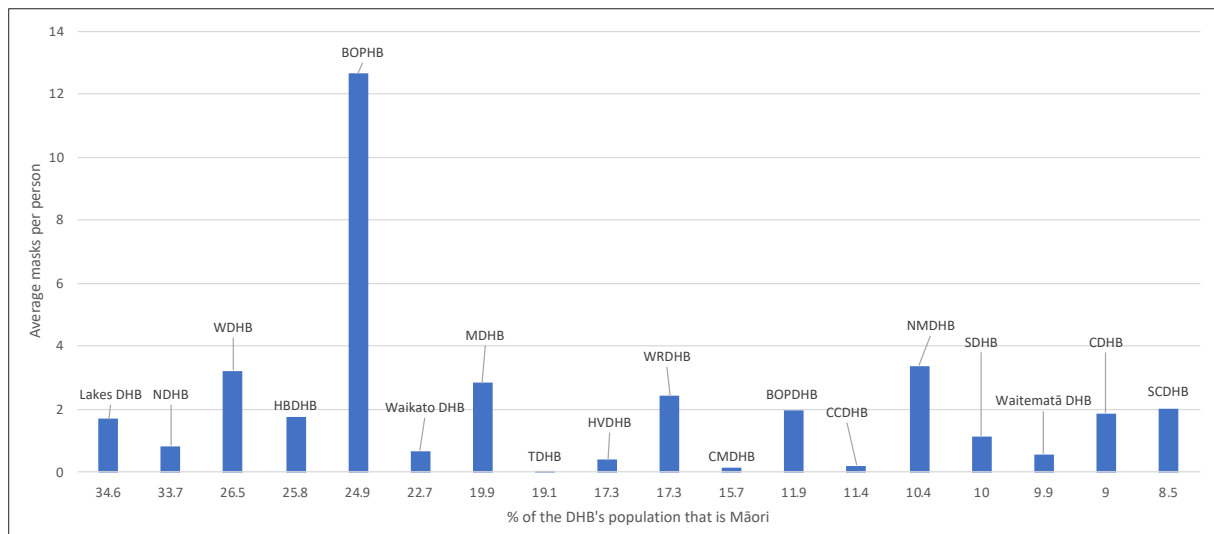
Figure 11: Masks per person by the percentage of the DHB's population living in high deprivation areas



- Associated with the highest percentage (38%) of residents living in areas of high deprivation, NDHB had the ability to supply 0.8 masks per person serviced by the DHB. In contrast, associated with the lowest percentage (8%) of residents living in areas of high deprivation, Waitematā DHB had the ability to supply 0.6 masks per person serviced by the DHB at the time stock was taken.

(ii) Population of Māori descent

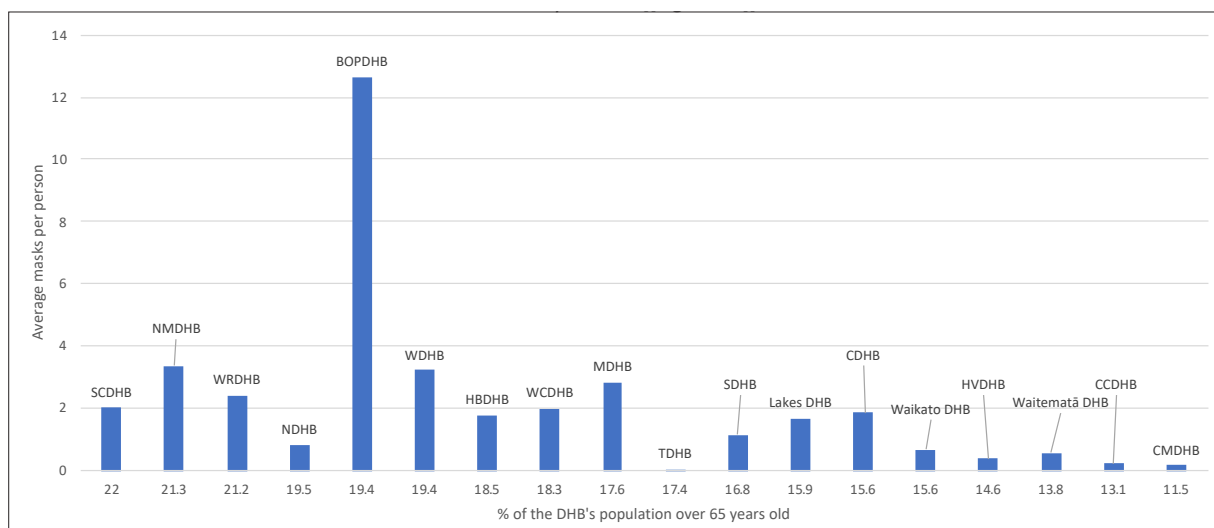
Figure 12: Masks per person by the percentage of the DHB's population that is of Māori descent



- Associated with the highest percentage (35%) of Māori residents, Lakes DHB had the ability to supply 1.7 masks per person serviced by the DHB. In contrast, associated with the lowest percentage (9%) of Māori residents, SCDHB had the ability to supply 2 masks per person serviced by the DHB at the time stock was taken.

(iii) Population over 65

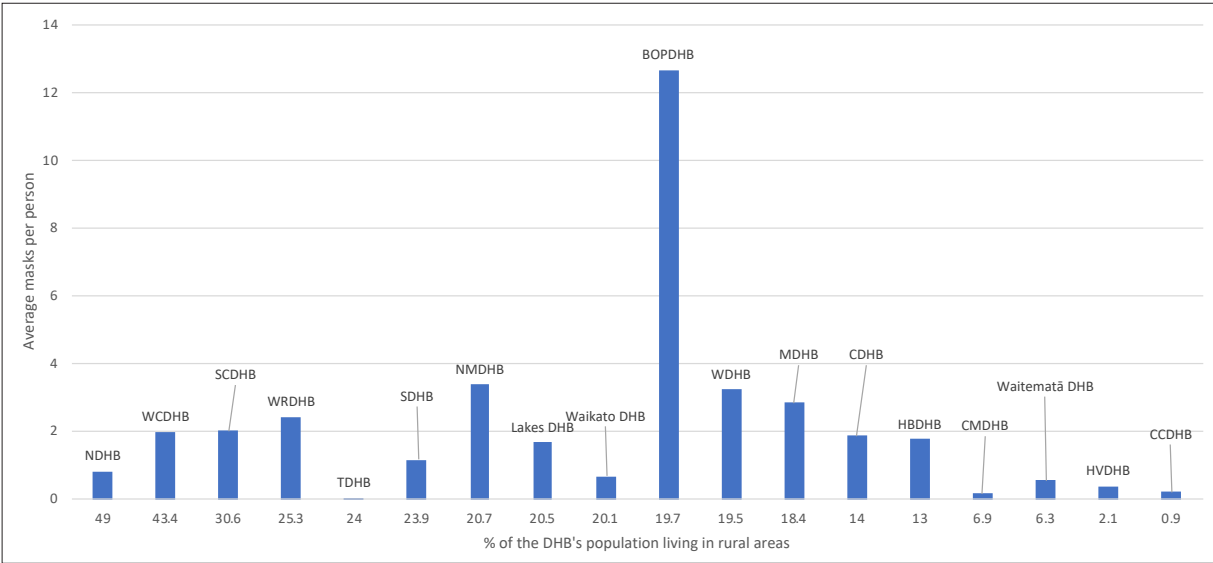
Figure 13: Masks per person by the percentage of the DHB's population that is over 65 years old



- Associated with the highest percentage (22%) of residents aged 65-years and older, SCDHB had the ability to provide 2.0 masks per person serviced by the DHB. In contrast, associated with the lowest percentage (12%) of residents aged 65-years and older, CMDHB had the ability to supply 0.2 masks per person serviced by the DHB at the time stock was taken.

(iv) Rural Population

Figure 14: Masks per person by the percentage of the DHB's population living in rural areas



- Associated with the highest percentage (49%) of residents living in rural areas, NDHB had the ability to supply 0.8 masks per person serviced by the DHB. In contrast, associated with the lowest percentage (1%) of residents living in rural areas, CCDHB had the ability to supply 0.2 masks per person serviced by the DHB at the time stock was taken.

6.0 Observations

6.1 Summary

The research process as a whole has indicated weaknesses associated with PPE systems within DHBs across New Zealand. This process has been difficult; namely due to the time it took for DHBs to respond (in some cases, up to six months) and DHBs being responsible for their own PPE procurement. These difficulties (alongside others) associated with the data collection process expresses that not all DHBs have:

- a. effective processes in place to be able to easily identify their inventory (especially in times of high demand);
- b. certainty over who is responsible for reporting stock levels (and possibly procurement); and who is to be held accountable when stocks are not maintained regularly .

Analysis regarding the range and volume of stocks has also indicated that a lack of a consistent product code exists for PPE across all DHBs (including certain items that also form part of the national reserve supply). This suggests there has been no central direction provided to DHBs, as PPE stock levels do not appear to be controlled or monitored. This has been indicated both by:

- (i) the time taken for some responses; and
- (ii) the large variance of the amounts of stock between DHBs (even for those of similar sizes).

This means that the MOH cannot easily identify PPE shortages and plan effectively. The Institute's opinion is that the lack of central direction represents a failure of risk management.

The experienced weaknesses within New Zealand's PPE protocols and procurement systems places emphasis on how poor risk management (especially in the face of large-scale, uncertain, and complex public health events) has the potential derail a country (e.g. USA's COVID-19 response). It is dangerous when issues associated with systems responsible for risk management only present themselves in response to shocks. The lack of central oversight highlights that DHBs across New Zealand were not ready to deal with COVID-19. This draws attention to the effectiveness of other risk management systems that exist in New Zealand that may also be outdated and unprepared to deal with other types of emergencies. How can New Zealand ensure that our systems are robust and able to deal with shocks without finding out the hard way?

6.2 Three major suggestions for consideration

In light of the discrepancies that this research has indicated, the Institute would like to make the following suggestions:

1. PPE procurement and protocol should have a standardised product code across all DHBs. This would enable consistent and confident communication of PPE levels between the MOH and DHBs, ensuring that supply shortages are identified before they become an issue. Create a standardised product code system to go with this that will ensure PPE across different DHBs is the same.
2. Establish a real-time PPE stock reporting system that is publicly accessible. This would ideally be run by a central organisation (such as the MOH or a health coordination body) and would allow for the DHBs to know exactly how much they have and whether they need to restock.
3. Put in place a minimum level of stock of pandemic PPE per capita and ensure each DHB can meet these requirements.

What is clear is that DHBs are required to collect stock level data for accounting and governance purposes and a simple systemised system could be put in place that is accurate, meaningful and timely. The Institute hopes that such a system as outlined in this working paper could easily be designed, implemented and made available to the those working in the healthcare system as well as members of the general public. It could also be easily audited so that there is complete trust in the stock the country holds going forward.

Appendix 1: 'OIA 2020/02: Open Letter to District Health Boards'

25 March 2020

Open Letter to District Health Boards

National Reserve Supply (NRS) stored by DHBs

Firstly, thank you to each and every DHB staff member throughout New Zealand working hard on the front line to protect New Zealanders in these uncertain times. We appreciate how busy you are at this time but we believe it is timely for each of New Zealand's District Health Boards (DHB) to make public its register of all the medical items it stores on behalf of the National Reserve Supply (NRS). Making the extent of the NRS available to the public will enable New Zealand to use the opportunity that the COVID-19 Alert 4 provides. This window will enable New Zealand to:

1. know what medical items need to be rationed early and/or substituted;
2. fill supply gaps (e.g. Hamilton-based brewery Good George is now producing hand sanitiser); and
3. order medical items from other countries (e.g. Australia, China or Singapore).

Since late January the McGuinness Institute has been trying to understand what supply chain risks might arise if the epidemic in China became a pandemic. We have organised these risks into three categories of supply chain management, those impacting on:

1. healthcare workers, enabling them to stay safe while treating patients (e.g. personal protective equipment [PPE]);
2. patients, enabling them to get the best medical care (e.g. ventilators); and
3. the wider population, differentiating between people that are infected and not infected (e.g. testing equipment).

We are working with a diverse number of people on this issue who would like to know this information, such as philanthropists, manufacturers, procurement officers, doctors and nurses. To this end we are asking all DHBs to share with us, and ideally place on their websites, the following information as applicable on the items listed below: the locations (e.g. hospital name), quantities, brand names, number of uses (i.e. are they disposable or reusable?), purchase dates and expiry dates:

1. Gowns
2. Masks
3. Goggles
4. Gloves
5. Disinfectant (e.g. bleach)*
6. Hand sanitiser*
7. Oxygen tanks*
8. CT scanners*
9. Medical ventilators*

The items asterisked above are ones for which we understand the information might need to be sought from hospitals in your district. For this reason, we thought a two batch approach to supplying this information might be realistic, Batch 1 being the PPEs (1-4 above) and Batch 2 (5-9).

We are confident the lockdown will prevent the escalation of COVID-19 cases, but New Zealand needs to be prepared for the possibility that the lockdown and the quarantine of arrivals were actioned too late. The Institute explores low probability/high magnitude events, and as such, we believe DHBs hold critical information that should be made public to enable any supply chain gaps (if they exist) to be filled.

Please do not hesitate to contact me if you have any further questions or comments.

Ngā mihi,



Wendy McGuinness
Chief Executive

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TE HONONGA WAKA

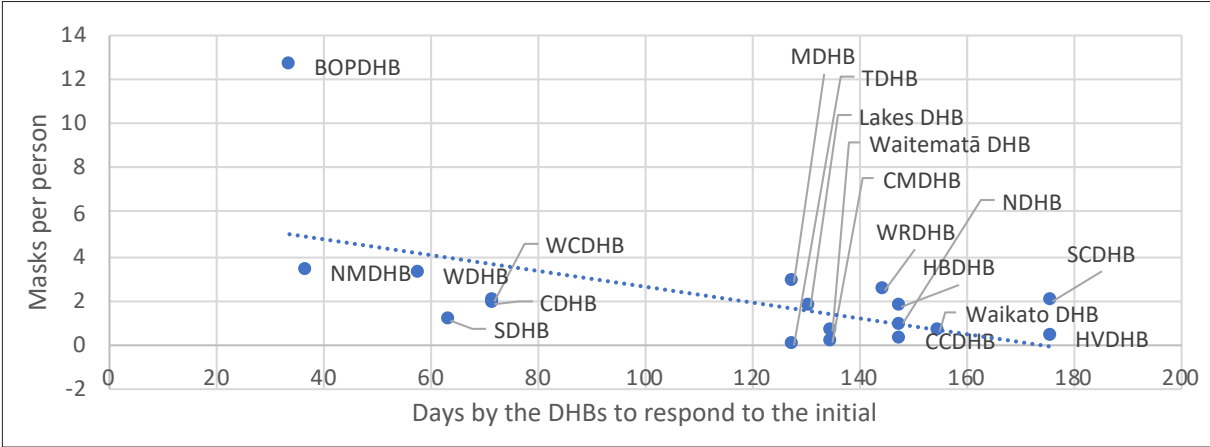
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+64 4 499 8888 | enquiries@mcguinnessinstitute.org | www.mcguinnessinstitute.org

Appendix 2: DHB research data (medical items required for pandemics held by district health boards)

Appendix 2 includes quantifiable data received from DHBs regarding stock levels of a range of medical items required for pandemics held in their respective stores.



Appendix 3: Graph of masks per person by DHB over the time it took DHBs to respond



Appendix 3 shows that there is a strong negative relationship between masks per person and the amount of time it took for the DHBs to respond to our OIA. This indicates that, over time, the number of masks per person diminishes, implying little restocking was undertaken by DHBs.

Appendix 4: Analysis of PPE volumes with respect to DHB staff and DHB populations

Table 4.1: Stock by DHB Staff

(Source: MOH, 2017b)

DHB	Number of staff	Total Stock				Stock per staff member			
	EMPLOYED FTE as at 31-Mar-17	Total Masks (N95, P2, Procedure, or equivalent)	Total Gloves (Latex, Nitrile)	Total Goggles	Total Gowns	Total Masks per employee	Total Gloves per employee	Total Goggles per employee	Total Gowns per employee
Auckland District Health Board (ADHB)*	3345	NA	NA	NA	NA	NA	NA	NA	NA
Bay of Plenty District Health Board (BOPDHB)	1178	2963250	14795400	133443	1901345	2515	12559	113	1614
Canterbury District Health Board (CDHB)	3358	1044843	2144459	19389	54312	311	639	6	16
Capital & Coast District Health Board (CCDHB)	1976	68322	377850	25797	74455	35	191	13	38
Counties Manukau District Health Board (CMDHB)*	2574	90255	NA	NA	NA	35	NA	NA	NA
Hawkes Bay District Health Board (HBDHB)	910	292650	853800	20427	84875	322	938	22	93
Hutt Valley District Health Board (HVDHB)	760	57645	104000	20802	35460	76	137	27	47
Lakes District Health Board	517	183960	843770	49008	60860	356	1632	95	118
Mid Central District Health Board (MDHB)	965	503775	7481	4675	41761	522	7	5	43
Nelson-Marlborough District Health Board (NMDHB)	616	504450	621500	104	10680	819	1009	0.68	17

	Number of staff	Total Stock				Stock per staff member			
DHB	EMPLOYED FTE as at 31-Mar-17	Total Masks (N95, P2, Procedure, or equivalent)	Total Gloves (Latex, Nitrile)	Total Goggles	Total Gowns	Total Masks per employee	Total Gloves per employee	Total Goggles per employee	Total Gowns per employee
Northland District Health Board (NDHB)	950	146120	556,312	300	33047	154	586	0	35
South Canterbury District Health Board (SCDHB)	306	120924	835100	7130	NA	395	2729	23	NA
Southern District Health Board (SDHB)*	1578	376570	NA	NA	NA	239	NA	NA	NA
Tairāwhiti District Health Board (TDH)*	273	NA	NA	NA	NA	NA	NA	NA	NA
Taranaki District Health Board (TDHB)	612	4974	971600	650	15655	8	1588	1	26
Waikato District Health Board	2465	278943	1317500	31360	40335	113	534	13	16
Wairarapa District Health Board (WRDHB)	241	107970	83900	12647	10820	448	348	52	45
Waitematā District Health Board*	2664	345410	NA	NA	NA	130	NA	NA	NA
West Coast District Health Board (WCDHB)	305	64607	132601	1199	3358	212	435	4	11
Whanganui District Health Board (WDHB)	384	207970	792 (boxes)	7179	4956	542	2 boxes	19	12.9

Note: NA - Not available

Table 4.2: Stock by DHBs population

(Source: Simpson, 2020)

	Breakdown of populations of the DHBs (Based off of the numbers in Figure 2)					Total Stock			
	Total Population	% Share in high deprivation areas	% Share Māori	% Share over 65	% Share in rural areas	Total Masks (N95, P2, Procedure, or equivalent)	Total Gloves (Latex, Nitrile)	Total Goggles	Total Gowns
Auckland District Health Board (ADHB)*	531201	18.3	8	11	0.2	NA	NA	NA	NA
Bay of Plenty District Health Board (BOPDHB)	234355	24.9	24.9	19.4	19.7	2963250	14795400	133443	1901345
Canterbury District Health Board (CDHB)	557137	9.4	9	15.6	14	1044843	2144459	19389	54312
Capital & Coast District Health Board (CCDHB)	314662	12.3	11.4	13.1	0.9	68322	377850	25797	74455
Counties Manukau District Health Board (CMDHB)*	552203	35.9	15.7	11.5	6.9	90255	NA	NA	NA
Hawkes Bay District Health Board (HBDHB)	164608	27.7	25.8	18.5	13	292650	853800	20427	84875
Hutt Valley District Health Board (HVDHB)	148581	19.8	17.3	14.6	2.1	57645	104000	20802	35460
Lakes District Health Board	109230	34.3	34.6	15.9	20.5	183960	843770	49008	60860
Mid Central District Health Board (MDHB)	177403	25.8	19.9	17.6	18.4	503775	7481	4675	41761
Nelson-Marlborough District Health Board (NMDHB)	149549	8.9	10.4	21.3	20.7	504450	621500	104	10680
Northland District Health Board (NDHB)	176954	37.7	33.7	19.5	49	146120	556,312	300	33047
South Canterbury District Health Board (SCDHB)	59804	9.4	8.5	22	30.6	120924	835100	7130	NA

			Stock per person						
Ventilators	CT Scanners	Oxygen tanks	Masks per person	Gloves per person	Goggles per person	Gowns per person	Ventilators per person	CT Scanners per person	Oxygen tanks per person
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
47	3	297	13	63	1	8	0	0	0
43	6	4	2	4	0	0	0	0	0
28	2	2 Bulk with a stock of portable oxygen cylinders	0	1	0	0	0	0	0
NA	NA	NA	0	NA	NA	NA	NA	NA	NA
17 + 7 due	1	347 x A size, 14 x D2 size, 3 x Manpaks (15 x G size each) (406 Total)	2	5	0	1	0	0	0
7	1	1 Bulk with a stock of portable oxygen cylinders	0	1	0	0	0	0	0
6	1	1 Bulk	2	8	0	1	0	0	0
8	1	45 x A size oxygen, 10 D size oxygen, 8 x Entonox A size, 4x entonox D size, 5 x medical Air (72 total)	3	0	0	0	0	0	0
24	2	NA	3	4	0	0	0	0	NA
12	2	1	1	3	0	0	0	0	0
12	1	1 Bulk with a stock of portable oxygen cylinders	2	14	0	NA	0	0	0

	Breakdown of populations of the DHBs (Based off of the numbers in Figure 2)					Total Stock			
	Total Population	% Share in high deprivation areas	% Share Māori	% Share over 65	% Share in rural areas	Total Masks (N95, P2, Procedure, or equivalent)	Total Gloves (Latex, Nitrile)	Total Goggles	Total Gowns
Southern District Health Board (SDHB)*	326275	11.9	10	16.8	23.9	376570	NA	NA	NA
Tairāwhiti District Health Board (TDH)*	48778	48.1	50.1	15.2	25.2	NA	NA	NA	NA
Taranaki District Health Board (TDHB)	118878	15.4	19.1	17.4	24	4974	971600	650	15655
Waikato District Health Board	412924	25.2	22.7	15.6	20.1	278943	1317500	31360	40335
Wairarapa District Health Board (WRDHB)	44642	20.4	17.3	21.2	25.3	107970	83900	12647	10820
Waitematā District Health Board*	614114	8.2	9.9	13.8	6.3	345410	NA	NA	NA
West Coast District Health Board (WCDHB)	32444	10.4	11.9	18.3	43.4	64607	132601	1199	3358
Whanganui District Health Board (WDHB)	64308	36.6	26.5	19.4	19.5	207970	792 boxes	7179	4956

			Stock per person						
Ventilators	CT Scanners	Oxygen tanks	Masks per person	Gloves per person	Goggles per person	Gowns per person	Ventilators per person	CT Scanners per person	Oxygen tanks per person
NA	NA	NA	1	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	0	8	0	0	NA	NA	NA
69	3	397	1	3	0	0	0	0	0
2 + 2 due November 2020	1	1 large tank, 40 smaller reserve tanks, variable stock of transportable tanks	2	2	0	0	0	0	0
NA	NA	NA	1	NA	NA	NA	NA	NA	NA
5	1	25	2	4	0	0	0	0	0
4	1	1	3	0 boxes	0	0	0	0	0

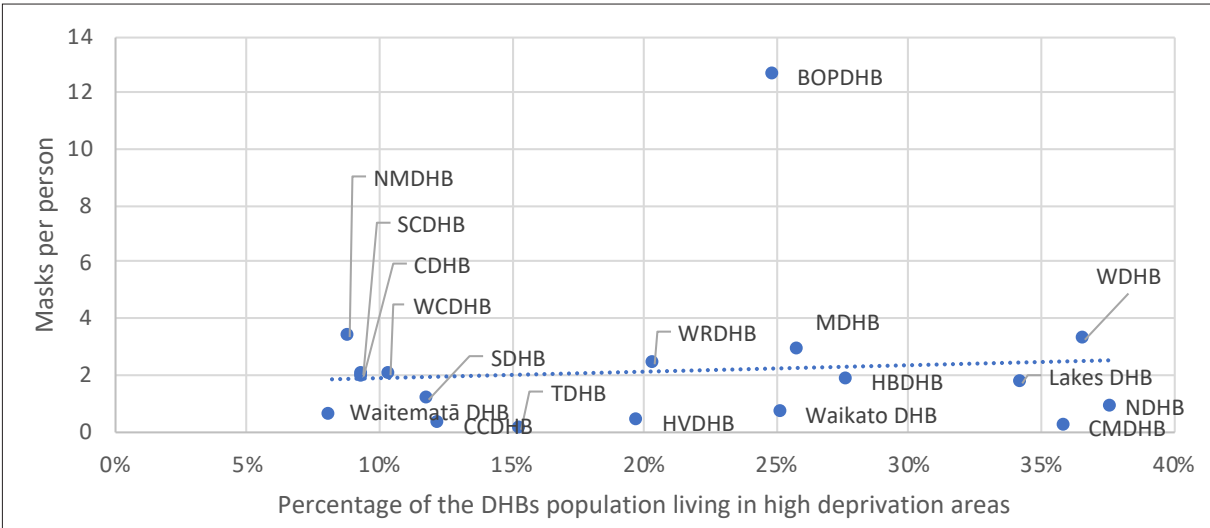
Note: NA - Not Available

Appendix 5: Graphs relating to mask analysis by demographic

(Source: Simpson, 2020)

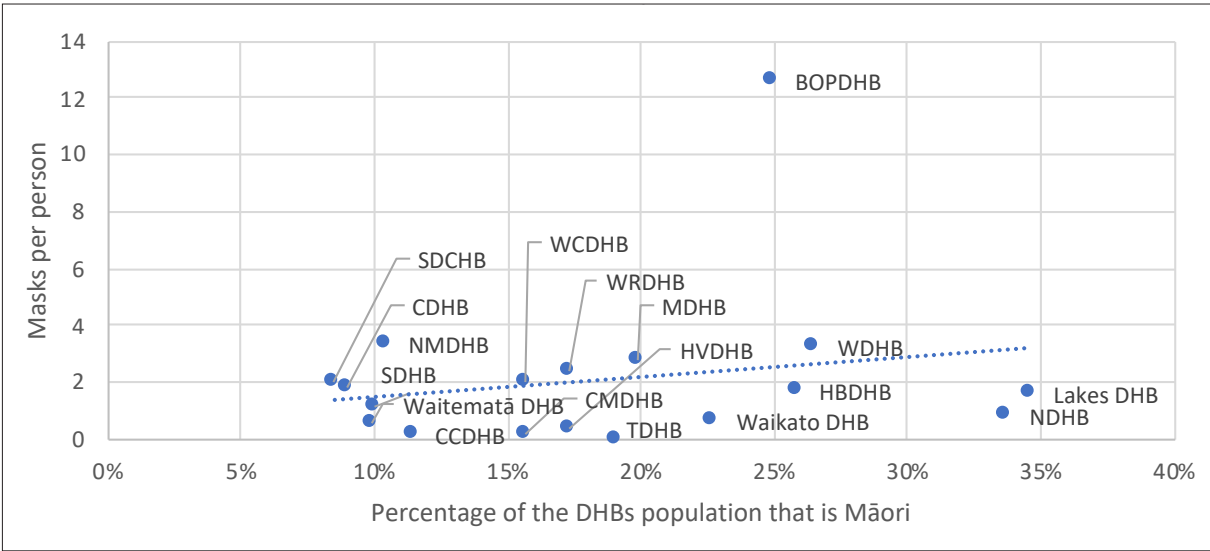
Note: As mentioned earlier, WCDHB provided their response with CDHB as total PPE stocked between them. For this analysis we divided the total number of masks proportionately between them in order to make the data shown in the graphs more accurate

Graph 5.1: Percentage of the DHBs population living in high deprivation areas



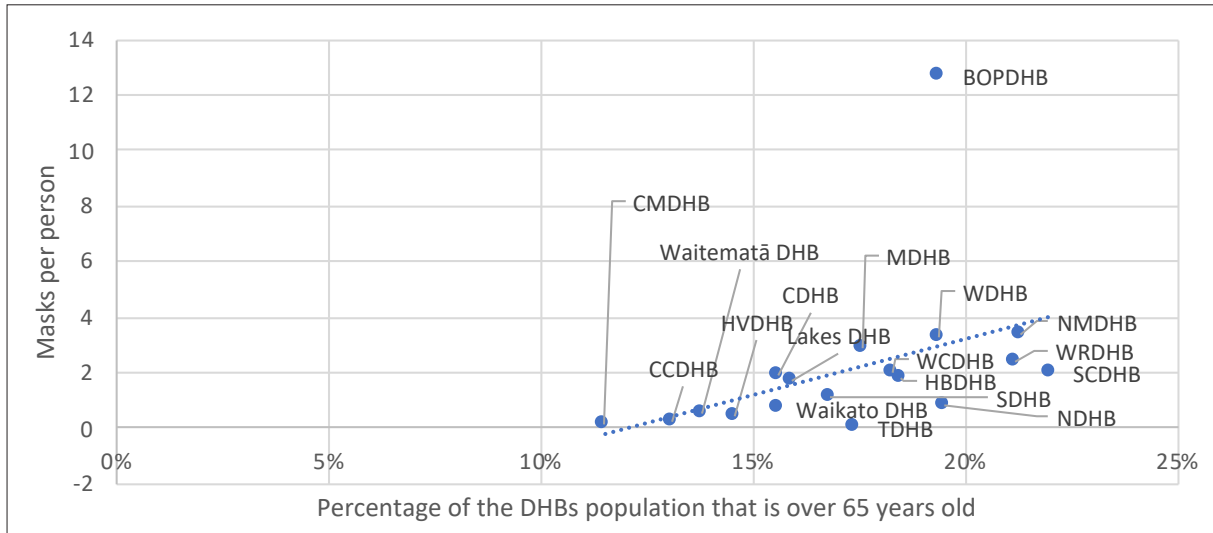
As seen in Graph 5.1, there is almost no trend between the number of masks per person as the percentage of the population living in high deprivation areas increases.

Graph 5.2: Percentage of the DHBs population that is of Māori descent



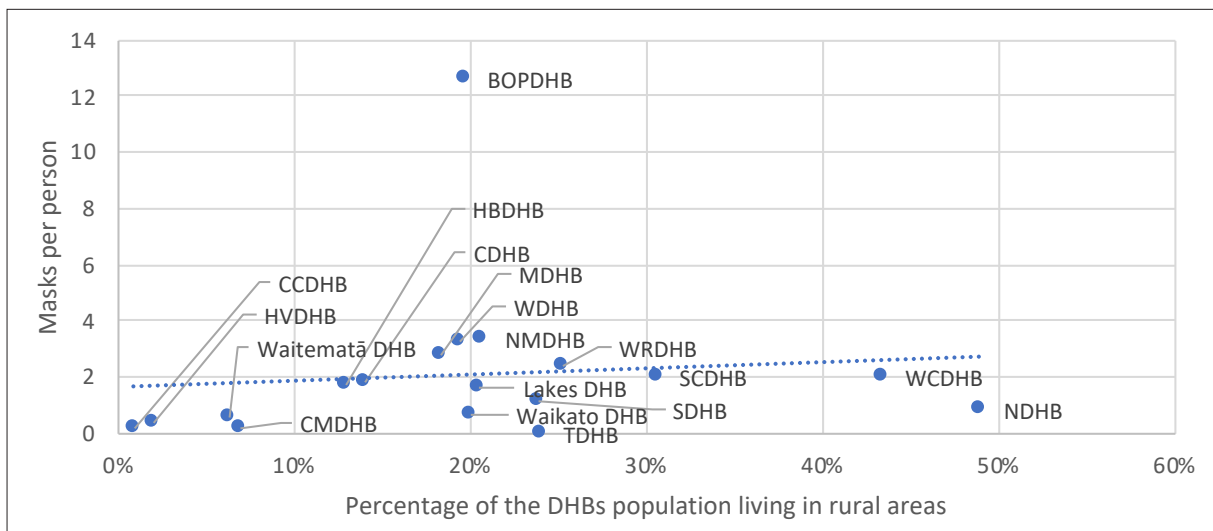
Graph 5.2 shows a slight positive trend between the percentage of the population that is Māori and the number of masks per person. However, this trend is not significant enough to make assumptions based on this.

Graph 5.3: Percentage of the DHBs population that is over 65 years old



Graph 5.3 shows a strong positive trend between the percentage of each DHB’s population over 65 years old, and the number of masks per person. This means that the higher the percentage of the DHB’s population that is over 65, the more masks will be available to the people within that DHB.

Graph 5.4: Percentage of the DHBs population living in rural areas



Graph 5.4 shows a slight positive trend between the percentage of each DHB’s population living in rural areas and the number of masks per person. However, much like Graph 5.2, this isn’t a significant enough trend to make assumptions off.

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