

# Productivity measurement case study: Police

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## **The New Zealand Productivity Commission Research Note 2017/09: Productivity measurement case study: Police**

Te Kōmihana Whai Hua o Aotearoa<sup>1</sup>

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<sup>1</sup> The Commission that pursues abundance for New Zealand

# Abstract

- The New Zealand Police collect a significant amount of output data, however this data has not previously been used to develop productivity metrics.
- This case study (Box 1) develops a productivity measure for the New Zealand Police between 2010/11 and 2016/17 focusing specifically on responses to mental health incidents.
  - Outputs are recorded as the number of responses to mental health-related incidents. The volume of responses has increased significantly during the period of analysis.
  - Police hours responding to mental health incidents are used to estimate inputs.
- The results show a sharp increase in the amount of officer time required to respond to incidents between 2010/11 and 2012/13, followed by more gradual increases for most of the remaining years in the series.
- The amount of officer time required to respond to mental health incidents in some police districts has remained relatively constant. However, for most districts, the trend mirrors the overall results.
- The productivity measure is not adjusted for factors such as changes in the quality of responses, changes in the complexity of cases, and differences in operating environment between different districts.
- There is scope to extend the analysis in this case study through the introduction of quality adjustments, and the application of more advanced measurement techniques.

## Box 1 Productivity measurement case studies

This case study supplements the New Zealand Productivity Commission's draft inquiry report *Measuring and improving state sector productivity*. The terms of reference for the inquiry ask the Productivity Commission to provide guidance and recommendations on:

- how to measure productivity in "core" public services (health, education, justice, social support) at the sector and service level;
- what role productivity measures should play in public sector performance frameworks; and
- how to develop the culture, capability and systems needed within government agencies to measure, understand and improve productivity.

This paper is one of a series of case studies that illustrate how productivity can be measured in the state sector, and how some of the difficulties in doing this can be overcome. The full selection of case studies can be accessed [on the Commission's website](#).

Readers should not view any of these case studies as a definitive exposition of productivity in respective state sector agencies. Rather, they are examples that demonstrate different aspects of productivity measurement. The results of these studies could be used to stimulate further discussion about what is driving the identified productivity trends, how productivity measurement could be improved, and how productivity measures could be incorporated into the wider performance frameworks of state sector organisations.

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# 1 Productivity measurement case study: New Zealand Police

## Key points

- The New Zealand Police collect a significant amount of output data, however this data has not previously been used to develop productivity metrics.
- This case study develops a productivity measure for the New Zealand Police between 2010/11 and 2016/17 focusing specifically on responses to mental health incidents.
  - Outputs are recorded as the number of responses to mental health-related incidents. The volume of responses has increased significantly during the period of analysis.
  - Police hours responding to mental health incidents are used to estimate inputs.
- The results show a sharp increase in the amount of officer time required to respond to incidents between 2010/11 and 2012/13, followed by more gradual increases for most of the remaining years in the series.
- The amount of officer time required to respond to mental health incidents in some police districts has remained relatively constant. However, for most districts, the trend mirrors the overall results.
- The productivity measure is not adjusted for factors such as changes in the quality of responses, changes in the complexity of cases, and differences in operating environment between different districts.
- There is scope to extend the analysis in this case study through the introduction of quality adjustments, and the application of more advanced measurement techniques.

## 1.1 Introduction

This case study develops productivity measures for the New Zealand Police concentrating on a specific area of police activity: responses to mental health incidents.<sup>1</sup>

The New Zealand Police has identified improving policing services for people with mental health conditions as a particular area of focus in their current 4-year plan (New Zealand Police, 2017a). The number calls for police assistance with mental health issues has been growing rapidly – in the 1996 financial year, police received a little over 5 000 calls relating to mental health or threatened or attempted suicide (New Zealand Police, 2014). By 2017 this number had increased to around 47 000. In addition to increasing in volume, the New Zealand Police have suggested that mental health incidents are becoming increasingly complex.

This case study begins by examining a range of existing performance and productivity measures for police, both in New Zealand and overseas (section 1.2). Sections 1.3 and 1.4 describe the output and input data used in the analysis, and section 1.5 uses this data to develop a set of productivity indexes.

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<sup>1</sup> Productivity measurement in the public sector can be undertaken at a number of different levels, ranging from measures for entire sectors, through to examination of a specific service. For example, the Commission's case study on early childhood education examines the productivity of that sector, while Statistics New Zealand's official productivity statistics for the education industry are aggregated at a higher level showing productivity trends for all levels of education including public and private provision.

Section 1.6 explores options to extend this analysis, including potential quality adjustors and alternative measurement techniques.

## 1.2 Existing police productivity measures

The New Zealand Police website provides a substantial amount of performance data and statistics about police work. However, in common with most other state sector agencies in New Zealand, efficiency measures are generally not included in regular reporting.

For example, the Police Annual Report provides a record of police activities, across seven output areas:

- policy advice and ministerial servicing;
- general crime prevention services;
- specific crime prevention services and maintenance of public order;
- police primary response management;
- investigations;
- case resolution and support to judicial process; and
- road safety programme.

Performance metrics relating to quantity, timeliness and in some cases quality, are reported for each output area. A selection are listed in Table 1.1.

**Table 1.1 Selected performance metrics for the New Zealand Police**

Output area	Quantity measures	Timeliness measures	Quality measures
<b>General crime prevention services</b>	Number of foot patrols Number of firearms licences revoked	Percentage of vetting requests processed within agreed timeframes	
<b>Police primary response management</b>	Number of 111 calls answered Number of emergency events responded to	Percentage of 111 calls answered within 10 seconds of being presented Median response time to emergency events	
<b>Investigations</b>	Number of multi-agency operations commenced by Organised and Financial Crime Agency New Zealand	Percentage of victimisations where investigation is finalised within 30 days because Police determine 'no crime has occurred' or the 'offender is proceeded against'	
<b>Case resolution and support to judicial process</b>	Number of cases prosecuted	Percentage of judge alone trials that do not proceed on the date agreed between Police and the Courts, for reasons that are the responsibility of Police	Percentage of cases resolved by prosecution that are withdrawn/ dismissed at defended hearing (judge alone trial) due to Police providing insufficient evidence

Source: New Zealand Police, 2017b.

Hence, the Annual Report provides useful measures of output. However it does not provide any information about the inputs expended to produce these outputs, which is needed to measure productivity.

## Police productivity measures in other countries

The following section provides an overview of international practice in measuring police productivity. Overall, in common with the New Zealand experience, systematic measures of police productivity are uncommon.

### Official productivity statistics

As set out in chapter 2 of *Measuring and improving state sector productivity draft report*, statistical agencies in several countries have begun measuring and reporting official productivity statistics for their respective government sectors. However, the Commission is not aware of any country that has produced official productivity statistics for Police services. One reason for this, is that it is difficult to specify outputs for police services, because many aspects of policing are not delivered to individuals, but instead are consumed collectively by society.

For example, in the United Kingdom, the Office of National Statistics publishes official productivity statistics for 'Public order and safety'. This category would normally include police services, along with the fire service, courts, and probation and prisons. However, because police services are consumed collectively, outputs are not measured directly. Instead, an 'inputs=output' convention is applied, which assumes that the volume of output is equal to the volume of inputs used in producing the output. "As output will always be equal to inputs under this convention, productivity remains constant with a growth rate of zero" (ONS, 2017, p. 21).

Statistics Denmark (2016) applies a similar approach to police services and other collective services:

For non-market services provided to individuals, volumes are compiled using the so-called output method. This method implies that the volume of production used for individual non-market consumption is calculated based on counting the services that the users (primarily households) receive and weighting them together using unit costs for each service. For collective services, the volume of production is calculated by deflating the value of the inputs used in production by relevant cost indices. (p. 5)

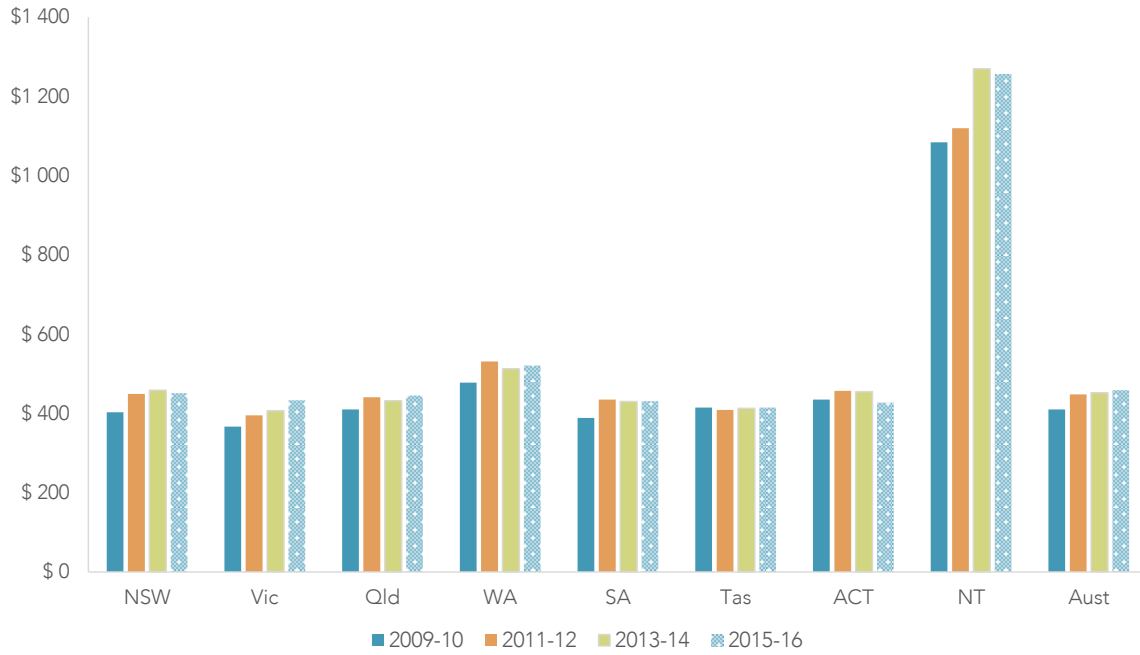
### Australia's Report on Government Services

The Report on Government Services (RoGS) is an important source of government performance data in Australia. This annual publication compares the efficiency and effectiveness of Commonwealth and State/Territory government services such as education, health, justice, emergency management, community services and housing.

The performance of police agencies in each State and Territory government is included in the RoGS. Efficiency is measured using a 'dollars per person metric'.

'Dollars per person' is defined as recurrent expenditure on policing per person. All else being equal, a low or decreasing expenditure per person is desirable. However, efficiency data should be interpreted with care. High or increasing expenditure per person might reflect poor efficiency, but might also reflect changing aspects of the service or policing environment. Low expenditure per person may reflect more efficient outcomes or lower quality or less challenging crime and safety situations. The scope of activities undertaken by police services also varies across jurisdictions. (APC, 2017, p. 24)

Recurrent expenditure (less revenue from own sources and payroll tax) on police services across Australia was \$459 per person in 2015-16, with an average annual increase of 2.4% from 2008-09 (Figure 1.1).

**Figure 1.1 Expenditure per person on police services (2015-16 dollars)**

Source: APC, 2017.

## Canada

In 2013, the Ministry of Public Safety (with responsibility for policing in Canada) commissioned a review of publicly-available police performance metrics and how Canadian police boards interpret and make use of them (Kiedrowski et al, 2013). There are no legislative requirements that control or dictate the use of specific performance measures in Canadian policing, and practice varies significantly.

The review identified that there is no single performance dimension that all police services use in their performance measurement framework. There are also large differences in the frequencies with which different dimensions of performance are considered.

Based on the performance measures used by each police service, the authors categorised performance management approaches into four models:

- *No model* – no performance measurement framework could be identified.
- *Basic model* – a measurement approach characterised by workload indicators that simply note work completed or to be completed. The focus is exclusively on reporting the volume of activity.
- *Efficiency model* – the measurement approach includes in indicators such as input-output measures, unit cost measures, and the reporting of time-series data trends.
- *Balanced model* – an approach that builds on the efficiency model by adding effectiveness and quality measures.

Of the 35 police services assessed, 11 employed an efficiency or balanced model, while the remaining 24 used a basic model or did not have a performance model (Kiedrowski et al, 2013).

## Data envelopment analysis

In addition to the official performance reporting of the type outlined above, there are also numerous academic studies examining police productivity. A commonly used technique within this literature is Data Envelopment Analysis (DEA). As described in chapter 2 of *Measuring and improving state sector productivity draft report*, DEA analysis can be used to compare the productivity of different service providers, and to assess how much more efficient different providers could be. Table 1.2 provides a summary of selected studies from other jurisdictions.

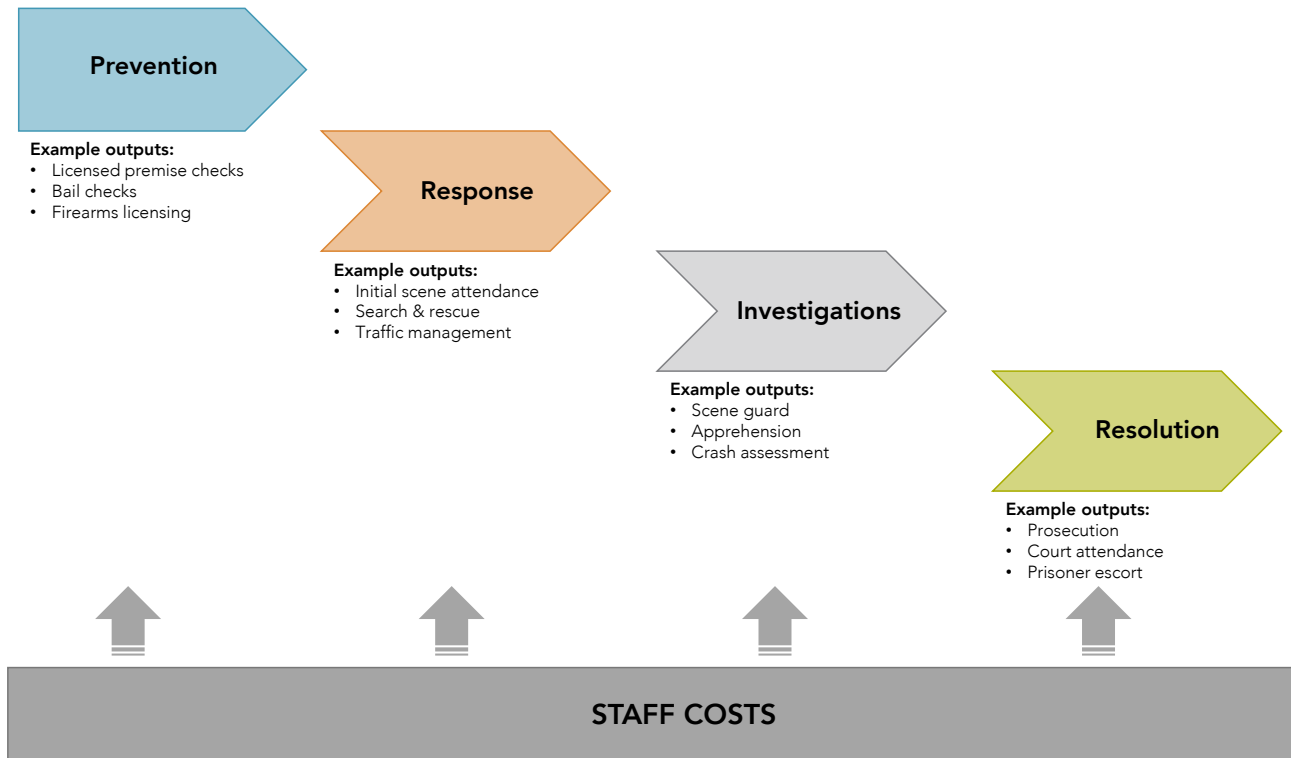


**Table 1.2 Studies of police productivity using DEA, selected examples**

Title and authors	Summary
<i>Measuring the performance of police forces in Taiwan using data envelopment analysis</i> (Wu, Chen & Yeh, 2010)	<p>This study uses DEA to construct an efficiency measure for Taiwan's 22 police precincts. The outputs measured in the analysis were the number of general and special services provided, and the number of burglaries, violent crimes, and other crimes solved. The inputs were labour cost, general operating costs, and equipment purchasing costs.</p> <p>In addition to examining overall efficiency, the report also considers how differing levels of urbanisation and other external environmental factors (including the number of public housing units, the unemployment rate, and average household yearly revenue) affect efficiency. None of these variables were shown to have a statistically significant effect on efficiency.</p>
<i>Yearly evolution of police efficiency in Spain and explanatory factors</i> (García-Sánchez, Rodríguez-Domínguez & Parra-Domínguez, 2013)	<p>Uses DEA to detect variations in police efficiency across Spain's 52 provinces in the 2001–2006 period. Police efficiency was calculated based on the number of solved crimes and the number of police staff. The analysis accounted for several external variables which negatively influence police efficiency, such as area, immigration rate and youth index. The findings show that the average police efficiency for the period analysed was 86%, with optimal efficiency in 55% of the police stations analysed. 45% of police stations increased their productivity yearly.</p>
<i>Evaluating US state police performance using data envelopment analysis</i> (Gorman & Roggiero, 2008)	<p>This paper evaluates the efficiency of state police services in the United States using a multiple-stage DEA model. Technical efficiency is calculated for the 49 continental states based on three inputs (the number of sworn officers, the number of other employees, and the number of vehicles) and three outputs (crime rates per population for three types of crime).</p> <p>The authors account for a number of external variables including the share of individuals in the labour force and population density and find that these have a significant impact on efficiency. They find that approximately 30% of state police forces are inefficient relative to their peers.</p>
<i>Performance measurement of police forces at the local level: A non-parametric mathematical programming approach</i> (Aristovnik, Seljak & Mencinger, 2014)	<p>DEA is used to measure the relative efficiency of selected police units in Slovenia. The results reveal that approximately 80% of the observed units are inefficient relative to their peers. The authors suggest that the relative efficiency results are important indicators that can serve as a guide for police management when investigating how to enhance the efficiency of police units.</p>

### 1.3 Output data for New Zealand police

The New Zealand Police have developed a business model for the entire agency. This is designed in part to enable Police leadership to understand how its activities and outputs relate to each other, and to communicate this to external stakeholders. 'Know your business' groups the agency's 40 outputs into four main categories, reflecting the flow of police work (Figure 1.2). Because front-line staff may carry out multiple outputs in the same day, cost attribution is a potentially significant undertaking.

**Figure 1.2 NZ Police 'Know your business' model**

Source: Adapted from New Zealand Police, 2016.

The Police collect a significant amount of data about the volume of different outputs and their corresponding labour inputs. Staff hour information is derived from the Police central dispatch system, which allocates tasks to police officers. This records with a relatively high level of accuracy the time a police officer responds to a certain incident, and the time they report completing the incident. Where dispatch information is not available, estimates of staff time are used for cost allocation.

The Know your business model “provides a consistent view of how much effort is allocated to activities, and a framework for discussion and decisions about future allocations” (New Zealand Police, 2016, p. 46). It can also be used to analyse specific areas of Police activity (eg, family violence), including assessing trends in performance and calculating the cost of service delivery.

This case study focuses on *initial scene attendance* relating to mental health and threatened or attempted suicide incidents.<sup>1</sup> Incidents are coded when a call is placed with Police dispatch, and coded again at the closure of the initial scene attendance. A mental health incident is coded as “1M” and a threatened or attempted suicide is coded as “1X”. Incidents that are initially coded as 1M or 1X, but are closed under another coding are classified as “Other” for the purposes of this case study.

Incident classification may change during scene attendance. Changes include:

- Incidents that start as mental health (1M) or threatened or attempted suicide (1X) that are then closed as “Other”. For example, an incident may be classified as a mental health incident by dispatch but could be reclassified as a result of other circumstances (such as a crime that results in an arrest). This occurs for approximately 15% of mental health and threatened or attempted suicide incidents.
- Mental health incidents that are closed as threatened or attempted suicide, or threatened or attempted suicide incidents that are closed as mental health incidents (ie, they change classification between the two). This occurs for less than five percent of mental health or threatened or attempted suicide incidents.

<sup>1</sup> Suicides where there is a fatality are coded separately in the police dispatch system, and are not included in this analysis.

- Incidents that were first classified into another category (“Other”) but end as a mental health or threatened or attempted suicide incident. This occurs in thirty-five to forty percent of all incidents that end as mental health or threatened or attempted suicide.

Trends in mental health and threatened or attempted suicide by Police District are shown in Table 1.3. This shows a 79% increase in incidents that are opened or closed as mental health or threatened or attempted suicide over the period 2010/11 to 2016/17. Much of this increase is due to a doubling of threatened or attempted suicide incidents.

**Table 1.3 Total outputs (responses to mental health incidents)**

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	% change
Auckland City	1 316	1 262	1 709	1 750	1 677	1 829	2 205	68%
Bay Of Plenty	1 251	1 371	1 644	1 985	2 063	2 108	2 383	90%
Canterbury	1 910	1 931	2 384	2 796	2 811	3 094	3 471	82%
Central	1 621	1 683	2 256	2 447	2 644	2 782	3 116	92%
Counties/Manukau	1 392	1 571	2 072	2 188	2 244	2 339	2 435	75%
Eastern	825	885	1 151	1 299	1 250	1 419	1 507	83%
Northland	566	541	697	726	822	946	970	71%
Southern	1 073	1 028	1 309	1 461	1 604	1 747	1 914	78%
Tasman	532	603	797	866	887	1 081	1 259	137%
Waikato	1 404	1 377	1 753	1 994	2 043	2 069	2 346	67%
Waitemata	1 465	1 576	1 964	2 223	2 203	2 472	2 777	90%
Wellington	2 034	2 181	2 606	3 039	2 918	3 233	3 240	59%
<b>Total</b>	<b>15 389</b>	<b>16 009</b>	<b>20 342</b>	<b>22 774</b>	<b>23 166</b>	<b>25 119</b>	<b>27 623</b>	<b>79%</b>

Source: Data supplied by the New Zealand Police.

Notes:

1. This dataset is a subset of the New Zealand Police’s total mental health demand and response.

## Calculating a total output metric

The total number of incidents are weighted for the purposes of this study. This is undertaken as mental health and threatened or attempted suicide incidents are not necessarily comparable and are increasing at different rates. The weighting of incidents is based on the cost-weighting described in chapter 3 of *Measuring and improving state sector productivity draft report*.

The weights are derived using the average number of hours spent on mental health and threatened or attempted suicide incidents in the 2010/11 year. Weights are calculated for each combination of start and end codes for incidents. The total output metric is derived by multiplying the total outputs for each category by these weights.

## 1.4 Input data

This study uses the number of Police hours responding to mental health and threatened and attempted suicide incidents as an estimate of inputs. As such, it is not a complete reflection of inputs, as capital and intermediate inputs are not captured. However Police hours do provide a good estimate for inputs

because the New Zealand Police is labour intensive, and most overheads are allocated proportionately to staff time. Trends in total Police hours spent responding to mental health and threatened or attempted suicide incidents by district are shown in Table 1.4.

**Table 1.4 Total inputs (total hours dedicated to mental health incidents) by Police district**

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	% change
Auckland City	6 066	6 460	12 511	12 261	13 599	14 990	17 141	183%
Bay Of Plenty	5 162	4 973	8 528	10 154	12 113	14 198	15 044	191%
Canterbury	7 790	7 670	10 922	11 652	12 283	16 144	15 599	100%
Central	6 364	7 012	11 890	12 580	15 038	15 834	20 034	215%
Counties/Manukau	6 331	9 360	15 494	14 000	18 167	19 338	18 660	195%
Eastern	3 146	4 602	6 876	7 931	7 049	9 169	11 508	266%
Northland	1 921	2 258	4 161	4 687	5 068	6 267	6 282	227%
Southern	4 532	4 072	6 851	6 366	8 331	9 338	9 182	103%
Tasman	1 889	2 607	3 702	3 336	3 891	4 680	6 494	244%
Waikato	5 519	5 132	8 299	10 146	12 166	13 544	14 745	167%
Waitemata	6 561	8 296	14 361	14 219	15 089	22 705	22 507	243%
Wellington	9 136	10 065	14 564	19 033	19 054	25 479	24 188	165%
<b>Total</b>	<b>64 418</b>	<b>72 506</b>	<b>118 158</b>	<b>126 363</b>	<b>141 847</b>	<b>171 685</b>	<b>181 384</b>	<b>182%</b>

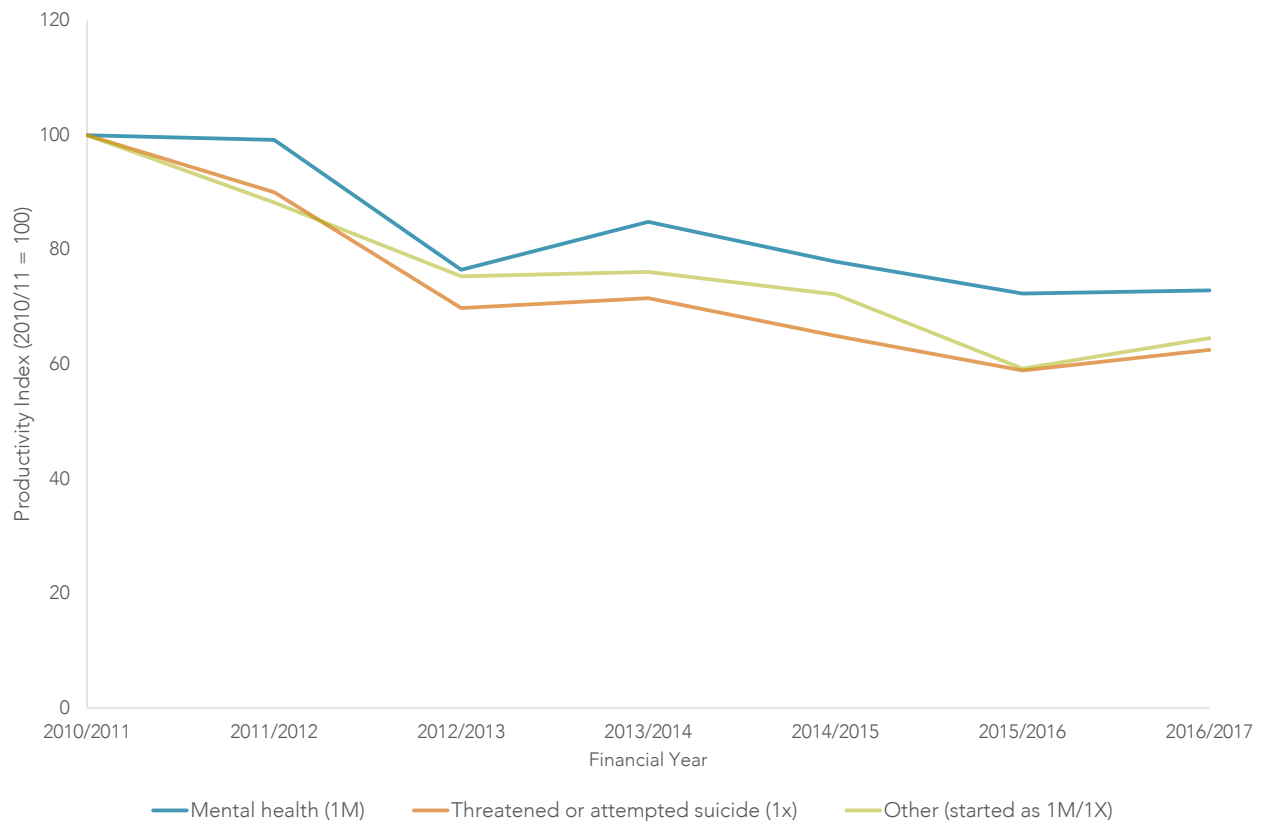
Source: Data supplied by the New Zealand Police

The total hours include both dispatch time and frontline police time. Dispatch staff members are paid a comparable amount to frontline staff members and hence no weighting has been applied to these hours. An extension to this study could involve weighting hours by individual staff members' salary, or by groups of staff members, to better reflect the costs incurred by the New Zealand Police.

## 1.5 Productivity measures

Figure 1.3 shows the productivity index for police responses to mental health and threatened or attempted suicide incidents since 2010/11. For mental health incidents, the results show a sharp increase in the amount of officer time required to respond to incidents between 2011/12 and 2012/13, after which the trend remains relatively flat. For threatened or attempted suicide and other incidents, the results show a significant increase in the amount of officer time required to respond to events over the first two years of the series, followed by more gradual increases for most of the remaining years in the series.

**Figure 1.3 Productivity of responses to mental health and threatened or attempted suicide incidents**



Importantly, the trends shown in Figure 1.3 are “raw results” – there are a number of factors that could impact productivity performance that are not captured in the measure.

- Quality adjustment* – the results do not take account of any changes in the quality of responses to mental health incidents. While the raw results show declining productivity (ie, the duration of police responses to mental health incidents is increasing), this may reflect an improvement in quality of the response. For example, police officers might be spending more time discussing the incident with the family of the person suffering from mental health problems in order to try to develop strategies to reduce the likelihood of a similar incident occurring in future. Such behaviour might be beneficial in the long-term, but if it resulted in spending more time at an incident, would show up in the current analysis as a decrease in productivity. Section 1.6 discusses ways that the existing analysis could be extended to account for changes in quality.
- Case complexity* – Police have indicated that mental health incidents are becoming increasingly complex and more challenging to respond to, and this is likely to affect the duration of responses. However this analysis is not adjusted to take account of changes in case-mix. As such, if average response times were unchanged over a five-year period, but each year the range of incidents that police were responding to became increasingly complex, productivity, in this measure, would be flat.
- Differences between districts in access to support services* – no account is taken of the availability or ease of access to District Health Board mental health services and how this may have changed over time. This may affect how quickly Police are able to resolve an incident by transferring care to an appropriate mental health service, and receiving timely advice in regards to services currently received.
- Changes vs levels* – the results shown here only identify changes in productivity over time; they do not address the issue of the absolute *levels* of productivity. Although productivity in this measure is

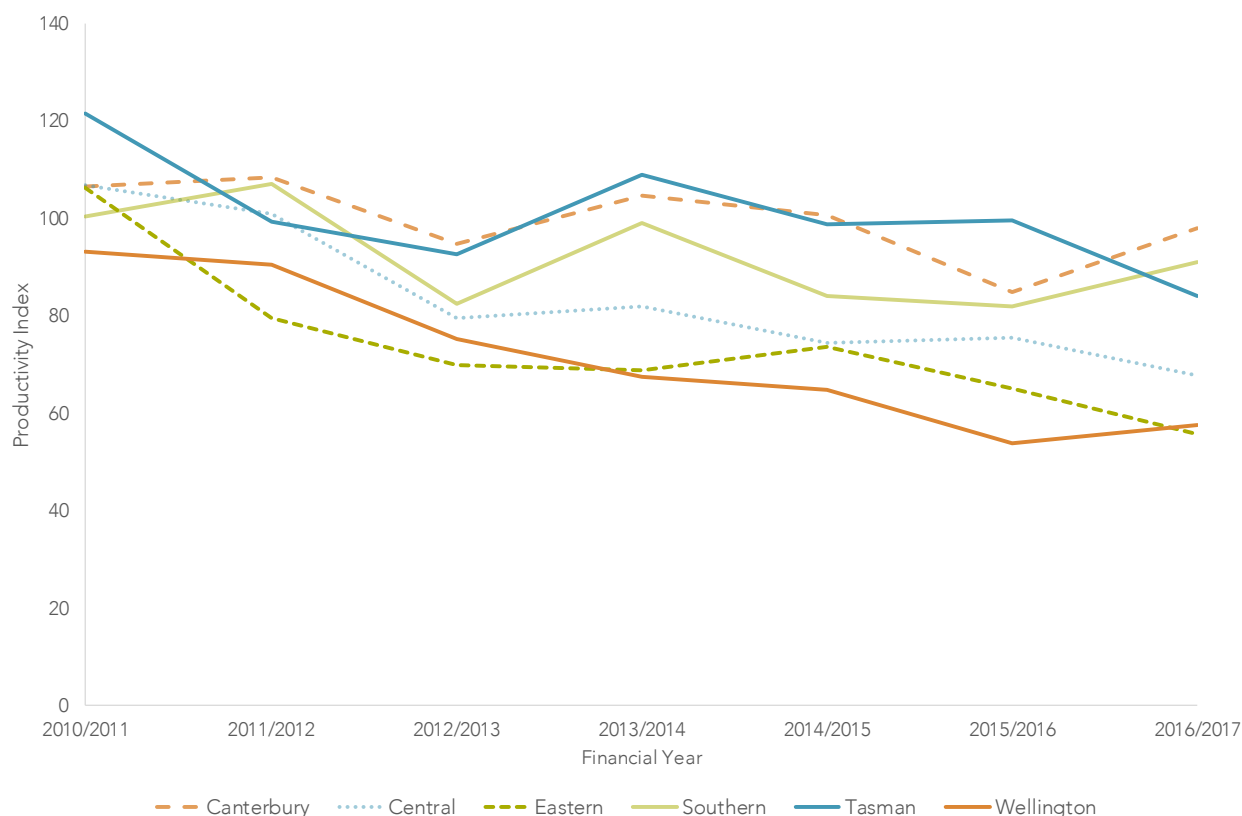
shown to have declined, the level of productivity could still be above average when compared, for example, with mental health responses of police in other countries.

Figure 1.4 and Figure 1.5 show police productivity in responding to mental health incidents, disaggregated for each police district. The amount of officer time required to respond to mental health incidents in some districts has remained relatively constant (eg, Canterbury and Southern). However, for most districts, the trend mirrors the overall results shown in Figure 1.3 of a rapid increase in the duration of responses in the first two years of the series, followed by a stabilisation or more gradual increase.

As with the results shown in Figure 1.3, these are “raw results” and do not account for changes in quality or case-mix. In addition, the comparisons between different police districts do not account for any differences in operating environment that might affect the duration of responses. For example, response times in some districts might be longer owing to the fact that their population is more dispersed and hence travel times to attend incidents are longer.

**Figure 1.4 Police productivity, upper North Island districts**



**Figure 1.5 Police productivity, South Island and lower North Island districts**

## 1.6 Next steps

This section discusses some ways that the productivity measures developed in this case study could be extended to improve their relevance for decision makers.

### Quality and case-mix adjustment

As noted above, the productivity measures are not adjusted for any changes in quality or case-mix.

Chapter 5 of *Measuring and improving state sector productivity draft report*, sets out two general approaches to adjusting productivity measures:

- Stratification: This approach groups outputs so that only products and services of the same specification are compared over time or in space (Schreyer, 2012).
- Explicit adjustment: Explicit approaches to quality adjustment are based on measures that adjust outputs for changes in outcomes (outcomes are the longer term changes in society, the economy, or the environment that result from outputs).

Applying the stratification approach would mean further disaggregation of the two types of mental health incident included in this analysis (mental health; threatened or attempted suicide), based on their level of complexity. This approach would involve significant collection of data, given that additional information on case complexity is not captured through the police dispatch system.

Explicit quality adjustment would involve identifying a desired outcome associated with the measured output (responses to mental health incidents), and then applying a weighting that reflects the presence or absence of that outcome. For example, one outcome that is sought in the area of mental health, might be a reduction in the number of repeat mental health incidents by connection to the right services. Police could measure the frequency with which mental health responses deal with individuals that they have already dealt with in the past (repeat occurrences), and use this as a proxy for the effectiveness of the response.

## Alternative measurement techniques

Chapter 2 of *Measuring and improving state sector productivity draft report* provides an overview of different productivity measurement techniques and notes that different techniques will illustrate different aspects of performance.

Frontier analysis is a useful technique in helping to explain the relative performance of different decision making units. For example, it can explain whether relatively poor performance of a sector is due to a lack of productivity growth among the best performing organisations (the frontier) or best practices failing to diffuse throughout a sector (e.g., from the best performers to the laggards). There are three main steps to a frontier analysis:

- *Define the decision making units (DMUs)* – DMUs are a central feature of frontier analysis and can refer to an individual, firm, public agency (e.g., a school or hospital), region or country.
- *Calculate the efficiency frontier* – the efficiency frontier (sometimes called the reference set) is made up of those DMUs whose input levels are the lowest for any given level of output. This becomes the set against which the efficiency of all DMUs can be assessed.
- *Estimate the distance of DMUs to the efficiency frontier* – each DMU receives an efficiency score that is determined by their performance relative to that of the best performers.

One of the most widely used types of frontier analysis is Data Envelopment Analysis (DEA). As noted in section 1.2, this technique has been used to compare the productivity of different police units in other countries.

One advantage of DEA, is that the approach can incorporate allowances for differences in operating environment that are beyond the control of police districts. For example, previous studies have accounted for environmental factors such as population density and employment levels.

With support from the New Zealand Police, the Productivity Commission is investigating the feasibility of extending the analysis in this case study by applying DEA.



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