

# Northland District Health Board Briefing Paper

**SUBJECT: FATAL AND NON-FATAL MOTOR VEHICLE ACCIDENTS IN NORTHLAND**

**Prepared by:** Dr Nick Chamberlain, Chief Executive

## **RECOMMENDATION**

**That the Board notes the attached report.**

## **KEY POINTS**

Late last year I requested an analysis on motor vehicle accidents in Northland for 2013- 2018 following an article in the media indicating there were a number of areas of highway for priority investment and none of them were in Northland. The report containing the results of that analysis is attached.

Points to note are:

- Northland data was compared to regional data from Auckland, Waikato, Bay of Plenty, Canterbury as well as national data. These were chosen because they have been perceived as having some of the highest motor vehicle accident rates in New Zealand.
- On balance, Northland appears to have the highest morbidity and mortality rates resulting from motor vehicle accidents in New Zealand.
- Northland had the highest fatality rate caused by motor vehicle accidents in 2017 and 2018.
- The rate per 100,000 population for motor vehicle fatalities and non-fatalities in Northland appears to be increasing.
- Northland had a higher number of hospital discharges due to motor vehicle accidents than all other regions considered in each year. Northland's rate per 100,000 hospital discharges was higher than the national average.
- This information has been provided to the New Zealand Transport Authority but we have yet to receive a response.

## Fatal and non-fatal motor vehicle accidents on Northland roads (2013 – 2018)

### Methodology

The information for this report was retrieved from the following sources:

- The New Zealand Transport Agency - Crash Analysis System (CAS);
- Ministry of Transport - Road deaths;
- The University of Otago - New Zealand Injury Query System (NZIQS);
- Statistics New Zealand - Population projection estimates.

The report contains information for the period 01/01/2013 to 23/10/2018 from the NZTA dataset, 01/01/2018 to 31/12/2018 from the Ministry of Transport, and from 01/01/2013 to 31/12/2017 from the NZIQS dataset.

The variables included for this report were year of accident, region of the accident, fatal or non-fatal accidents, and Statistics New Zealand projected population estimates.

### **New Zealand Transport Agency - Crash Analysis System (CAS)**

Data for the CAS is sourced from the New Zealand Police. The data reflects most motor vehicle accidents that occur on public roads, where the public have legal access. Not all motor vehicle accidents are reported to the Police. The regions in the analysis below are based on regional authority areas. The location of the crash provides the counts for the region in the tables below, as opposed to the home address or region in which the person lives. This data is updated quarterly.

### **Ministry of Transport - Road deaths**

The Ministry of Transport provide up-to-date information for 2018 for road fatalities only. This data has not yet been uploaded by NZTA on to the CAS data spreadsheet. The Ministry of Transport count only those who have died within 30 days of their accident. Therefore, people who are in hospital from a motor vehicle accident that occurred after the 25<sup>th</sup> of December 2018 who have survived so far in 2019 are not included for 2018 in the data that has been reported here. This data is categorised by regional authority areas.

### **University of Otago - New Zealand Injury Query System (NZIQS)**

The NZIQS extracts data from the Ministry of Health's National Minimum Dataset and the National Mortality dataset. If the person presented to a Northland DHB hospital after a motor vehicle accident then this would be a count for Northland.

The inclusion and exclusion criteria for the NZIQS are listed below:

- Day patients are excluded (where the injury only results in a short stay in the emergency department).
- Patients who do not have a principal diagnosis of injury are also excluded.
- This data does not include readmissions or injuries that were fatal.



- It is unclear whether being transferred from the Northland region to another DHB for severe injuries or transferred to the NDHB results in a count for Northland.

The regions selected below are based on DHB areas. The rate per 100,000 populations is also based on the usual resident population from Statistics New Zealand.

During the analysis, statistical techniques were used to eliminate bias which included using Statistics New Zealand population projections from 2013 to 2018 based on the census 2013 data (Appendix I). Rate per 100,000 population were calculated to be able to compare the death rates across the regions using the standard formula (Appendix II) with the denominator being the Statistics New Zealand population projections. Using the 2013 census data as the constant denominator would have made it appear as though more accidents are occurring per 100,000 populations over time. This inflation may, in part, be due to our growing population; hence, the population projections were used to provide rates that could be compared to other regions and the national rate. The results presented below are descriptive statistics where no inferences can be made about population sub groups.

## **Results**

### **Fatal motor vehicle accidents**

Data on the number of deaths that occurred due to motor vehicle accidents over the past five years and by region are presented below in Table 1 and Figure 1.

**Table 1:** Deaths due to motor vehicle accidents, by year and region (brackets contain rate per 100,000 population<sup>a</sup>).

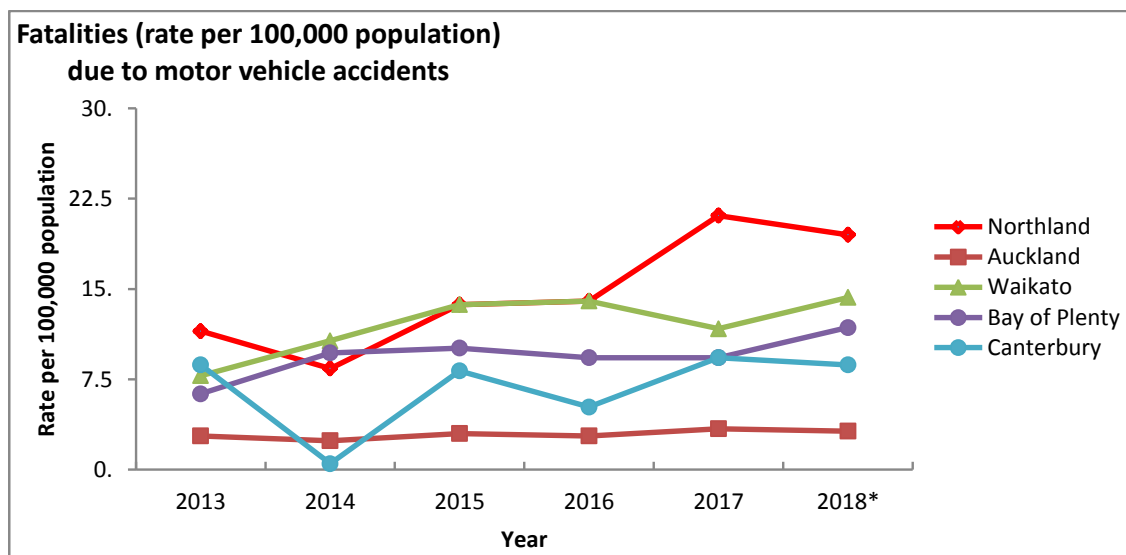
| <b>Region</b> | <b>2013</b> | <b>2014</b> | <b>2015</b> | <b>2016</b> | <b>2017</b> | <b>2018<sup>p</sup></b> |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------------------|
| Northland     | 19 (11.5)   | 14 (8.4)    | 23 (13.7)   | 24 (14.0)   | 37 (21.1)   | 35 (19.5)               |
| Auckland      | 42 (2.8)    | 36 (2.4)    | 47 (3.0)    | 46 (2.8)    | 57 (3.4)    | 54 (3.2)                |
| Waikato       | 33 (7.8)    | 46 (10.7)   | 60 (13.7)   | 63 (14.0)   | 54 (11.7)   | 67 (14.3)               |
| Bay of Plenty | 17 (6.1)    | 26 (9.2)    | 27 (9.4)    | 25 (8.5)    | 25 (8.3)    | 36 (11.8)               |
| Canterbury    | 47 (8.3)    | 35 (6.1)    | 44 (7.5)    | 28 (4.7)    | 50 (8.2)    | 54 (8.7)                |
| New Zealand   | 238 (5.4)   | 266 (5.9)   | 291 (6.3)   | 285 (6.1)   | 342 (7.1)   | 379 (7.8)               |

<sup>a</sup> Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year;

<sup>b</sup> The data for 2018 is sourced from Ministry of Transport  
*Data source: Ministry of Transport; NZTA*



**Figure 1:** Deaths due to motor vehicle accidents by year and region (rate per 100,000 population<sup>a</sup>).



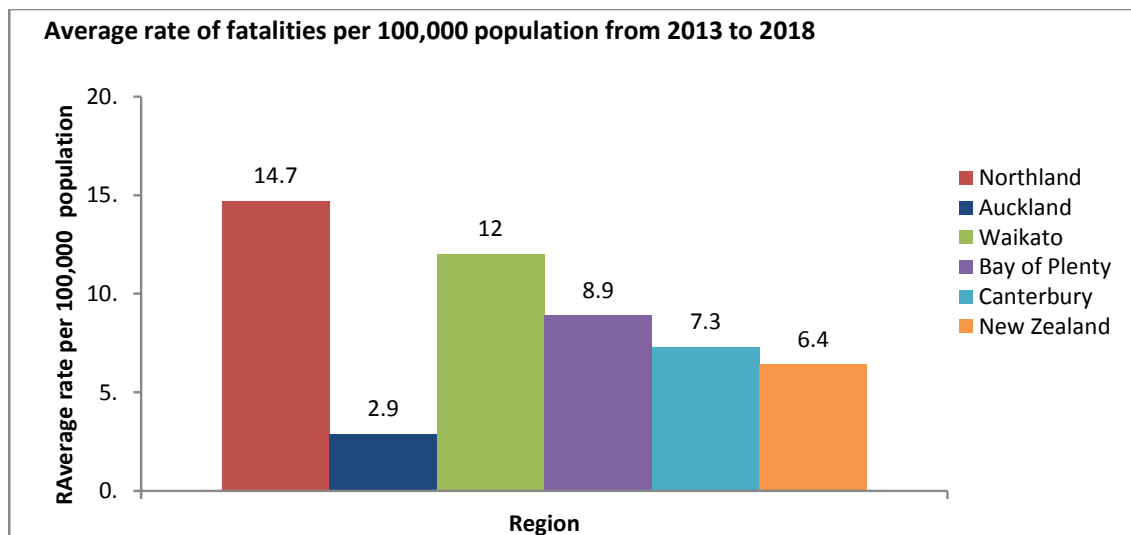
<sup>a</sup> Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year.

\* The rate per 100,000 population is calculated from the 2018 road deaths data from the Ministry of Transport

Northland had a higher rate (per 100,000 population) of fatalities due to motor vehicle accidents than any other region in 2018, 2017 and 2013.

Figure 2 below presents the average rate of fatalities across the five regions over a period of seven years.

**Figure 2:** Average rate<sup>a</sup> of deaths from 2013 to 2018 by region.



<sup>a</sup> The average rate was calculated as the mean of the rate per 100,000 for each region based on the values presented in Table 1. The formula used in calculating the average rate is presented in Appendix II.

Northland had the highest fatality rate per 100,000 population; 2.30 times the national average over the past seven years.

Figure 3 below presents the geographical distribution of all fatal crashes in Northland from 2013 to 2018.

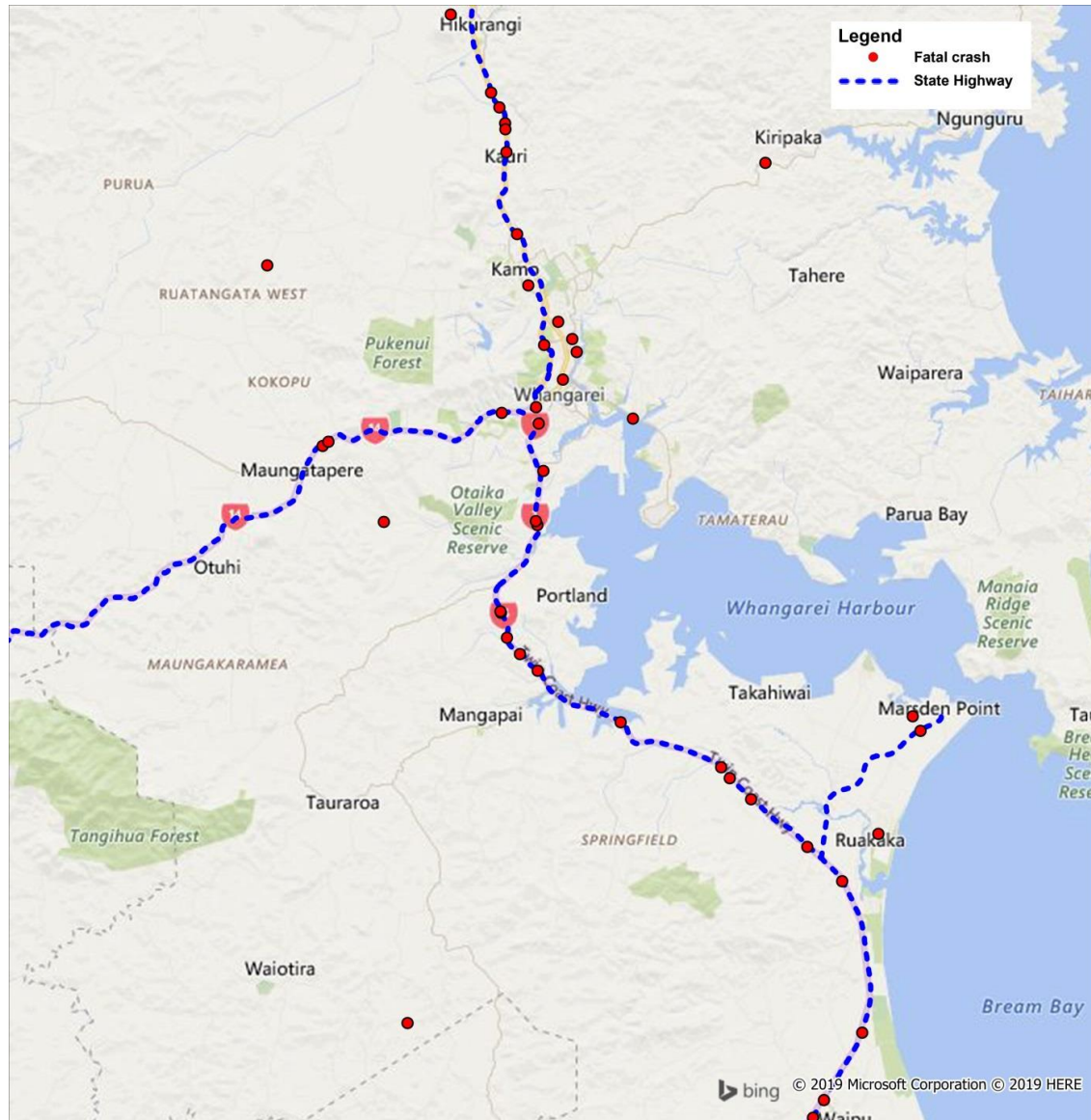
**Figure 3.** Fatal crashes on Northland roads (2013 – 2018)



The number of fatalities on Northland roads was higher on State Highway 1 between Kamo traffic lights in the north to Waipoua in the South.

Figure 4 below presents the geographical distribution of fatal crashes between the Kamo traffic lights in the north to Waipu in the South.

**Figure 4.** Geographical distribution of fatal crashes between Hikurangi in the north to Waipu in the South.



The number of fatalities was higher on SH1 north of Kauri and between Portland and Ruakaka junction in the south of Whangarei.

### Non-fatal motor vehicle accidents

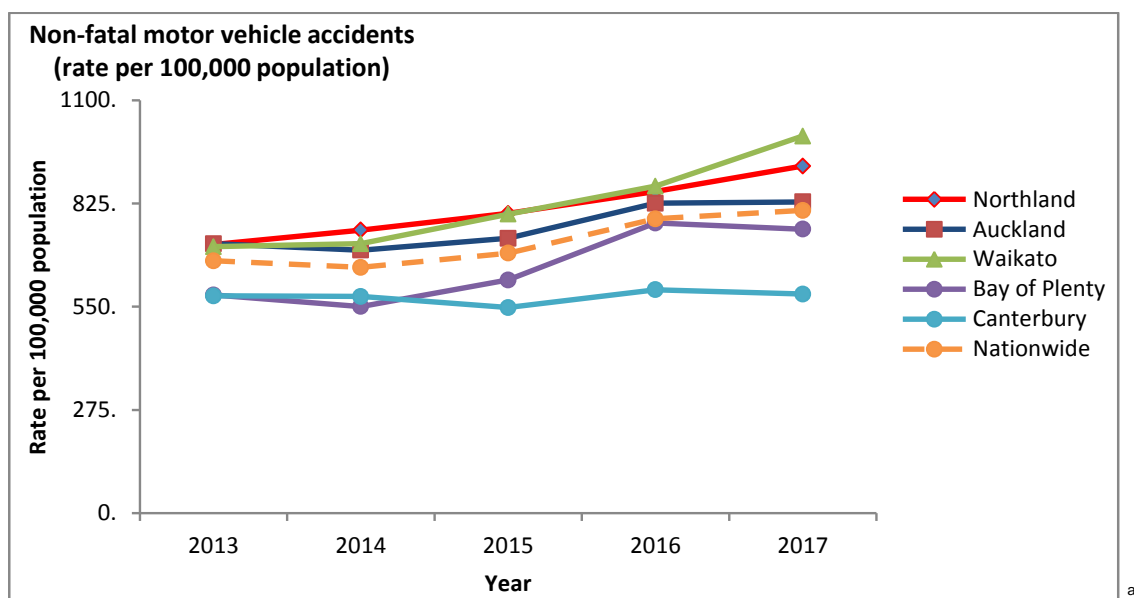
Data on non-fatal motor vehicle accidents by year and region are presented in Table 2 and Figure 5 below. Given that data on all the crashes in 2018 was not available from the CAS dataset as mentioned in the methodology; the analysis for the data from 2013 – 2017 is presented below.

**Table 2:** Non-fatal motor vehicle accidents by year and region (brackets contain rate per 100,000 population<sup>a</sup>).

| Region        | 2013           | 2014           | 2015           | 2016           | 2017           |
|---------------|----------------|----------------|----------------|----------------|----------------|
| Northland     | 1,178 (715.2)  | 1,252 (754.2)  | 1,344 (798.6)  | 1,469 (857.1)  | 1,622 (924.7)  |
| Auckland      | 10,717 (717.7) | 10,698 (700.6) | 11,497 (732.3) | 13,326 (825.4) | 13,741 (829.2) |
| Waikato       | 3,013 (709.6)  | 3,092 (717.7)  | 3,498 (796.6)  | 3,914 (871.3)  | 4,621 (1004.3) |
| Bay of Plenty | 1,626 (581.3)  | 1,554 (550.5)  | 1,783 (621.0)  | 2,268 (772.7)  | 2,269 (756.6)  |
| Canterbury    | 3,259 (579.0)  | 3,316 (577.4)  | 3,212 (547.7)  | 3,571 (595.3)  | 3,572 (583.7)  |
| New Zealand   | 29,864 (672.3) | 29,527 (654.7) | 31,837 (692.8) | 36,797 (784.0) | 38,662 (806.5) |

<sup>a</sup> Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year.

**Figure 5:** Non-fatal motor vehicle accidents by year and region (rate per 100,000 population<sup>a</sup>).



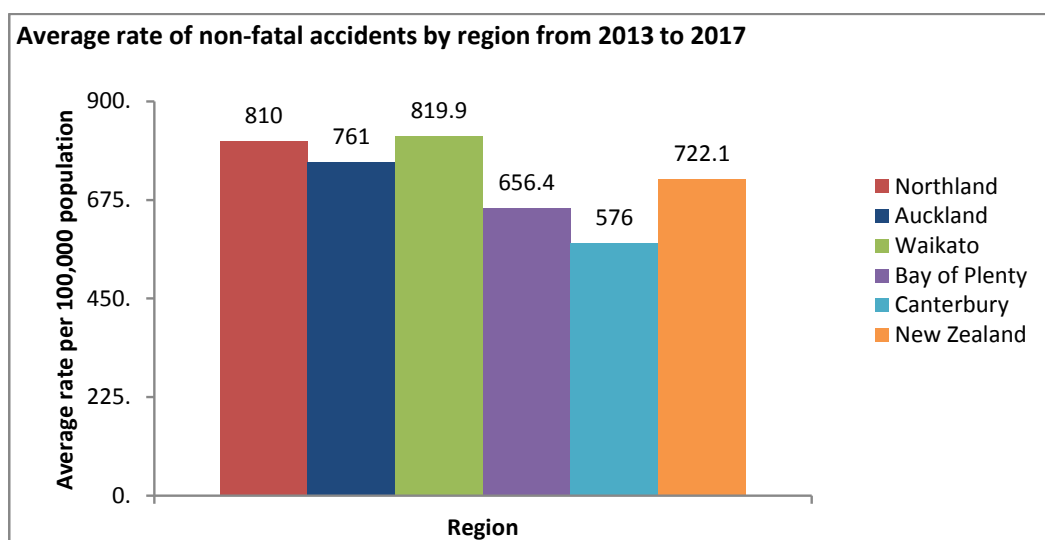
Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year.

Northland had the second highest rate of non-fatal motor vehicle accidents in 2017, following Waikato. Northland rates were consistently higher than the national average of non-fatal crashes across all the years (2013 – 2017).



The average rate of non-fatal motor vehicle accidents over the five years (2013 – 2017) by region is presented below.

**Figure 6:** Average rate of non-fatal motor vehicle accidents from 2013 to 2017 by region.



<sup>a</sup> The average rate was calculated as the mean of the rate per 100,000 for each region based on the values presented in Table 2. The formula used in calculating the average rate is presented in Appendix II.

Northland had a higher average non-fatal accident rate per 100,000 population than all other regions considered over the past five years, except for the Waikato region.

### Hospital discharges due to motor vehicle accidents

Hospital discharges due to motor vehicle accidents data is presented in Table 3 and Figure 7 below.

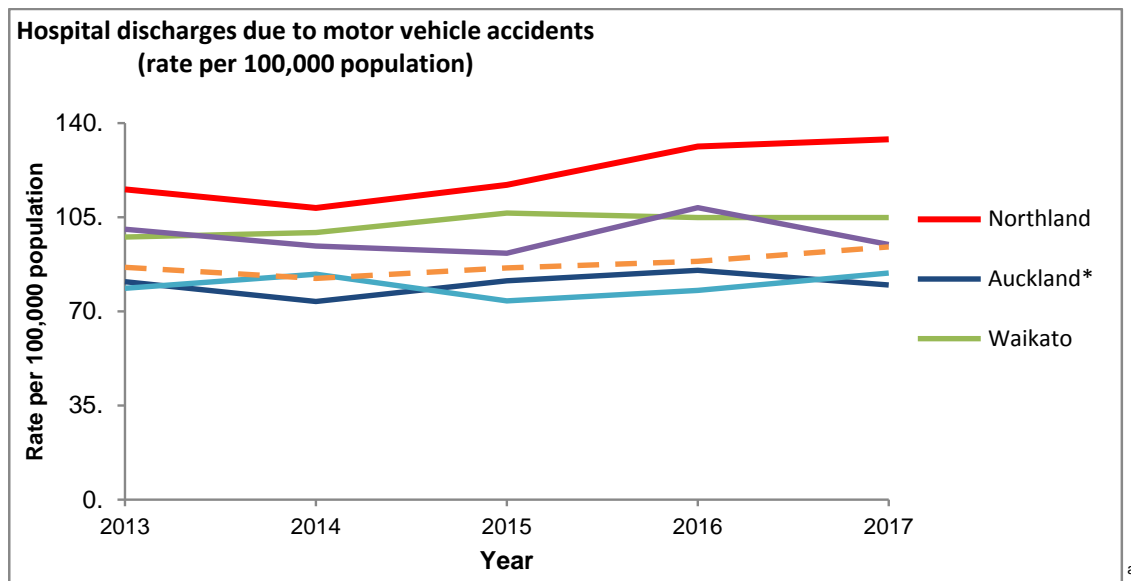
**Table 3:** Hospital discharges (non-fatal injuries) due to motor vehicle accidents, by year and region (brackets contain rate per 100,000 population<sup>a</sup>).

| Region        | 2013         | 2014         | 2015         | 2016         | 2017         |
|---------------|--------------|--------------|--------------|--------------|--------------|
| Northland     | 190 (115.3)  | 180 (108.4)  | 197 (117.0)  | 225 (131.3)  | 235 (134.0)  |
| Auckland*     | 373 (81.0)   | 348 (73.7)   | 399 (81.4)   | 432 (85.2)   | 418 (79.8)   |
| Waikato       | 369 (97.6)   | 381 (99.3)   | 416 (106.5)  | 419 (104.9)  | 429 (104.9)  |
| Bay of Plenty | 216 (100.5)  | 205 (94.3)   | 203 (91.6)   | 246 (108.5)  | 220 (94.8)   |
| Canterbury*   | 396 (78.6)   | 431 (83.8)   | 389 (73.9)   | 420 (77.8)   | 464 (84.2)   |
| New Zealand   | 3,840 (86.4) | 3,708 (82.2) | 3,958 (86.1) | 4,160 (88.6) | 4,502 (93.9) |

<sup>a</sup> Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year.

\*Auckland does not include Waitemata or Counties Manukau; Canterbury does not include south Canterbury.

**Figure 7:** Hospital discharges (non-fatal injuries) due to motor vehicle accidents, by year and region (rate per 100,000 population<sup>a</sup>).



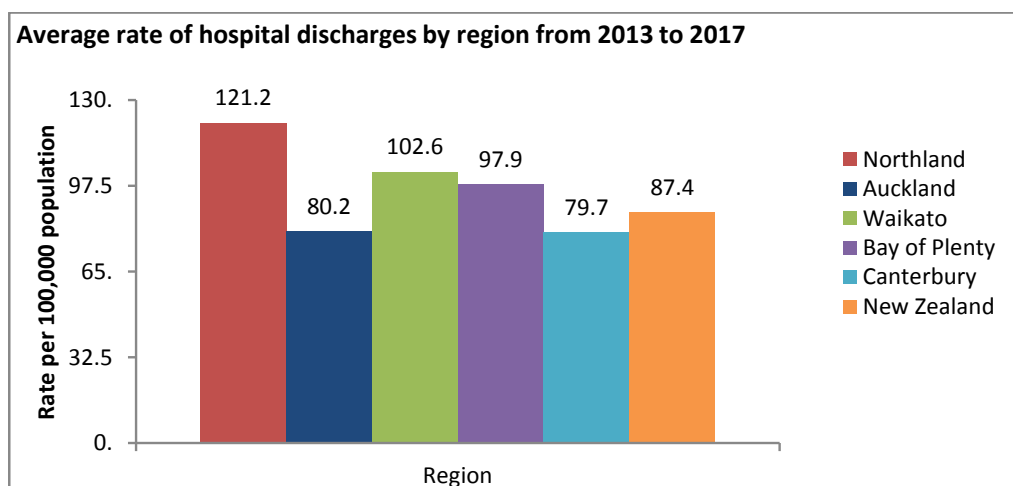
Rate per 100,000 population is based on Statistics New Zealand's population projection estimates for each region and by each year.

\* Auckland does not include Waitemata or Counties Manukau; Canterbury does not include south Canterbury.

Northland had the highest rate of hospital discharges per 100,000 population in each year considered (2013 – 2017).

The average rate of hospital discharges due to motor vehicle accidents over the five years (2013 – 2017) by regions is presented below.

**Figure 7:** Average rate of hospital discharges per 100,000<sup>a</sup> population by region.



<sup>a</sup> The average rate was calculated as the mean of the rate per 100,000 for each region based on the values presented in Table 3. The formula used in calculating the average rate is presented in Appendix II.

Northland had by far the highest average hospital discharge rate per 100,000 population over the five year period, being 18.1% above that of the Waikato region.

## Discussion

Overall, the average rate of deaths due to motor vehicle accidents in Northland was 230% of the national average each year (2013 – 2017). Of all regions considered, Northland had the highest fatality rate in 2017 and 2018, and a comparable fatality rate to Waikato in 2015 and 2016. The total fatality rate for 2017 in Northland was approximately 297% of the national average. Auckland had by far the least fatalities on their road for their population size and, however, had more road traffic accidents than the national average each year considered. The rate per 100,000 population for motor vehicle fatalities and non-fatalities appears to be increasing for Northland. This increasing trend in fatalities appears to be increasing more rapidly than other regions (and the national average), without formal hypothesis tests to assess this as such.

For hospital discharges, Northland had a higher number of discharges than all other regions considered for each year in this analysis. Northland had over 30% more hospital discharges from motor vehicle accidents than the national average each year. Northland and Waikato had the most vehicle accidents overall, however, Northland had more fatalities for its population size than Waikato. Northland had 12.2% greater (on average) non-fatal vehicle accidents each year compared to New Zealand overall. Northland does have the lowest population size compared to the other regions considered in this analysis, and therefore, the rate per 100,000 population will be more variable than for those with a larger population. No inferential statistics or confidence intervals were calculated to see if there is a true difference, and not due to chance, between these regions or between different years.

## Limitations

The data reported does not represent the total of all motor vehicle accidents. Due to the nature of using different sources, these estimates may change due to the criteria (or limitation) each source uses (or has) to calculate their statistics. Information for 2018 in the CAS system was not available for the last quarter of 2018 and their last update for CAS was on the 23/10/2018. NZTA expect to process all crash reports within four weeks of being received. Holiday periods are likely to lead to more accidents (fatal and non-fatal) and non-fatal information is not available for 2018 yet. The data from the Ministry of Transport for road fatalities could be questionable as a true rate as it depends on the assumption that those in hospital, who have not yet died, are no more likely to be from one region more than another. Northland is a holiday destination, with a large geographical area which may increase the population size that uses the Northland roads. These population projections only include the resident population and it was not feasible to access a better denominator for the total population. Exact population size estimates for calculating the rates per 100,000 population is also not possible with the data available. The averages, or mean rate per 100,000 population over time, contain estimates from rounded numbers to calculate these averages. For the purpose of determining the amount of crashes on New Zealand roads the NZIQS would not be a good source because of their exclusion criteria, where they exclude crashes that result in minor injuries, those whom their primary diagnosis was not injury related, and those that are day patients.

## Conclusion

Northland has more fatalities per 100,000 population on their roads than other regions, and is second to Waikato for non-fatal vehicle accidents on average. In terms of non-fatal vehicle accidents, it is still high for Northland compared to other regions and the national average, for its estimated population size. Northland's rate per 100,000 hospital discharges is consistently above all other regions considered for each year. Lastly, Northland is well above the national average for motor vehicle accidents fatalities, motor vehicle accident non-fatalities, and hospital discharges for the years considered.

## References

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- Ministry of Transport (2019). *2018. Road deaths*. Retrieved from <http://www.transport.govt.nz/mot-resources/road-safety-resources/road-deaths/>
- Statistics New Zealand (2017). Population Estimates. Retrieved from <http://archive.stats.govt.nz/infoshare/>
- Statistics New Zealand (2013). Census 2013. Retrieved from <http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place>
- University of Otago (2018). New Zealand Injury Query System. Retrieved from <https://psm-dm.otago.ac.nz/nigs/>



**Appendix I**  
**Population projection estimates**

| Year        | Northland Region | Auckland Region | Waikato Region | Bay of Plenty Region | Canterbury Region | New Zealand |
|-------------|------------------|-----------------|----------------|----------------------|-------------------|-------------|
| <b>2013</b> | 164,700          | 1,493,200       | 424,600        | 279,700              | 562,900           | 4,442,100   |
| <b>2014</b> | 166,000          | 1,526,900       | 430,800        | 282,300              | 574,300           | 4,509,700   |
| <b>2015</b> | 168,300          | 1,569,900       | 439,100        | 287,100              | 586,400           | 4,595,700   |
| <b>2016</b> | 171,400          | 1,614,500       | 449,200        | 293,500              | 599,900           | 4,693,200   |
| <b>2017</b> | 175,400          | 1,657,200       | 460,100        | 299,900              | 612,000           | 4,793,900   |
| <b>2018</b> | 179,100          | 1,695,900       | 468,800        | 305,700              | 624,200           | 4,885,500   |

The population projection estimates have been sourced from Statistics New Zealand and were last updated on the 15/11/2018.



## Appendix II

### Formulae

Formula used to calculate the 'rate per 100,000 population'

$$\text{Rate of fatal accidents per 100,000}_{ij} = \frac{\text{Total fatal Accidents}_{ij}}{\text{Total Population Size}_{ij}} \times 100,000 = \tau_{ij} \text{ where}$$

Formula used to calculate the 'average rate per 100,000 population'

$$\text{Average rate per 100,000}_j = \frac{\sum_i^{n+i} \tau_{ij}}{n} \text{ where } \begin{array}{l} i = \text{Start year} \\ j = \text{Region} \\ n = \text{Number of years} \end{array}$$

