Impacts of local alcohol policies

Analysis of changes in spending following local changes in trading hours

August 2019

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Key points

This report examines the impact of alcohol-related policy changes associated with spending at bars, pubs and taverns, and licensed cafés and restaurants (on-licences) and liquor stores (off-licences). The analysis focuses on local purchasing patterns at licensed venues that sell alcohol both before and after local alcohol policies (LAPs) have been implemented in three local authorities: Tauranga, Western Bay of Plenty and Waimakariri. For the purpose of this report we examine bars, pubs and taverns as separate categories from licensed cafés and restaurants ("cafés and restaurants").

The analysis is based on spending at licensed venues using a dataset of credit and debit card payments from January 2009 to April 2016.

We tested whether restrictions on maximum trading hours introduced in the LAPs were associated with:

- a reduction in spending at on-licences
- a shift in spending from on-licences to liquor stores
- spending being brought forward i.e. an increase in spending immediately prior to new restricted maximum trading hours.

We find no evidence that total spending at on-licences has declined in the local authorities examined.

We do find evidence for changes in composition of spending by outlet and by day of the week. Spending at on-licences during peak purchasing days of the week (concentrated on late Friday night/Saturday morning and Saturday night/Sunday morning) has declined following reductions in maximum trading hours.

In Waimakariri aggregate spending at bars, pubs and taverns has declined, suggesting there may have been substitution away from spending at such premises towards spending at cafés and restaurants.

In Tauranga and Western Bay of Plenty, there is no evidence to suggest a shift in spending from bars, pubs and taverns towards cafés and restaurants.

There is strong evidence of a substitution in spending from on-licences to liquor stores, particularly on Fridays and Saturdays. This pattern was found in both Waimakariri and the joint LAP area of Tauranga and Western Bay of Plenty.

We find mixed evidence for the idea that reductions in trading hours result in spending being brought forward:

- spending in bars, pubs and taverns was brought forward in Tauranga and Western Bay of Plenty though this effect was concentrated amongst people aged between 30 and 39
- spending at cafés and restaurants in Tauranga and Western Bay of Plenty was not affected, overall, by the LAP, but there were age-specific effects with people aged 30 to 34 and 55 to 59 increasing their spending prior to new restricted maximum trading hours
- in Tauranga and Western Bay of Plenty only people aged 18 to 29 brought forward their spending at liquor stores immediately prior to new restricted maximum trading hours

- there was no strong evidence of spending at bars, pubs and taverns being brought forward in Waimakariri, as much of the reduction in spending has occurred early in the evening, rather than immediately prior to trading hour cut-offs.

Our method examines purchasing patterns at venues licensed to sell alcohol from which inferences can be drawn about changes in alcohol purchases. Specifically, it looks for patterns in purchasing before and after policy changes, from which changes in consumption might be inferred. While purchases in on-licences are likely to be closely associated with consumption at the same time, some purchases in off-licences may be for delayed consumption.

The data includes spending on food and other non-alcohol products in on-licences and to lesser extent off-licences which influences volume and timing of purchases. But this does not affect conclusions associating purchasing changes with policy, assuming mealtime spending patterns do not significantly change.

The analysis results are sensitive to the assumption that policy changes are the only influences driving the observed changes in purchasing, and to how good an explanation of the data prior to the policy changes is provided by the fitted models.

Observed percentage changes could be due to random effects or changes in spending due to factors not accounted for in the models.

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1. Overview

New Zealand in 2015 was ranked 10th out of 34 countries in consumption of alcohol in per capita terms.[1] The manner of drinking, the observation of binge drinking and drunkenness and the association of alcohol with traffic accidents, injuries and criminal offences is a mounting cause of concern. In 2012, Parliament passed the Sale and Supply of Alcohol Act (SSAA), following a review of existing legislation by the Law Commission in 2010 and many submissions received from the public.

The SSAA 2012 introduced a number of changes to the provision of alcohol. These changes are intended to minimise harm from alcohol and introduce opportunities for local communities to establish different local drinking environments. Key changes include:

- **Maximum default trading hours**. Introduced from the 18 December 2013, unless specified under a local alcohol policy, bars, restaurants and nightclubs must close at 4am while off-licence sales (primarily supermarkets and liquor stores) cannot operate outside 7am – 11pm
- **Establishing the Alcohol Regulatory and Licensing Authority (ARLA)** to replace the Liquor Licensing Authority
- **Allowing territorial authorities to have local alcohol policies**.

The Health Promotion Agency approached NZIER to examine MarketView data to provide insights on purchasing patterns at venues that are licensed to sell alcohol. The MarketView data does not allow precise observation of alcohol purchases or consumption, but does provide details of purchases at venues licensed to sell alcohol from which inferences can be drawn about alcohol purchasing.

This report examines the effects of local alcohol policies (LAPs) associated with local purchasing patterns at licensed premises (data covering 1 January 2009 to 30 April 2016). LAPs are voluntary and as at 1 August 2017, 29 councils had adopted a LAP and 22 others had embarked on the stipulated process of developing one or were awaiting hearings before the Alcohol Regulatory and Licensing Authority.[2] This analysis focuses on data from LAPs in force as at June 2016 in three local authorities: a joint LAP for the Tauranga City and Western Bay of Plenty; and a LAP in the Waimakariri District.

[1] With an estimated per capita consumption of 9.5 litres of alcohol a year, New Zealand was 20th highest out of 34 OECD countries in 2013; in 2015 the WHO placed New Zealand at 10th out of the 34 countries, following updated estimates and adjustments for previously unrecorded consumption that added 12% to its per capita estimate.

[2] Jackson, N. and Robertson, H. (December 2017). A review of Territorial Authority progress towards Local Alcohol Policy development (2nd edition). Auckland: Alcohol Healthwatch. http://www.ahw.org.nz/Portals/5/Resources/Documents-other/2017/LAPReport_2017_WEB_amended%2020_3_18.pdf

1.1. The analysis is based on card payment data

Our analysis looks at changes in expenditure patterns at the following licensed premises:

- off-licences, comprising liquor stores, also known as bottle stores
- on-licences, comprising a separate category for bars, pubs and taverns and another for licensed cafés and restaurants.

The card payment data[3] combines BNZ data of bank customers and Paymark data of retail outlet transactions. The BNZ data includes information on amount of spending, location of spending and age, gender and home address of card holders, and these characteristics are applied by Marketview across the entire dataset. The data spans the period from 1 January 2009 to 30 April 2016.

Our data includes a mixture of information on outlets by type of licence and by industry type. We have chosen to focus on industry level categories rather than licence categories because this connects our analysis to a venue's primary activity and allows better differentiation between spending that is likely to be dominated by alcohol from spending on other goods and services. [4] For example, venues may effectively operate as a café or restaurant while holding a bar or tavern licence – at least in terms of the amount of spending that is alcohol related.

The data we have excludes supermarket sales of alcohol and clubs and special licence sales. It also excludes cash purchasing.[5] The exclusion of supermarkets is to avoid obscuring effects on alcohol sales by changes in purchasing patterns of other products which account for most supermarket sales,[6] as the data we use records total purchase value, not the separate components within a purchase.

Licensed cafés and restaurants are examined as a separate category of on-licences. For this category we strip out unlicensed cafés and restaurants (which account for around 40% of card spending at all cafés and restaurants), and report results on them both as a separate category and included within the wider on-licence category.

This dataset has limitations for policy analysis in so far as it does not precisely capture consumption or purchase of alcohol, but only purchases made at licensed premises – at bars, pubs and taverns, cafés and restaurants (on-licences) and liquor stores (off-

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3 Sourced, for a fee, from Marketview (http://www.marketview.co.nz/).

4 Statistics New Zealand's Retail Trade Survey deflator weights indicate nationally alcohol accounts for 97% of sales in liquor stores and 20% of sales in food and beverage services, which after taking out unlicensed cafés and restaurants, implies around 55% of sales at on-licensed premises of all types, on average. We expect alcohol spending at bars and pubs to be above this average, at cafes and restaurant below it. The weights indicate alcohol accounts for just 7% of sales in supermarkets and grocery stores, so they have been excluded from the dataset analysed here to avoid other products obscuring patterns of alcohol purchases,.

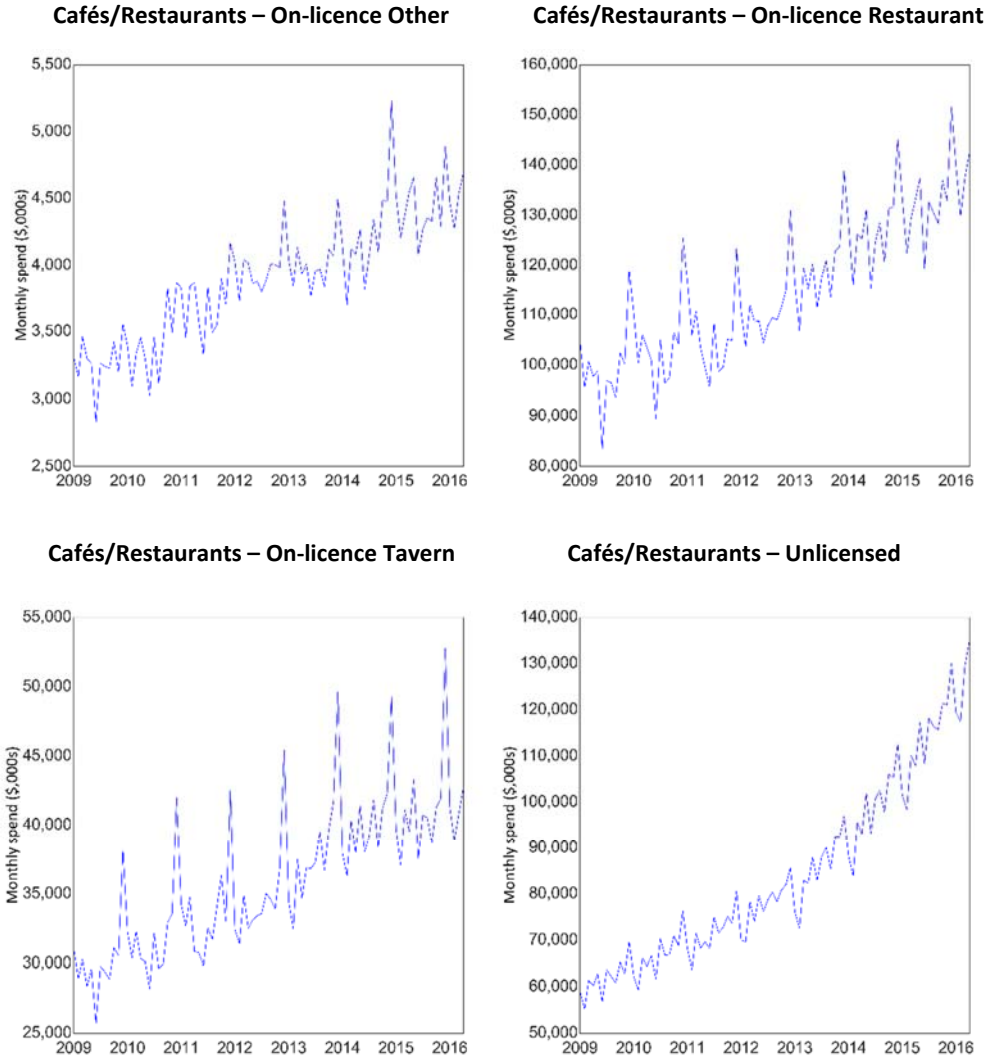
5 It is unclear whether exclusion of cash purchases makes much difference to our analysis because our analysis is based on changes to spending patterns and we do not have any reason to believe that cash purchasing, for example, is large enough and distinctive enough to be affected differently to card purchases. That said, it is possible that some small market segments may be dominated by cash purchases and consequently this analysis cannot make inferences about such segments of the market for purchasing on licensed premises.

6 Statistics New Zealand's Retail Trade Survey deflator weights indicate nationally alcohol accounts for 97% of sales in liquor stores and 20% of sales in food and beverage services, which after taking out unlicensed cafés and restaurants, implies around 55% of sales at on-licensed premises of all types, on average. The weights indicate alcohol accounts for just 7% of sales in supermarkets and grocery stores, so these outlets have been excluded from the dataset analysed here to avoid other products obscuring patterns of alcohol purchases,.

licences) – while the policies of interest are targeted at the use of alcohol. On-licence purchase data in particular includes some food and other products along with alcohol; off licence premises include sales of a much smaller proportion of non-alcoholic products.[7]

Our approach, does, however, have the benefit of being able to track spending over time and across a very large number of people. This means that it is a useful complement to alternative approaches such as survey-driven analysis.

Figure 1 Cafés and restaurants, spending by type of licence

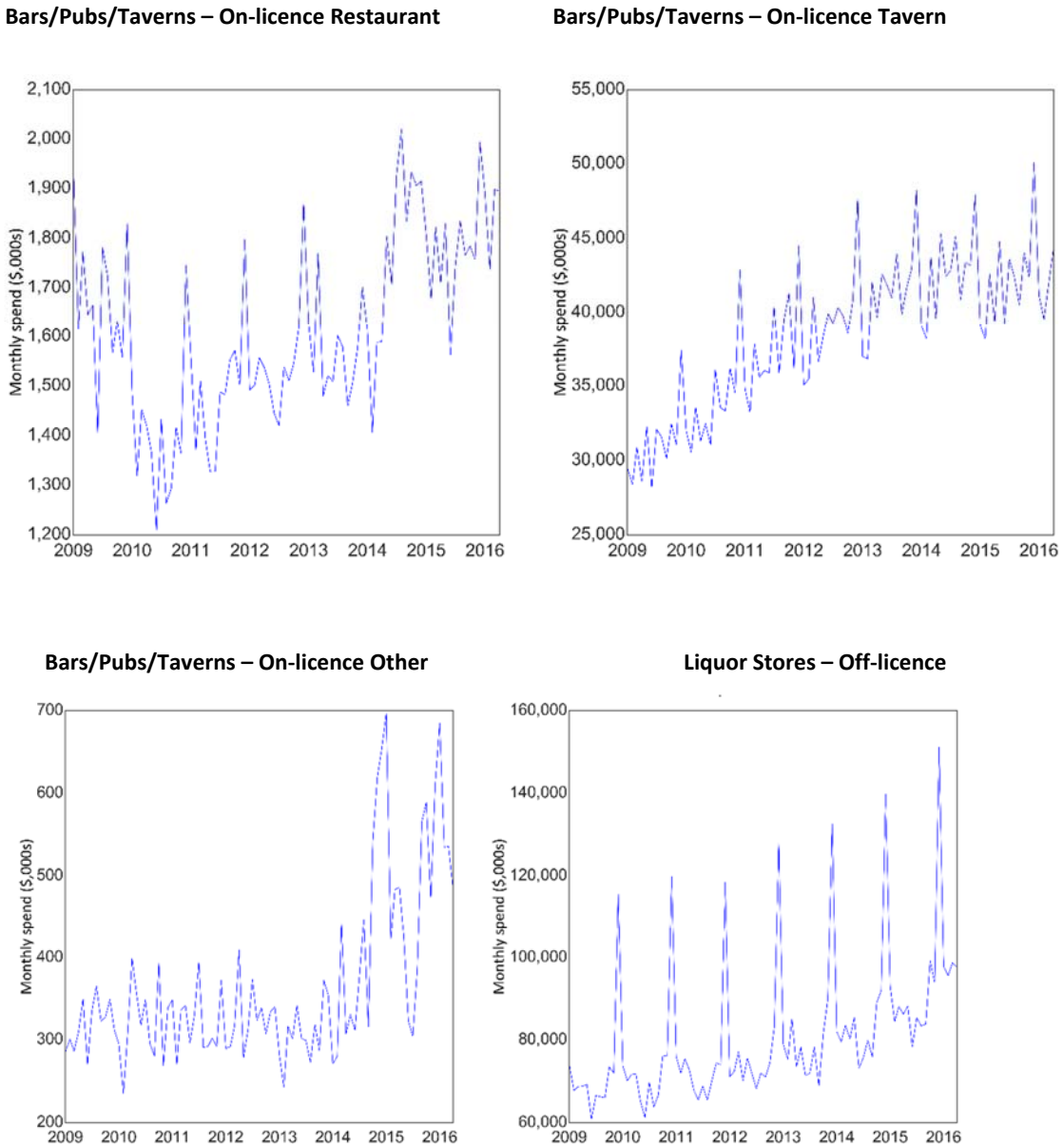


Source: NZIER, Marketview

[7] The data is categorised according to industry categories and not licence categories. Hence the use of the term 'liquor stores', while the SSAA uses the term 'bottle stores'. The Australia New Zealand Standard Industry Classification 2006, used for the categories in this data set, defines a 'bar, pub or tavern' as a business with the primary activity of "Bar operation" as described by business owners. These sorts of outlets may well have restaurant licences.

The coverage of our data is summarised in Figure 1 (previous page) for cafés and restaurants and in Figure 2 below for bars, pubs, taverns and liquor stores. The data in these charts is for New Zealand overall, to demonstrate, at a high level, the relative sizes of each type of outlet and trends in spending over time.[8]

Figure 2 Bars/Pubs/Taverns and liquor stores, spending by type of licence



Source: NZIER, Marketview

The fluctuations in the charts reflect a marked seasonality in purchases at licensed premises, with the main peaks in the summer holiday period around Christmas and New Year. Figure 1 shows that peaking is much more pronounced for licensed premises

[8] Similar charts for the district LAPs we are analysing can be found in additional contextual information in Appendix A.

than for unlicensed premises, but all categories of premises display strong upward trend in aggregate purchases in nominal dollar terms, in line with growth in population and incomes over the period covered, and to a lesser extent price (as inflation was relatively low over those years).

Figure 2 shows that the seasonal peaking is much more pronounced for liquor stores (off-licences) than for the on-licensed categories of bars, pubs and taverns. It also shows that the growth trend for most categories has been flatter than those on-licence categories in Figure 1. On-licence restaurants in Figure 2 exhibit a marked drop in purchases from 2009 to 2010, with growth recovering since then, and the "On-licence other" category had flat spending between 2009 and 2014 (although much smaller in purchase value terms than the other categories).

1.2. Local alcohol policies examined

This report presents evidence of changes in spending at licensed premises associated with the introduction of LAPs and resulting changes to maximum permissible trading hours.

The option for councils to create voluntary LAPs was introduced in the SSAA in 2012.

As at June 2016, few LAPs had entered into force and overcome appeal to the Alcohol Regulation and Licensing Authority. Some that had included:

- a joint LAP for Tauranga City and the Western Bay of Plenty District (entry into force on 16 November 2015)
- a joint LAP for the Eastern Bay of Plenty comprising the Kawerau, Opotiki and Whakatane districts (entry into force 18 March 2016)
- a LAP for the Waimakariri District (entry into force on 16 February 2015).

The LAPs examined in this report are limited to those in force in Tauranga City, the Western Bay of Plenty District and Waimakariri. The Eastern Bay of Plenty is not included because the main observable changes in its LAPs – the changes in maximum permissible trading hours – did not come into effect until 21 June 2016 and as a result there is insufficient data to examine the impact of those changes.

2. Context

2.1. Tauranga and Western Bay of Plenty

The joint Tauranga City and Western Bay of Plenty LAP entered into force on 16 November 2015. The policy included:

- maximum hours for on-licences of
  - 9am to 1am
  - 9am to 3am in Tauranga city centre
  - a 'one-way' door restriction limiting sales of alcohol to people already on premises before 2am
- a number of discretionary elements to be considered by the District Licensing Committee when issuing on-licenses to bars, pubs and taverns and clubs, such as
  - restrictions on use of outdoor areas after 10pm
  - restrictions on the types of drinks that can be served, such as 'shots'
- provisions for security staff after particular times
- maximum hours for off-licences of 7am to 10pm.

In practice, most licensed premises do not trade to the limits of the hours set out in their licences. Based on spending data we estimate that the restrictions would have affected at most 2.5% of spending at bars, pubs and taverns 0.8% of spending at cafés and restaurants and 0.4% of spending at liquor stores.[9]

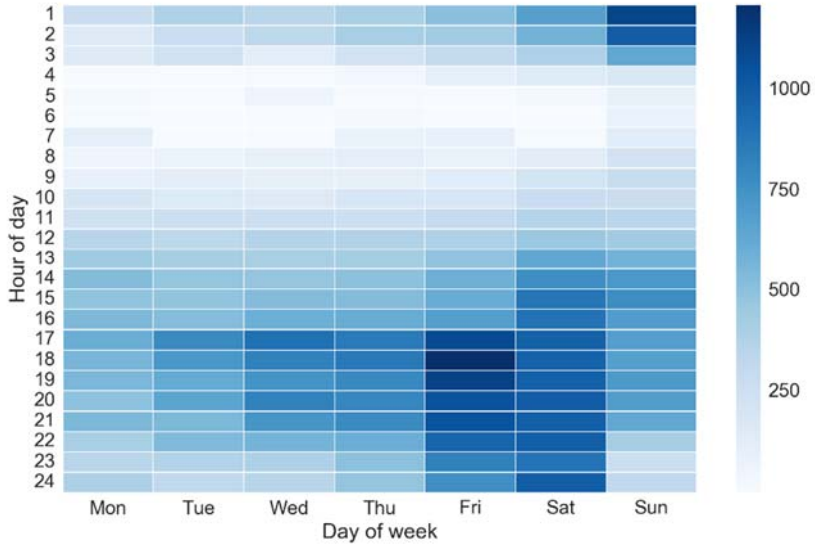
Most of the spending which used to occur outside of the maximum trading hours in the LAP is in Tauranga City rather than the Western Bay of Plenty. The share of spending at licensed premises in the Western Bay of Plenty which has been affected by the LAP is 0.004% at bars, pubs and taverns 0.01% of spending at cafés and restaurants, and 0.8% at liquor stores.

Figure 3, Figure 4 and Figure 5 below provide a summary of the profile of spending at different licensed venues in Tauranga and Western Bay of Plenty. They show spending at bars, pubs and taverns peaks after work on Fridays and later on Saturday night and Sunday morning (Figure 3); spending in cafés and restaurants peaks mid-late evening on Fridays and Saturdays (Figure 4) ; and spending at liquor stores peaks around the end of work hours on Fridays (Figure 5).

[9] This is based on shares of spending occurring outside the new maximum trading periods. For the purposes of these estimates we calculate the share of spending at bars, pubs and taverns and cafés and restaurants after 1am in 2014, before the introduction of the LAP. This ignores the fact that on-licences in the Tauranga city centre have maximum licence hours extending to 3am. We ignore this difference because our data does not differentiate between spending in Tauranga and spending in the city centre. This means the share of spending being affected will be an overestimate. Note also that the term 'affected' is used here to indicate the amount of trade that occurs after 1am but does not indicate the amount of trade that would not take place following the introduction of the LAP.

Figure 3 Spending in bars, pubs and taverns in Tauranga and Western Bay of Plenty

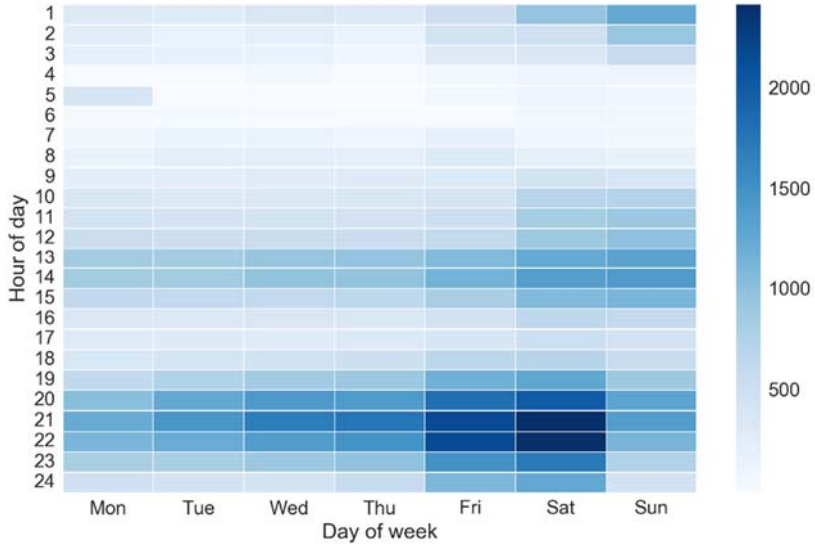
Average hourly spend in $millions, 2009 to 2016 (June)



Source: NZIER, Marketview

Figure 4 Spending in licensed cafés and restaurants in Tauranga and Western Bay of Plenty

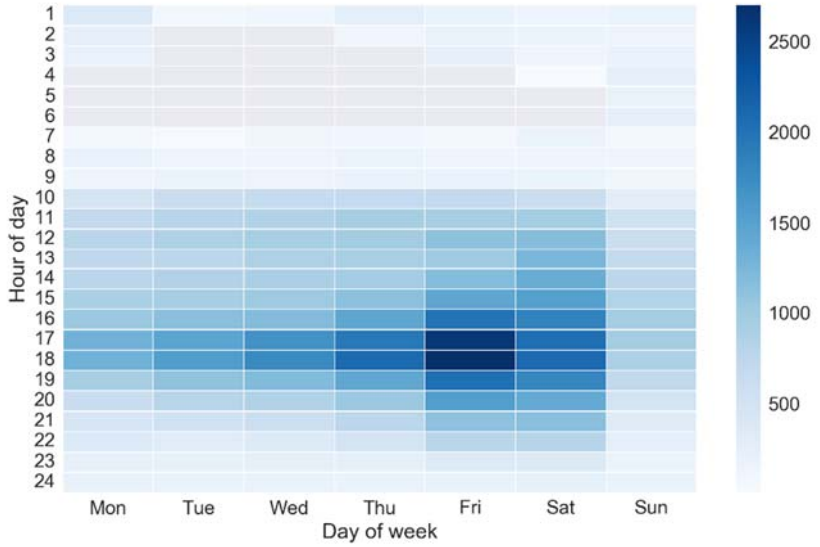
Average hourly spend in $millions, 2009 to 2016 (June)



Source: NZIER, Marketview

Figure 5 Spending at liquor stores in Tauranga and Western Bay of Plenty

Average hourly spend in $millions, 2009 to 2016 (June)



Source: NZIER, Marketview

2.2. Waimakariri

The Waimakariri LAP entered into force on 16 February 2015. The policy included:

- maximum hours for on-licences of
  - 9am to 11pm from Sunday to Thursday
  - 9am to 1am on Fridays and Saturdays
- a number of discretionary elements to be considered by the District Licensing Committee when issuing on-licences, such as
  - restrictions on use of outdoor areas
  - 'one-way' door restrictions limiting sales of alcohol to people already on premises before a certain time
  - provisions for security staff after particular times
- maximum hours for off-licences of 7am to 10pm
- limitations on locations for new off-licences.

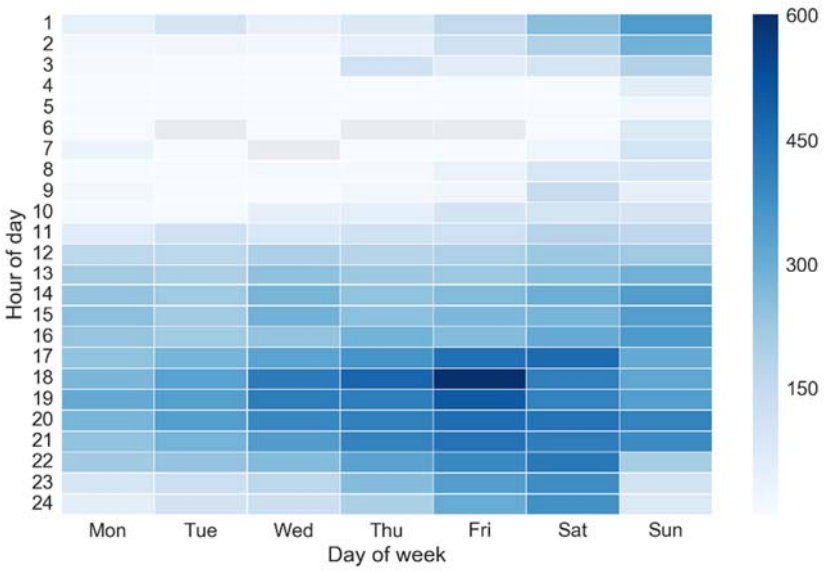
In the background report to its LAP the District Council notes that maximum trading hour restrictions do not provide a very accurate description of actual trading hours and actual trading hours mostly reflect commercial viability and changes in patronage at different days and times of the week.

Based on spending data we estimate that the new trading hour restrictions would have affected 0.6% of spending at bars, pubs and taverns 0.03% of spending at cafés and restaurants and 0.01% of spending at liquor stores.

Figure 6, Figure 7, andFigure 8 provide a summary of the profile of daily and hourly spending at different types of venues in Waimakariri. Spending in bars, pubs and taverns peaks around the end of work hours on Friday and tails off through the evening (Figure 6). Spending in licensed cafés and restaurants peaks late on Saturday night with a secondary peak on Friday from 8pm to 11pm (Figure 7). Spending in liquor stores in Waimakariri is highest at 9am on Saturday morning, with secondary peak early evening on Friday (Figure 8).

Figure 6 Spending in bars, pubs and taverns in Waimakariri

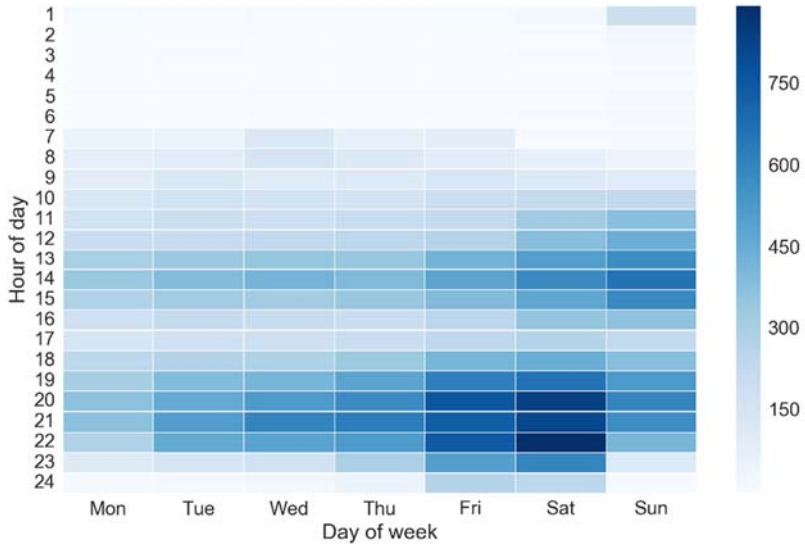
Average hourly spend in NZ dollars, 2009 to 2016 (June)



Source: NZIER, Marketview

Figure 7 Spending in licensed cafés and restaurants in Waimakariri

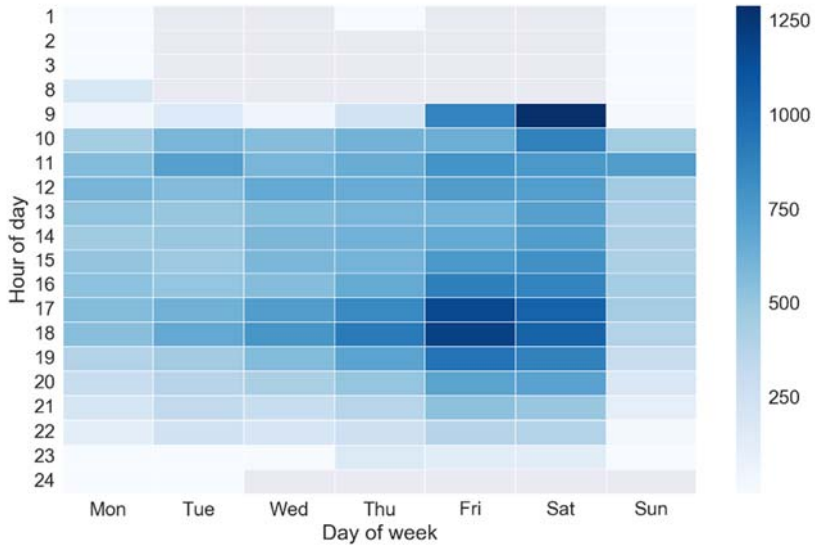
Average hourly spend in NZ dollars, 2009 to 2016 (June)



Source: NZIER, Marketview

Figure 8 Spending in liquor stores in Waimakariri

Average hourly spend in NZ dollars, 2009 to 2016 (June)



Source: NZIER, Marketview

3. Approach

3.1. Guiding questions

Our analysis focusses on the impacts of the changes to maximum permissible trading hours. The reason for this focus is that the other aspects of the LAPs being studied are less clear cut because they are discretionary or only likely to have a gradual impact over time.[10]

Our analysis is guided by three hypotheses:

- reductions in maximum trading hours for on-licences (bars, pubs and taverns and licensed cafés and restaurants) will reduce spending at these premises, in aggregate
- spending at off-licences will increase as people drink more or more frequently at private residences instead of at licensed premises
- spending will increase at on-licences during the hours directly before the new, more restrictive, trading times as people increase consumption in anticipation of earlier closing.

These are only guiding hypotheses in the sense that whether or not they hold is an empirical question.

3.2. Methods

To test our hypotheses, we analyse:

- **changes in spending over time** to see if the introduction of LAPs have had a material effect on spending at bars, pubs and taverns and liquor stores
- **changes in the distribution of spending** within a day, to see if there is a material reallocation of spending.

3.2.1. Analysis of spending over time

To analyse changes in spending over time we fit statistical models to spending data prior to policy changes and then test how well those models explain the data after the policy changes.

Our analysis is based on fitting statistical models to predict spending at on-licences and off-licences for each day and hour of the week and for each of our two LAP areas.

Each model is fitted separately thus treating each series as if it is statistically independent from the others. This is a simplification for practical purposes. Our other analytical approach – analysis of changes in daily spending patterns – is used to account for relationships in spending between different hours of the day.

The models we use are based on so-called 'time series methods' for explaining and predicting spending patterns. That is, spending is explained using mathematical

[10] Restrictions on locations of outlets, for example, only apply to new stores.

measures of typical movements over time as opposed to information on population changes or other behavioural factors.[11]

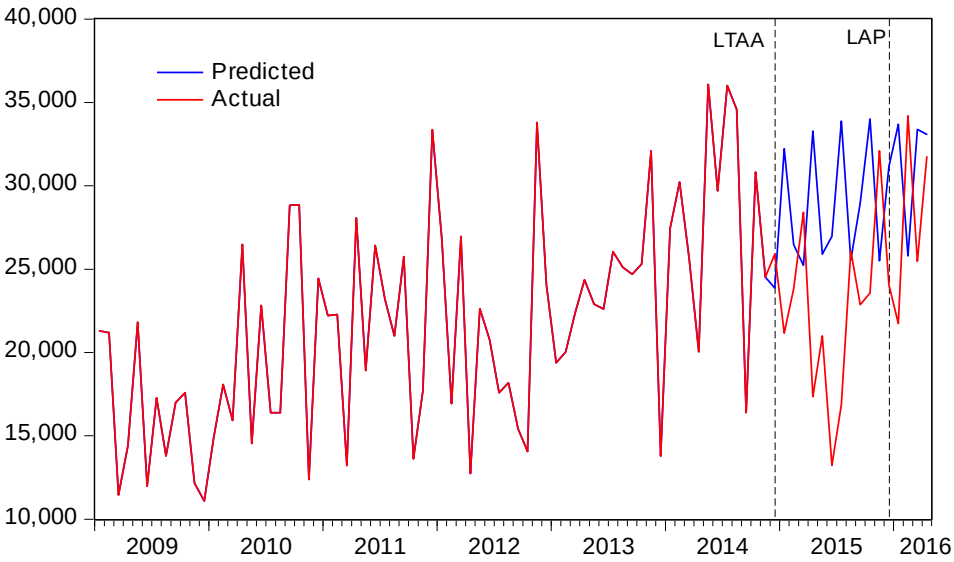
The models include step-change factors (so-called 'dummies') which measure the size of changes in spending that coincide with policy changes. Two influences are modelled in this way. The first is reductions in blood alcohol limits for drivers in December 2014 as these may have affected consumption behaviour around the time that LAPs were introduced. The second influence is the LAPs themselves and their effects on maximum trading hours.

We use our models to look for changes in spending that differ from what we (i.e. our models) would expect if policy changes hadn't occurred. The models estimate purchase patterns before the law changes and use them to predict purchases after changes, which can be compared against actual observed purchases after the changes to assess the impact of the law change.

Figure 9 helps to illustrate this by showing how spending in Tauranga and Western Bay of Plenty has tracked over time and when policy changes occurred. We test for changes in data patterns at each point where a policy change occurred. Possible policy effects that we account for are LAP changes to trading hours and the effects of reductions in blood alcohol limits under the Land Transport Amendment Act (No 2) 2014 (LTAA).[12]

Figure 9 Example of possible policy-related changes in spending

Seasonally adjusted spending on Fridays at midnight in Tauranga and Western Bay of Plenty, for both on- and off-licences.



Source: NZIER, Marketview

[11] A much more detailed study could seek to incorporate behavioural information but this would require quite different methods as behavioural data is slow to change and more costly to collect.

[12] The LTAA (No 2) 2014 (LTAA) reduced blood alcohol and breath alcohol limits for drivers: from 80 mg to 50 mg (-37.5%) per litre of blood for drivers aged 20 and over; under 20 years of age, the limit remained unchanged at zero.

3.2.2. Changes in daily spending patterns

To analyse the possibility of a reallocation of spending across the day we analyse spending at different times of the day for each different type of licensed venue.

Our focus is on shares of spending rather than levels of spending to avoid the results being confounded by underlying trends in the data. Although we do consider spending levels to help us interpret changes in shares of spending.

The analysis is based on fitting curves to shares of spending across the day. An example of this is shown in Figure 10. A curve is fitted on spending data and this curve is used to predict – or benchmark – expected values for spending as if no LAP existed.

Curves are fitted for each day for the week for each month of the year. The analysis is also conducted for different age groups but only for Tauranga City, where there is sufficient data at an age-group level to conduct robust estimation.

Prediction intervals are calculated for +/- 95% of values we would expect to fall above and below the predicted values.

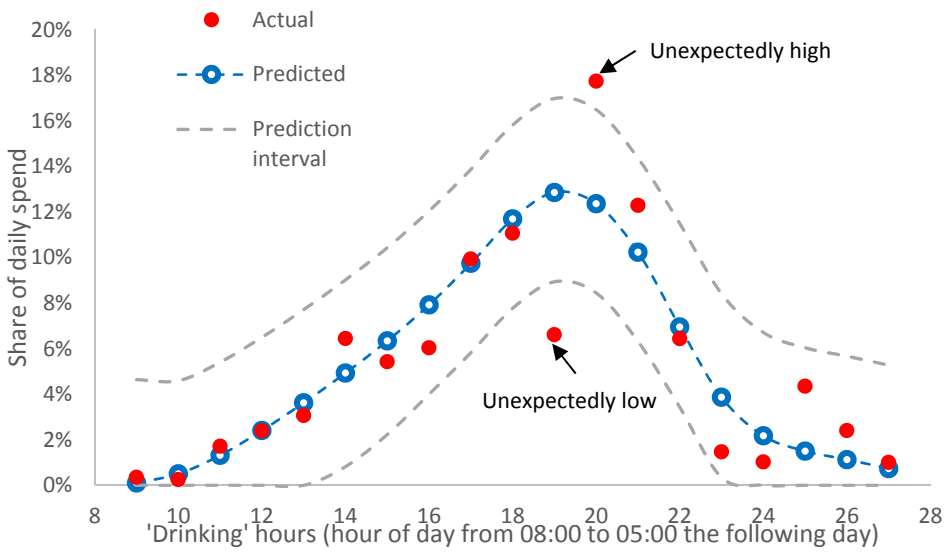
We then compare this to the actual data and where actual data is unexpectedly high or unexpectedly low (outside the prediction intervals) the change in spending is considered to be material. We then aggregate the results by taking the average impact across all months to produce typical impacts by hour of day and day of the week.

The curves are fitted using 'generalised additive models' of spending based on the hour of day. Generalised additive models are regression models where the response variable (in this case spending) is predicted using a smooth function of the predictor (in this case hour of day).

We fit the models using penalised regression splines with 10 knots and generalised cross validation to select the value of a smoothing parameter.

Figure 10 Method for identifying impacts on daily spending patterns

Example is for spending at on-licences in the Bay of Plenty on a Wednesday in January (2009-2015)



Source: NZIER

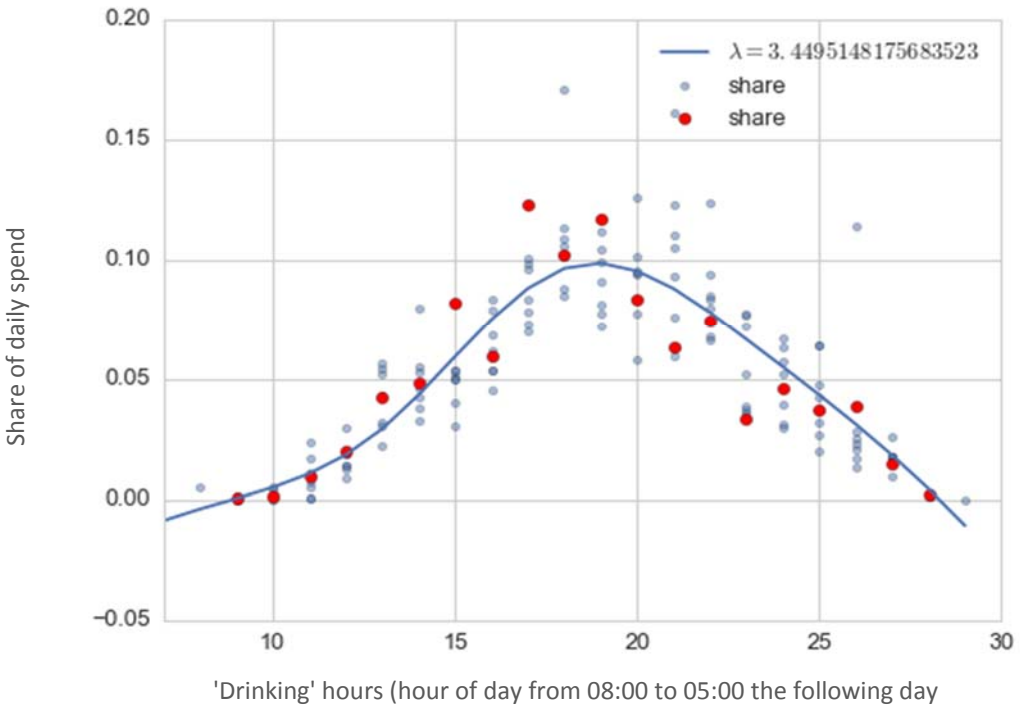
Our models are fitted on 'shares of spending' data for each month and day of the week for each year of the data prior to the introduction of LAPs (see example in Figure 11). Each model includes 19 hours: for on-licences this is 09:00 to 03:00 the following day and for off-licences this is 06:00 to 24:00. Data ranges vary between the LAP areas. For Tauranga and the Western Bay of Plenty each model is fitted using 133 observations[13] (on average, with years 2009 to 2015 and 19 hourly observations) except in the case of the models for spending during December months where the model is fitted on 114 observations (2009 to 2014 and 19 hourly observations) to account for the fact that the first full month of the LAP was in December 2015. For Waimakariri, the models are fitted using 114 observations (2009 to 2014 and 19 hourly observations).

The models of spending levels are fitted, after transformation by natural logarithms, for each year and the model of the most recent year prior to a LAP is used to predict spending once the LAP is in place. The levels models are not fitted on the full range of hourly observations because trends in spending levels would bias the model results.[14]

Figure 11 Example of spending share model

Model of hourly shares of daily spend on Fridays during January (2009-2015). Blue dots are data used to fit the model. Red dots are the 2016 data shares we are trying to predict. The blue line is the fitted model with smoothing parameter λ = 3.5. Prediction intervals are not shown.

x axis: hours; y axis: shares



Source: NZIER

[13] That is, 19 hourly observations for 7 years; or 19 x 6 =114 hourly observations for data on December year ends.

[14] This means that these models have large prediction errors and few degrees of freedom.

4. Results

4.1. Tauranga and Western Bay of Plenty

The LAP in Tauranga and Western Bay of Plenty is targeted entirely at on-licence trading (see Section 2.1). It includes reduction in early morning on-licence trading hours in the city centre, longer reduction on trading hours in the rest of the district, one-way door restrictions and other discretionary elements.

4.1.1. Changes in spending over time

No effect on total spending at on-licences

There is no evidence of a reduction in spending at on-licences, based on our time series model analysis.

The one moderating factor in this finding is that the raw results of the time series model analysis indicate a 0.5% reduction in combined spending at licensed cafés and restaurants, and bars, pubs and taverns following the introduction of the Tauranga and Western Bay of Plenty LAP (see Table 19 in Appendix B.1). This includes all estimated changes, prior to excluding statistically insignificant impacts.

All other results from our models suggest that there has been an increase in spending following the increase in the LAP. Model results are shown in Table 1, Table 2, and Table 3 below for on-licences in total and, separately, for bars, pubs and taverns, and cafés and restaurants. In all cases observed spending, after accounting for time trends and changes due to LAPs, are higher than we would have expected.

It is hard to reason why the LAP itself would increase spending at on-licences. For this reason, we do not conclude that there has been an increase in spending. Rather we reject our hypothesis of a reduction in spending at on-licences and conclude that there is no negative effect on spending at on-licences.

Decrease in spending on Saturdays

Though there is no evidence of a reduction in total spending at on-licences there is evidence of a decrease in spending on Saturdays – both early on Saturdays (or late Friday night) and in the late evening on Saturdays. This pattern of reduced spending appears to hold for both cafés and restaurants, and bars, pubs and taverns.

Saturdays are the peak spending day at bars, comprising around a quarter of weekly spending at bars, pubs and taverns in Tauranga and Western Bay of Plenty (Friday and Saturday combined are 45% of weekly spending at bars, pubs and taverns). This suggests that, to the extent there has been a reduction in spending on alcohol at on-licences, it has occurred during days of peak consumption.

Evidence of a shift towards purchasing from liquor stores

Overall results for liquor stores suggest a 1.9% increase in spending following the introduction of the LAP. This finding is the same whether we account for all estimated

changes (Table 22) or after excluding results where the estimated effects of the LAP were jointly insignificant alongside effects from changes in blood alcohol limits (Table 14).

This increase means we cannot reject the hypothesis that there has been a substitution in alcohol spending in favour of spending at liquor stores. The increase in spending at liquor stores is around three times larger than the percentage increases we observe in spending at on-licences (0.6% increase at bars, pubs and taverns and licensed cafés and restaurants).

Indeed, while spending at on-licences has not fallen, the decrease in on-licence spending on Saturday mornings and Saturday nights corresponds to an increase in spending at liquor stores on Fridays and Saturdays (up 3% and 1%, respectively).

Spending at liquor stores, like spending at bars, pubs and taverns peaks on Fridays and Saturdays (collectively making up 45% of weekly spending in Tauranga and Western Bay of Plenty). There have also been marked increases on Thursdays. So, to the extent that there has been an increase in spending at liquor stores, it has occurred during periods of peak consumption.

Table 1 Time series model estimates of changes in spending at on-licences in Tauranga, Western Bay of Plenty

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	--	--	2,952	--	--	-214	--	**2,738**	7%
2:00	1,753	-2,867	--	--	108	-2	--	**-1,008**	7%
3:00	--	--	-1,255	370	--	--	-2	**-887**	3%
Non-trading hours									
12:00	--	--	--	192	--	--	--	**192**	1%
13:00	--	--	--	1,835	--	--	--	**1,835**	
14:00	--	-1,432	-3,322	592	--	--	--	**-4,162**	-4%
15:00	--	--	--	-1,561	--	--	--	**-1,561**	
16:00	--	--	842	-1,075	194	--	--	**-39**	
17:00	--	--	-1,673	--	--	--	--	**-1,673**	-1%
18:00	617	--	--	1,136	--	-1,109	--	**644**	1%
19:00	--	--	--	--	71	--	--	**71**	
20:00	--	-1,133	--	-2,030	-871	-765	--	**-4,798**	1%
21:00	--	--	--	--	--	303	--	**303**	
22:00	--	--	3,183	--	--	--	1,126	**4,309**	5%
23:00	--	--	-2,327	--	--	2,391	7,135	**7,199**	0%
0:00	--	--	--	--	--	--	4,570	**4,570**	10%
Total	**2,370**	**-5,432**	**-1,600**	**-539**	**-498**	**605**	**12,831**	**7,736**	
% change by day	1%	-2%	-1%	-1%	0%	0%	8%	0.6%	

Source: NZIER

Table 2 Time series model estimates of changes in spending at bars, pubs and taverns in Tauranga, Western Bay of Plenty

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	--	--	--	473	-426	--	--	**47**	1%
2:00	2,223	--	--	17	--	1,394	-754	**2,880**	5%
3:00	--	--	--	--	--	--	--	**0**	
Non-trading hours									
12:00	--	--	--	1,081	--	--	--	**1,081**	3%
13:00	2,428	--	--	--	--	-1,081	--	**1,347**	2%
14:00	1,616	--	--	--	--	--	--	**1,616**	2%
15:00	--	--	--	--	--	--	--	**0**	
16:00	--	--	--	--	--	--	--	**0**	1%
17:00	--	--	-2,651	--	--	--	1,898	**-753**	-1%
18:00	--	--	--	--	--	--	682	**682**	
19:00	--	--	--	--	--	261	--	**261**	2%
20:00	--	--	--	--	--	--	--	**0**	
21:00	--	--	--	--	--	--	--	**0**	
22:00	--	--	1,628	--	--	--	--	**1,628**	
23:00	--	--	--	--	--	-1,336	--	**-1,336**	
0:00	--	-805	--	648	471	--	586	**900**	4%
Total	**6,268**	**-805**	**-1,023**	**2,219**	**45**	**-762**	**2,413**	**8,354**	
% change by day	2%	0%	-1%	3%	0%	0%	1%	0.6%	

Source: NZIER

Table 3 Time series model estimates of changes in spending at licensed cafés and restaurants in Tauranga, Western Bay of Plenty

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	--	--	2,825	--	--	-896	--	**1,929**	7%
2:00	1,312	-2,867	--	--	108	-2	--	**-1,449**	7%
3:00	--	--	-1,255	370	--	--	-2	**-887**	4%
Non-trading hours									
12:00	--	--	--	1,702	--	--	--	**1,702**	1%
13:00	--	--	--	1,835	--	--	--	**1,835**	
14:00	--	-1,432	-3,322	1,104	--	--	--	**-3,650**	-1%
15:00	--	--	--	-1,561	--	--	--	**-1,561**	
16:00	--	--	842	-1,075	322	--	--	**89**	
17:00	--	--	-2,331	--	--	--	--	**-2,331**	-2%
18:00	617	--	--	1,395	--	-1,109	--	**904**	1%
19:00	--	--	--	--	--	--	--	**0**	
20:00	--	-1,133	--	-2,030	-871	-765	--	**-4,798**	1%
21:00	--	--	--	--	--	1,778	--	**1,778**	
22:00	--	--	3,172	--	--	--	6,558	**9,730**	2%
23:00	--	--	-2,327	--	--	8,375	7,135	**13,183**	3%
0:00	--	--	--	--	--	--	4,570	**4,570**	7%
Total	**1,929**	**-5,432**	**-2,396**	**1,742**	**-440**	**7,381**	**18,262**	**21,045**	
% change by day	0%	-1%	0%	1%	0%	1%	3%	0.5%	

Source: NZIER

Table 4 Time series model estimates of changes in spending at liquor stores in Tauranga, Western Bay of Plenty

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
8:00	--	-150	--	--	--	--	-3	**-153**	-8%
9:00	--	--	--	--	-173	--	--	**-173**	-6%
10:00	--	--	--	--	--	--	--	**0**	
11:00	1,960	-3,479	-612	-2,913	--	--	1,283	**-3,762**	-3%
12:00	--	--	-1,939	-4,260	-2,783	--	9,884	**902**	1%
13:00	--	2,420	--	-671	--	--	4,769	**6,519**	4%
14:00	4,949	1,296	609	--	--	10,631	4,275	**21,761**	12%
15:00	27	--	-669	2,570	--	--	12,359	**14,288**	6%
16:00	--	--	--	-2,082	--	--	14,649	**12,567**	4%
17:00	517	--	-1,921	--	--	--	-2,633	**-4,037**	-1%
18:00	3,874	6,271	-2,413	-5,613	--	--	--	**2,118**	1%
19:00	1,973	--	--	--	--	--	--	**1,973**	1%
20:00	3,037	--	--	-2,185	-2,763	--	-2,677	**-4,588**	-3%
21:00	2,427	466	--	--	--	--	673	**3,566**	4%
22:00	--	--	--	1,036	-359	--	--	**677**	2%
23:00	-1	-2,043	--	--	--	--	--	**-2,044**	-21%
0:00	--	--	125	--	--	--	--	**125**	7%
Total	**18,761**	**4,781**	**-6,820**	**-14,118**	**-6,078**	**10,631**	**42,579**	**49,737**	
% change by day	3%	1%	-4%	-6%	-2%	3%	10%	1.9%	

Source: NZIER

4.1.2. Changes in spending by time of day

Our analysis of the profile of spending in bars, pubs and taverns by hour and day of week across all age groups indicates that, following the introduction of the LAP, the proportion of spending taking place after 11pm has fallen on Fridays and Saturdays with no evidence of any off-setting effects from a reallocation of spending to earlier in the day.

That said, our analysis of spending by age groups, discussed below, suggests that the aggregate results disguise quite different age-specific effects.

The main results of our analysis are shown in Table 5 which shows changes in daily shares of spending by hour which are outside what our models predicted.

There is some indication of increasing spending early in the evening on Tuesdays, Wednesdays and Thursdays but these do not occur on the shoulders of new trading hour restrictions, suggesting that these changes may not be related to the LAP or at least do not provide direct evidence of spending being brought forward in time because of new trading hour restrictions.

Table 5 Changes in hourly shares of spending at bars, pubs and taverns in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals[15]

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11							
12							
13					1.4		
14							
15							1.7
16	1.2				-0.6		-0.7
17		1.5		0.9			-1.0
18							-1.0
19		-1.2	-2.1	-0.9	-0.8		
20		0.9	0.1			0.8	
21				1.4			
22							
23					-0.7	-0.9	
24					-0.7	-2.4	
1						-0.5	
2						-0.5	
3						-0.5	

Source: NZIER

Table 6 shows changes in levels of spending, by hour and day of the week. This provides context to our analysis of changes in hourly shares. The results show a general increase in spending in 2015-16, following the LAP, as compared to 2014. It also shows

[15] The zeroes present in some tables (5-10, 15-18) indicate changes that are very small and do not appear at one decimal place. Blank cells in tables mean no changes in % shares.

an increase in spending beyond 1am on Thursdays, which is inside maximum trading hours in Tauranga City centre but outside them in the rest of the city and the Western Bay of Plenty District.

The increase in spending at 3am on Friday (following on from Thursday night) is also notable for its size – up 5.8%. This provides some evidence that one-way door restrictions have not had a material effect on spending. This is corroborated by results for Tauranga City (in Table 31 in Appendix B.4), where the one-way door restriction applies in the centre of the city. This shows a 0.9% increase in spending at 3am on Friday night/Saturday morning with no corresponding change in the share of spending at 3am on Saturday (Table 30).

Table 6 Changes in hourly spending at bars, pubs and taverns in Tauranga and Western Bay of Plenty following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	-8.7	1.6	33.4	4.2	0.3	-0.8	
10	1.5	4.0	4.2	1.1	-0.3	0.3	
11	0.7	1.2	0.3		-0.1	0.1	
12	0.4		0.2		-0.2	0.0	
13			0.4		0.0		
14			0.1			0.1	
15	-0.2				-0.1		
16	0.2		-0.1		-0.2	0.1	
17			0.4		0.3	0.2	
18	0.4		0.5	0.3	0.5	0.3	
19		0.2	0.3		0.1	0.1	
20		0.4	0.6	0.3	0.5	0.3	-0.1
21		0.2	0.5	0.6	1.6	0.8	
22	0.1	0.3	0.8	0.9	4.4	2.1	-0.3
23	-0.5	0.2	0.6	0.8	3.5	3.0	-0.6
24	-0.6	0.3	0.2	0.6	2.1	3.5	-0.8
1	-0.8	-1.0	-0.4	0.2	1.5	4.3	-1.4
2	-1.2	-3.5	0.1	0.5	2.8	2.9	-1.6
3	-1.0	-0.9	0.0	5.8	4.5	1.9	-1.8

Source: NZIER

A breakdown of changes in timing of spending by age groups suggests that some age groups have brought forward their spending at bars pubs and taverns as a result of the LAP trading hour restrictions. In particular, people in their thirties appear to have increased spending during hours immediately inside the new trading time restrictions of 1am and 3am (Table 7).

Our analysis of spending at cafés and restaurants in Tauranga and Western Bay Plenty cannot reject a hypothesis that there was a reallocation of spending but it does not strongly support this view either. The share of spending taking place around 10-11pm did increase following the LAP, but this looks to be due to reductions in spending later in the evening rather than an increase in spending earlier in the evening (see Table 28 in the appendix).

Table 7 Changes in hourly shares of spending at bars, pubs and taverns by age group in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
9			-0.3					-0.2	0.3	
10			-0.3	0.5						-0.2
11							0.5			
12		0.4			0.9					-0.2
13		1.2	0.7				-0.2	0.9		-0.3
14	-0.2	0.4		1.0	2.0	0.7		2.5		-0.4
15	-0.4		0.4	0.7		0.6			1.3	-0.2
16	0.7		-0.2		-0.5		0.4		-0.4	-0.9
17	-0.3	-0.1	0.2	4.2	-0.7	0.4	0.5	1.3	1.1	-1.6
18	-0.3	0.7	-1.2	0.3	-0.3	3.1	1.8		0.9	-1.3
19	-0.6	-0.7	-1.0	0.7	-1.0	0.7	0.8	-0.3	-0.4	-0.9
20	-0.6	-0.5	-1.1	-0.9	1.1	3.4	-1.0	-0.7	1.5	-2.0
21	-0.5	-1.3	-1.2	0.0	1.8	-0.1	-0.4	-0.6	1.4	-1.1
22	-0.5	-0.3	-1.2	0.4	1.1	-0.6	0.3	-0.8	-0.3	-1.1
23	-0.8	-1.1	-1.5	-1.0	-0.3	-0.7	-0.8	-0.6		-0.5
24	-1.3	-0.9	0.1	0.4	0.2	-0.5	-0.3	0.8		
1	-1.0	-1.0	-0.3	-0.4	-0.5	-0.7				
2	-0.8	-1.1	0.8	0.4	-0.6	-0.6				
3	-1.3	-0.9	-0.9	-0.2	-1.7	-1.1				

Source: NZIER

Our analysis of spending at liquor stores shows, at best, weak evidence for a reallocation of spending from times after the new restrictions to just prior to the new restrictions.

Table 8 does show increases in hourly shares of daily sales occurring immediately before 10pm on Thursdays and Fridays. However, on balance, the effects are small in the context of a general drift towards spending at liquor stores, with the largest percentage increases earlier in the evening around 6pm.

Table 9 repeats the result found earlier in our time series analysis, that there has been a shift towards increased spending at liquor stores in general. Interestingly, the major increases appear to occur quite early in the day.

The one notable exception to these observations is that there is much stronger evidence for a reallocation of spending amongst people under the age of 30. Results summarised in Table 10 show that shares of spending in this age group increase up to around 9pm.

Table 8 Changes in hourly shares of spending at liquor stores in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11					0.4		
12	0.8			-0.6			0.5
13							0.0
14							
15					-0.9		
16				-1.9		1.0	-0.6
17	1.5	0.7	-0.3		-0.1		
18			-0.4	2.0	0.2	0.6	0.9
19	-0.9	-0.6	-0.1		-0.1	-0.4	-0.2
20				0.0	-0.1	-0.3	
21				0.0	0.2		
22				0.0	-0.1	0.1	
23		0.1	0.0	0.0	-0.1	-0.1	
24	-0.2			0.0	0.0	-0.1	
1							
2							
3							

Source: NZIER

Table 9 Changes in hourly spending at liquor stores in Tauranga and Western Bay of Plenty following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	23.7	2.1	0.0	-8.7	-0.4	0.6	-2.5
10	233.7	18.0	5.1	0.2	0.3	79.4	-5.3
11	22.1	62.1	7.7	4.9	20.0	114.0	-60.8
12	10.3	31.2	11.1	-1.1	10.4	33.3	-21.6
13	1.9	1.4	0.7	-0.6	3.3	3.7	-1.5
14	0.7		-0.2	-0.3	1.1	1.5	-0.6
15	0.2	0.9	0.1	-0.2	0.7	0.9	-0.3
16	0.4	0.9	0.1	0.4	1.7	1.3	-0.3
17	1.6	1.6	0.9	2.0	2.4	0.8	-0.2
18	0.7	1.7	1.0	2.4	2.3	1.5	-0.3
19	0.3	0.7	0.6	1.4	1.6	1.0	-0.2
20	0.2	0.4	0.4	0.6	1.1	0.8	-0.2
21	0.1	0.2	0.2	0.3	0.8	0.6	
22	-0.2	0.1	0.0	0.2	0.6	0.5	-0.1
23		0.0	0.0	0.0	0.2	0.1	0.0
24		-0.4	0.0	0.0	0.0	0.0	0.0

Source: NZIER

Table 10 Changes in hourly shares of spending at liquor stores by age group in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Hour	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
6		-0.2						-3.1		
7								-1.8		
8		0.1		0.0				-0.8		
9	0.3	0.0	0.1	-0.1		0.0				
10	0.1	0.0	-0.1	-0.2	0.4					
11	0.3	0.0	0.1	-0.1	0.6					0.8
12	0.4	0.2	0.0	0.9			2.1	0.8		1.9
13	0.4	0.1	1.3	0.0		1.2		-0.3	1.2	
14	0.4	0.7	-0.2			0.3	0.7			-0.2
15	0.9	1.2	-0.4	0.4	0.5		0.7	0.9	1.3	-0.5
16	1.4	0.7	0.1	3.3	1.3	0.7	2.2	3.8	0.8	-0.4
17	1.4	3.7	1.8	7.2	5.0	2.7	1.6	7.3		5.7
18	2.9	6.5	6.5	14.0	7.2	6.8	2.5	3.5	2.2	-0.3
19	2.3	6.1	1.5			1.5	-0.6	-0.8	1.0	-3.3
20	0.3	0.9	-0.3	-0.2	-0.9	-0.2	-1.2	-4.3	-1.3	-4.2
21	0.3	0.4	-1.4	-2.3	-2.2	-3.5	-3.5	-3.8	-1.6	-4.7
22	-2.5	-3.4	-3.5	-2.1	-4.1	-3.1	-2.9	-2.3	-0.5	-2.7
23	-7.2	-6.1	-4.5	-3.7	-2.2	-1.8	-0.8	-0.8		-0.5
24	-7.5	-5.8	-3.6	-3.0	-0.5	-0.9	-0.7	-0.5		

Source: NZIER

The evidence for reductions in trading hours resulting in spending being brought forward is mixed and varies across age groups, as detailed in Appendix B4. In Tauranga City's bars, pubs and taverns this effect was evident in the 30 to 34 year old age group (Table 32) while in cafés and restaurants it occurred in the 25 to 29 and 40 to 44 year old age groups (Table 34). In Tauranga City's liquor stores there was increased spending in the hour before LAP cut-off by those aged 18 to 39 and also 45 to 49 year olds, but there were also marked (and sometimes larger) spending increases in the preceding two hours across a wide span of ages from 18 to 59 (Table 37).

4.2. Waimakariri

The Waimakariri LAP reduced maximum trading hours for on-licences in late night and early morning, allowing longer hours on Fridays and Saturdays, introduced discretionary elements for consideration when issuing on-licences, and reduced maximum trading hours (in evenings) for off-licences (Section 2.2).

Increase in spending at on-licences, cafés and restaurants

The results of the time series models, shown in Table 11, indicate an increase in on-licence spending up 1.4% and a 1.6% increase in spending at licensed cafés and restaurants (see Table 13) following the introduction of the Waimakariri LAP.

Indication of a shift away from spending at bars, pubs and taverns

In contrast to café and restaurant spending, spending at bars, pubs and taverns has declined 2.3%. This strongly suggests a degree of substitution in spending away from bars, pubs and taverns towards licensed cafés and restaurants.

On-licence spending declining on Thursdays, Fridays and Saturdays

We find reductions in spending concentrated in particular days of the week. In the case of Waimakariri, on-licence spending has fallen on Thursdays, Fridays and Saturdays (see Table 11) – albeit with the impact being largest on Saturday in the early evening, but offset by increases in Sunday morning carry-over from Saturday night.

The LAP in Waimakariri is associated with a 6% decline in spending at bars, pubs and taverns on Saturdays (see Table 12) while café and restaurant spending has declined by 2% in the early evening, but increased by 9% in the early morning on Sunday (see Table 13).

Changes in daily spending patterns do not reflect trading hour maximums

The model results show a pattern which only roughly accords with the new trading hour restrictions. There is little change in spending around and after 11pm on week nights (Wednesdays and Thursdays), indicating that spending at these times was not large before the introduction of the LAP. Some spending appears to still take place at 1am on Sunday mornings, a continuation of Saturday night activity.

There is a large increase in on-licence spending between midnight Saturday and 1am Sunday, which is driven by increase in spending in Cafés and Restaurants at that time. This coincides with the last trading hour on Saturday night/Sunday morning. The cause of this sharp increase is unclear from the data but may simply reflect the time that final billing tallies for the night's spending is recorded. If so, viewing this as the end of the Saturday night session would reverse the conclusion of a decline in spending at cafés and restaurants on Saturday night.

Outside of the increase at 1am on Sunday mornings, there is no other evidence of a systematic increase in spending immediately prior to maximum permitted trading times. This raises the possibility that the reductions in spending that are observed, at on-licences on Saturdays, could reflect changes in location of spending from Waimakariri to Christchurch, for example. This hypothesis has not been tested but it could explain these results.

Increased purchasing from liquor stores

Results for liquor stores suggest an increase in spending of between 0.4% and 2.4% following the introduction of the LAP. This range reflects a relatively modest impact if we account for all estimated changes in spending (see Table 26 in Appendix B1) and a larger effect after excluding results where the estimated effects of the LAP were jointly insignificant alongside effects from changes in blood alcohol limits (see Table 14).

Table 11 Time series model estimates of changes in spending at on-licences in Waimakariri

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	--	--	8,936	--	--	--	--	**8,936**	5606%
2:00	-1	--	-1	--	--	--	--	**-2**	
3:00	--	--	--	--	--	1	--	**1**	3%
Non-trading hours									
12:00	--	--	--	--	--	--	--	**0**	-7%
13:00	--	--	--	--	--	--	--	**0**	
14:00	--	--	--	--	--	--	--	**0**	3%
15:00	--	--	--	--	--	--	--	**0**	
16:00	--	--	--	1,940	-1,720	--	--	**220**	-6%
17:00	-464	--	--	--	325	--	--	**-139**	
18:00	--	--	--	--	--	--	--	**0**	
19:00	--	-3,247	--	--	--	--	--	**-3,247**	-5%
20:00	--	808	--	--	--	--	--	**808**	1%
21:00	--	--	--	--	1,788	--	-888	**900**	3%
22:00	--	--	--	--	--	--	--	**0**	
23:00	--	1	2	--	--	--	26	**30**	0%
0:00	--	--	--	--	--	--	--	**0**	
Total	**-465**	**-2,438**	**8,936**	**1,940**	**393**	**1**	**-862**	**7,505**	
% change by day	0%	-2%	9%	5%	1%	0%	-1%	1.4%	

Source: NZIER

Table 12 Time series model estimates of changes in spending at bars, pubs and taverns in Waimakariri

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	71	--	--	--	--	--	--	**71**	-11%
2:00	--	--	--	--	--	--	--	**0**	
3:00	--	--	--	--	--		--	**0**	
Non-trading hours									
12:00	-1	--	--	--	--	--	476	**475**	9%
13:00	--	--	--	--	--	--	--	**0**	
14:00	--	--	--	--	--	-1,491	-1,128	**-2,619**	-8%
15:00	281	--	--	--	--	--	--	**281**	
16:00	--	--	-405	--	--	--	--	**-405**	-10%
17:00	-144	--	--	--	--	--	--	**-144**	
18:00	--	--	--	--	--	--	--	**0**	
19:00	--	237	--	--	--	-279	--	**-42**	
20:00	359	294	--	-1,487	489	--	766	**422**	1%
21:00	--	-3,674	--	--	--	-527	--	**-4,201**	-11%
22:00	--	-958	2	--	-485	438	--	**-1,003**	0%
23:00	--	-400	1	--	-1	--	--	**-399**	0%
0:00	--	--	--	--	--	--	--	**0**	
Total	**566**	**-4,501**	**-402**	**-1,487**	**3**	**-1,859**	**115**	**-7,565**	
% change by day	1%	-6%	-1%	-7%	0%	-5%	0%	-2.3%	

Source: NZIER

Table 13 Time series model estimates of changes in spending at licensed cafés and restaurants in Waimakariri

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	--	--	8,936	--	--	--	--	**8,936**	1494%
2:00	-1	--	-1	--	--	--	--	**-2**	
3:00	--	--	--	--	--	1	--	**1**	3%
Non-trading hours									
12:00	--	--	--	--	--	--	--	**0**	-7%
13:00	--	--	--	--	--	--	--	**0**	
14:00	--	--	--	--	--	--	--	**0**	3%
15:00	--	--	--	--	--	--	--	**0**	
16:00	--	--	--	1,940	--	--	--	**1,940**	
17:00	-464	--	--	--	325	--	--	**-139**	
18:00	--	--	--	--	--	--	--	**0**	
19:00	--	-3,449	--	--	--	--	--	**-3,449**	-5%
20:00	--	808	--	--	--	--	--	**808**	1%
21:00	--	--	--	--	1,788	--	-888	**900**	3%
22:00	--	--	--	--	--	--	--	**0**	
23:00	--	1	2	--	--	--	26	**30**	0%
0:00	--	--	--	--	--	--	--	**0**	
Total	**-465**	**-2,641**	**8,936**	**1,940**	**2,113**	**1**	**-862**	**9,023**	
% change by day	0%	-2%	9%	5%	4%	0%	-1%	1.6%	

Source: NZIER

Table 14 Time series model estimates of changes in spending at liquor stores in Waimakariri

Statistically significant changes based on a chi-square test for joint significance of model dummy variables

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
8:00			--	--				**0**	
9:00	--	--	--	--	--	--	--	**0**	
10:00	--	--	--	-5	--	--	--	**-5**	0%
11:00	--	--	--	--	--	--	--	**0**	
12:00	--	--	--	--	3,257	--	--	**3,257**	8%
13:00	6,361	--	--	--	--	1,063	--	**7,425**	18%
14:00	--	--	-392	--	--	--	-599	**-991**	-2%
15:00	--	--	--	--	--	--	--	**0**	
16:00	--	2,421	--	--	--	-3,992	--	**-1,571**	-2%
17:00	2,682	--	--	--	1,650	--	--	**4,332**	5%
18:00	--	--	--	872	--	--	--	**872**	1%
19:00	--	--	--	--	--	--	--	**0**	
20:00	-346	1,942	--	--	--	--	--	**1,596**	5%
21:00	--	--	-14	--	--	--	-1,077	**-1,091**	-7%
22:00	--	--	--	--	--	-6	--	**-6**	0%
23:00	--	--	-1	--	--	--	--	**-1**	-1%
0:00				--	--			**0**	
Total	**8,697**	**4,364**	**-407**	**866**	**4,907**	**-2,935**	**-1,676**	**13,816**	
% change by day	6%	3%	-1%	2%	9%	-4%	-2%	2.4%	

Source: NZIER

As for Tauranga and Western Bay of Plenty, the increases in spending at liquor stores are largest on Fridays and Saturdays and are correlated with reductions in spending at on-licences by day of week. This suggests we cannot reject the idea that there has been a substitution of spending from on-licences to off-licences following the imposition of the LAP.

There is, however, no evidence from these models of spending being brought forward to hours immediately before trading hour maximums (10pm).

4.2.1. Changes in spending by time of day

Changes in spending in Waimakariri at bars pubs and taverns is dominated by increased spending in the late afternoon and early evening. This accords with our findings from the time series analysis showing that spending in this category had declined in the evenings, albeit well before trading hour restrictions begin to 'bind'.

Peak spending at bars, pubs and taverns in Waimakariri has, historically, occurred between 5pm and 9pm. The results in Table 15 show that tails of that peak later in the evening have been dropping away and, consequently, shares of spending are increasing earlier in the peak period.

The analysis based on hourly spending shares (see Table 15) suggests there is no evidence of spending being brought forward by trading hour limits. The table shows small increases in spending after 11 pm on Sundays, which is non-compliant with the LAP, unless it refers to non-alcoholic purchases or late settlement of bills earlier in the evening.

Table 15 Changes in hourly shares of spending at bars, pubs and taverns in Waimakariri following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Hour of day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							0.6
10							
11				0.4			
12	0.7						
13	0.8						-0.4
14		0.5				0.4	-0.5
15			1.6	0.6			-0.3
16		1.3	3.5	2.2	1.8	1.5	0.9
17	2.2	2.1	4.7	4.1	3.4	2.1	1.1
18	1.0	0.0	0.1	2.3	0.8	1.9	1.2
19	0.0	0.8	-2.1	-2.0	-0.3	1.0	-1.0
20	-2.3	0.0	-2.3	-2.8	-0.7	-0.4	-4.2
21	-2.9	-2.9	-2.5	-2.8	0.1	-1.1	-3.4
22	-0.9	-2.7	-2.5	-3.4	-0.1	-2.4	-2.4
23		-0.3	-0.5	-1.3	-1.5	-2.8	-0.2
24	-0.1		-0.1	-0.3	-1.7	-2.8	0.1
1			0.0		-1.6	-3.4	0.1
2							
3							

Source: NZIER

These findings are further supported by our estimate of changes to spending levels, with spending in the evenings falling across the board, as can be seen in Table 16. Note that the reductions in spending between 1am and 3am are measured relative to the bottom of our prediction intervals rather than actual changes. Actual changes in spending in the early morning are close to 100% with spending at, for example, 2am and 3am averaging around $15 per hour (so possibly a few coffees).

Our results do not include analysis of spending by age-group, as it did for Tauranga and Western Bay of Plenty, because there are too few observations of spending, particularly late in the evening, for us to fit daily spending share by age models.[16]

Table 16 Changes in hourly spending at bars, pubs and taverns in Waimakariri following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	-0.2	-0.7	0.0	0.0	-0.3	-0.1	-0.5
10	-0.1	-0.1	0.0	-0.4	-0.2	0.0	-0.2
11	0.1	0.2	-0.2	-0.2	-0.3	0.1	-0.4
12	-0.2	0.0	-0.1	-0.3	-0.2	0.0	0.0
13	0.0	-0.1	-0.1	-0.1	0.0		0.2
14	0.0	-0.1	-0.1	0.0	-0.1	-0.1	0.2
15		-0.1	-0.1	-0.2	-0.2	-0.1	0.1
16	-0.1	-0.1	-0.2	-0.1	0.0	-0.1	0.0
17	-0.2	-0.1	-0.3	0.0	0.2		-0.1
18	-0.2	-0.1	-0.1	0.1			0.0
19	-0.1	-0.1	-0.1	-0.1		0.0	-0.1
20	-0.2	-0.1	-0.2	0.0			-0.2
21	-0.4	-0.1	-0.3	-0.1	0.0		-0.3
22	-0.4	-0.4	-0.5	-0.3	-0.1		-0.6
23	-0.5	-0.5	-0.6	-0.5	-0.2	-0.1	-0.6
24	-0.5	-0.5	-0.6	-0.6	-0.4	-0.1	-0.7
1	-0.5	-0.4	-0.6	-0.6	-0.5	-0.3	-0.6
2	-0.6	-0.4	-0.5	-0.7	-0.5	-0.7	-0.4
3	-0.4	-0.5	-0.5	-0.8	-0.3	-0.8	-0.2

Source: NZIER

Cafés and restaurants

Licensed café and restaurant spending, in contrast to bar, pub and tavern spending, does appear to have been affected by maximum trading hours under Waimakariri's LAP. As shown in Table 17 there appears to be an across the board increase in the share of spending taking place at 9pm and 10pm.

Unlike our observations from bars, pubs and taverns we have no way of knowing whether this effect is very strongly related to alcohol spending. However, as these venues are licensed it is likely that the weekday trading hour limits have changed spending patterns at these venues and brought forward spending along with closing hours.

[16] This accords with our initial observations that maximum trading hours impact on only a very small share of spending.

It is interesting that spending at and after 11pm appears to have declined on Fridays and Saturdays (see Table 17 and Figure 12) despite maximum trading hours for on-licences allowing trade until 1am and that a majority of cafés and restaurants in the district had licences (pre-LAP) permitting them to trade until 1am.

These results could be due to a number of factors. Perhaps there has been a change in entertainment culture locally since the LAP (possibly due to the LAP). Perhaps people do not dine or drink out in the evenings as much as they did in the past. On the other hand, it may reflect an increase in the number of people travelling to Christchurch City from Waimakariri – whether because of more interesting entertainment options or because Christchurch is open later. We can't tell either way.

Another, complementary, hypothesis is that people are leaving licensed cafés and restaurants with enough time left to go to a liquor store on the way home. This would be consistent with increases in spending shares at 9pm to 10pm. Of course, we can't say, but this does align with the results of our analysis for liquor store spending.

Table 17 Changes in hourly shares of spending at licensed cafés and restaurants in Waimakariri following the LAP

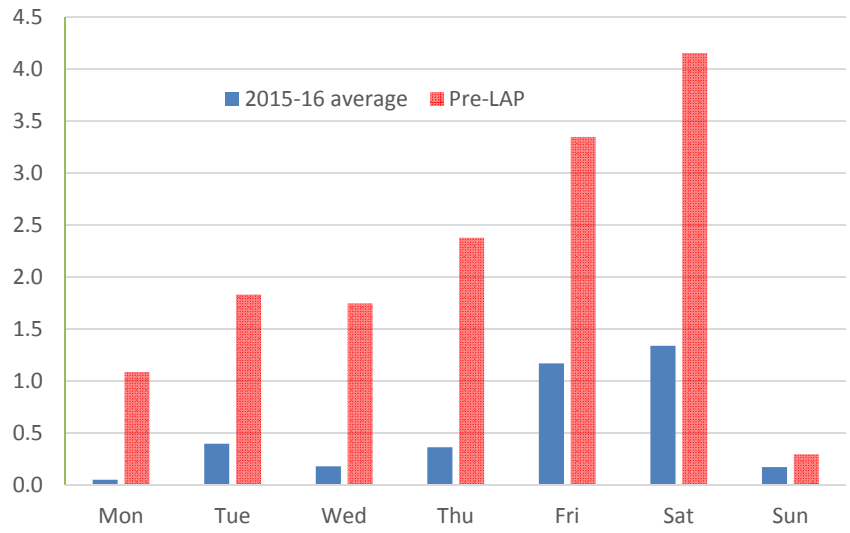
Changes in percentage shares of daily spending that are outside model prediction intervals. (Zero means change too small to show at 1 decimal place; blank means no change in percent share)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11							
12				-0.3		-0.3	
13	-0.6		-1.0		-0.7	-1.3	-0.4
14	-0.6	-0.5	-1.2	-0.7		-1.0	-0.8
15	-0.8	-0.4	-1.0	-1.1	-0.6	-0.6	-0.7
16						-0.5	-0.8
17						-0.4	
18							
19	0.6	0.6			0.4	1.4	
20	1.3	1.2	-0.2	1.3	1.3	1.6	1.3
21	1.4	1.7	3.6	1.6		0.9	1.3
22		0.6	0.5	0.5	0.7		
23				-0.2		-0.3	-0.1
24							
1							
2							-0.1
3							0.0

Source: NZIER

Figure 12 Reduction in licensed café and restaurant spending between 11pm and 12am

Share of daily spending pre and post LAP (%); Pre LAP is the 2014 average.



Source: NZIER

Spending at liquor stores has been brought forward

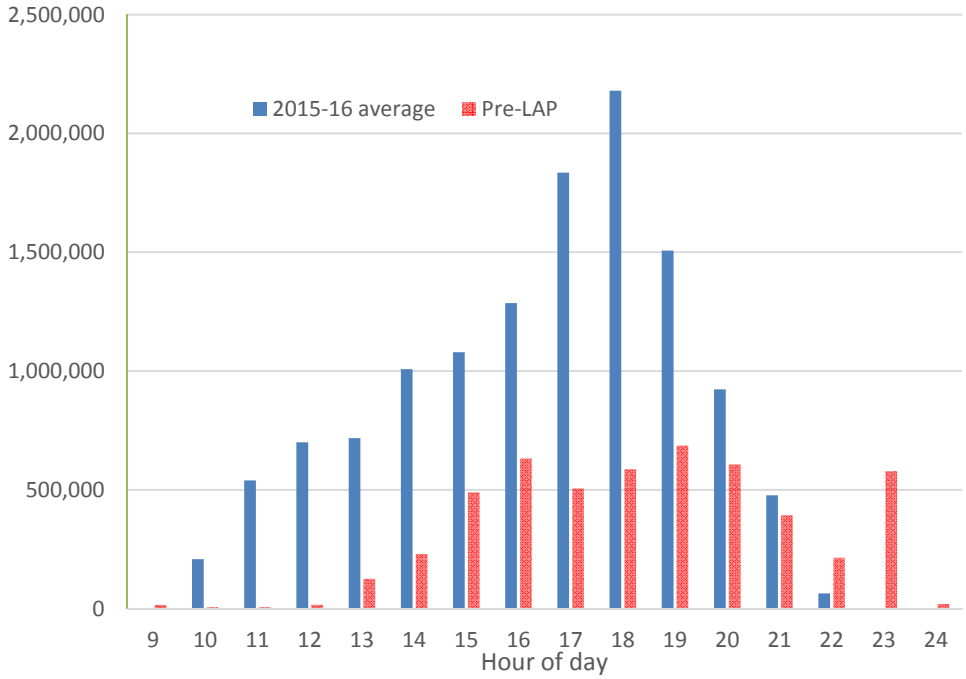
Spending at liquor stores in Waimakariri appears to have increased considerably in the past two years and been brought forward. This can be clearly seen in Figure 13.

Our analysis of spending shares helps to determine the extent to which changes in spending reflect a reallocation related to trading hour restrictions or the impact of other factors, including blood alcohol limit changes.

The results of the spending share analysis confirm a lift in the share of spending prior to maximum trading hours. This is shown in Table 18 – although the results are less stark than the change in spending shown in Figure 13.

Figure 13 Spending at liquor stores has risen and shifted in time

Annual spending on Thursdays in Waimakariri. Pre LAP is the 2014 average.



Source: NZIER

Table 18 Changes in hourly shares of spending at liquor stores in Waimakariri following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Significant changes

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	-0.3	-0.3		-0.3		-0.4	0.0
10	-0.8	-0.7	-0.5	-0.6	-0.1	-0.4	-0.1
11	-1.1	0.3	-0.5	-0.5	-0.2	-0.6	-0.1
12	1.2	-1.3	-1.2	-1.1	-0.7	-0.1	-0.8
13	-1.2	-0.8	-0.8	-2.0	-1.2	-1.0	-2.3
14	-1.9	-0.5	-1.7	-0.6	-0.9	-0.9	-1.7
15	-2.3	-1.7	-1.4	-1.4	-1.2	-0.2	-2.8
16	-0.3	-2.3	-1.9	-2.0	-1.4	0.0	-1.1
17	-0.9	-1.9	-2.1	-1.0	-0.4	-0.6	0.6
18	-0.7	-0.3	-0.1	-0.6	0.1	0.4	-0.6
19	-0.3	-0.6	-0.2	-0.1	-0.1	0.1	-0.2
20	0.2	-0.1	0.2	-0.7	-0.3	0.1	-0.1
21	-0.1	-0.3	0.1	-0.1	0.6	0.0	0.2
22	0.0	0.0	0.0	0.0	0.2	0.3	
23	-0.1				0.0	0.0	-0.1
24	-0.1	-0.1	-0.2				-0.4
1							
2							
3							

Source: NZIER

5. Conclusions

This report presents results of analysis of the impacts of alcohol-related policy changes on licensed premises associated with the introduction of LAPs under the SSAA. At the time the analysis was undertaken few LAPs had been operative for long, so the analysis is confined to LAPs in three local territorial authorities: the joint LAP applying to Tauranga and Western Bay of Plenty and the LAP in operation in Waimakariri.

5.1. Main findings

Analysis focused on the effects of changes in maximum trading hours, as these were general LAP measures applied across the districts, whereas other measures are more selective in application. We tested whether restrictions on maximum trading hours were associated with:

- a reduction in spending at on-licences
- a shift in spending from on-licences to liquor stores
- spending being brought forward i.e. an increase in spending immediately prior to new restricted maximum trading hours.

We found no evidence that spending at on-licences, in total, has declined as a result of LAPs. But there is evidence for changes in composition of spending by outlet and by day of the week.

In Tauranga and Western Bay of Plenty, spending appears to decrease at on-licences both early on Saturday morning (continuing from Friday night) and in the mid-late evening on Saturdays. To the extent there is reduced spending on alcohol at on-licences, it has occurred during days of peak consumption.

There also appears to be a shift towards purchasing from liquor stores, raising the possibility of a substitution in alcohol spending in favour of liquor stores. To the extent there has been increased spending at liquor stores, it has occurred at times of peak consumption.

In Waimakariri since the introduction of the LAP, spending at bars, pubs and taverns has declined in aggregate while overall on-licence spending has increased, suggesting there may have been a substitution away from spending at bars, pubs and taverns and towards spending at cafés and restaurants. There is no evidence of such a shift from bars, pubs and taverns to cafés and restaurants in Tauranga and Western Bay of Plenty. There has also been an increase in spending at liquor stores in Waimakariri in the period since the LAP was introduced.

There is mixed evidence for the idea that reductions in trading hours result in spending being brought forward. To the extent this effect occurs, it varies across different age groups, with spending in bars, pubs and taverns by 30 to 34 year olds in Tauranga and Western Bay of Plenty increasing in the hour before the LAP trading cut-off. In Tauranga City this effect was evident in 30 to 34 year-olds while in cafés and restaurants it occurred in the 25 to 29 and 40 to 44 year old age groups. In Tauranga City's liquor stores there was increased spending in the hour before LAP cut-off by those aged 18 to 39 and also 45 to 49 year-olds, but there were also marked (and

sometimes larger) spending increases in the preceding two hours across a wide span of ages from 18 to 59.

5.2. Strengths and weaknesses of modelling and results

Our method looked for patterns in alcohol purchasing before and after policy changes, from which might be inferred changes in alcohol consumption. While consumption in on-licence premises is likely to be closely associated with the time of purchase, this is less the case for off-licences where some purchases may be for delayed consumption.[17]

Our analysis is based on credit and debit card data from licensed premises, but excludes cash sales and excludes sales of alcohol at supermarkets and grocery stores.

There is no reason to expect cash sales to be large or to exhibit patterns different from card sales. Supermarket alcohol sales are more substantial, but are excluded to avoid results being skewed by the majority of purchases that are not of alcoholic beverages. While the data coverage is less than complete, it is sufficient to identify changes in purchase behaviour that can be related to the introduction of new policy measures.

The data includes some spending on food and other non-alcohol products, particularly for on-licences and to lesser extent off-licences which sell non-alcoholic mixers. This influences volume of purchases and timing of peaks, but this does not affect conclusions about changes brought about by policy, assuming mealtime spending patterns do not significantly change.

The results of our analysis are quite sensitive to the assumption that policy changes are the only influences driving the observed changes in purchasing. The method is also sensitive to whether or not models can be fitted that provide a good explanation of the data prior to the policy changes.

It is possible that random variation, before or after the policy changes, might be inadvertently interpreted as a pattern, or a pattern might be treated as if it was random. Observed percentage changes could be due to random effects or changes in spending due to factors not accounted for in our models.

The analysis focuses on observational data from spending and does not purport to identify all the influences on purchasing behaviour or alcohol consumption. This places caveats on the conclusions that can be drawn about the influence of policy on purchasing patterns. Further analysis of demographic and economic effects on spending would be needed to isolate the differences between policy changes and underlying trends, and the effect of different policies on alcohol purchases.

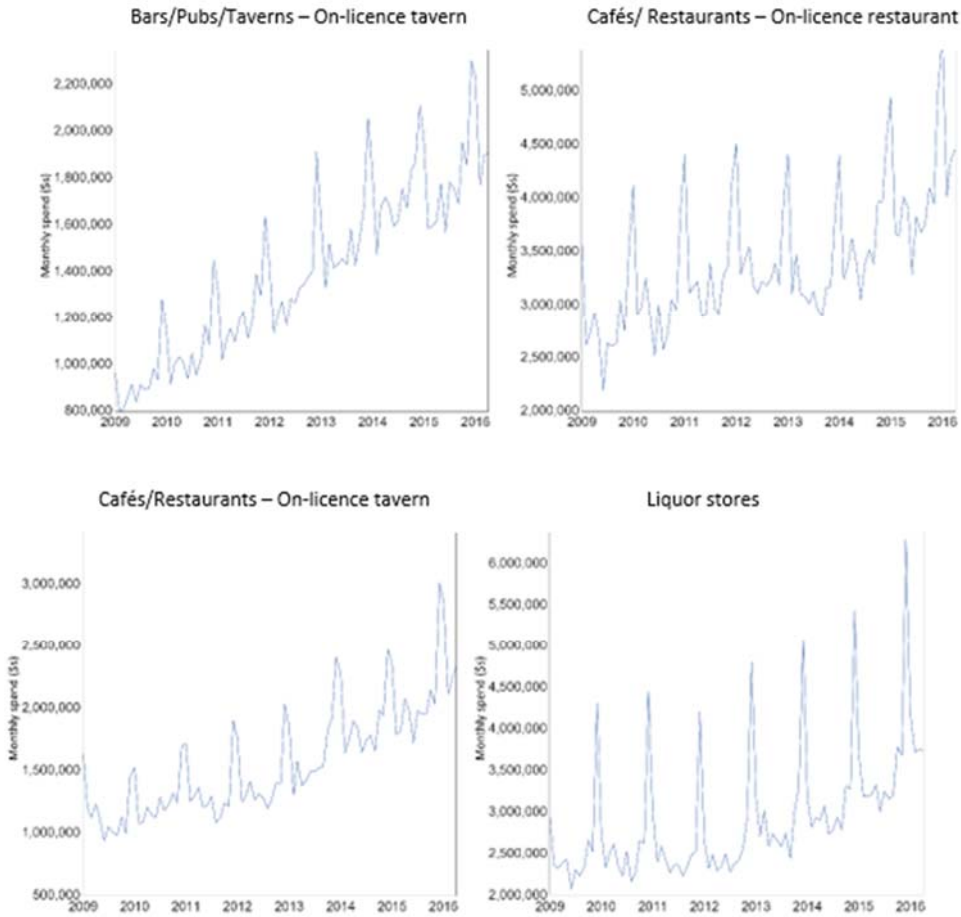
[17] In the context of an analysis which looks at changes in spending, this does not invalidate associating changes with the policy discontinuity being considered, unless there is an exogenous change that materially altered delayed consumption from off-licence purchases. This seems unlikely, but cannot be confirmed within the scope of this modelling.

Appendix A Supplementary descriptive data

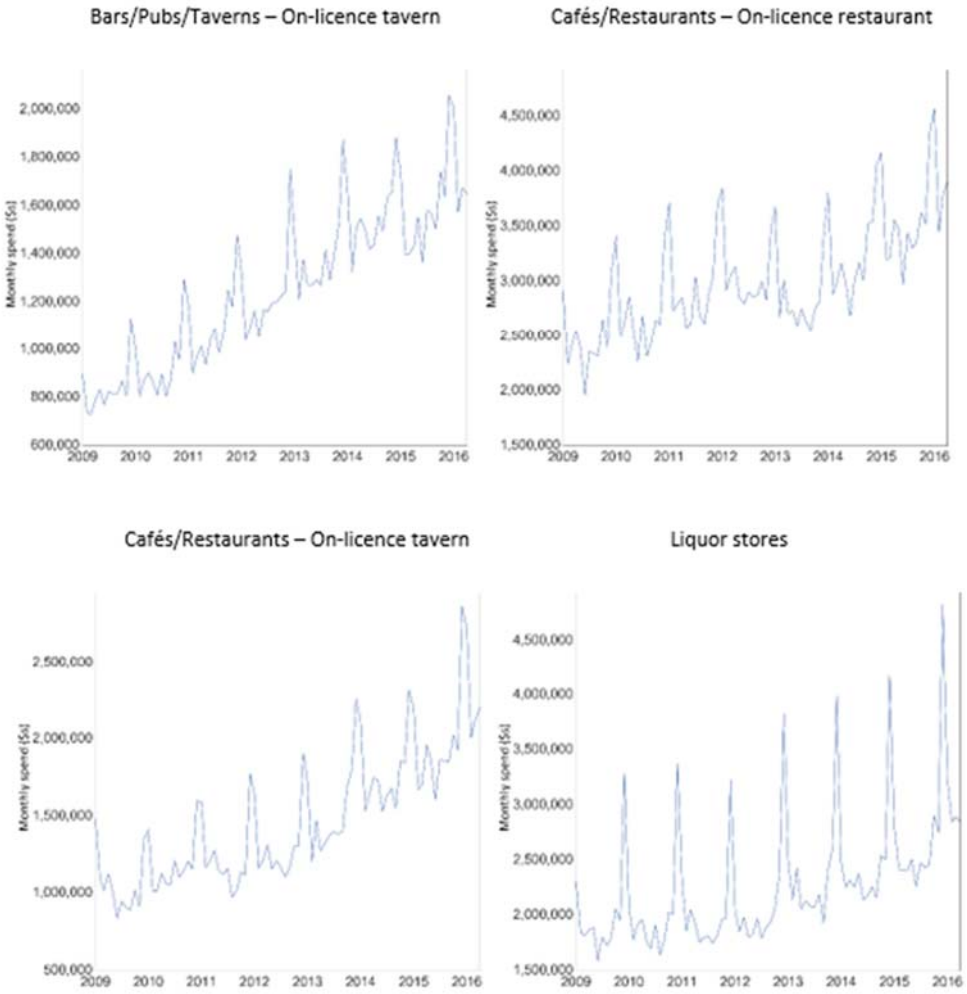
The following graphs present data for the regions that correspond to the national level data presented in Figure 1 and Figure 2 and described in Section 1.1.

These show stronger upward trends over time in most on-licence categories in urban Tauranga and Western Bay of Plenty (particularly in Bars/Pubs/Taverns) than in more rural Waimakariri, where licensed restaurants and liquor stores exhibit strongest growth.

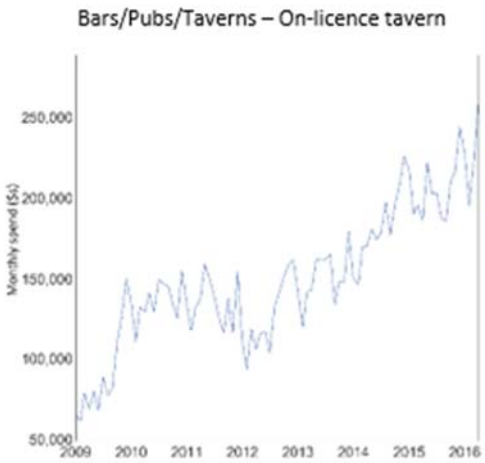
A.1 Bay of Plenty spending over time

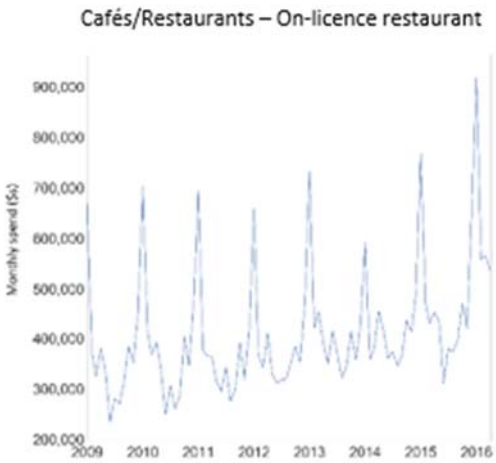


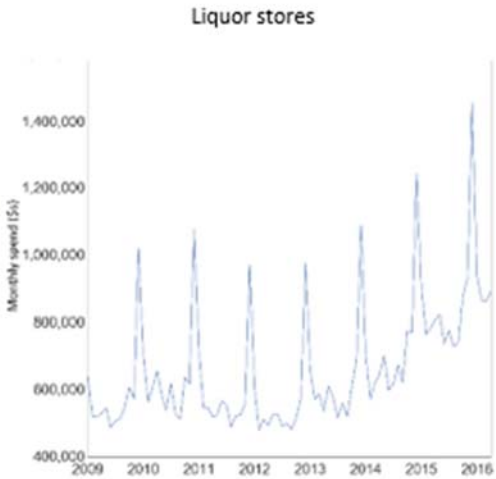
A.2 Tauranga City spending over time



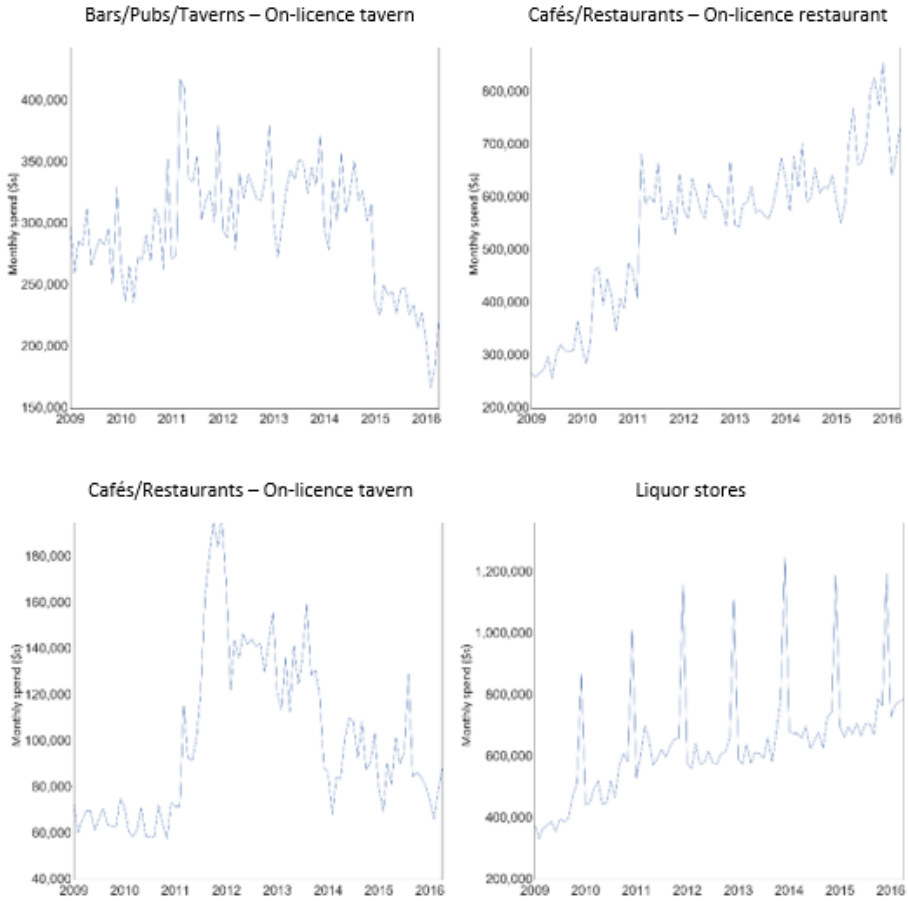
A.3 Western Bay of Plenty spending over time







A.4 Waimakariri spending over time



Appendix B Additional results

B.1 Estimated changes in spending for all hours from time series models for Tauranga and Western Bay of Plenty

Table 19 Time series estimates of changes in spending at on-licences in Tauranga, Western Bay of Plenty

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	866	960	2,952	3	71	-214	324	**4,962**	12%
2:00	1,753	-2,867	-82	34	108	-2	1	**-1,055**	-4%
3:00	1	-1,582	-1,255	370	-26	8	-2	**-2,487**	-19%
Non-trading hours									
12:00	-172	390	-3,051	192	-26	-168	7	**-2,827**	-10%
13:00	93	148	-482	1,835	246	131	-1,253	**718**	1%
14:00	-1,360	-1,432	-3,322	592	1,116	-186	-442	**-5,034**	-6%
15:00	1,608	7	-5,074	-1,561	120	158	-78	**-4,819**	-6%
16:00	-365	-14	842	-1,075	194	572	-186	**-32**	0%
17:00	-188	-1,922	-1,673	-667	-1,244	78	-223	**-5,839**	-5%
18:00	617	-1,609	-40	1,136	-613	-1,109	-70	**-1,688**	-1%
19:00	3,004	378	-546	172	71	259	-2,005	**1,332**	1%
20:00	1,174	-1,133	312	-2,030	-871	-765	-3,180	**-6,493**	-5%
21:00	127	751	99	-38	-411	303	-349	**482**	0%
22:00	356	313	3,183	-1,910	-2,143	-379	1,126	**546**	1%
23:00	708	4,211	-2,327	4	-847	2,391	7,135	**11,276**	21%
0:00	1,407	-693	2	-253	-378	-367	4,570	**4,289**	9%
Total	**9,628**	**-4,095**	**-10,462**	**-3,194**	**-4,633**	**711**	**5,377**	**-6,668**	
% change by day	4%	-1%	-6%	-4%	-4%	1%	3%	-0.5%	

Source: NZIER

Table 20 Time series estimates of changes in spending at bars, pubs and taverns in Tauranga, Western Bay of Plenty

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	1,368	-1,605	572	473	-426	-39	115	**458**	1%
2:00	2,223	-817	-250	17	1	1,394	-754	**1,815**	6%
3:00	34	309	-292	-1	-2	27	-170	**-94**	-1%
Non-trading hours									
12:00	963	-848	-82	1,081	272	53	-150	**1,288**	3%
13:00	2,428	-1,204	1,525	5	-818	-1,081	391	**1,246**	2%
14:00	1,616	505	-872	920	247	-1,341	1,131	**2,206**	2%
15:00	1,714	-51	-821	831	-326	-6	631	**1,973**	2%
16:00	1,070	-395	-302	1,210	17	782	510	**2,892**	3%
17:00	4,661	-2,819	-2,651	1,380	-1,337	511	1,898	**1,643**	1%
18:00	902	-636	88	127	-151	-571	682	**441**	0%
19:00	2,785	1,131	-356	-56	-262	261	-582	**2,921**	2%
20:00	895	-825	-648	1,254	-260	309	-827	**-103**	0%
21:00	2,412	-356	-78	152	181	698	-1,643	**1,366**	1%
22:00	287	199	1,628	155	-842	520	51	**1,999**	2%
23:00	1,791	2,255	335	284	538	-1,336	-873	**2,993**	5%
0:00	2,382	-805	-271	648	471	50	586	**3,061**	7%
Total	**27,531**	**-5,962**	**-2,475**	**8,479**	**-2,696**	**232**	**996**	**26,105**	
% change by day	9%	-2%	-1%	10%	-2%	0%	1%	1.9%	

Source: NZIER

Table 21 Time series estimates of changes in spending at cafés and restaurants in Tauranga, Western Bay of Plenty

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	866	1,150	2,825	3	71	-896	324	**4,343**	10%
2:00	1,312	-2,867	-82	32	108	-2	1	**-1,498**	-8%
3:00	1	-1,281	-1,255	370	-5	8	-2	**-2,164**	-22%
Non-trading hours									
12:00	-1,203	443	-3,051	1,702	-245	-1,402	52	**-3,704**	-1%
13:00	664	897	-3,736	1,835	2,069	1,140	-1,253	**1,615**	0%
14:00	-1,133	-1,432	-3,322	1,104	1,116	-1,260	-2,613	**-7,540**	-2%
15:00	1,121	24	-5,150	-1,561	120	158	-293	**-5,581**	-2%
16:00	-530	-27	842	-1,075	322	844	-54	**324**	0%
17:00	-188	-2,067	-2,331	-667	-789	78	-223	**-6,187**	-6%
18:00	617	-1,609	-81	1,395	-674	-1,109	-91	**-1,552**	-1%
19:00	3,004	1,303	-2,014	472	713	756	-2,005	**2,229**	1%
20:00	5,217	-1,133	1,933	-2,030	-871	-765	-3,180	**-829**	0%
21:00	643	4,716	-39	-279	-3,319	1,778	-2,049	**1,451**	0%
22:00	1,815	1,451	3,172	-1,910	-2,143	-2,343	6,558	**6,601**	1%
23:00	2,335	4,211	-2,327	31	-847	8,375	7,135	**18,913**	10%
0:00	2,168	-1,010	2	-253	-378	-437	4,570	**4,663**	7%
Total	**16,709**	**2,768**	**-14,614**	**-829**	**-4,751**	**4,923**	**6,878**	**11,083**	
% change by day	2%	0%	-2%	0%	-1%	1%	1%	0.3%	

Source: NZIER

Table 22 Time series estimates of changes in spending at liquor stores in Tauranga, Western Bay of Plenty

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance

	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
8:00	104	-150	-31	9	-55	60	-3	**-66**	-3%
9:00	-137	341	134	288	-173	-111	-117	**224**	12%
10:00	775	428	-250	-306	-3,932	2,518	1,767	**1,001**	7%
11:00	1,960	-3,479	-612	-2,913	130	4,421	1,283	**789**	4%
12:00	1,343	718	-1,939	-4,260	-2,783	173	9,884	**3,137**	11%
13:00	901	2,420	-278	-671	-535	-184	4,769	**6,423**	21%
14:00	4,949	1,296	609	-605	881	10,631	4,275	**22,037**	71%
15:00	27	1,063	-669	2,570	1,466	1,499	12,359	**18,316**	52%
16:00	1,158	1,978	-1,806	-2,082	-463	169	14,649	**13,603**	29%
17:00	517	1,772	-1,921	-1,570	-1,455	-256	-2,633	**-5,546**	-11%
18:00	3,874	6,271	-2,413	-5,613	-3,105	-2,830	-1,439	**-5,256**	-10%
19:00	1,973	1,290	719	-459	498	-2,932	-2,680	**-1,591**	-4%
20:00	3,037	-695	129	-2,185	-2,763	130	-2,677	**-5,024**	-21%
21:00	2,427	466	-131	-322	323	-884	673	**2,552**	22%
22:00	-97	-198	368	1,036	-359	-108	-937	**-296**	-5%
23:00	-1	-2,043	28	62	8	-1	-5	**-1,952**	-97%
0:00	-15	44	125	-2	4	50	21	**229**	30%
Total	**22,795**	**11,523**	**-7,938**	**-17,021**	**-12,312**	**12,346**	**39,189**	**48,580**	
% by day	4%	2%	-4%	-7%	-4%	4%	9%	1.9%	

Source: NZIER

B.2 Estimated changes in spending for all hours from time series models for Waimakariri

Table 23 Time series estimates of changes in spending at on-licences in Waimakariri

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	-2	33	8,936	-1	0	1	-1	**8,965**	5625%
2:00	-1	1	-1	-1	0	1	0	**0**	0%
3:00	0	13	2	0	1	1	0	**17**	58%
Non-trading hours									
12:00	324	1,463	893	1,328	194	121	-2,502	**1,820**	5%
13:00	4	-779	1,052	1,477	-111	-2,092	640	**192**	0%
14:00	-1,393	-4,005	1,698	2,372	-2,747	-1,836	1,551	**-4,361**	-6%
15:00	1,315	-3,195	928	1,366	-1,067	60	-883	**-1,475**	-3%
16:00	-183	-3,511	238	1,940	-1,720	-730	-157	**-4,123**	-14%
17:00	-464	790	881	96	325	27	-455	**1,200**	7%
18:00	-707	578	-29	-53	-513	-52	667	**-109**	0%
19:00	219	-3,247	984	566	-251	738	1,024	**34**	0%
20:00	-250	808	175	-451	-245	936	2,698	**3,671**	5%
21:00	44	610	1,185	471	1,788	-1,283	-888	**1,926**	3%
22:00	1,405	925	-74	3	-854	571	1,343	**3,318**	8%
23:00	1,569	1	2	117	8	-202	26	**1,522**	18%
0:00	265	4	2	2	4	-3	-23	**250**	27%
Total	**2,145**	**-9,510**	**16,871**	**9,229**	**-5,189**	**-3,743**	**3,042**	**12,846**	
% change by day	2%	-8%	17%	25%	-10%	-6%	4%	2.3%	

Source: NZIER

Table 24 Time series estimates of changes in spending at bars, pubs and taverns in Waimakariri

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	71	191	-599	-11	-3	-1	-11	**-362**	-6%
2:00	3	134	-34	-1	0	-2	-1	**99**	4%
3:00	1	13	35	0	0	0	4	**52**	7%
Non-trading hours									
12:00	-1	64	381	193	-65	297	476	**1,346**	24%
13:00	25	-898	-626	-338	300	154	-179	**-1,562**	-12%
14:00	52	-424	-137	-654	-44	-1,491	-1,128	**-3,825**	-22%
15:00	281	-442	-209	1,018	468	40	652	**1,808**	11%
16:00	-305	-1,818	-405	-33	-327	-12	-103	**-3,004**	-17%
17:00	-144	433	109	119	213	272	-422	**581**	2%
18:00	207	27	114	74	324	899	23	**1,668**	4%
19:00	469	237	582	415	350	-279	787	**2,561**	6%
20:00	359	294	-881	-1,487	489	-556	766	**-1,015**	-2%
21:00	-358	-3,674	257	236	-288	-527	-1,685	**-6,040**	-18%
22:00	414	-958	2	-127	-485	438	389	**-327**	-2%
23:00	428	-400	1	-41	-1	-1	-112	**-126**	-1%
0:00	136	233	-10	2	-5	-47	-12	**299**	3%
Total	**1,638**	**-6,986**	**-1,421**	**-634**	**927**	**-816**	**-554**	**-7,846**	
% change by day	2%	-10%	-3%	-3%	3%	-2%	-1%	-2.4%	

Source: NZIER

Table 25 Time series estimates of changes in spending at cafés and restaurants in Waimakariri

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance. Results for bars, pubs, taverns and cafés and restaurants

Hour of day	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
1:00	-2	33	8,936	-2	0	1	-1	**8,964**	1499%
2:00	-1	1	-1	-1	0	1	0	**0**	0%
3:00	0	13	2	0	1	1	0	**16**	58%
Non-trading hours									
12:00	321	1,467	1,076	1,149	194	121	-2,470	**1,860**	5%
13:00	4	-779	1,051	1,477	-111	-1,989	638	**292**	0%
14:00	-1,393	-4,005	1,692	2,412	-2,747	-1,822	1,551	**-4,313**	-6%
15:00	1,313	-3,195	933	1,392	-1,067	60	-883	**-1,447**	-3%
16:00	-183	-3,477	234	1,940	-210	-732	-158	**-2,587**	-9%
17:00	-464	790	907	99	325	27	-465	**1,220**	7%
18:00	-707	598	-31	-53	-513	-52	667	**-91**	0%
19:00	237	-3,449	984	566	-262	719	1,024	**-181**	0%
20:00	-263	808	199	-506	-266	936	2,848	**3,756**	5%
21:00	295	643	1,364	507	1,788	-1,283	-888	**2,425**	3%
22:00	1,518	958	-79	3	-854	639	1,415	**3,600**	8%
23:00	1,643	1	2	117	9	-202	26	**1,596**	17%
0:00	269	4	2	2	3	-3	-22	**254**	25%
Total	**2,588**	**-9,589**	**17,271**	**9,102**	**-3,710**	**-3,580**	**3,284**	**15,366**	
% change by day	2%	-7%	17%	23%	-7%	-5%	4%	2.7%	

Source: NZIER

Table 26 Time series estimates of changes in spending at liquor stores in Waimakariri

Effects implied by model dummy variable for LAP introduction, without any exclusion based on statistical significance

	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	**Total**	% change by hour
8:00	0	0	0	0	0	0	0	**0**	-1%
9:00	-7	2	-1	-145	-5	-1	26	**-131**	-172%
10:00	-2,730	1,506	-30	-5	-2	-236	-453	**-1,951**	-36%
11:00	2,100	181	125	49	944	-772	-1,372	**1,254**	10%
12:00	-257	667	-506	525	3,257	-2,045	-3,073	**-1,432**	-12%
13:00	6,361	-1,106	457	463	162	1,063	-3,363	**4,039**	37%
14:00	-894	220	-392	-1,371	1,115	2,060	-599	**138**	1%
15:00	820	36	219	-939	1,057	-915	201	**480**	4%
16:00	160	2,421	-48	200	-705	-3,992	-3,939	**-5,903**	-42%
17:00	2,682	2,027	-540	-331	1,650	-2,090	-1,189	**2,209**	15%
18:00	725	454	102	872	553	1,668	-1,801	**2,572**	17%
19:00	622	-705	-254	173	-222	442	-865	**-809**	-8%
20:00	-346	1,942	-97	80	600	416	-216	**2,379**	39%
21:00	242	152	-14	-30	153	-152	-1,077	**-726**	-23%
22:00	214	-10	-1	2	49	-6	44	**292**	58%
23:00	15	7	-1	0	0	0	0	**22**	238%
0:00	0	0	0	0	0	0	0	**0**	-1%
Total	**9,708**	**7,794**	**-983**	**-458**	**8,607**	**-4,559**	**-17,677**	**2,431**	
% by day	7%	6%	-2%	-1%	16%	-6%	-20%	0.4%	

Source: NZIER

B.3 Café and restaurant spending in Tauranga and Western Bay of Plenty

Table 27 Changes in hourly shares of spending at cafés and restaurants in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11				0.5	0.4		
12							-0.5
13			0.6	0.5			
14						-0.3	
15							
16							
17							
18							
19		-1.0	-0.3	-0.7			-0.2
20	-0.3		-0.4	-1.0	-0.5		-0.6
21	-0.1	1.3	0.7			-0.2	-0.3
22	-0.6	0.9	0.5			-0.9	-1.2
23	-1.5	-2.4	-1.5	-0.4	-1.1	-1.8	-1.1
24	-0.3	-0.3	-0.3	-0.8	-0.3	-0.5	-0.1
1				-0.1	0.8		
2				-0.2	-0.3	-0.5	-0.1
3	-1.3	-1.7	-0.2	-0.3	-0.2	-0.7	-0.3

Table 28 Changes in spending at cafés and restaurants in Tauranga and Western Bay of Plenty following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	-0.2	-0.1	0.1		-0.2		
10	-0.1	-0.3	-0.1	-0.1	-0.2		
11	-0.2	-0.3	-0.3	-0.1	-0.1		
12	-0.2	-0.3	-0.2	-0.2	-0.2		
13		-0.1			-0.1		
14	-0.1	-0.1		-0.2			
15	-0.2	-0.2	-0.2	-0.1	-0.1		
16	-0.2	-0.4	-0.1	-0.2	-0.1		
17		-0.3	-0.3	-0.1	-0.1	0.1	-0.1
18	-0.1	-0.1		0.0	0.2		-0.1
19					0.1	0.4	
20		0.2		0.1		0.4	
21		0.5	1.5	0.6	0.8	0.5	
22	0.0	0.7	0.2	1.8	2.7	2.1	
23	-0.5	0.3	0.0	0.3	1.9	1.7	-0.6
24	-0.8	-0.3	-0.8	-0.6	2.0	2.2	-0.9
1	-0.7	-0.3	-0.6	-1.3	3.6	2.5	-0.7
2	-1.1	-0.6	-0.5	-0.8	-0.7	1.2	-0.8
3	-0.2	-1.0	-1.4	-0.6	1.3	1.9	-0.9

Table 29 Changes in hourly shares of spending at cafés and restaurants by age group in Tauranga and Western Bay of Plenty following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
9										
10										
11	0.3							0.7		0.6
12		-0.2		-0.1						-0.2
13	0.6			1.0		-0.2	0.6	0.8		-0.2
14	0.4	-0.1		0.5		1.0	-0.1	-0.1	0.2	-0.2
15				-0.3	0.4	-0.1	-0.1	-0.6		-0.2
16			0.9	-0.2	-0.1		-0.2			-0.1
17				0.5		-0.1				-0.2
18			-0.2			-0.1				
19	-0.1	0.5	-0.3	-0.3	-0.1	-0.6		-0.5	-0.2	-0.7
20	-0.3	-0.2	0.1	0.8	-0.5	1.5	0.0	-0.8	1.7	-0.6
21	0.3	2.1	1.8	-0.3	1.2	2.6	-1.2	0.0	3.9	-0.2
22	0.8	1.1	1.2	2.1	1.2	1.1	1.2	2.1	-0.1	-0.5
23	-1.2	-2.1	-0.4	-0.4	-0.7	-1.2	0.1	-1.3	0.2	-0.5
24	-0.8	0.0	-0.4	-0.7	-0.3	-0.3	-0.8	0.4	-0.7	-0.3
1	-0.4	-0.3	1.2	-0.2	-0.4		-1.9	-2.7	-3.9	-3.0
2	-1.5	-1.4	-0.2	-0.2	-2.5		-7.1	-11.2	-13.5	-12.5
3	-0.6	-2.7		-0.4	-6.2	-2.9	-17.1	-26.4	-32.0	-28.0

B.4 Changes in spending in Tauranga City

B.4.1 Bars, pubs and taverns

Table 30 Changes in hourly shares of spending at bars, pubs and taverns in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Significant changes

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11							
12							
13							
14	1.0						
15							
16	1.0		-0.6				1.1
17						-0.6	-0.9
18			-1.2				
19		-1.2					
20		1.4					
21	-0.8			1.3			
22							
23	2.7		-0.6		-0.6	-0.9	
24					-0.5		
1	-0.3					-0.6	
2	-0.2					-0.5	-0.1
3						-0.3	-0.3

Table 31 Changes in hourly spending at bars, pubs and taverns in Tauranga City following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	-2.6	-0.2	-24.6	-1.0	-0.3	-0.9	-22.4
10	-0.2	1.2	-2.6	-0.6	0.3	0.4	-0.2
11		1.3	-0.2	0.0	-0.4	0.2	-0.3
12	-0.4	0.4	0.2	-0.1	-0.5	0.1	-0.2
13			0.1		-0.3		
14		0.1	0.2	0.1	-0.1	0.5	0.0
15		0.1		0.0	-0.1	0.4	-0.2
16				-0.1	-0.2	0.5	-0.1
17	0.1		0.5		0.1	0.6	
18	-0.1	0.5	0.3	0.1	0.3	0.5	
19		0.1	1.0	0.4	1.0	1.0	
20		0.9	1.2	1.0	0.5	1.2	-0.1
21		1.5	1.3	1.8	1.6	1.0	-0.1
22	0.1	0.9	0.7	1.0	2.9	2.7	0.1
23	0.4	-0.3	-0.7	0.7	3.5	4.5	-0.4
24	-0.4	-0.5	-0.5	0.0	3.6	8.3	-0.6
1	-1.2	-0.6	0.0	0.1	3.0	5.9	-1.1
2	-1.2	-0.4	-0.5	0.1	2.6	3.7	-1.6
3	-0.6	-0.8	-0.6	-0.3	0.9	0.9	-1.6

Table 32 Changes in hourly shares of spending at bars, pubs and taverns by age group in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
9					-0.2		-1.6		0.3
10			-0.4		-0.2		-0.7	-0.7	-0.9
11			-0.1				-0.6	-0.6	-0.2
12	1.8	-0.1	0.2		-0.3	-0.3	-0.1	-0.3	-0.4
13	-0.2	0.6	-0.3		-0.3	-0.8	-0.3	-0.5	
14		0.0	0.1	-0.3	1.6		-0.2	-0.3	
15	0.1	-0.2	0.1	2.9	-1.1	0.4	1.3	-0.2	-0.4
16	0.3	0.3	-0.6	0.2	0.2	-1.3	1.0	-0.2	-0.3
17	-0.6	-0.5	-0.8	-0.4	0.6	0.5	-1.2	-0.3	-0.1
18	-0.1	-1.1	-1.7	-0.2	0.8	-1.3	-1.1	0.1	-1.2
19	0.9	-0.2	-1.0	-0.3	-0.9	0.3	-1.4	-0.7	4.6
20	3.5	0.0	-0.8	-1.4	-0.1	-0.4	-0.4	-1.1	0.5
21	0.8	-0.4	0.6	-1.0	-2.0	-0.3	-0.7	-1.5	0.9
22	-0.1	-0.5	-0.8	-2.2	-1.4	-1.7	-0.5	-1.4	-1.1
23	-1.8	-1.7	-0.3	-2.1	-1.4	-0.2	-0.8	-1.8	
24	-0.9	-1.6	0.2	-1.7	-1.1	-0.3	-0.3	-2.8	-1.1
1	-2.6	-1.6	-0.9	-1.0	-0.9	-1.8	-0.2	-4.0	
2	-2.7	-2.0	-1.3	-1.7	-1.4	-2.7		-6.5	
3	-2.0	-2.2	-2.2	-1.9	-2.2	-3.9		-9.3	

B.4.2 Cafés and restaurants

Table 33 Changes in hourly shares of spending at cafés and restaurants in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

Significant changes

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11							
12					-0.4		-1.1
13							
14				-0.5		0.4	
15						0.4	
16							
17							
18							
19						0.4	-0.3
20				-1.5	0.1	0.0	
21	-0.3	1.9	2.5	0.8	-0.3	0.7	0.0
22	0.0		-0.9	1.7		-0.3	
23	-1.5	-2.1	-1.3	-1.2	-1.6	-0.9	-0.2
24			-0.3	-0.6	-0.3	-0.1	
1						0.0	
2	-0.5			-0.2	-0.1	-0.7	-0.3
3	-1.4	-0.4	-0.4	-0.1	-0.1	-0.5	-0.1

Table 34 Changes in hourly shares of spending at cafés and restaurants by age group in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
9										
10										
11										
12	-0.1	0.5	-0.1						-0.2	
13		-0.3	0.2		0.5		-0.2		-0.1	
14	-0.1	-0.1	0.5	0.9	-0.2		-0.1	0.6		1.0
15			2.2	-0.2	-0.1	0.1	0.3	-0.5	-0.2	
16		0.4	0.5			-0.1		-0.2		
17			-0.1	0.4		0.6			0.7	-0.1
18		0.4	0.4	-0.1					-0.1	-0.1
19	1.4	-0.1	-0.6	-0.1	-0.3	-0.4	0.5	-0.4	-0.2	-0.1
20	6.2	0.5	0.8	0.7	-0.3	0.4	-1.5	0.4	1.4	-0.7
21	7.8	6.1	1.2	2.4	2.4	2.6	2.4	2.8	1.5	0.4
22	-0.6	-0.4	0.3	2.6	1.2	0.2	2.1	3.5	-0.1	-1.1
23	-3.2	-1.5	-0.7	-1.8	-1.0	-1.5	-1.2	-1.8	-1.7	-1.1
24	-1.2	0.5		-0.7	0.6	-0.3	-0.6	-1.4	-3.4	
1	-1.0	-0.4		-0.1	-0.5			-5.1	-15.5	
2	-2.0	-1.6		-0.2	-4.5			-15.3	-42.2	-17.3
3	-1.1	-3.5			-11.9	-4.8		-34.1	-87.1	-39.5

B.4.3 Liquor stores

Table 35 Changes in hourly shares of spending at liquor stores in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9							
10							
11		0.8					
12				0.8			-0.9
13					-0.6	0.4	
14							
15				1.1			0.5
16				-0.6			
17			1.1	0.6			
18			1.1	1.1	1.3	0.2	
19	-0.5	-0.7	-1.5	-0.6			0.9
20	-0.5			-0.3		-0.4	
21						0.4	
22			-0.3	-0.3			
23					-0.2	-0.3	
24	-1.1					0.0	
1							
2							
3							

Table 36 Changes in hourly spending at liquor stores in Tauranga City following the LAP

Percentage changes in hourly spending, where actual spending is outside model prediction intervals

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	35.3	-0.8	0.0	-2.5	-0.1	7.1	0.2
10	0.1	-0.3	2.6	2.1	16.7	121.3	-0.9
11	11.3	64.8	13.2	47.4	17.5	79.2	-40.8
12	-4.8	10.2	8.1	23.0	11.0	30.1	-28.6
13	3.8	0.5	1.3	7.3	-0.5	7.9	-1.0
14	1.2	0.4	0.4	0.5	0.8	3.8	0.1
15	0.2	1.0	0.2	0.8	0.9	2.2	0.1
16	0.6	0.9	0.6	1.5	2.1	2.4	0.1
17	0.9	1.6	1.8	3.8	3.1	2.4	0.0
18	0.9	1.9	1.6	2.5	3.5	2.1	-0.1
19	0.4	0.9	0.6	1.4	2.0	1.6	-0.1
20	0.1	0.9	0.4	0.8	1.2	1.1	-0.1
21	0.1	0.5	0.3	0.6	0.9	1.1	-0.1
22	-0.4	0.0	0.0	0.2	0.6	0.7	-0.2
23		-0.2	-0.1	-0.1	0.0	0.0	
24			-0.1	0.0	0.0		

Table 37 Changes in hourly shares of spending at liquor stores by age group in Tauranga City following the LAP

Changes in percentage shares of daily spending that are outside model prediction intervals

	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
9			-0.4		-0.4		-0.5			
10			-0.1		-0.4		-0.4		-1.9	
11			0.1		-0.5		-0.6		-1.4	
12	0.3	0.0	0.0	0.0	-0.4		-0.6	-0.7	-1.2	
13	0.1	-0.1	0.9	-0.2	-0.2	0.0	-0.3	0.5	-0.4	
14	0.2	0.1	0.0	-0.1	-0.3	0.0	-0.2	-0.4	-0.4	-0.3
15	0.5	0.5	0.2	-0.4	-0.3		-0.3	-0.4	1.0	-0.9
16	0.7	0.0	-0.7		-0.2	-0.3	-0.4	-0.2		-0.9
17	1.0	0.2	-0.5	-0.3	-0.4	-0.6	-0.3	-0.2	1.2	-2.2
18	1.0	1.5	0.5	-0.1	-0.1	-0.7	1.5	-1.0	-0.4	-0.1
19	1.4	0.5	-0.1	0.5			0.6	-0.2		1.6
20	4.4	3.2	1.7	5.4	4.5	5.5	1.2	4.2		-0.8
21	5.3	4.0	2.7	10.9	4.2	5.4	1.7		-0.3	-2.6
22	1.9	2.9	2.6	0.8		0.7	-0.2	-2.9	-1.2	-5.1
23	0.0	0.8	0.9	-0.8	-1.6	-0.7	-1.7	-4.7	-5.2	-6.8
24	-1.0	0.0	-1.8	-3.0	-3.2	-3.4	-3.1	-4.1	-4.9	-7.4