

# **South Island Campylobacteriosis**

## **A review of notifications 2010-2012**

### **by District Health Board**

---



**Canterbury**

**District Health Board**

Te Pōari Hauora o Waitaha

**Prepared by:**

**Hongfang Dong, Analyst**

**Dr Peter Mitchell, Medical Officer**

**Community and Public Health**

**Canterbury District Health Board**

**October 2013**

# South Island Campylobacteriosis: A review of notifications 2010-2012 by District Health Board

## CONTENTS

	<b>Page</b>
Contents .....	2
Acknowledgements .....	3
Foreword .....	3
Summary .....	4
Introduction .....	5
Methods .....	5
Incidence and rates .....	5
Demographic characteristics .....	8
Ethnicity .....	10
Occupation .....	10
Seasonality .....	12
Risk exposures .....	12
Outbreaks .....	15
Discussion .....	15
References .....	16

**ACKNOWLEDGEMENTS**

The authors wish to acknowledge the contribution of the following persons: Ruth Pirie (ESR) for the maps (figure 3), reviewing the report and providing advice, Keith Reid and Jill Sherwood for permission to use EpiSurv data from Southern and Nelson Marlborough District Health Boards and Kaylene Newall and Barbara Grieve from Southern for providing information on outbreaks.

**FOREWORD**

This report on campylobacteriosis has been produced to improve understanding of its recent local epidemiology in order to assist with its public health management.

**Document availability**

This document will available on the C&PH website [www.cph.co.nz](http://www.cph.co.nz)

---

## SUMMARY

- Campylobacteriosis was the commonest notifiable disease in the South Island accounting for 39.5% of notifications in 2010-2012.
- The average annual rate declined 52% from 2003-2007 to 2008-2012. Since 2009 however, rates have trended upwards across all South Island DHBs, from 158% in Southern to 206% in Canterbury. This may be related to an increase in sales of raw (as opposed to frozen) poultry and an increase in dairying.
- In 2010-2012 South Canterbury had the highest average notification rate (263 per 100,000 pop.) and Nelson-Marlborough the lowest (189 per 100,000 pop.).
- Annual campylobacteriosis notification rates varied significantly between urban and rural areas with rural areas generally having higher rates, particularly in the 0-4 and 20-29 year age groups
- Campylobacteriosis rates were lowest for Māori .
- The available information showed that the occupational group with the highest campylobacteriosis incidence was farmers, farm managers or farm workers (5.9%), followed by meat process workers (3.3%).
- Seasonality was apparent in the DHBs with the highest populations.
- Campylobacteriosis cases in rural areas had higher exposure rates to risk factors (contact with farm animals, drinking untreated water, exposure to another symptomatic person, recreational water contact and recent overseas travel) than those in urban areas.
- Fifty-four outbreaks were reported, the largest being a waterborne incident in Canterbury that involved 138 cases.
- Most outbreaks occurred in domestic settings
- In C&PH household outbreaks were not reported but were able to be identified by a search of the personal data fields. It is not known to what extent there was under-reporting of these incidents in other DHBs. Appropriate coding would enable the incidence of household outbreaks to be identified and allow for further analysis.
- The report is subject to possible bias from missing information from the non-return and incompleteness of questionnaires. Thirty-one percent of campylobacteriosis questionnaires were not returned in Canterbury.
- The highest percentage of unknown data was for risk factors. This varied from 39.6% for recent overseas travel to 52% for drinking untreated water. In contrast ethnicity data was almost complete.
- Another potential inaccuracy in the analyses resulted from the use of the 2006 Census populations and urban/rural classifications because of the unavailability of the 2011 data.

## INTRODUCTION

*Campylobacter* is an enteric organism found in farm, domestic and wild animals and birds. Infection and outbreaks are due to contamination of food or water, person to person spread or from environmental contamination. Although essentially a gastroenteritis, campylobacteriosis can also be associated with significant sequelae including reactive arthritis, febrile convulsions and Guillain-Barré syndrome. From 2010-2012 campylobacteriosis was the principal diagnosis in 1515 hospital admissions nationally and a relevant diagnosis in another 355. It has resulted in 13 deaths since 1997.

## METHODS

Campylobacteriosis notification data of the five District Health Boards (DHBs) in the South Island were provided by ESR from EpiSurv.<sup>1</sup> Descriptive analyses were conducted to summarize the data for each DHB by Territorial Local Authority (TLA) and for the South Island as a whole. The seven urban and rural categories were simplified to two (urban or rural) using the Statistics New Zealand Urban/Rural profile classification.<sup>2</sup> Rate ratio and 95% confidence intervals were calculated to compare the rates of rural areas with that of urban areas. For consistency, since the urban and rural classification data was only available for the 2006 Census population, this data rather than 2011 projection data was used for the analyses throughout the report. Outbreak information was obtained directly from EpiSurv and local reports. The DHB populations used are given in Table 1 and ethnicity data in Table 5.

Table 1. South Island Populations By District Health Board (2006 Census)

Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern
130,041	31,332	466,380	53,871	286,176

## INCIDENCE AND RATES

Campylobacteriosis is a zoonosis and the commonest notifiable disease in the South Island and New Zealand. Of the various species *C. jejuni* is the commonest.<sup>3</sup> In a recent study in the South Island *C. jejuni* accounted for 95% of isolates, *C. coli* 4% and *C. lari* 1%.<sup>4</sup> From 2010-2012 campylobacteriosis accounted for 39.5% of notifications in the South Island (range 29.1% for Nelson Marlborough to 48.5% for Southern) and 38.3% nationally (Table 2). In the past decade the national rates peaked in 2003 at 395.6 per 100,000 population but in 2008 the annual rate declined markedly, coinciding with the introduction of a range of voluntary and regulatory interventions to reduce *Campylobacter* spp. contamination of poultry.<sup>5</sup> The average annual New Zealand rate declined 55% from 2003-2007 to 2008-2012 compared with 52% for the South Island (Fig. 1). Since 2009 however, South Island rates have trended upwards from 125 to 226 per 100,000 population. An increase in rates has occurred across all DHBs from 158% in Southern to 206% in Canterbury.

From 2010 to 2012, a total of 6149 cases of campylobacteriosis in the South Island were reported in EpiSurv, giving an annual average of 2050 cases (average rate 212 per 100,000 pop.). South Canterbury had the highest average notification rate (263 per 100,000 pop.) and Nelson-Marlborough the lowest (189 per 100,000 pop) (Fig.2 and Table 3).

Annual campylobacteriosis notification rates varied significantly between urban and rural areas with rural areas generally having higher rates (Table 3 and Fig. 3). In Canterbury, the rural notification rate was more than twice the urban rate (RR=2.10 95%CI=1.92-2.29)). Southern and South Canterbury also had significantly higher notification rates in rural compared with urban areas (RR=1.80 and RR=1.54 respectively). In West Coast there was virtually no difference in the rates (RR=1.02 95%CI=0.71-1.47) although 38% had no urban/rural classification available and the rates should be interpreted with caution. Similarly for Nelson-Marlborough, 20% of cases had this information missing.

Figure 1. New Zealand And South Island Campylobacteriosis Notification Rates 2003-2012

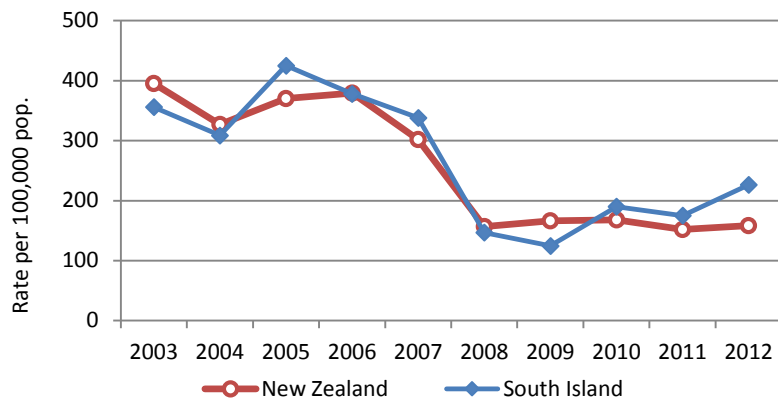


Table 2. Notifications for campylobacteriosis and all notifications 2010-2012 by South Island District Health Board. Percentage of all notifications due to campylobacteriosis.

	NelsMarl	WCoast	Canty	Sth Canty	Southern	Sth Island	New Zealand
<b>Campylobacteriosis</b>							
2010	235	66	931	122	619	1973	7346
2011	199	54	881	126	561	1821	6692
2012	303	72	1124	178	678	2355	7031
Average	246	64	979	142	619	2050	7023
<b>All notifications</b>							
2010	475	154	2394	304	1235	4562	17665
2011	853	340	1971	284	1111	4559	16610
2012	1204	280	3096	376	1485	6441	20727
Average	844	258	2487	321	1277	5187	18334
<b>Percentage of all notifications due to campylobacteriosis</b>							
	29.1	24.8	39.4	44.2	48.5	39.5	38.3

Figure 2. Average annual notification rates by District Health Board 2010-2012

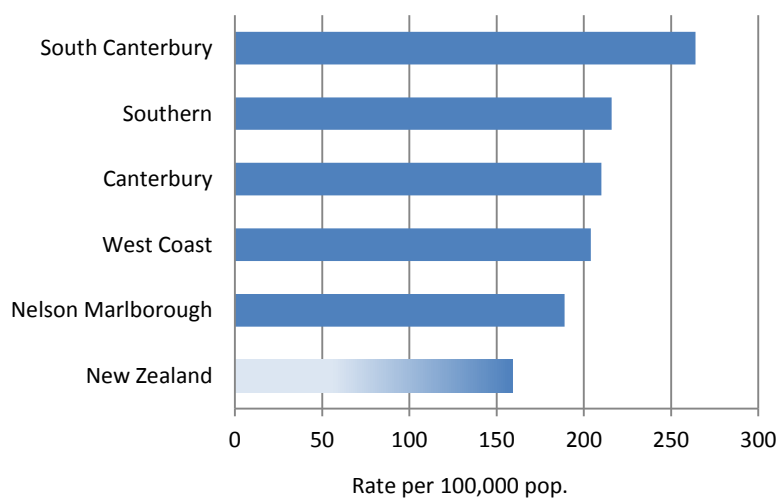


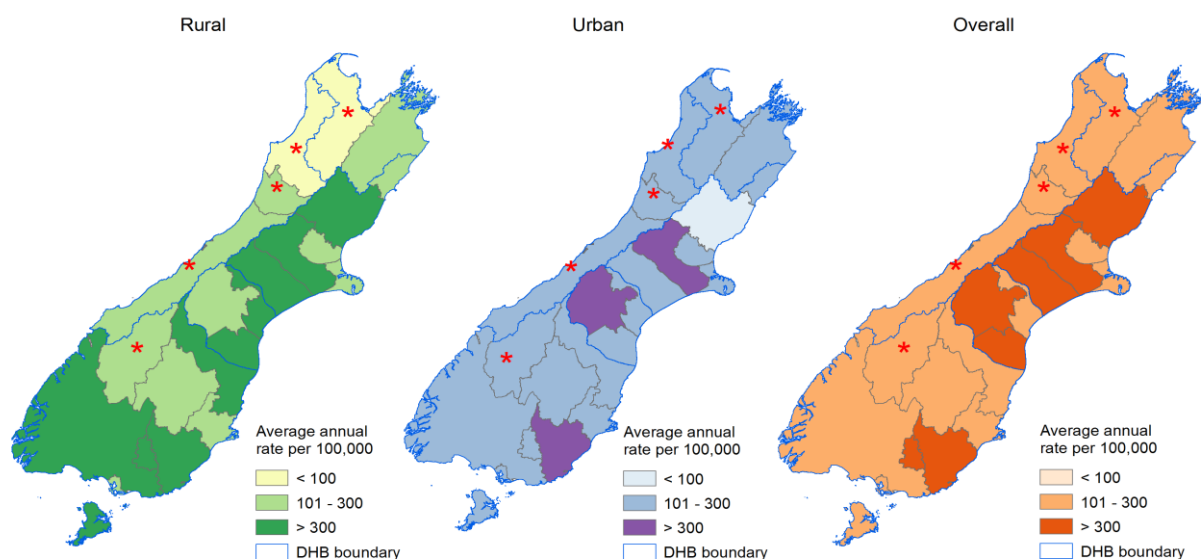
Table 3. Average annual campylobacteriosis notification counts and rates per 100,000 population by District Health Board and by Territorial Authority, 2010-2012

DHB	TA	Average annual number of notifications	Average annual rate <sup>§</sup>			Relative rate of rural to urban rates RR (95% CI)		
			Rate in urban area	Rate in rural area	Total <sup>¥</sup>			
Nels-Marlborough	Tasman District	77	123.0	63.7	172.5	0.56 (0.44-0.71)		
	Nelson City	78	173.7	76.9	181.9			
	Marlborough District	91	196.0	151.7	213.9			
	<b>Total</b>	<b>246</b>	<b>167.7</b>	<b>93.9</b>	<b>189.2</b>			
West Coast	Buller District	21	137.5	89.3	216.5	1.02 (0.71-1.47)		
	Grey District	25	113.7	169.1	189.1			
	Westland District	18	141.4	136.9	214.2			
	<b>Total</b>	<b>64</b>	<b>125.5</b>	<b>128.1</b>	<b>204.3</b>			
Canterbury	Kaikoura District	8	138.1	230.0	220.9	2.10 (1.92-2.29)		
	Hurunui District	46	91.1	455.3	439.1			
	Waimakariri District	95	191.7	253.0	221.8			
	Christchurch City	596	164.6	284.0	171.1			
	Selwyn District	118	318.4	334.7	350.5			
	Ashburton District	116	277.2	557.0	418.9			
	<b>Total</b>	<b>979</b>	<b>175.6</b>	<b>368.5</b>	<b>209.9</b>			
	South Canterbury	Timaru District	104	194.1	324.6		242.6	1.54 (1.26-1.90)
		Mackenzie District	12	327.8	263.4		315.7	
Waimate District		26	293.9	335.5	362.3			
<b>Total</b>		<b>142</b>	<b>205.1</b>	<b>316.8</b>	<b>263.6</b>			
Southern	Waitaki District	53	202.4	359.0	262.1	1.80 (1.64-1.99)		
	Central Otago District	39	210.0	255.1	234.3			
	Queenstown-Lakes District	59	181.5	224.8	169.9			
	Dunedin City	208	164.9	287.8	175.3			
	Clutha district	67	369.8	397.9	397.9			
	Southland District	83	163.7	309.7	291.9			
	Gore District	38	290.2	379.4	313.8			
	Invercargill City	72	135.9	265.0	143.1			
	<b>Total</b>	<b>619</b>	<b>174.7</b>	<b>315.0</b>	<b>216.3</b>			
	<b>Total</b>	<b>2050</b>	<b>174.6</b>	<b>284.5</b>	<b>211.8</b>		<b>1.63 (1.54-1.73)</b>	

§ Rate per 100,000 population 2010 – 2012

¥ The total rate was calculated from the total reported notifications and not from combined urban and rural notifications. Since urban/rural classification was missing in 4.1% - 38% of DHB notifications, the total rate was higher than both the urban and rural rates in some areas.

Figure 3. Maps of campylobacteriosis rates per 100,000 population by TLA, 2010-2012



\* More than 20% of records could not be classified as rural or urban.

**DEMOGRAPHIC CHARACTERISTICS**

The ages of cases in the South Island ranged from one month to 95 years, with a median of 34 years and an average of 36 years (Table 4). Ashburton District had a significant younger median age (25 years) than other TLAs. Campylobacteriosis rates varied across age groups, especially in rural areas, with peaks in the 0-4 and 20-29 year age groups and the elderly (Figs. 4 and 5). The rural 0-4 and 20-29 years age groups were 3 and 2.4 times those of their urban counterparts possibly related to their higher rates of exposure to farm animals and drinking untreated water (see Risk Factors below).

Fifty-eight percent of notifications were males with every DHB having more males than females notified (Table 4). There were no significant differences in male to female ratios between rural and urban areas for all the DHBs (data not shown in Table 2). Analysis by age resulted in unstable rates in Nelson Marlborough and West Coast because of the low numbers of cases and their results are not included.

Figure 4. Average annual campylobacteriosis rates per 100,000 population by age group and urban/rural dwelling in the South Island, 2010 - 2012

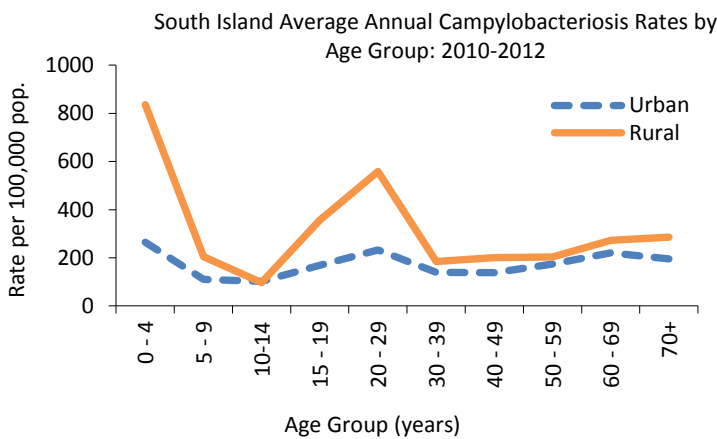
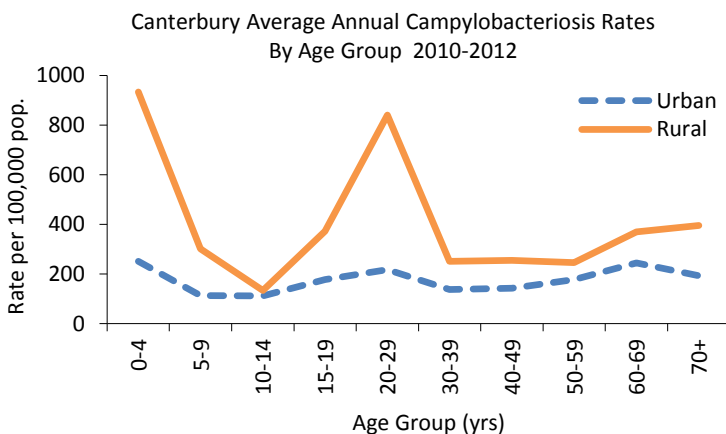


Figure 5. Average annual campylobacteriosis rates per 100,000 population by age group and urban/rural dwelling in District Health Boards as indicated, 2010 - 2012. Nelson Marlborough and West Coast rates not shown (see text above).





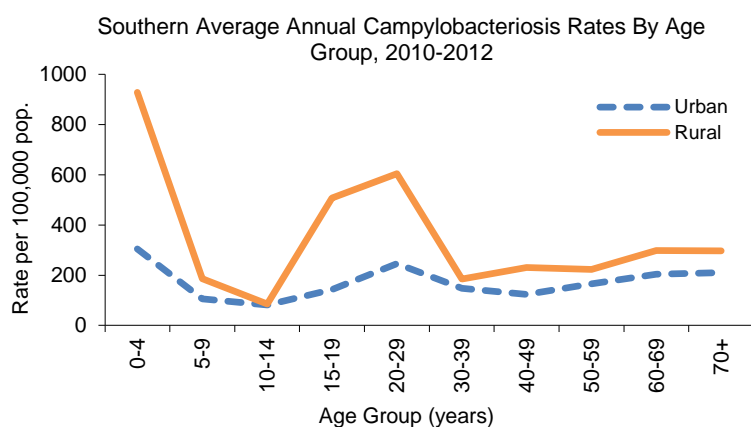
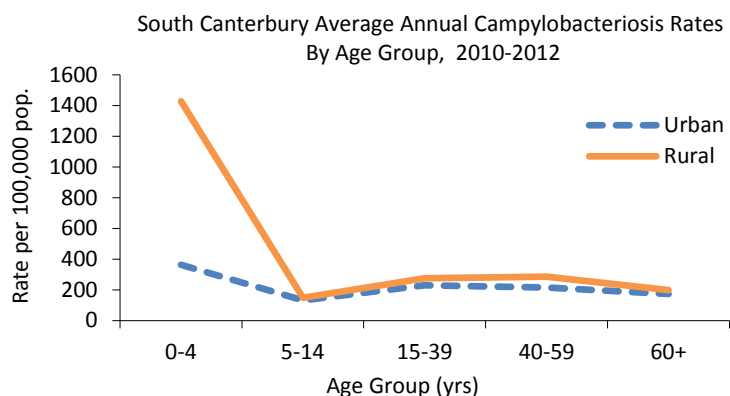


Table 4. Age and sex of campylobacteriosis notifications by District Health Board and Territorial Authority

DHB	TA	Age (yrs)			Sex (percentage of males)		
		Range	Average	Median			
<b>Nels- Marlborough</b>	Tasman District	0-94	36.4	36	<b>57.3%</b>		
	Nelson City	0-87	40.1	43.5			
	Marlborough District	0-89	39.7	38.5			
	<b>Total</b>	<b>0-94</b>	<b>38.8</b>	<b>39</b>			
<b>West Coast</b>	Buller District	1-76	33.7	27	<b>55.7%</b>		
	Grey District	0-83	32.5	31			
	Westland District	0-85	34.5	32.5			
	<b>Total</b>	<b>0-85</b>	<b>33.5</b>	<b>30</b>			
<b>Canterbury</b>	Kaikoura District	1-84	38.8	37	<b>58.3%</b>		
	Hurunui District	0-80	33.6	34			
	Waimakariri District	0-92	37.9	41			
	Christchurch City	0-95	38.3	36			
	Selwyn District	0-90	33.3	30			
	Ashburton District	0-92	32.0	25			
	<b>Total</b>	<b>0-95</b>	<b>36.7</b>	<b>34</b>			
<b>South Canterbury</b>	Timaru District	0-88	36.2	35.5	<b>59.6%</b>		
	Mackenzie District	0-88	38.2	46			
	Waimate District	0-87	29.8	26			
	<b>Total</b>	<b>0-88</b>	<b>35.2</b>	<b>34</b>			
<b>Southern</b>	Waitaki District	0-86	32.9	28	<b>57.9%</b>		
	Central Otago District	0-90	37.4	38			
	Queenstown-Lakes	0-91	35.0	32			
	Dunedin City	0-91	38.2	36			
	Clutha district	0-89	32	27			
	Southland District	0-89	31.3	26			
	Gore District	0-91	35.0	31			
	Invercargill City	0-90	38.1	33			
	<b>Total</b>	<b>0-91</b>	<b>35.6</b>	<b>31</b>			
	<b>Total</b>		<b>0-95</b>	<b>36.4</b>		<b>34</b>	<b>58.1%</b>

## ETHNICITY

Approximately 90% of campylobacteriosis cases were New Zealand European for all DHBs in the South Island, in contrast to 76% of the population generally. Campylobacteriosis rates were lower among Māori, varying from 3.8% in South Canterbury to 6.8% in West Coast. (Refer to the Statistics New Zealand ethnicity classification in the footnotes to Table 5.)

Table 5. Ethnicity of campylobacteriosis notifications in the South Island District Health Boards 2010 - 2012

DHB	Ethnicity					
	NZ Europ.	Māori	Pacific People	Asian	Other	Unknown
<b>Nels-Marlborough</b>	90.6%	4.6%	0.4%	1.5%	0.4%	2.4%
<b>West Coast</b>	89.1%	6.8%	0%	1.6%	0.5%	2.1%
<b>Canterbury</b>	89.1%	4.2%	0.8%	2.9%	0.8%	2.4%
<b>South Canterbury</b>	91.5%	3.8%	0.5%	1.4%	0.5%	1.6%
<b>Southern</b>	90.9%	5.2%	0.4%	1.7%	0.4%	1.3%
<b>Total</b>	<b>90.0%</b>	<b>4.6%</b>	<b>0.6%</b>	<b>2.2%</b>	<b>0.6%</b>	<b>2.0%</b>
<b>SI population*</b>	76.1% <sup>§</sup>	7.6%	1.8%	4.2%	14.4% <sup>§</sup>	2.9%

\* Ethnic Group includes all of the people who stated each ethnic group, whether as their only ethnic group or as one of several ethnic groups. Where a person reported more than one ethnic group, they have been counted in each applicable group. Therefore the numbers do not sum to 100%.

§ An updated standard for ethnicity statistics was developed in 2005 to standardise the way ethnicity information is collected and classified. 'New Zealander' responses were moved from the 'European' category to the 'Other Ethnicity' category. In the 2006 Census, 429,429 people gave New Zealander or a similar response to the ethnicity question. This represents 11.1 percent of the 3,860,163 people who usually reside in New Zealand and who gave valid answers to the ethnicity question in the census. "Other Ethnicity" includes responses for a number of small ethnic groups and for "New Zealander". For 2006, "New Zealander" responses made the largest contribution towards the "Other Ethnicity" category.<sup>6</sup>

## OCCUPATION

Of the 4057 campylobacteriosis cases aged 15-65 years, 853 (21.0%) did not provide their occupational information. A further 648 out of the remaining 3204 cases were not in the labour force, for example students, housewives and retired persons. The results in tables 6 and 7 were based on analysis of the 2551 campylobacteriosis cases that were in labour force.

The occupational groups with the highest campylobacteriosis incidence were dairy farmers/farm workers (7.3%) and other farmers/farm workers (7.3%), followed by meat boners and slicers/meat process workers (6.2%) (Table 6). In all DHB regions apart from the Nelson-Marlborough, farmers/farm workers and meat process workers had the greatest frequency of campylobacteriosis cases (Table 7).

Table 6. Cumulative number of South Island campylobacteriosis cases aged 15-65 years that were in labour force by occupation, 2010-2012 (only includes occupations accounting for more than 1% of the total)

Occupation	Frequency	Percent	Occupation	Frequency	Percent
Dairy Cattle Farmer/Farm Worker	187	7.3	Manager	46	1.8
Other Farmer/Farm Worker	185	7.3	Administrator	42	1.6
Meat Boners, Slicers, and Slaughterers/Meat Process Worker	159	6.2	Truck Driver	40	1.5

Table 6. continued

Occupation	Frequency	Percent	Occupation	Frequency	Percent
Teacher	95	3.7	Clerical and Office Support Worker	39	1.5
Sales Assistants and Salespersons	75	2.9	Nurse	34	1.3
Construction Trades Worker	58	2.3	Carers and Aides	33	1.3
Tourist	54	2.1	Design, Engineering, Science and Transport Professional	33	1.3
Food Preparation Assistant/Chef	54	2.1	Technicians and Trades Workers	27	1.0

Table 7. Cumulative number of campylobacteriosis cases aged 15-65 years that were in labour force by District Health Boards and occupation, 2010 - 2012 (only includes occupations accounting for more than 1% of the total)

<b>Nelson Marlborough</b>					
Occupation	Frequency	Percent	Occupation	Frequency	Percent
Sales Assistants and Salespersons	15	4.3	Design, Engineering, Science and Transport Professional	7	2.0
Other Farmer/Farm Worker	13	3.7	Nurse	7	2.0
Teacher	12	3.4	Sickness Beneficiary	7	2.0
Construction Trades Worker	11	3.1	Truck Driver	7	2.0
Winery Worker	11	3.1	Manager	6	1.7
Clerical and Office Support Worker	10	2.8	Administrator	4	1.1
Carers and Aides	9	2.6	Invalid Beneficiary	4	1.1
Tourist	9	2.6	Legal Professional	4	1.1
Food Preparation Assistant/Chef	8	2.3	Painting Trades Worker	4	1.1
<b>West Coast</b>					
Occupation	Frequency	Percent	Occupation	Frequency	Percent
Other Farmer/Farm Worker	10	11.9	Food Preparation Assistant/Chef	4	4.8
Dairy Cattle Farmer/Farm Worker	8	9.5	Truck Driver	3	3.6
Meat Boners and Slicers, and Slaughterers/Meat Process Worker	6	7.1	Teacher	3	3.6
Miner	5	6.0	Administrator	2	2.4
Nurse	4	4.8	Manager	2	2.4
Sales Assistants and Salespersons	4	4.8	Technicians and Trades Workers	2	2.4
<b>Canterbury</b>					
Occupation	Frequency	Percent	Occupation	Frequency	Percent
Dairy Cattle Farmer/Farm Worker	85	7.5	Food Preparation Assistant/Chef	23	2.0
Other Farmer/Farm Worker	73	6.5	Truck Driver	21	1.9
Teacher	49	4.4	Clerical and Office Support Worker	18	1.6
Sales Assistants and Salespersons	34	3.0	Design, Engineering, Science and Transport Professional	18	1.6
Construction Trades Worker	29	2.6	Technicians and Trades Workers	16	1.4
Administrator	27	2.4	Nurse	14	1.2
Manager	26	2.3	Carers and Aides	11	1.0

Meat Boners and Slicers, and Slaughterers/Meat Process Worker	26	2.3	Tourist	11	1.0
---	----	-----	---------	----	-----

Table 7. continued

**South Canterbury**

Occupation	Frequency	Percent	Occupation	Frequency	Percent
Meat Boners, Slicers, and Slaughterers/Meat Process Worker	35	18.2	Stock Truck Driver	4	2.1
Dairy Cattle Farmer/Farm Worker	24	12.5	Food Preparation Assistant/Chef	3	1.6
Other Farmer/Farm Worker	15	7.8	Invalid Beneficiary	3	1.6
Teacher	5	2.6	Manager	3	1.6
Carers and Aides	4	2.1	Nurse	3	1.6
Sickness Beneficiary	4	2.1	Sales Assistants and Salespersons	3	1.6

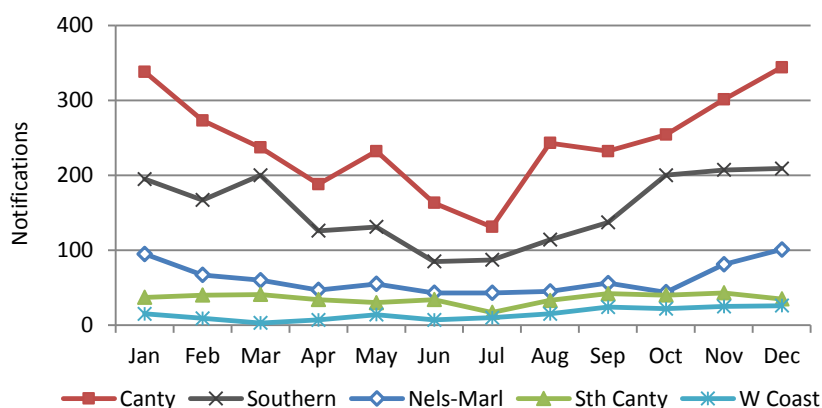
**Southern**

Occupation	Frequency	Percent	Occupation	Frequency	Percent
Meat Boners, Slicers, and Slaughterers/Meat Process Worker	92	11.5	Carers and Aides	14	1.8
Other Farmer/Farm Worker	74	9.3	Clerical and Office Support Worker	12	1.5
Dairy Cattle Farmer/Farm Worker	67	8.4	Nurse	10	1.3
Tourist	34	4.3	Administrator	9	1.1
Teacher	22	2.8	Manager	9	1.1
Sales Assistants and Salespersons	19	2.4	Plumber (General)	9	1.1
Construction Trades Worker	16	2.0	Truck Driver	9	1.1
Food Preparation Assistant/Chef	16	2.0			

**SEASONALITY**

Notifications in Canterbury, Southern and to a lesser extent Nelson-Marlborough showed seasonality with a summer peak and winter trough, consistent with the pattern observed nationally<sup>7</sup>(Fig. 6).

Figure 6. South Island campylobacteriosis notifications by DHB and month: 2010-2012 averages

**RISK FACTORS**

The following five risk factors were analysed: contact with farm animals, drinking untreated water, exposure to another symptomatic person, recreational water contact and recent overseas travel. However, for all risk factors there was a considerable amount of data unknown varying from 39.6% for being overseas during the incubation time to 52% for drinking untreated water.

West Coast and South Canterbury had the highest percentage of notified cases who had had contact with farm animals (40% and 38% respectively) (Fig. 7). West Coast also had the highest percentages of cases associated with the consumption of untreated water (28%) and contact with other symptomatic persons (13%).

Campylobacteriosis cases in rural areas had higher exposure rates to risk factors than those in urban areas (Fig. 8). The percentage with farm animal contact in rural areas was three times that of urban areas in Nelson-Marlborough and Canterbury, and twice the urban rate in South Canterbury. The percentages of notifications associated with drinking untreated water in rural areas were 2-5 times that of urban areas across all the DHBs. No significant differences in recreational water contact and overseas travel during the incubation time were seen between urban and rural notifications.

Figure 7. Risk exposures for campylobacteriosis notifications by District Health Board

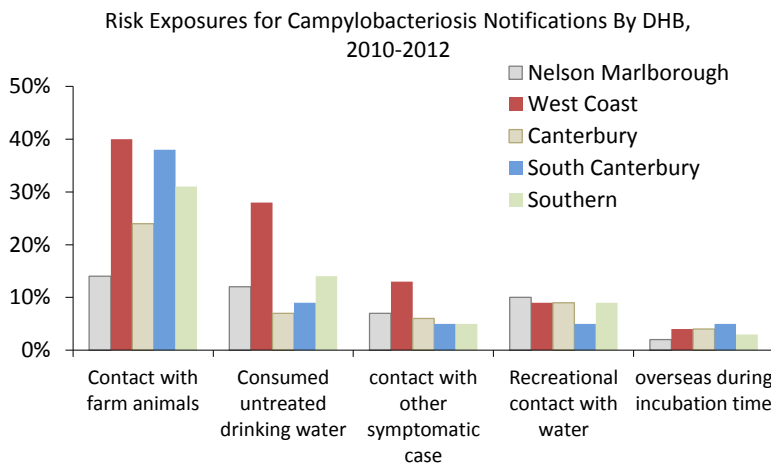
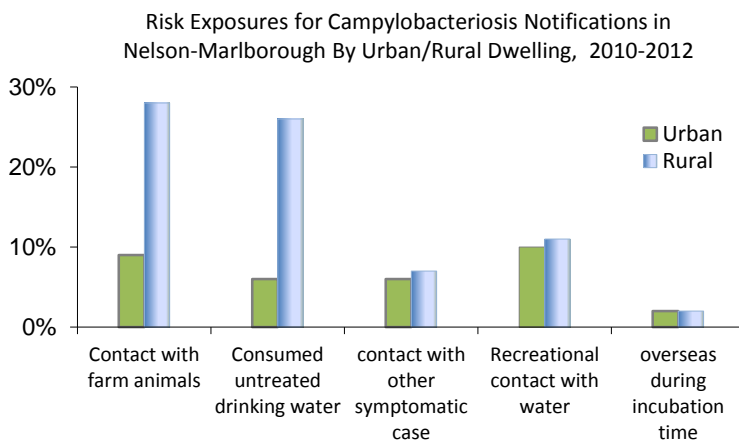
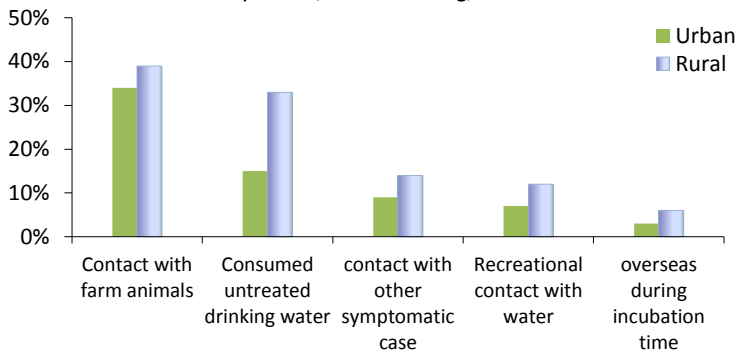


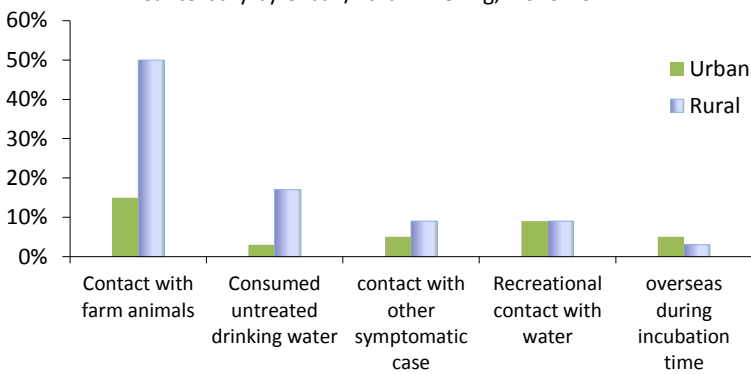
Figure 8. Risk exposures for campylobacteriosis notifications by urban/rural dwellings for each District Health Board



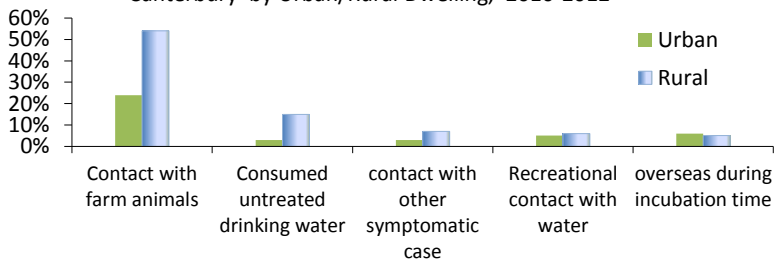
Exposures for Campylobacteriosis Notifications in West Coast by Urban/Rural Dwelling, 2010-2012



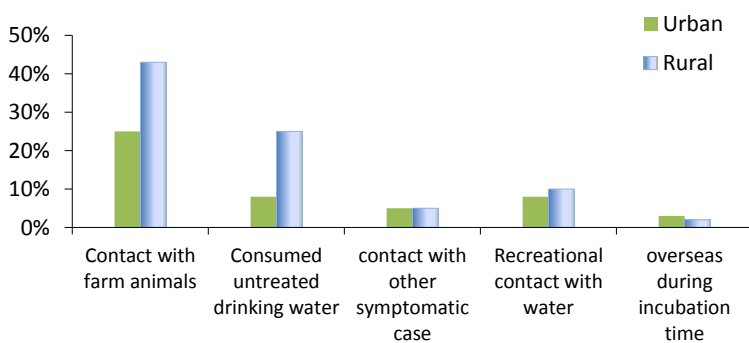
Risk Exposures for Campylobacteriosis Notifications in Canterbury by Urban/Rural Dwelling, 2010-2012



Exposures for Campylobacteriosis Notifications in South Canterbury by Urban/Rural Dwelling, 2010-2012



Exposures for Campylobacteriosis Notifications in Southern by Urban/Rural Dwelling, 2010-2012



## OUTBREAKS

An outbreak was defined as two or more related cases although not all DHBs recorded familial clusters as outbreaks in EpiSurv. A review of the C&PH entries identified 31 familial clusters of two cases and one of three that were not recorded as outbreaks, South Canterbury had five clusters of two cases that weren't recorded and West Coast had one. These events have been included in the analysis shown in Table 8. It is likely that under-reporting also occurred nationally as there were only 89 campylobacteriosis outbreaks with 509 cases documented for 2010-2012.<sup>8</sup>

In the South Island there were 54 outbreaks of campylobacteriosis reported (Table 8). With one notable exception, all outbreaks involved less than 10 persons and most occurred in the domestic setting. In New Zealand households are recognised as the commonest setting for outbreaks generally.<sup>9</sup>

The largest outbreak occurred in Darfield, Canterbury in August 2012 when 138 persons developed a gastrointestinal illness that was either laboratory confirmed (29) campylobacteriosis or met the case definition (109).<sup>10</sup> After the pump failed in the town's deep bore, the supply had been accessed from a shallow infiltration gallery adjacent to the Waimakariri river and a multi-barrier approach to ensure water quality had not been implemented. Investigation indicated that the most likely explanation for the cause of the outbreak was contamination of the water supply by pasture effluent following heavy rainfall in the area.

Table 8. Campylobacteriosis outbreak characteristics by District Health Board, 2010-2012

Outbreak characteristics	Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern
No. of outbreaks	1	1	36	5	10
Total no. of cases	2	4	214	10	41
Average no. of cases		3	5.9	2	4.1
Median		3	2	2	3
Range		2-4	2-138	2	2-9
<b>No. of outbreaks with ≥ 4 cases</b>	0	1	5	0	4
<b>Risk exposures</b>					
Water		1	1		3 <sup>§</sup>
Food			1		1 <sup>§</sup>
Raw milk					1 <sup>§</sup>
Person to person			2 <sup>§</sup>		2 <sup>§</sup>
Environment			2 <sup>§</sup>		1 <sup>§</sup>
Animals			1 <sup>§</sup>		1 <sup>§</sup>

§ one or more other risk factors also implicated

## DISCUSSION

Missing information from the non-return and incompleteness of questionnaires from notified cases may have biased results in this descriptive analysis. At C&PH (and possibly other DHBs) information from the campylobacteriosis questionnaire is not pursued for most notifications once the pamphlet and questionnaire are posted. For 2010-2012, approximately 31% of questionnaires were not returned in Canterbury. As a consequence, C&PH are considering developing an online questionnaire for self-completion to try and improve the return rate.

With respect to the incompleteness of data the highest percentage of unknowns was for risk factors. This varied from 39.6% for recent overseas travel to 52% for drinking untreated water. Twenty-four percent of occupations were unknown for cases aged 15-65 years and 7.6% of urban rural classifications were missing. On the other hand, data on ethnicity was almost complete with only 2% unknown. Geocoding issues may be

able to be addressed by ESR but for other missing data it may be necessary to review the way the information is collected.

Another potential inaccuracy in the analyses resulted from the use of the 2006 Census populations and urban/rural classifications because of the unavailability of the 2011 Census data.

It would appear that the higher rate of exposure to risk factors of rural cases contributed to an amplification of the higher rates known to occur in young children and young adults.<sup>11</sup> The reason for the higher incidence in these age groups is unknown.<sup>12</sup> The possibility of increased transmission within rural households was not able to be explored.

The decrease in rates seen in 2006-2008 coincided with a strategy to reduce the burden of *Campylobacter* in processed poultry. In New Zealand generally this decrease has been maintained but not in the South Island where every DHB has shown an upward trend in notifications. One possibility for the rise may have been an increase in the microbiological contamination of product in the secondary poultry processing industry at the same time as the market has been requiring fresh as opposed to frozen product. The dramatic increase in dairying in the South Island in recent years with its associated increase in exposure to campylobacteriosis risk factors may also have contributed to the increase.

The reporting of small outbreaks in domestic settings was problematic. In C&PH these household outbreaks were not reported as such but were able to be identified by a search of the personal data fields. It is not known to what extent there was under-reporting of these incidents in other DHBs. Application of the definition of a household outbreak<sup>9</sup> with appropriate coding whether or not the lengthy outbreak report was completed would at least enable incidence to be identified from EpiSurv and allow for further analysis.

## REFERENCES

1. EpiSurv is the national notifiable disease surveillance database operated by Environmental Science & Research on behalf of the Ministry of Health.
2. Defining urban and rural New Zealand. Statistics New Zealand [cited 11 September 2013] available at: [http://www.stats.govt.nz/browse\\_for\\_stats/people\\_and\\_communities/Geographic-areas/urban-rural-profile/defining-urban-rural-nz.aspx](http://www.stats.govt.nz/browse_for_stats/people_and_communities/Geographic-areas/urban-rural-profile/defining-urban-rural-nz.aspx)
3. Campylobacter enteritis. Control of communicable diseases manual. DL Heymann editor. 19<sup>th</sup> edition. An official report of the American Public Health Association, 2008.
4. Gilpin BJ, Walsh G, On S, Smith D, Marshall J, French N (2012) Application of molecular epidemiology to understanding campylobacteriosis in the Canterbury region of New Zealand. *Epidemiology & Infection*. 21:1-14
5. Sears A, Baker MG, Wilson N, Marshall J, Muellner P, Campbell DM, et al. Marked campylobacteriosis decline after interventions aimed at poultry, New Zealand. *Emerg Infect Dis* [serial on the Internet]. 2011 Jun [date cited 8 Aug 2013].
6. Statistics New Zealand 2009. Profile of New Zealander Responses, Ethnicity Question: 2006 Census. Available: <http://www.stats.govt.nz/~media/Statistics/Census/2006-reports/profile-of-nz-census-2006.pdf>
7. ESR Notifiable and Other Diseases In New Zealand: Annual Report 2012, page 25 [cited 31 July 2013] available at: [http://www.surv.esr.cri.nz/PDF\\_surveillance/AnnualRpt/AnnualSurv/2012/2012AnnualSurvRpt.pdf](http://www.surv.esr.cri.nz/PDF_surveillance/AnnualRpt/AnnualSurv/2012/2012AnnualSurvRpt.pdf)
8. ESR Notifiable and Other Diseases in New Zealand: Annual Report 2010, 2011, 2012 [cited 31 July 2013] available at: [http://www.surv.esr.cri.nz/PDF\\_surveillance/AnnualRpt/AnnualSurv/2010/2010AnnualSurvRpt.pdf](http://www.surv.esr.cri.nz/PDF_surveillance/AnnualRpt/AnnualSurv/2010/2010AnnualSurvRpt.pdf)  
[http://www.surv.esr.cri.nz/PDF\\_surveillance/AnnualRpt/AnnualSurv/2011/2011AnnualSurvRpt.pdf](http://www.surv.esr.cri.nz/PDF_surveillance/AnnualRpt/AnnualSurv/2011/2011AnnualSurvRpt.pdf)  
[http://www.surv.esr.cri.nz/PDF\\_surveillance/AnnualRpt/AnnualSurv/2012/2012AnnualSurvRpt.pdf](http://www.surv.esr.cri.nz/PDF_surveillance/AnnualRpt/AnnualSurv/2012/2012AnnualSurvRpt.pdf)
9. Guidelines for Investigating Communicable Disease Outbreaks. Porirua: Institute of Environmental Science & Research Limited; Updated 2011.
10. Bartholomew N, Mitchell P, Ball R and Williamson J. An outbreak of waterborne gastroenteritis in Darfield, Canterbury, July to August 2012. *New Zealand Public Health Report* December 2012, Volume 10, Issue 4, p 6-7, 2012.



11. Allos BM, Blaser MJ. *Campylobacter jejuni* and related species. Chapter 216 in Mandell, Douglas and Bennett's Principles and practice of infectious diseases, 7<sup>th</sup> edition, 2012, p. 2795.S
12. Allos B M, Microbiology, pathogenesis, and epidemiology of Campylobacter infection. Update [cited 9/09/2013] Available at <http://www.uptodate.com/contents/microbiology-pathogenesis-and-epidemiology-of-campylobacter-infection>