Department of **Health**
Government of **Western Australia**

OzFoodNet—Enhancing Foodborne Disease Surveillance Across Australia Annual Report 2006 Western Australia

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Summary

Notification rates for enteric diseases in WA in 2006 were consistent with rates seen in previous years. *Campylobacter*, *Salmonella* and *Giardia* infection were the most commonly notified enteric diseases in 2006. The demographic characteristics of notifications were similar to previous years, with no significant differences in notification rates by sex (with the exception of *Campylobacter*), higher notification rates for young children and higher notification rates in the Kimberley region of WA.

Notification rates for the majority of enteric infections were at least ten times higher for Aboriginal people as compared to non-Aboriginal people. Indigenous status was recorded for 70% of the enteric notifications. The Aboriginal population was 3.6% of the total population of WA in 2006, but accounted for 17% of enteric disease notifications. The greatest difference in notification rates was for *Shigella* infections, for which the notification rate was 63 times greater for the Aboriginal population as compared to the non-Aboriginal population.

Mandatory notification of rotavirus infection was introduced in July 2006. There were 151 rotavirus notifications in 2006, which placed it as the fifth most commonly notified enteric infection in WA. The distribution of rotavirus notifications by age, sex and geography was similar to other enteric infections. The rotavirus notification rate for Aboriginal people was much lower than notification rates of other enteric infections in Aboriginal people.

Mandatory laboratory notification for all notifiable diseases was introduced in July 2006. This resulted in a 3 to 4% increase in notification rates for *Campylobacter* and *Giardia* infection in 2006, with no observable effect for the other major enteric pathogens.

A data linkage project examining the use of other health information sources to reduce the amount of missing information on Aboriginality was carried out using 2004 data. Missing Aboriginality information was reduced from a starting point of 49% to 7.1%. This study showed that using only the original notification information on Aboriginality resulted in an overestimation of the rate of enteric infections in Aboriginal as compared to non-Aboriginal populations. The greatest overestimation of the rate ratio was for *Campylobacter* infection. The rate ratio for *Campylobacter* notifications in Aboriginal people as compared to non-Aboriginal people was 35% higher using the original notification information than the more accurate estimate obtained through data linkage.

The number of gastroenteritis outbreaks reported to the WA Department of Health in 2006 was 2.3 times the number reported in 2005. The majority of these outbreaks appeared to be

due to person-to-person transmission, occurred in aged care facilities and were due to norovirus infection.

There were six new foodborne or suspected foodborne outbreaks in 2006, and one outbreak that continued from 2005 to 2006. Two outbreaks of salmonellosis were caused by contaminated fresh produce. A *Salmonella* Oranienburg outbreak that continued from November 2005 until April 2006 was caused by contaminated alfalfa sprouts, and a *Salmonella* Litchfield outbreak was caused by contaminated paw paws. Although investigation of these outbreaks did not identify the cause of the contamination of these products, on farm production practices were thought to be possible sources. In the case of the alfalfa sprouts, the seeds used for sprouting came from farms where animals had been grazing, with possible contamination of seeds from animal manure. The paw paws were washed with untreated river water that was found to be contaminated with a variety of *Salmonella* species.

A cluster of three cases of *Listeria monocytogenes* infection was associated with one hospital. It was found that small goods served on the hospital menu were from a company that had products with low level listeria contamination. The listeria isolates from the cases and from the small good products were genetically indistinguishable, suggesting that the small goods were a likely source of the infections.

Recommendations

It is recommended that:

- The cause of higher enteric disease notification rates for Aboriginal people be further investigated with the aim of reducing these infection rates

- Production practices for fruit and vegetables that are eaten without cooking be reviewed.

- Patients considered to be at a greater risk of acquiring listeria infection should be:
  1. made aware of the need to adopt a diet that is low risk for listeria
  2. placed on a diet that is low risk for listeria when in hospital

- Microbiological guidelines for listeria levels in food eaten without cooking be reviewed.

1.0 Introduction

Western Australia is divided into two metropolitan – North and South - and seven non-metropolitan population health regions – Kimberley, Pilbara, Midwest and Gascoyne, Wheatbelt, Goldfields, SouthWest, and Great Southern (Figure 1). Prior to July 2006 the Gascoyne Region was grouped with the Pilbara region.

Each region is administered by a Population Health Unit (PHU) responsible for public health activities, including communicable disease control. Disease control activities for the metropolitan area are administered by the Communicable Disease Control Directorate (CDCD) in collaboration with the two metropolitan population health units. The CDCD also maintains and coordinates the notifiable disease surveillance system and provides specialist clinical, public health and epidemiological advice to all PHUs. The West Australian notifiable diseases surveillance system relies on the mandatory reporting by doctors of the 17 notifiable enteric diseases. Prior to 2000, notifications were purely doctor-based. An informal agreement was made between some laboratories and the Department of Health (DOH) to provide laboratory notification at the beginning of 2000. Mandatory laboratory reporting introduced in July 2006 meant that after this date notifications were received from all private and public pathology providers in WA. The inclusion of laboratory data from the beginning of 2000 and introduction of mandatory laboratory notification in July 2006 introduces a bias to both West Australian and national data when comparing data with previous years. The notification data now reflect actual incidence more closely.

The OzFoodNet site in Perth Western Australia is responsible for the whole of WA - total population approximately 2.0 million. The mission of OzFoodNet is to enhance surveillance of foodborne illness and to conduct applied research into associated risk factors. A full-time epidemiologist coordinates activities in Western Australia, which are overseen by a coordinating national epidemiologist. Collaboration between states is facilitated by monthly teleconferences, quarterly face-to-face meetings, and through the informal network. This network also includes communication and consultation with Food Standards Australia New Zealand, the Commonwealth Department of Health and Ageing, the National Centre for Epidemiology and Population Health, the Communicable Diseases Network of Australia and the Public Health Laboratory Network.

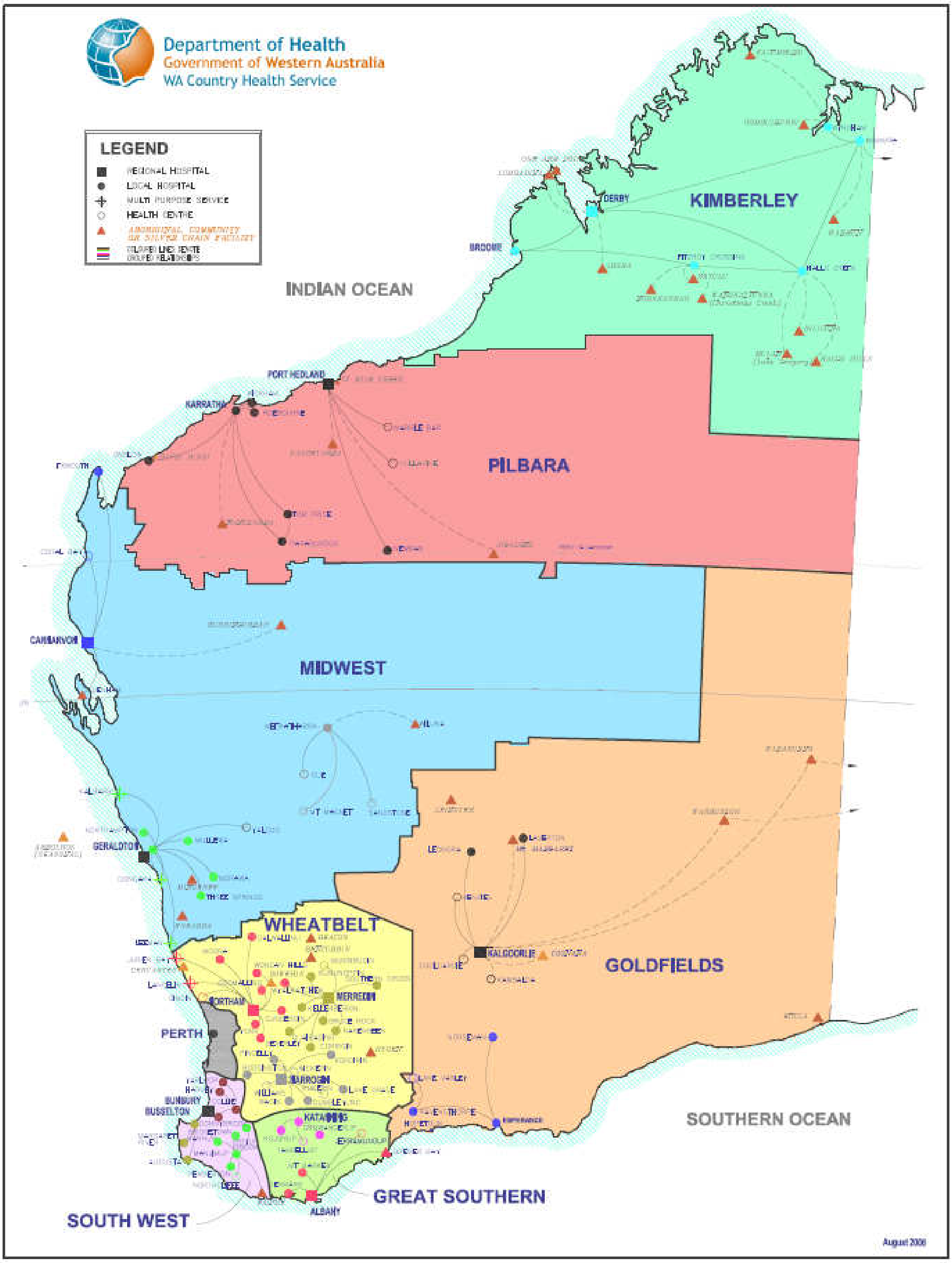


Figure 1: Map showing location of population health regions in Western Australia

The primary objectives of OzFoodNet nationally are to:

- Determine the frequency and burden of foodborne disease in Australia,
- Identify the causes and contributing factors to foodborne disease in Australia;
- Provide epidemiological information to inform prevention efforts, and
- Describe the epidemiology of new and emerging foodborne pathogens.

On a local level, the OzFoodNet epidemiologist regularly liaises with staff at the Food Unit of the Environmental Health Directorate of the Department of Health; the Food Hygiene, Diagnostic and Molecular Epidemiology laboratories at PathWest Laboratory Medicine; and regional and metropolitan PHUs.

This report summarises the surveillance and research activities of the West Australian OzFoodNet sentinel site for the year 2006.

2.0 Activity During Year

During 2006 the following activities were conducted at the West Australian OzFoodNet site:

- Ongoing surveillance of foodborne disease in Western Australia.

- Investigation of 81 non-foodborne outbreaks, 64 of which were in aged care facilities, eight in hospitals and nine in other settings.

- Cluster investigations into increased statewide notification rates for *Salmonella* Newport, *Salmonella* Adelaide, *Listeria monocytogenes*: cryptosporidiosis in a regional town, *Salmonella* Saintpaul in the north-west of Western Australia and Hepatitis A in metropolitan Perth.

- Ongoing investigation into an increase in *S*. Oranienburg notifications first reported in the WA OzFoodNet Annual Report 2005 (Anon, 2006a).

- Investigation of six foodborne or suspected foodborne outbreaks affecting at least 109 people, including a case control study to determine the source of a *Salmonella* Litchfield outbreak.

- OzFoodNet epidemiologist attendance at OzFoodNet face-to-face meetings in Melbourne in May and Brisbane in September.

- The OzFoodNet WA site hosted the December OzFoodNet face-to-face meeting in Fremantle.

- Intensive investigation of 13 cases of listeria infection, one case of paratyphoid fever, three cases of Shiga Toxin producing *E. coli* infection, 11 cases of typhoid fever, three cases of *Vibrio parahaemolyticus* and three locally acquired *Salmonell*a Enteritidis cases.

- Preparation of fortnightly cluster reports and quarterly reports.

- Supervision of Masters of Applied Epidemiology students undertaking outbreak investigation training.

- Participation in a national STEC case-control study

- An analysis of missing data on Aboriginality using data linkage

3.0 Incidence of Foodborne Disease

3.1 Background

3.1.1 Population under surveillance

Estimated resident population figures for Western Australia for calculation of notification and age-specific rates were obtained from the Rates Calculator version 9.1.5 designed by Dr. Jim Codde at the Health Information Centre of the Department of Health, Government of Western Australia. The Rates Calculator provides population estimates by age, sex, Aboriginality, year and area of residence, and is based on population figures calculated from the 2001 census. The estimated population for WA in 2006 was 2,036,426 persons.

3.1.2 *Data sources*

3.1.2.1 Rates of notified infections

Data for Western Australia were obtained from cases notified to the DOH, and maintained in the Western Australian Notifiable Infectious Diseases Database (WANIDD). Notifications received for campylobacteriosis, salmonellosis, giardiasis, cryptosporidiosis, rotavirus infection, shigellosis, hepatitis A infection, listeriosis, typhoid fever, amoebiasis, shiga-toxin producing *E. coli* (STEC) infection, *Vibrio parahaemolyticus* infection, yersiniosis, Hepatitis E infection, paratyphoid fever, cholera, Haemolytic Uraemic Syndrome (HUS) and botulism were exported to Microsoft® Excel 2002 and analysed by date of receipt of notification.

Data on *Salmonella* serotypes were obtained from PathWest Laboratory Medicine, the reference laboratory for *Salmonella* isolates in WA. Phage typing data were obtained from the Microbiological Diagnostic Unit, University of Melbourne, the Institute of Medical and Veterinary Science, the National Enteric Pathogens Surveillance Scheme and the Australian Salmonella Reference Laboratory.

Rotavirus infection became a notifiable disease in July 2006.

To compare current disease rates to historical totals, crude numbers and rates of notification for 2006 were compared to the mean values for the previous four years. Where available, numbers and rates of notification for specific sub-types of infecting organisms were compared to notifications for the previous year.

Age-specific rates were calculated for the major notified enteric diseases. This includes campylobacteriosis, salmonellosis, giardiasis, cryptosporidiosis, rotavirus infection, shigellosis, and hepatitis A infection. Rates were calculated by region, sex and Aboriginality.

This report acknowledges that Aboriginal and Torres Strait Islander people are the original people(s) of Australia. For the purposes of this report, however, the term 'Aboriginal' is used in preference to 'Aboriginal and Torres Strait Islander' in recognition that Aboriginal people are the original inhabitants of WA.

3.1.2 Limitations of the data

The number of notifications and crude notification rates reported here do not represent illness from foodborne sources exclusively, and include illness acquired through non-foodborne routes (eg. through contaminated water, person-to-person contact and direct animal contact).

As with other disease notification data, these data are limited to diagnosed and reported illnesses. The majority of foodborne illness is unreported and undiagnosed, so the rate of diseases reported here is an under-estimation of the true incidence of foodborne illness. This underestimation was calculated to range from a notification to disease ratio of 0.5 for severe illnesses to 0.07 for moderate illnesses (DOHA, 2005). Importantly, infections with some of the most common enteric pathogens are not notifiable in WA, particularly norovirus infection. These infectious organisms may be notified as the cause of outbreaks, but not individual cases of disease. Notification data are also inherently biased and require careful interpretation. These biases include certain population groups having a higher likelihood of being tested as well as variation in laboratory testing methods between States and Territories resulting in different levels of detection of disease. In addition to the above limitations, some of the numbers of disease reports are small, as are the underlying populations in some jurisdictions. This can make rates of notification unstable and meaningful interpretation difficult.

Another limitation of the data is that up until July 2006 laboratory notification was not a statutory requirement in WA. Prior to this only some of the laboratories notified the DOH, so laboratory notification data prior to July 2006 are incomplete. The effect of the introduction of mandatory laboratory notification on notifications rates in 2006 was examined and is described in Appendix 2. A small percentage (<5%) of notifications for diseases caused by *Campylobacter*, *Giardia* and *Cryptosporidium* in 2006 were from laboratories that previously would not have notified DOH. For these infections notifications for 2007 are expected to be approximately 10% above what would have occurred prior to the introduction of mandatory lab notification.

Incomplete information on Aboriginality means that in 2006 the percentage of notifications with missing data for Aboriginality ranged from 0% for Hepatitis A infection to 38% for rotavirus infection. A research project that used data linkage to provide missing data on Aboriginality for cases notified in 2004 is described in Appendix 3. Notification rates for both

Aboriginal and non-Aboriginal people increased as a result of the data linkage, with the increase being greater for non-Aboriginal people.

3.2 Overall Rates of Notified Infections

In 2006 there were 4224 notifications of enteric disease in Western Australia. This equated to a rate of 206 notifications per 100 000 population. This rate is similar to the mean of the previous four years, which was 202 per 100 000 population.

3.3 Campylobacteriosis

Campylobacter infection was the most commonly notified enteric infection in WA in 2006, with 2003 cases notified in 2006, giving a rate of 98.4 per 100 000 population (Appendix 1). The mean rate for the previous four years was 108.4 per 100 000 population.

The notification rates for *Campylobacter* infection varied throughout the year, ranging from 100 to 200 notifications per month, with notifications generally highest in the summer months (Figure 2).

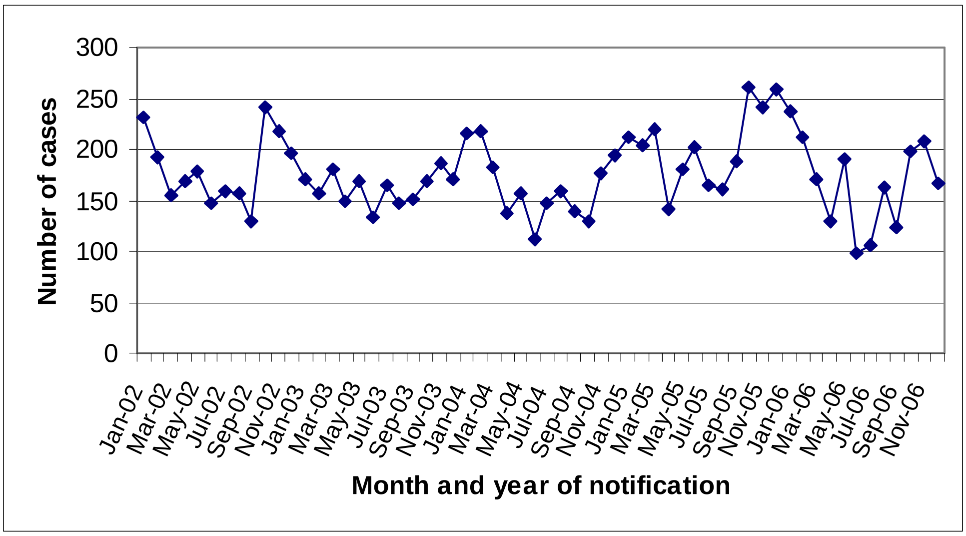


Figure 2: Number of cases of campylobacteriosis by month and year of notification, WA, 2002 – 2006

The notification rate for *Campylobacter* infection was higher for males than females in 2006, with rates of 106.1 and 90.6 per 100 000 population respectively. The difference is highly significant with a z test result of 3.53 (p<0.001). *Campylobacter* notification rates for males were also significantly higher than females for the previous four years, 2002 to 2005 (z = 3.39 to 5.95, p<0.001), as demonstrated in Figure 3.

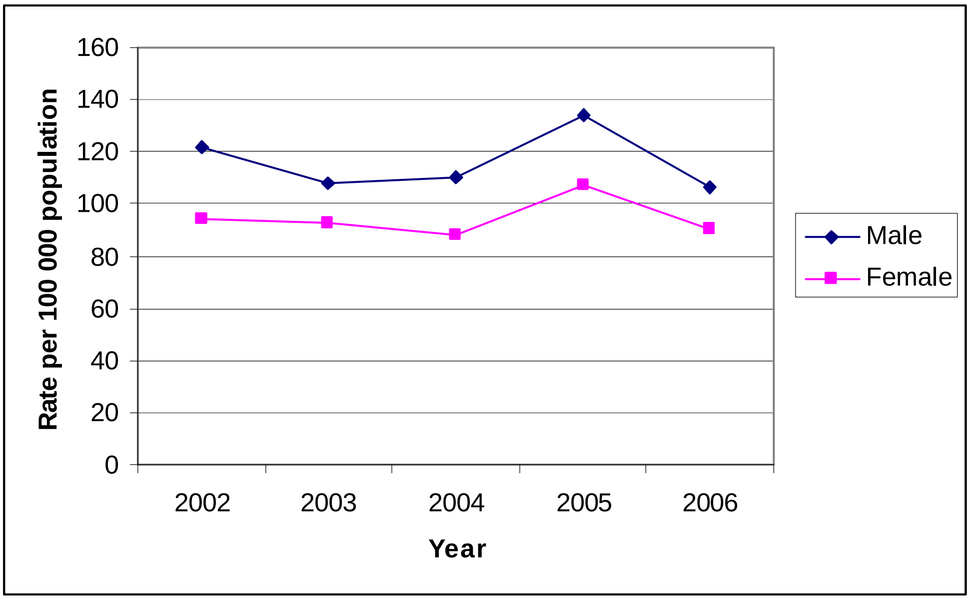


Figure 3: Campylobacter notification rates by sex, 2002 to 2006

Campylobacter notification rates were highest in the 0 to 4 age group with a rate of 189 per 100 000. However, compared to notifications for other enteric infections, *Campylobacter* notifications were relatively evenly spread through the different age groups (Figure 4).

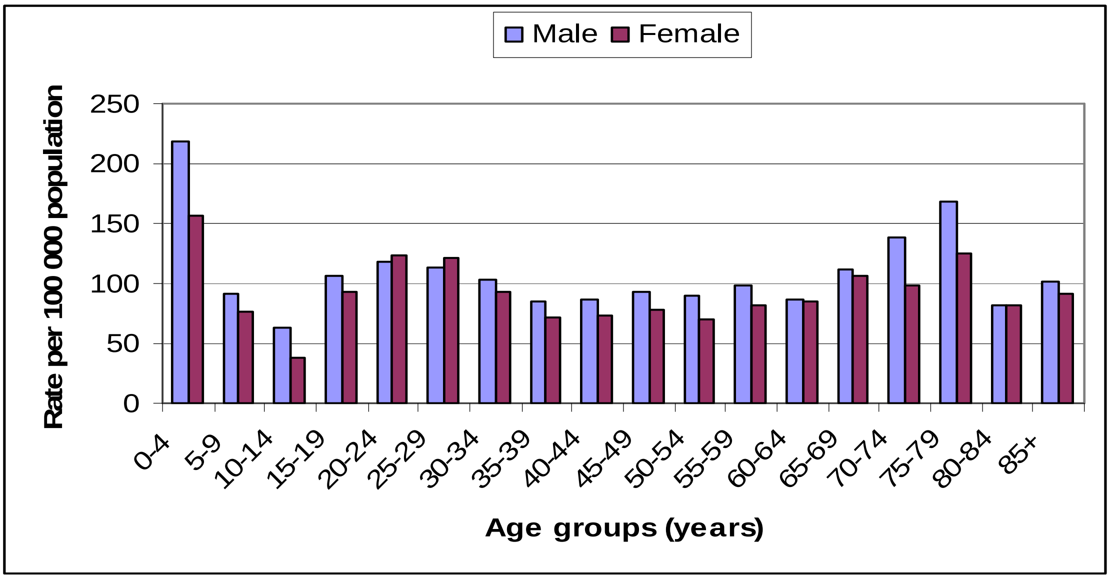


Figure 4: Age-specific notification rates of campylobacteriosis by sex, WA, 2006

Notification rates for Aboriginal and non-Aboriginal people were compared. Data on Aboriginality was missing for 34% of *Campylobacter* notifications in 2006. Overall notification rates were higher for Aboriginal people, with a rate of 96.1 per 100 000 population, compared to 63.3 per 100 000 population for non-aboriginal people. Rates for Aboriginal children were particularly high, with a rate of 579.8 per 100 000 for the 0-4 age group, compared to a rate of 95.1 for non-Aboriginal children in this age group. Although only 6% of children in the 0 to 4 age group were Aboriginal, they carried 29% of the burden of *Campylobacter* notifications for this age group.

Campylobacter notifications were highest in the Kimberley region of WA in 2006, with a notification rate of 158.7 per 100 000 population. The region with the next highest notification rate was the Goldfields, with a rate of 140.1. The Midwest had the lowest notification rate for *Campylobacter* with a rate of 58.9 per 100 000 population.

3.4 Salmonellosis

Salmonellosis was the second most commonly notified enteric infection in WA in 2006, with an overall notification rate of 39.7 per 100 000 population and 808 notified cases. This was similar to the notification rate for the previous year of 39.5 per 100 000 cases, and higher than the mean of the previous four years, of 35 per 100 000 cases (Appendix 1). Elevated notification rates in 2005 and 2006 were caused by outbreaks and increases in particular serotypes, which were investigated as clusters. An outbreak of *Salmonella* Oranienburg resulted in an increase in monthly *Salmonella* notifications from November 2005 to April 2006 (Figure 5), as described previously in the 2005 WA OzFoodNet Annual Report. Figure 5 shows that there was seasonal variation in *Salmonell*a notification rates over all of the five years, with rates elevated in the summer.

There was no significant difference between overall *Salmonella* notification rates for males (40.9) and females (38.4) in 2006 (z= 0.683, p=0.317). By age, the notification rate was highest in children under five years of age (167.7 per 100 000 population) (Figure 6). Information on Aboriginality was missing for 22% of notifications. *Salmonella* notification rates were higher for the Aboriginal population (130.5 per 100 000) as compared to the non-Aboriginal population (27.3 per 100 000). Once again, the difference in notification rates was most evident for children in the 0 to 4 age group. This group had a notification rate of 680.6 per 100 000 population, which was six times greater than the notification rate for non-Aboriginal children in this age group.

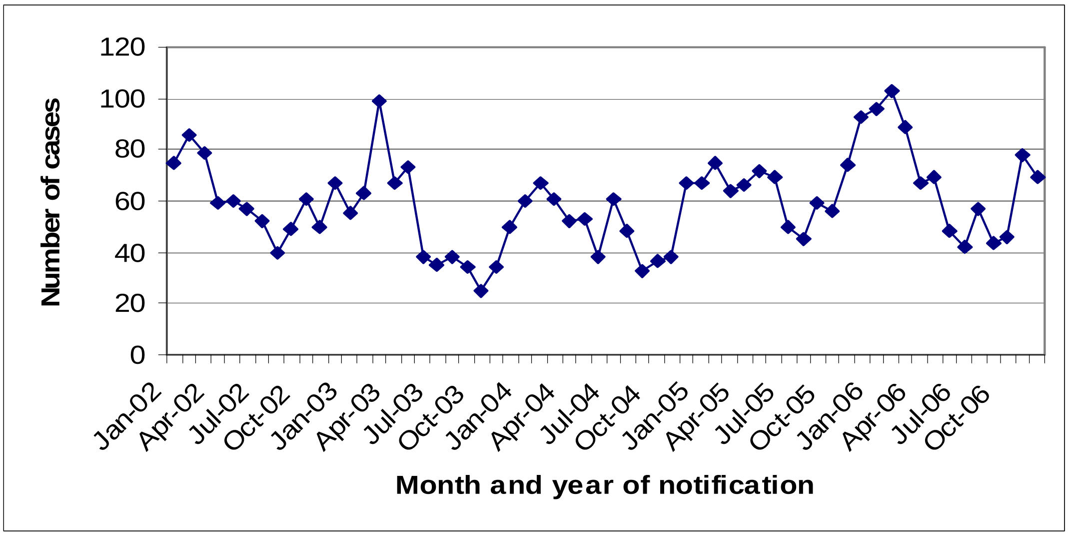


Figure 5: Number of cases of salmonellosis by month and year of notification, WA, 2002 –2006

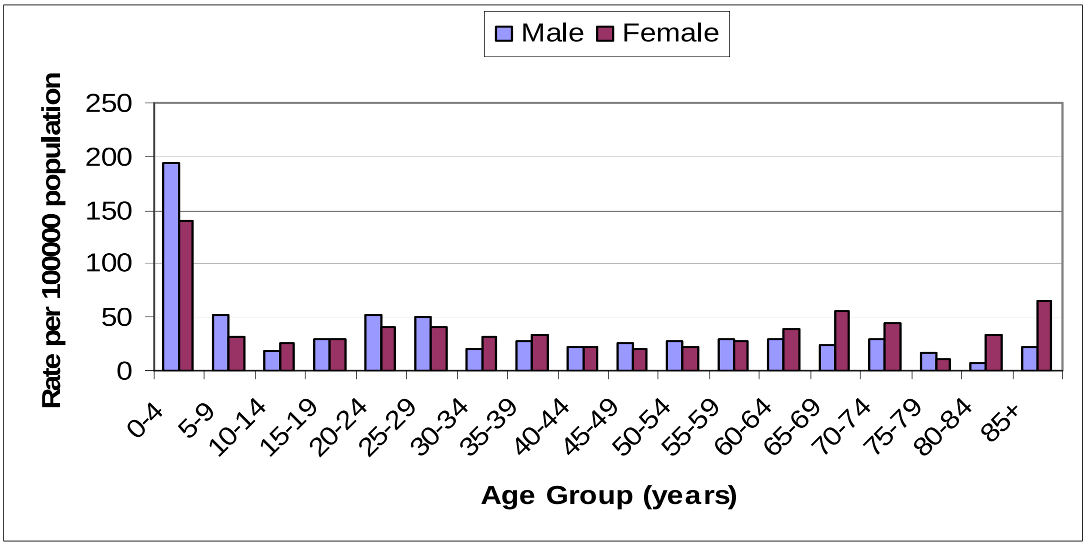


Figure 6: Age-specific notification rates of salmonellosis by sex, WA, 2006

The region with the highest notification rate for *Salmonella* was the Kimberley, with a rate of 191.6 per 100 000 population. Notification rates were 10 times greater in the Kimberley than for the Wheatbelt, the region with the lowest notification rate, and this was reflected in both the Aboriginal and non-Aboriginal population (267.1 and 124.0 per 100 000 population respectively in the Kimberley region, compared to 19.3 per 100 000 population for non-Aboriginal people in the Wheatbelt region and no notified cases for Aboriginal people). The area with the second highest notification rate was the Pilbara, with a rate of 163.1 per 1000 000 population.

The *Salmonella* serotype with the greatest number of notifications in 2006 was Salmonella *Oranienburg* (Table 1), which was attributable to a large outbreak that extended from November 2005 to April 2006. *Salmonella* Saintpaul, was the second most commonly notified serotype, and this was investigated as a cluster in the first half of 2006 (described in Section 5). *Salmonella* Typhimurium 135/135A continued to be a dominant serotype/phage type in WA. *Salmonella* Typhimurium 12 was the fourth most commonly notified phage type in 2006, and is a phage type that has emerged in WA in the last two years. Increases were also noted in S. Typhimurium UNTY and S. Litchfield, the latter which was investigated.

Table 1: Number and proportion of the top 10 serotypes or phage types of *Salmonella* infections notified in WA, 2006.

***Salmonella* type (serotype/phage type)**	**2006 n**	**Proportion %‡**	**Mean Number (2002-2005)**	**Ratio§**
Oranienburg	82	10.1	23.5	3.5
Saintpaul	60	7.4	37	1.6
Typhimurium 135/135A	54	6.7	76.8	0.7
Typhimurium 12	33	4.1	7.2	4.6
Muenchen	31	3.8	27.2	1.1
Chester	26	3.2	30.8	0.8
Typhimurium UNTY	25	3.1	7.2	3.4
Anatum	22	2.7	15	1.5
Enteritidis 6A	20	2.5	18.5	1.1
Litchfield	19	2.4	3.2	5.8

‡ Proportion of total *Salmonella* cases notified in 2006.

§ Ratio of the number of reported cases in 2006 compared to the four year mean of 2002 – 2005.

3.5 Giardiasis

Giardia was the third most commonly notified enteric infection in WA in 2006. There were 785 *Giardia* notifications in 2006, with a notification rate of 38.5 per 100 000 population (Appendix 1). This was slightly lower than the mean notification rate from 2002 to 2005 of 43.5 per 100 000. Notification rates were generally higher in the late summer months (Figure 7).

There was a significant difference between notification rates for males (42.0 per 100 000) and females (35.1 per 100 000) (z=2.53, p=0.009), however this difference was not reflected in rates for the previous four years notification rates were higher for males than females, but the difference was not significant. As described for other enteric infections, the highest notification rate was for the 0 to 4 age group, with a notification rate of 251.1 per 100 000 population. A secondary peak in adults in the 35 to 39 age group was also observed (Figure 8).

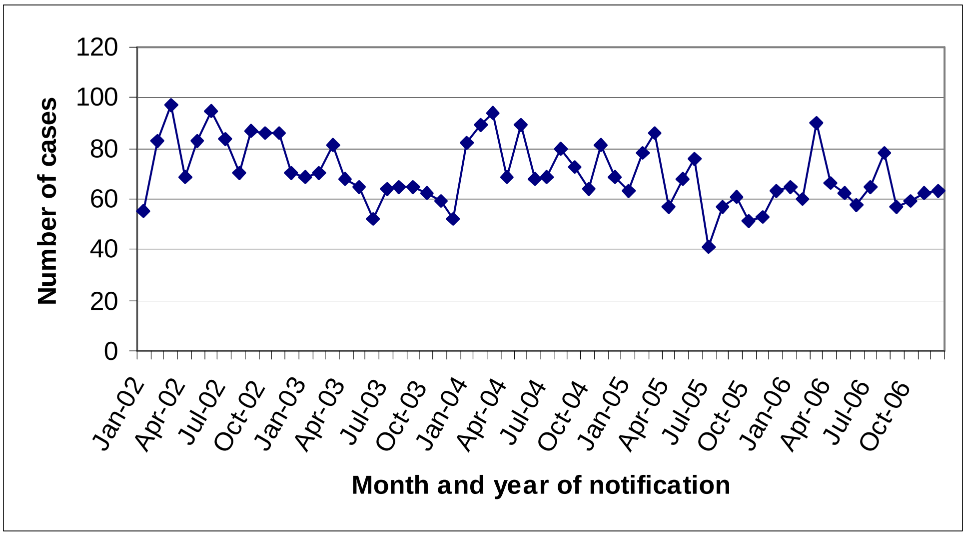


Figure 7: Number of cases of giardiasis by month and year of notification, WA, 2002 – 2006

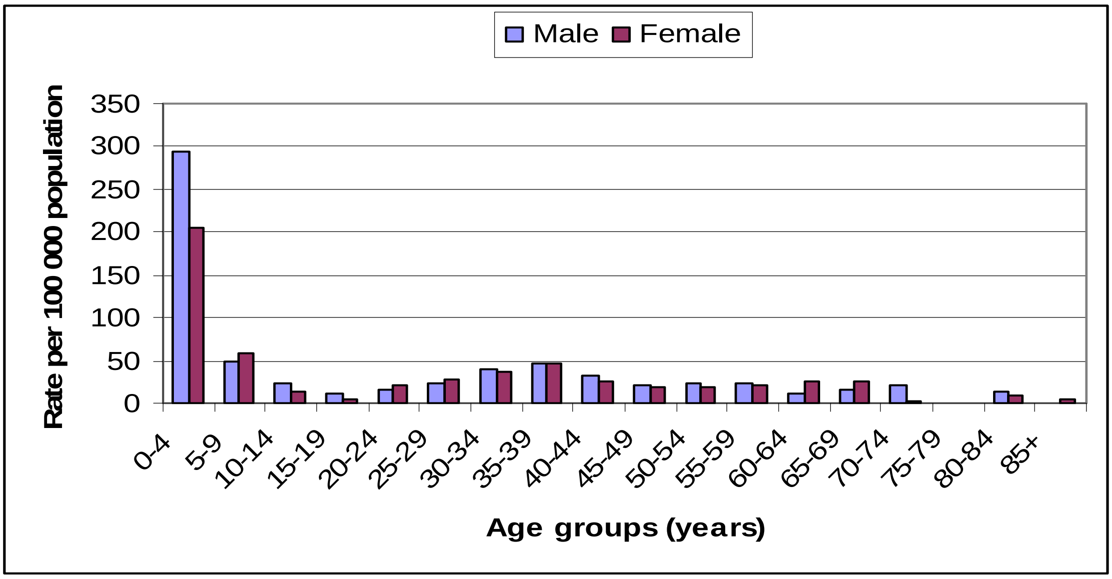


Figure 8: Age-specific notification rates of giardiasis by sex, WA, 2006

As described previously for other enteric infections, notification rates for *Giardia* were higher for Aboriginal people as compared to non-Aboriginal people (with 28% of notifications missing

Aboriginality data). The notification rate for Aboriginal people was 276.1 per 100 000 population, which was 15 times greater than the notification rate for non-Aboriginal people, of 18.6 per 100 000 population. Aboriginal children in the 0-4 age group had a notification rate of 2193 per 100 000 population, which means that 2.2 % of Aboriginal children in the 0-4 age group had a notified *Giardia* infection in 2006. The notification rate for Aboriginal children in the 0 to 4 age group was 28 times the notification rate of 78.1 per 100 000 population for non-Aboriginal children in this age group. The 6% of children in this age group who were Aboriginal therefore accounted for 68% of the *Giardia* notifications for this age group.

The region with the highest notification rate for *Giardia* infection was the Kimberley, with a rate of 333.9 notifications per 100 000 population. This rate was 13 times greater than the notification rate for the Metropolitan region, which had 26.4 notifications per 100 000 population. Notification rates were high for both Aboriginal and non-Aboriginal people in the Kimberley. The notification rate for the Pilbara region was the second highest, with a rate of 231.9 per 100 000 population.

3.6 Cryptosporidiosis

In 2006 there were 228 notified cases of cryptosporidiosis which equated to a rate of 11.2 per 100 000 population. *Cryptosporidium* notification rates in 2006 were similar to three of the previous four years, with the exception of 2003, where a large outbreak of cryptosporidiosis resulted in a doubling of the notification rate (Figure 9). Notification rates were higher in the late summer than at other times of the year.

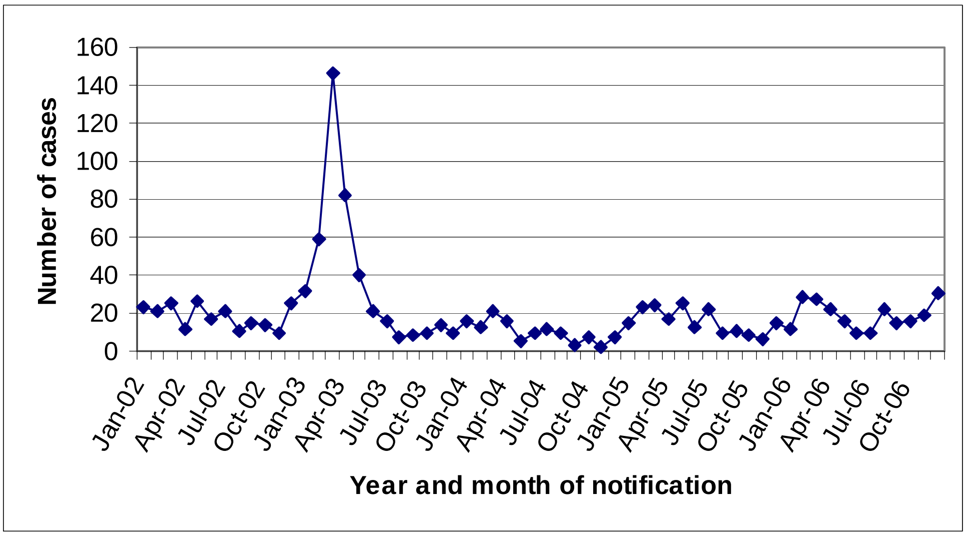


Figure 9: Number of cases of cryptosporidiosis by month and year of notification, WA, 2002 – 2006

There was no significant difference between *Cryptosporidium* notification rates for males and females (z=1.03, p=0.317). The rate for males was 11.95 and for females 10.43 per 100 000 population. The notification rate was highest for children in the 0-4 age group, with a rate of 75.3 notifications per 100 000 population (Figure 10). Cryptosporidiosis notifications were higher for Aboriginal people than non-Aboriginal people, with notification rates of 78.3 and 6.2 per 100 000 population respectively. Twenty-two percent of notifications were missing information on Aboriginality. Aboriginal children in the 0-4 age group had a notification rate of 642.8 per 100 000, which was 27 times greater than the notification rate for non-Aboriginal children in this age group of 23.4 per 100 000 population. Of the 178 notifications for which Aboriginality was identified in 2006, 51 were for Aboriginal children in the 0-4 age group. Therefore 0.4% of the total population, that is Aboriginal children in this age group, accounted for 28.6% of the total *Cryptosporidium* notifications in WA in 2006. As described for other enteric infections, the region with the highest notification rate was the Kimberley, with 128.6 notifications per 100 000 population. Notification rates were higher in the Kimberley than other regions for both Aboriginal and non-Aboriginal people. The Pilbara had the second highest notification rate, with 53.5 notifications per 100 000 population, and the notification rate was lowest in the Metropolitan region, with a rate of 5.8 per 100 000 population.

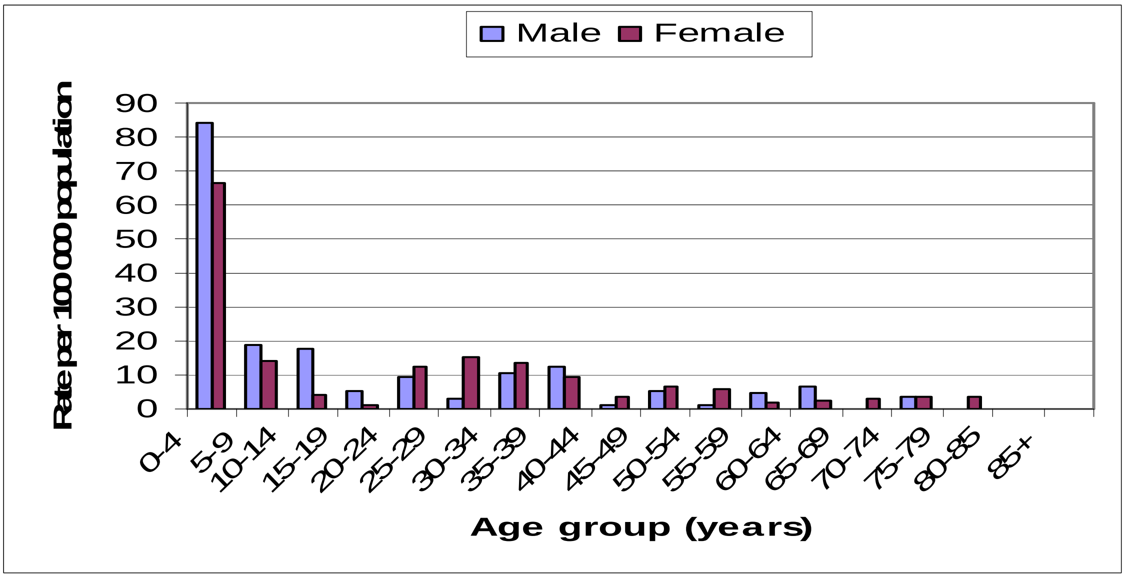


Figure 10: Age-specific notification rates of cryptosporidiosis by sex, WA, 2006

3.7 Rotavirus Infection

Notification of rotavirus infection became a statutory requirement in WA in July 2006. Crude notification rates for 2006 were therefore based on only six months of data. Figure 1 shows that there may have been a delay in laboratories and doctors commencing notification, with the first notifications received in the middle of August. From August to December 151 rotavirus notifications were received. The notification rate for males was 7.8 per 100 000 population and for females 7.0 per 100 000. These rates were not significantly different (z=0.786, p=0.424). As with other enteric infections, the highest notification rate was for the 0 to 4 age group, with a notification rate of 91.1 per 100 000 population, and with this age group accounting for 77% of rotavirus notifications (Figure 12).

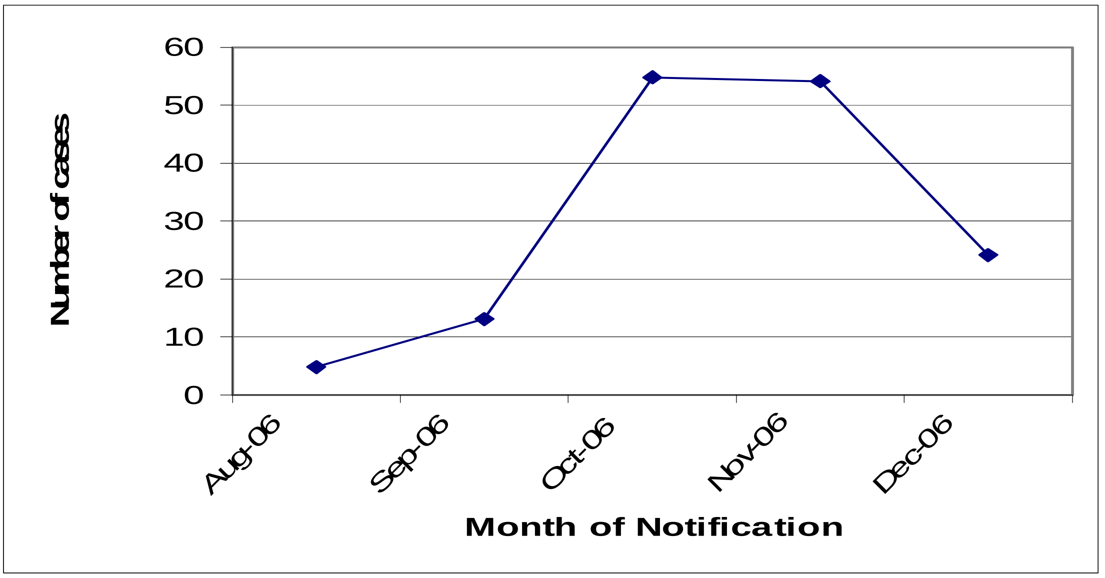


Figure 11: Number of cases of rotavirus by month of notification, WA, 2006

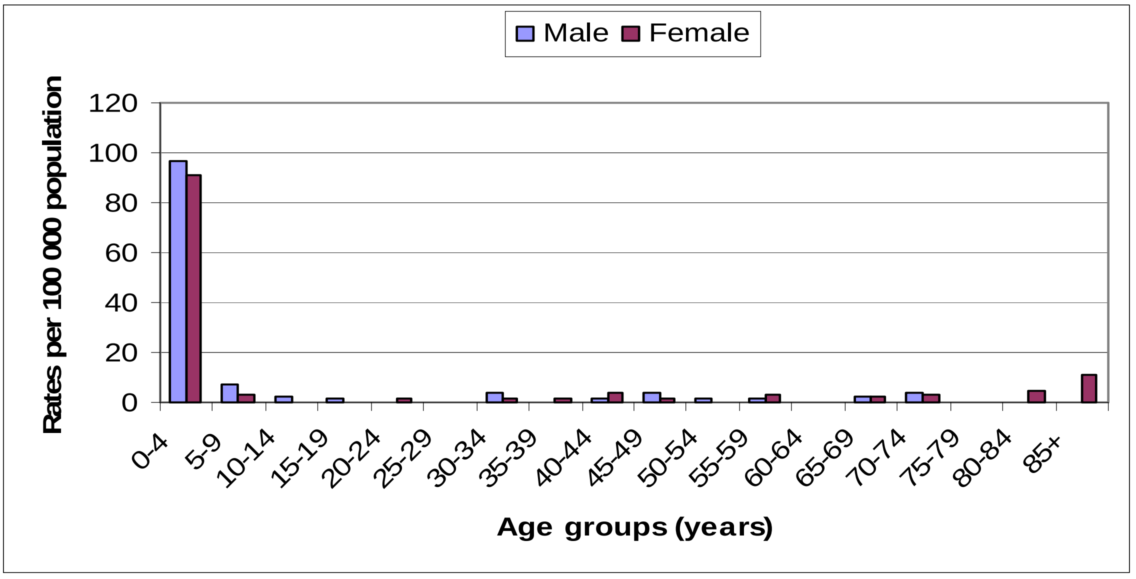


Figure 12: Age-specific notification rates of rotavirus by sex, WA, 2006

There was only one rotavirus notification for an Aboriginal person compared to 93 notifications for non-Aboriginal people. This means that this initial period of surveillance for rotavirus has not showed the strong association with Aboriginality found for other enteric infections. Aboriginality information was missing for 38% of notifications. Due to low numbers of notifications, rates could not be meaningfully calculated for all the regions of WA. Table 2 shows that there were no Rotavirus notifications from the Kimberley, and that the highest number of notifications came from the metropolitan area. This regional distribution is different to that observed for other enteric infections, as for other enteric infections notification rates from the Kimberley and Pilbara are generally higher than notification rates for other regions.

Table 2: Number of Rotavirus notifications by Region, 2006

Region	No. of Notifications
Metropolitan	125
Great Southern	4
Southwest	10
Coastal and Wheatbelt	3
Midwest	2
Pilbara	1
Kimberley	0
Goldfields	4

3.8 *Shigellosis*

The overall rate of *Shigella* notification in 2006 was similar to that of previous years. There were 136 *Shigella* notifications in 2006, which was a notification rate of 6.7 per 100 000 population (Appendix 1). The number of *Shigella* notifications per month varied from a minimum of 2 to maximum of 23, with no distinct seasonal patterns (Figure 13).

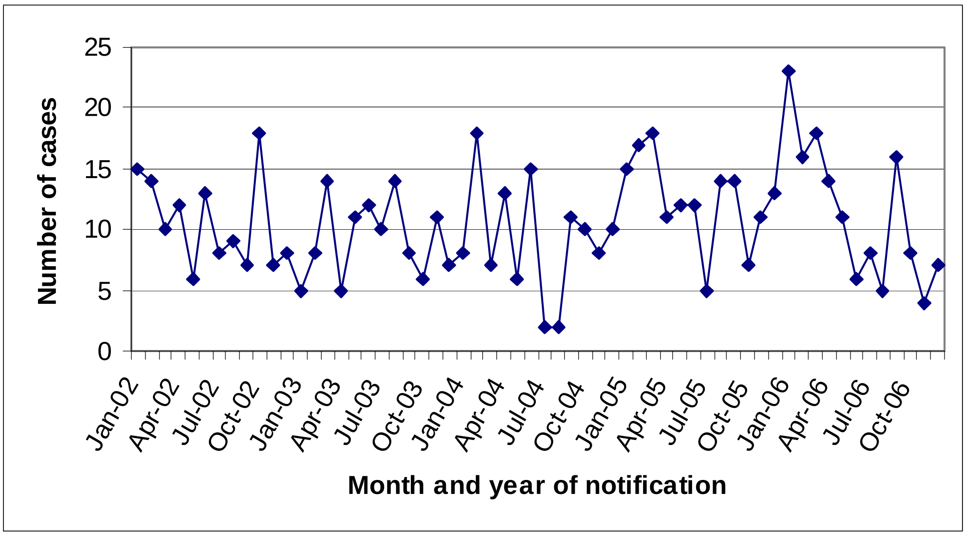


Figure 13: Number of cases of shigellosis by month and year of notification, WA, 2002 – 2006

There was no significant difference between notification rates for males and females (z=-1.29, p=0.23) which were 6.0 and 7.5 per 100 000 population respectively. Although the highest notification rate was for the 0 to 4 age group, with a rate of 31.6 per 100 000 and accounting for 29% of notifications, notifications were not as highly concentrated in this age group as there were for *Giardia*, *Cryptosporidium* and rotavirus infection (Figure 14). The notification rate of 112.6 per 100 000 for Aboriginal people was 63 times the rate for non-Aboriginal people, which was 1.78 per 100 000 population. Aboriginality information was missing for 14% of *Shigella* notifications. The Kimberley region had the highest notification rate for *Shigella*, with a rate of 125.9 per 100 000 population. The Pilbara had the second highest notification rate, with 71.35 per 100 000 population. The rate in the Metropolitan region was 2.2 per 100 000 population.

The majority of *Shigella* isolates from clinical cases in 2006 were *Shigella flexneri* (77%). The majority of these were of one biotype, that is *Shigella flexneri* biotype 4 (54%). The remainder of *Shigella* cases were predominantly *Shigella sonnei* (19%), and there were two cases of *Shigella dysenteriae*. The dominance of *Shigella flexneri* in 2006 was a change from the previous year when there was more even distribution between *Shigella flexneri* (54% of cases) and *Shigella sonnei* (42% of cases). There were no cases of *Shigella boydii* notified in 2006.

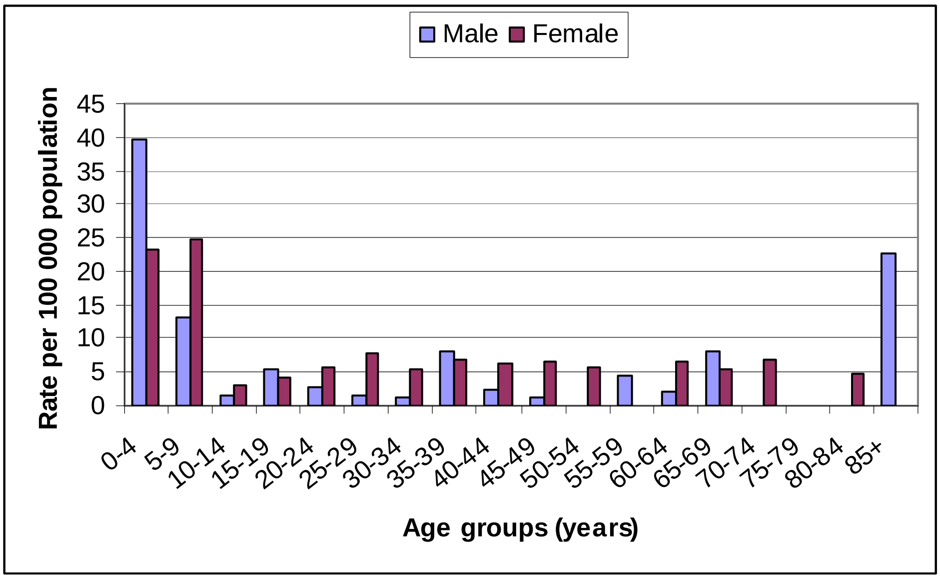


Figure 14: Age-specific notification rates of shigellosis by sex WA, 2006

3.9 Hepatitis A Infection

There were 73 notified cases of hepatitis A infection in WA in 2006, which was a notification rate of 3.6 per 100 000 population. The notification rate was identical to that of 2005, but slightly higher than the mean for the previous four years, of 3.1 per 100 000 population (Appendix 1). The number of notifications ranged from 1 to 20 per month, with no seasonal pattern over the years 2002 to 2006 (Figure 15). There was no significant difference between notification rates for males and females (z=0.798, p=0.424) with rates of 3.9 and 3.2 per 100 000 population respectively.

Hepatitis A notifications were more evenly spread through different age groups than notifications for other enteric infections. The highest notification rate of 10.5 per 100 000 population was for children aged 5 to 9 years. Notification rates were also relatively high for the 10 to 14 and 20 to 24 year age groups (Figure 16).

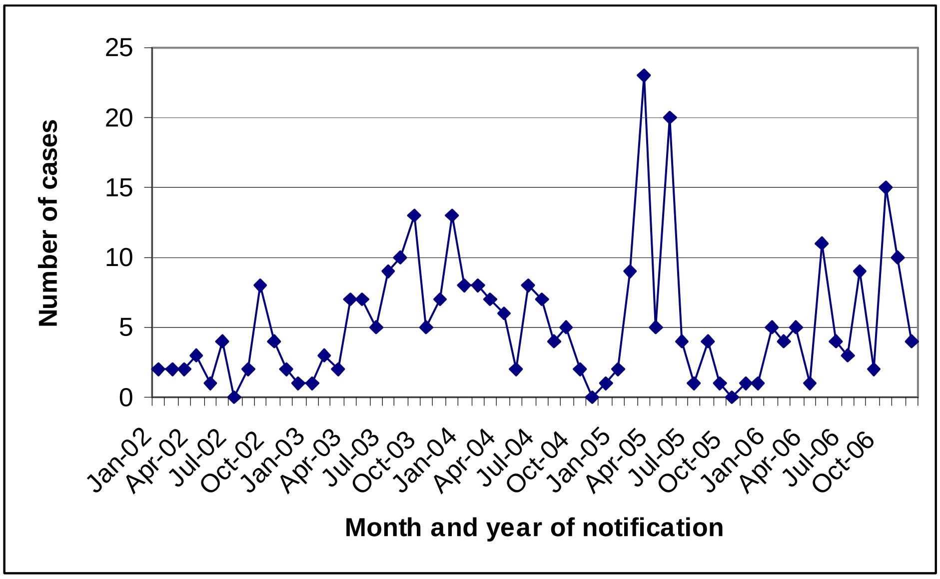


Figure 15: Number of cases of hepatitis A by month and year of notification, WA, 2002 – 2006

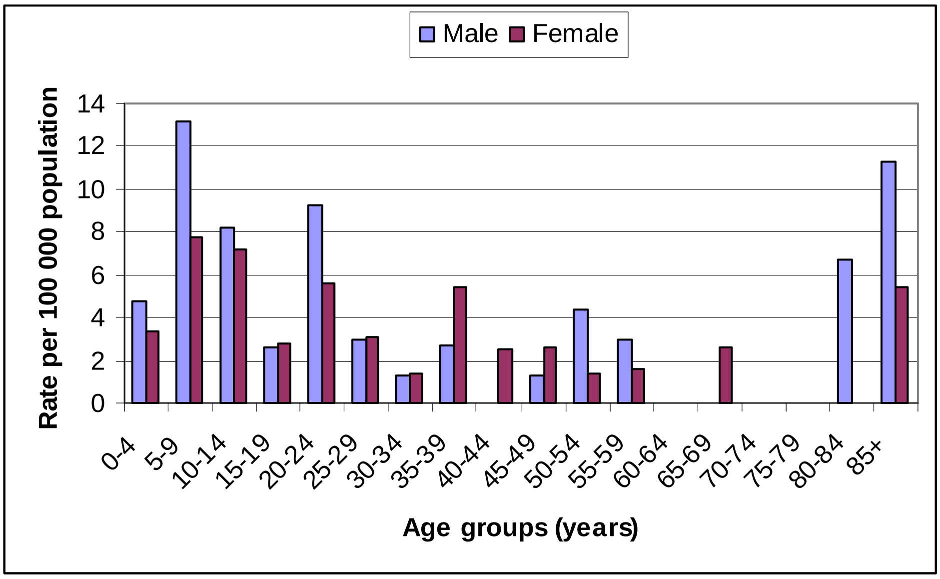


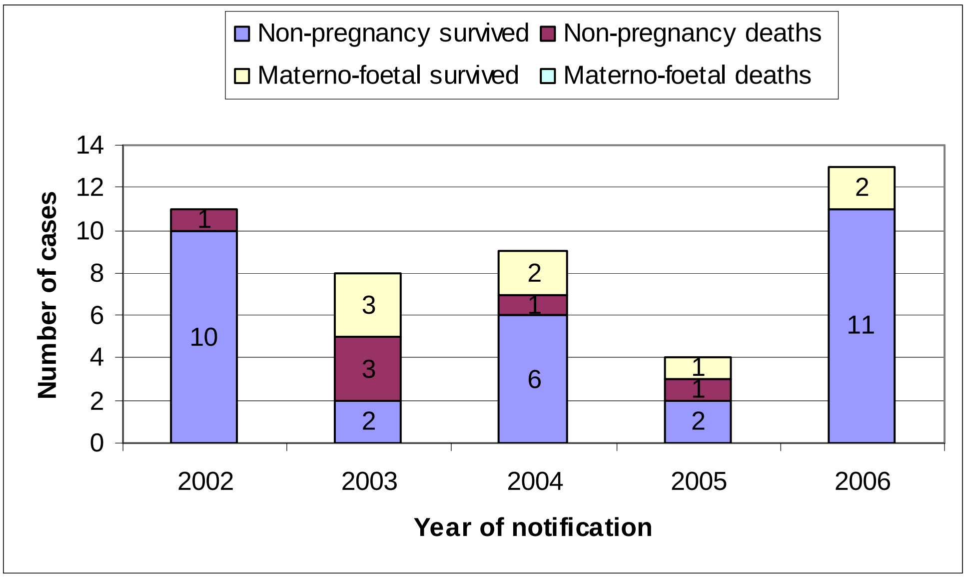
Figure 16: Age-specific notification rates of hepatitis A by sex, WA, 2006

As described for other enteric infections, notification rates were higher for Aboriginal people as compared to non-Aboriginal people. The notification rate for Aboriginal people was 17.9 per 100 000 population and for non-Aboriginal people 3.1 per 100 000 population. There was no missing data on Aboriginality for hepatitis A notifications. As described for other enteric infections, the region with the highest notification rate was the Kimberley, with a rate of 27.4 notifications per 100 000 population. There were no hepatitis A notifications in 2006 for the Great Southern, Southwest and Wheatbelt regions.

3.10 Listeriosis

In 2006 there were 13 reported cases of listeriosis. This was higher than the four yearly mean of eight cases for the years 2002 to 2005. In 2006 there were two pregnancy related cases (Figure 18). One infection was diagnosed from the gastric aspirate from the baby and the other was diagnosed from blood cultures from the mother. Both babies were delivered prematurely and survived. Both mothers were from a non-English speaking background and ate high risk foods prior to the infection, as they were not aware of the risk of listeriosis.

The 11 non pregnancy related cases were in five females and six males aged between 22 and 91 years old. All cases were either immunocompromised or taking immunosuppressive drugs prior to their illness. A cluster of eight cases was identified early in 2006. A description of the cluster investigation is detailed in Section 5.



Numbers in the bars indicate number of cases

Figure 17: Notifications of listeriosis showing non-pregnancy related infections and deaths and materno-foetal infections and deaths, WA, 2002 to 2006

3.11 Typhoid and paratyphoid fever

There were 11 cases of typhoid fever and one case of paratyphoid fever in 2006. All cases were overseas acquired. The paratyphoid case had travelled to Indonesia prior to illness. Two of the typhoid cases had travelled to India, seven had travelled to Indonesia and two had travelled to Kenya in the month before their illness.

3.12 Amoebiasis

Five cases of *Entamoeba histolytica* infection were reported in 2006, all of which were acquired overseas. Four males and one female were affected, with a median age of 44 years (range 33-84).

3.13 **Shiga toxin producing E. coli infections (STEC)**

Three cases of STEC were notified in 2006, resulting in a crude notification rate of 0.15 per 100 000 population. The notification rate was approximately half the mean rate for the previous four years. A large increase in STEC notifications in 2005 was due to a trial of a polymerase chain reaction (PCR) method of detecting this disease, which was used in addition to the conventionaltraditional culture method. As a result of this trial ceasing partway through 2006, the number of notifications returned to expected levels, thus accounting for the lower notification rate for 2006. The cases ranged from 7 – 64 years of age. Two isolates detected by culture methods were typed as serotype 0157:H- and 0153:H-. One sample was serotype non 0157, non 0111 by PCR. Public health follow-up was conducted with two of the three cases. One case was not contactable due to relocation to another state. One case had travelled to Papua New Guinea prior to her illness. The third case was a seven year old male from the metropolitan area. The only risk factors identified were consumption of minced beef, pork, lamb, salami and ham prior to illness. Samples of scotch fillet and rump steak collected from the home were negative for STEC.

3.14 Vibrio parahaemolyticus Infection

There were three cases of *Vibrio parahaemolyticus* infection notified in 2006. All were male and aged between 29 and 57 years old. Two cases acquired their infection overseas, while the third case did not have any recent history of travel.

3.15 Yersiniosis

Three cases of *Yersinia enterocolitica* were notified in 2006. There were two non Indigenous cases: one male aged 10 months from the metropolitan region and one female aged six years from the SouthWest region. The one indigenous case was a 58 year old male from the

Goldfields that reported eating a variety of unrefrigerated foods including uncooked bacon. None of the cases reported a recent history of travel.

3.16 Hepatitis E Infection

There was one case of Hepatitis E notified in 2006 in a 33 year old female who had travelled to Thailand in the month prior to the onset of infection.

3.17 Cholera, Haemolytic uraemic syndrome (HUS) and Botulism

There were no cases of cholera, HUS or botulism notified in 2006.

3.18 Discussion

The overall notification rate for all enteric diseases in WA in 2006 was similar to that of previous years. There were also no large increases or decreases in notification rates for specific diseases. *Campylobacter* continued to be the most commonly notified enteric infection in WA, followed by *Salmonella* and *Giardia*.

Seasonal variation continued to be a feature of notifications for *Campylobacter*, *Salmonella*, *Giardia* and *Cryptosporidium*, with notifications higher in the summer or early autumn.

There was a significant difference in notification rates for males and females for *Campylobacter* in 2006, and this was also the case for the previous four years. In 2006 there was also a significantly higher number of males than females with *Giardia* infection, but this was not observed in previous years.

Children in the 0 to 4 age group had the highest notification rates for all the major enteric infections apart from Hepatitis A infection. Hepatitis A infection rates for young children were probably not as high as infection rates for other enteric pathogens because Hepatitis A infection is generally asymptomatic or associated with mild symptoms in young children.

Notification rates were higher for Aboriginal people as compared to non-Aboriginal people for all the major enteric infections, with the exception of rotavirus. However a data linkage research project using 2004 data showed that calculated rate ratios of rates in Aboriginal populations as compared to non-Aboriginal populations were overestimates by as much as 35% for *Campylobacter* down to 8% for *Giardia*. Differences in notification rates were greatest for *Shigella*, *Cryptosporidium* and *Giardia* infection. The notification rate for *Shigella* infection for the Aboriginal population was 63 times the *Shigella* notification rate for the non-Aboriginal population of WA. The 3.6% of the WA population who were Aboriginal accounted for 70% of *Shigella* infections. The difference in notification rates was particularly marked for children in the 0 to 4 age group. The highest notification rate for this age group was for *Giardia*, with 2% of Aboriginal children in the 0 to 4 age group having a notified *Giardia* infection in 2006. This was compared to 0.07% of non-Aboriginal children in this age group having a notified *Giardia* infection. The 0.4% of the total population of WA that were Aboriginal children in this 0 to 4 age group in 2006, accounted for 28.6% of the total *Cryptosporidium* notifications in WA in that year.

The Kimberley region had the highest notification rates for all the major enteric diseases. Notification rates in the Kimberley were higher for both the Aboriginal and non-Aboriginal populations, suggesting that high notification rates in the Kimberley cannot be completely explained by the high proportion of Aboriginal people comprising the Kimberley population. For most enteric diseases the region with the second highest notification rates was the Pilbara.

Rotavirus infection became a notifiable disease in WA in July 2006. There were 151 notifications in the second half of 2006, making it the 5th most common enteric notification in WA in 2006.

4.0 Gastrointestinal and foodborne disease outbreaks

Information was collected on gastrointestinal and foodborne disease outbreaks that were reported in WA during 2006. This report collates summary information about the setting where the outbreak occurred, the month the outbreak occurred, the aetiological agent, the number of persons affected, the type of investigation conducted, the level of evidence obtained and the food vehicle responsible (if identified).

During 2006, 87 outbreaks of gastrointestinal illness were reported to the DOH, affecting 2837 people. This is 2.3 times the number of gastroenteritis outbreaks reported in 2005. Eighty-one (93%) outbreaks appeared to be due to person-to-person transmission, affecting 2725 people (Table 3). The majority of these outbreaks (n=64) occurred in aged care facilities with the symptoms consistent with norovirus infection, and the norovirus infection was confirmed in 51 of the outbreaks. Fifty people were hospitalised and there were two deaths.

Six foodborne or suspected foodborne outbreaks of gastroenteritis in WA in 2006 affecting 109 people were reported (Table 4). A food source was only identified in one outbreak (*S*. Litchfield) which was associated with paw paw consumption. A summary of each of the outbreaks is given below.

4.1 Salmonella Anatum Outbreak

In June six cases of gastroenteritis caused by *Salmonella* Anatum were notified to the DOH, with onset dates between 29/05/06 and 7/06/06. All cases lived in or near a south west regional town. Two males and four females ranging in age from 20 to 68 years were affected. These were the first cases of *S*. Anatum in this region since 1999. Five of the six cases had eaten at a common take away food venue in the week prior to onset. Local environmental health officers inspected the take away food venue on two occasions and found that food handling, temperature control, documentation and cleaning were satisfactory. The seven food samples collected were negative for *Salmonella* species. The venue was suspected to be the source of the outbreak.

4.2 Salmonella Kiambu Outbreaks

There were two suspected foodborne outbreaks of *Salmonella* Kiambu in September and it is highly likely that the two outbreaks were from a common source. Seven cases of *S.* Kiambu were notified to DOH with onset dates between 24/8/06 and 4/9/06, which was above the expected average of 6 cases per year. Six females and one male ranging in age from 26 to

61 years were affected, and all cases were from the Perth metropolitan area. Initial interviews showed that three cases had eaten at the same café within a five day period and that the other four cases had eaten at another restaurant venue within a seven day period. Pulsed Field Gel Electrophoresis (PFGE) analysis showed that all seven cases had an indistinguishable PFGE profile, which was distinct from the PFGE profiles of two WA clinical isolates from earlier in 2006, suggesting that all people had become infected from a common source.

Interviews from the three people that had eaten at the café showed that all had eaten sandwiches that contained raw egg mayonnaise. Samples of mayonnaise, tartare sauce and aioli were collected but were not the same batch that was eaten by the three café patrons. Salmonellae were not detected in these samples. Food handling staff were interviewed and provided stool specimens. No staff reported recent history gastroenteritis or worked at the other venue that had cases. All five staff stool specimens were negative for *Salmonella*. Although raw egg mayonnaise was identified as a high risk food consumed by cases, this was not able to be confirmed as the cause of their illness as no samples were available for testing. On advice from DOH the café subsequently elected to use pasteurised eggs for the preparation of mayonnaise.

The four other people reported to DOH with *S.* Kiambu had eaten at another restaurant venue on two consecutive weekends, between 26/8/06 and 3/9/06. A cohort study of patrons that ate on 26 and 27 August was conducted. The venue served a five course menu with choice of entrée, mains and dessert. Patrons were interviewed about recent gastrointestinal illness and foods consumed at the restaurant venue. Surface swabs of the food preparation area and samples of food items served on the two weekends were collected. Staff were interviewed and those who had a recent history of gastroenteritis provided stool specimens. Of the 241 people who ate at the restaurant venue on the weekend of interest, 149 were interviewed. Thirty-one of 149 reported gastrointestinal illness consistent with salmonellosis within five days of eating at the venue (attack rate 21%). Analysis showed that illness was not positively associated with any of the menu items. All samples and swabs were negative for *Salmonella*. Nine of 23 staff had reported gastrointestinal illness in the preceding two months. Of eight stool specimens that were submitted by staff, four were positive for *S.* Kiambu. The conclusion of the investigation was that the outbreak of illness associated with this restaurant venue was most likely caused by contaminated food, with the source of the contamination not identified. Possible sources were a contaminated raw or undercooked food product, cross-contamination from a contaminated food to other food items, and an infected food handler. It is possible that staff members from the restaurant venue contracted salmonellosis from eating food from the venue.

4.3 Missing Person Search Outbreak

A number of people involved in a search for a missing person in October became ill with gastroenteritis. A cohort study was conducted and of the 35 people interviewed 19 reported illness (attack rate 54%). The majority of people (16/19, 84%) fell ill over a 12 hour period suggesting a point source outbreak, with the duration of illness ranging from 4 hours to 4 days. Searchers were provided with meat and salad rolls for lunch, as well as morning and afternoon teas, and had takeaway chicken or Chinese food for dinner. Analysis did not show any significant associations between food consumed and illness. However, the only food eaten by all ill people was the lunch rolls. The one faecal specimen collected was negative for common viral and bacterial pathogens. The symptoms and duration of illness were consistent with viral gastroenteritis. Leftover rolls and Chinese takeaway were submitted for analysis. While no bacterial pathogens were isolated or toxins detected, the lunch rolls did have very high aerobic plate counts, indicating that food may not have been stored or transported at the correct temperature. An inspection of the premises that made the lunch rolls found no deficiencies in storage or handling of food, and staff members had not reported any recent illness.

4.4 BBQ Lunch Outbreak

In November the DOH were notified of a gastroenteritis outbreak in two groups that attended an outdoor entertainment venue. A total of 78 people ate BBQ lunches at the venue on 23/11 and 24/11. A cohort study was conducted with 52 people interviewed, 29 of which had been ill with symptoms of vomiting and diarrhoea (attack rate 56%). The age range of those interviewed was 61 to 86 years, with 22 males and 30 females. Staff involved in food preparation had been ill with similar symptoms before the event. Norovirus was detected in 7/8 samples from patrons and 3/6 samples from food preparation staff and their families. There was a significant association (relative risk 4.67, Fisher exact p=0.014) between eating green salad and becoming ill, with no significant association between illness and any other food or drinks consumed. It was concluded that patrons had become ill from eating green salad that was contaminated with norovirus by food preparation staff.

4.5 Salmonella Litchfield Outbreak

Between November 2006 and January 2007, 20 cases of *Salmonella* Litchfield were notified in Western Australia and six cases were notified in Queensland (QLD). There were nine male and 17 female cases ranging in age from eight months to 86 years. *S.* Litchfield is an uncommon serotype in both States with an average of four and 12 notifications per year respectively. A case control study of 12 cases and 24 controls identified a highly significant association between paw paw (papaya) consumption and illness (odds ratio 32.8; 95% CI 2.71 – 884; p value 0.006).

PFGE profiles of clinical isolates of *S.* Litchfield from WA and QLD were indistinguishable, suggesting a point source outbreak. *S.* Litchfield was isolated from nine of 38 paw paw samples collected from retail outlets in WA, with indistinguishable patterns to the clinical isolates. Multi Locus VNTR Analysis (MLVA) typing also showed that WA and QLD clinical isolates were of an indistinguishable profile.

Traceback of paw paws indicated that paw paw consumed in WA was grown in northern WA. Paw paws that were positive for *S.* Litchfield were from three of five growers. The QLD traceback investigation indicated that while bananas from northern WA were imported into QLD around the time of the QLD cases, there was no record of paw paw shipments. However, given that the QLD cases exhibited the same PFGE and MLVA profiles it suggests that WA paw paw was sold in QLD. As a result of this investigation a product withdrawal was instigated in WA in December 2006. Environmental investigations revealed that river water samples from three farms were negative for *S.* Litchfield but positive for a variety of other *Salmonella* serotypes. The untreated river water was used to wash fruit after harvest. This is the second outbreak in WA in the past 18 months attributed to fresh produce. These outbreak investigations have important implications for the development of primary production standards for fresh produce.

Table 3: Outbreaks of non-foodborne gastrointestinal illness in WA by month, setting and agent, 2006

			Number				
Month of outbreak	Setting	Agent responsible	Affected	Hospitalised	Deaths	Evidence*	Epidemiological study†
January	Aged care facility	Norovirus	3	0	0	M	D
March	Aged care facility	Norovirus	53	1	0	M	D
April	Aged care facility	Norovirus	13	4	0	M	D
April	Hospital	Norovirus	31	n/a	0	M	D
April	Aged care facility	unknown	8	0	0	D	D
April	Other	unknown	15	0	0	D	N
April	Aged care facility	Norovirus	84	0	0	M	D
May	Aged care facility	Norovirus	26	0	0	M	D
May	Hospital	Norovirus	32	n/a	0	M	D
May	Aged care facility	unknown	6	0	0	D	D
May	Aged care facility	Norovirus	61	0	0	M	D
May	Aged care facility	unknown	22	1	0	D	D
May	Aged care facility	Norovirus	30	0	0	M	D
May	Hospital	unknown	8	n/a	0	D	N
May	Aged care facility	Norovirus	92	4	0	M	D
May	Other	unknown	13	0	0	D	N
May	Aged care facility	Norovirus	24	1	0	M	D
May	Aged care facility	unknown	37	0	0	D	D
May	Aged care facility	Norovirus	23	1	0	M	D
May	Aged care facility	Norovirus	194	3	0	M	D
May	Hospital	Norovirus, Adenovirus, Rotavirus	18	n/a	0	M	D
June	Aged care facility	Norovirus	80	0	0	M	D
June	Aged care facility	unknown	25	0	0	D	D
June	Hospital	Norovirus	35	n/a	0	M	D
June	Aged care facility	unknown	12	0	0	D	D
June	Hospital	Norovirus	44	n/a	0	M	D
June	Aged care facility	unknown	32	1	0	D	D
June	Aged care facility	Norovirus	4	0	0	M	D
June	Aged care facility	Norovirus	31	1	1	M	D
June	Camp	Norovirus	10	0	0	M	N
June	Aged care facility	Norovirus	30	2	1	M	D
June	Aged care facility	Norovirus	76	1	0	M	D

Month of outbreak	Setting	Agent responsible	Affected	Hospitalised	Deaths	Evidence*	Epidemiological study[†]
June	Aged care facility	unknown	32	0	0	D	D
June	Aged care facility	Norovirus	57	0	0	M	D
June	Aged care facility	Norovirus	104	1	0	M	D
June	Aged care facility	Norovirus	54	0	0	M	D
June	Aged care facility	unknown	18	1	0	D	D
June	Aged care facility	Norovirus	25	1	0	M	D
June	Aged care facility	Norovirus	45	1	0	M	D
June	Aged care facility	Norovirus	70	0	0	M	D
June	Aged care facility	Unknown	18	0	0	D	D
June	Aged care facility	Norovirus	34	1	0	M	D
July	Aged care facility	Norovirus, Adenovirus	46	2	0	M	D
July	Aged care facility	Norovirus	62	1	0	M	D
July	Aged care facility	Norovirus	43	1	0	M	D
July	Aged care facility	Norovirus, Rotavirus	51	2	0	M	D
July	Aged care facility	Norovirus	27	0	0	M	D
August	Camp	Unknown	30	0	0	D	N
August	Aged care facility	Norovirus	39	0	0	M	D
August	Aged care facility	Unknown	13	0	0	D	D
August	Aged care facility	Norovirus	18	1	0	M	D
August	Aged care facility	Norovirus	52	3	0	M	D
August	Aged care facility	Unknown	9	1	0	D	D
August	Aged care facility	Norovirus	13	1	0	M	D
September	Aged care facility	Unknown	12	0	0	D	D
September	Aged care facility	Unknown	12	0	0	D	D
September	Aged care facility	Norovirus	42	0	0	M	D
September	Aged care facility	Rotavirus	27	3	0	M	D
October	Aged care facility	Norovirus	30	4	0	M	D
October	Aged care facility	Norovirus	28	0	0	M	D
October	Aged care facility	Unknown	6	0	0	D	D
October	Aged care facility	Norovirus	20	0	0	M	D
October	Restaurant	Unknown	6	0	0	D	N
October	Aged care facility	Norovirus	45	0	0	M	D
October	School	Unknown	54	1	0	D	D
October	Aged care facility	Rotavirus	29	1	0	M	D
October	Hospital	Norovirus	22	n/a	0	M	D

Month of outbreak	Setting	Agent responsible	Affected	Hospitalised	Deaths	Evidence*	Epidemiological study†
November	Aged care facility	Norovirus	37	0	0	M	D
November	Hospital	Norovirus	55	n/a	0	M	D
November	Aged care facility	Unknown	4	0	0	D	D
December	Aged care facility	Unknown	4	0	0	D	D
December	Aged care facility	Norovirus	43	1	0	M	D
December	Aged care facility	Norovirus	23	3	0	M	D
December	Aged care facility	Norovirus	38	0	0	M	D
December	Aged care facility	Norovirus	29	0	0	M	D
December	Institution – other	Unknown	34	0	0	D	N
December	Aged care facility	Unknown	27	0	0	D	D
December	Restaurant	Norovirus	18	0	0	AM	C
December	Other	Unknown	14	0	0	D	D
December	Aged care facility	Unknown	23	0	0	D	D
December	Aged care facility	Unknown	11	0	0	D	D
Total			**2725**	**50**	**2**		

* A=analytical epidemiological evidence; D=descriptive evidence: M=microbiological evidence
† C=cohort study; CS=descriptive case series; N=no study

Abbreviations: n/a: not applicable.

Table 4: Outbreaks of foodborne disease in WA by month, setting and agent, 2006

Month of outbreak	Setting	Agent responsible	Number				Evidence*	Epidemiological study[†]	Suspected responsible vehicles
			Exposed	Affected	Hospitalised	Deaths			
June	fast food restaurant	*Salmonella* Anatum	unknown	6	1	0	D	D	takeaway sandwiches/rolls
September	restaurant	*Salmonella* Kiambu	466	35	2	0	D	C	Unknown
September	restaurant	*Salmonella* Kiambu	unknown	3	1	0	D	D	unknown
October	other	unknown	37	19	0	0	D	C	Unknown
November	primary produce	*Salmonella* Litchfield	unknown	17	4	0	AM	CCS	Paw paw
November	other	Norovirus	78	29	0	0	A	C	Salad
Total				**112**	**8**	**0**			

* A=analytical epidemiological evidence; D=descriptive evidence: M=microbiological evidence
† C=cohort study; CS=descriptive case series; CCS=case control study.

5.0 Cluster Investigations

Six cluster investigations were conducted in WA in 2006.

5.1 *Listeria cluster*

Eight cases of listeriosis were reported between 17/2/2006 and 25/3/2006. This was an unusually high number of cases in a one month period. Annually, between 8 and 12 cases of listeriosis are notified to the DOH, generally spread throughout the year. Only one of the cases was pregnancy-related. The age range of the remaining seven cases was from 22 – 91 years. All cases either had immunosuppressive conditions or were undertaking immunosuppressive treatment. Detailed food and environmental histories were obtained from all cases, and PFGE analysis was conducted at PathWest on clinical isolates and compared to a database of PFGE profiles of historical *L. monocytogenes* clinical and environmental isolates. PFGE analysis showed the eight clinical isolates were of five different genetic types. Three cases exhibited the same PFGE profile, which was indistinguishable from the pattern of two food isolates, both from small goods products from the same company. Listeria concentrations in the small goods products were at a level considered to be 'fairly satisfactory' (Food Watch, April 1999). The cases were patients from the one hospital, which was also supplied with small goods by this particular company. Food Safety Officers conducted an investigation of the hospital catering service as well as the small goods supplier. As a result of these investigations the company commenced a review of their production processes. Isolates from three other cases matched the PFGE profiles of a variety of historical food isolates, while isolates from the remaining two cases did not match the PFGE profile of any food items tested.

5.2 *Salmonella Newport Cluster*

A cluster of seven cases of *Salmonella* Newport with onset dates from 18/1/2006 to 25/1/2006 was investigated. All cases resided in the metropolitan area and none had travelled in the month prior to the onset of illness. *S.* Newport is a serotype seen infrequently in WA with 4 – 5 cases occurring sporadically throughout the year. Infections acquired overseas are often a result of antibiotic resistant *S.* Newport strains. Five of the seven cases were interviewed and reported consumption of commonly consumed products but no specific food or venue was identified. Antibiotic susceptibility testing conducted at PathWest showed all isolates were sensitive.

5.4 *Salmonella* Adelaide Cluster

A cluster of five cases of *S*. Adelaide with onset dates from 1/2/2006 to 7/2/2006 was investigated. Four cases were aged 11 months to one year, and a fifth was aged 68 years. Parents of three child cases and the fifth case were interviewed. No common food items or venues were identified.

5.5 *Cryptosporidium* Cluster

Between 4/2/06 and 28/3/06, 11 notifications of cryptosporidiosis from the same regional town were reported. Of the seven cases interviewed, four reported swimming in the local pool in the two weeks prior to the onset of illness. The pool was super-chlorinated on 31/3/06. No water was tested. An investigation by the local Environmental Health Officer revealed a fault in construction that allowed water to enter the pool without first being filtered and chlorinated. This fault was rectified. Three more *Cryptosporidium* cases from the same town were reported after the pool was super-chlorinated. All were secondary cases to those cases that had their onset prior to the super-chlorination.

5.6 *Salmonella* Saintpaul Clusters

A higher than expected number of *Salmonella* Saintpaul cases was notified to the DOH between the months January and June 2006, and an investigation of was commenced in April 2006. The higher than expected number of *S*. Saintpaul cases was primarily associated with an increase in the number of cases from a north-west town, with 16 reported cases.Isolates from this north-west town (with the exception of one case) and four cases from other north-west towns had an indistinguishable PFGE profile. Hence, these 19 cases were investigated as a cluster. The age range for this cluster of cases was 0 to 80 years with 10 males and 9 females. Interviews were conducted with 10/19 cases. Take-away foods were not from a common venue. The majority of cases shopped at two major supermarket chains and the only food sourced from local suppliers was eggs, which had a food frequency of 40%. One sample of eggs and two manure samples were collected from the regional egg supplier, all of which were negative for *S*. Saintpaul. The source of infection was not found and notification rates returned to expected levels in June 2006.

As part of this investigation it was found that another group of 10 *S*. Saintpaul cases had PFGE patterns indistinguishable from each other and different to that for the cluster described above. These cases were aged 9 to 71 years, with 4 males and 6 females. These cases were spread throughout WA with four from regional areas and the other six from the Perth metropolitan area. Seven cases were interviewed. Commonly consumed foods (>50% frequency) were minced beef, sausages, packaged cheese, potatoes, frozen vegetables, sauces/chutneys and take-away cooked chicken. This group of cases had a PFGE pattern indistinguishable from two poultry samples and one pig sample collected during the first half of 2006, and from two cases from June 2005. This suggests that a large percentage of the regularly reported *S*. Saintpaul cases in WA may be connected, possibly through a food product such as chicken or pork. PFGE analysis of isolates proved to be a very useful tool in this investigation. It allowed the identification of two genetically distinct clusters, which in turn allowed a more focussed approach to this investigation.

Fifteen cases of Hepatitis A from a suburb in the north metropolitan area were notified between 23/10/2006 and 17/11/2006. Nine males and six females between six and 52 years of age were affected. All cases were linked, with 11 cases from two family groups, one family of seven and one of four. Poor hygiene and sharing of drug using equipment were thought to be the source of transmission between cases.

Table 5: Cluster investigations by month and agent, 2006

Month of outbreak	Setting	Agent responsible	Number			Evidence*	Epidemiological study†
			Affected	Hospitalised	Deaths		
February	Hospital and Community	*Listeria monocytogenes*	9	9	0	D	D
February	Community	*Salmonella* Newport	7	3	0	D	D
February	Community	*Salmonella* Adelaide	5	0	0	D	D
March	Community	*Cryptosporidium sp.*	10	3	0	D	D
April	Community	*Salmonella* Saintpaul	19	3	0	D	D
October	Community	Hepatitis A	15	0	0	D	D

* A=analytical epidemiological evidence; D=descriptive evidence: M=microbiological evidence
† C=cohort study; CS=descriptive case series; CCS=case control study; N=no study

6.0 Prevention Measures

The following preventative actions were undertaken during 2006:

- The OzFoodNet epidemiologist and an Environmental Health Officer from the Food Safety Branch visited the hospital that had suspected hospital-acquired cases of listeriosis in the first quarter of 2006. A meeting was held with the catering manager, infection control manager and clinician in charge. Discussions were held about methods to ensure that patients at high risk for listeriosis were not supplied with high risk foods. As a result of this meeting the hospital introduced a low listeria diet.
- An article was written for the WA monthly CDCD publication, ‘Disease WAtch’, providing information on the listeriosis cases from the first quarter of 2006. The article included a recommendation to treating physicians that immunocompromised patients should be informed of their high risk status for listeriosis, and of their need to adopt a diet low in risk for listeria.
- A media campaign was launched in early December reminding people at high risk of contracting listeria to either consume low risk foods or to make them safe by appropriate heating.
- A listeria working party was formed in November. This working party aims to increase education in high risk groups, to introduce low listeria diets to hospitals and to improve the mechanism for identifying at risk patients in hospitals.
- WA OzFoodNet staff assisted in the development a national OzFoodNet questionnaire for the investigation of sporadic listeria cases.
- A WA OzFoodNet staff member was an invited speaker at the Infection Control Association of WA conference and presented a seminar about the epidemiology of listeriosis in WA.
- The OzFoodNet epidemiologist worked with other CDCD personnel to develop an in-house operating procedure for gastroenteritis outbreaks in aged care facilities.
- An article on managing gastroenteritis in aged care facilities was prepared for ‘Disease WAtch’. The article summarised the outbreaks that had occurred, and contained recommendations for managing outbreaks of gastroenteritis in aged care facilities.
- A meeting was held with the Ambulatory Care Manager for the Perth metropolitan area to discuss how ambulatory care could provide services to aged care facilities during gastroenteritis outbreaks. Ambulatory care could assist with clinical

management of cases in residential care facilities, therefore reducing the number of people transferred to hospital, and reducing the spread of infection.

- Guidelines for the Management of Viral Gastroenteritis Outbreak in Institutions were developed and these are now sent to residential care facilities when outbreaks are reported.
- Community health nurses and school nurses in a town affected by an outbreak of cryptosporidiosis in the first quarter were contacted, as person-to-person transmission appeared to have occurred in a primary school. The nurses then conducted hygiene education in all schools in this area.
- A debrief meeting for the *Salmonella* Oranienburg outbreak described in the OzFoodNet WA January to March quarterly report was held. One of the objectives of the debrief meeting was to look at what could be improved. One recommendation of this meeting was that an outbreak investigation and management protocol for Western Australia should be developed. A working group consisting of staff from the Communicable Disease Control and Environmental Health Directorates of DOH WA has started to develop this protocol.
- A Salmonellosis Fact Sheet was developed to send to cases interviewed as part of outbreak investigations.
- As a result of the *Salmonella* Litchfield outbreak in November linked to contaminated paw paws, affected growers agreed to use potable standard water for the washing of fruit prior to sale.
- A media release was issued during the *S.* Litchfield outbreak advising consumers to thoroughly wash fruit and vegetables prior to consumption.

7.0 Acknowledgements

This report represents the collation of information from several sources and different organisations, and the contribution of various public health professionals and laboratory staff.

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8.0 References

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Appendix 1: Number of notifications, crude notification rate and ratio of current to historical mean by pathogen/condition, 2002 – 2006, WA

Pathogen/ Condition	Year 2002 (n=1,927,322)		2003 (n=1,949,439)		2004 (n=1,973,671)		2005 (n=2,000,459)		2006 (n=2,036,426)		Mean rate 2002-2005[4]	Rate ratio 2006 to mean[5]
	No.	Rate[3]	No.	Rate	No.	Rate	No.	Rate	No.	Rate		
Campylobacter	2175	112.8	1947	99.9	1969	99.8	2429	121.4	2003	98.4	108.5	0.9
Salmonella	735	38.1	612	31.4	615	31.2	791	39.5	808	39.7	35	1.1
Giardia	965	50.1	772	39.6	926	46.9	747	37.3	785	38.5	43.5	0.9
Cryptosporidiosis[2]	220	11.4	444	22.8	121	6.1	189	9.4	228	11.2	12.4	0.9
Rotavirus[2]	-	-	-	-	-	-	-	-	151	7.4[6]	-	-
Shigella	127	6.6	111	5.7	112	5.7	150	7.5	136	6.7	6.4	1.05
Hepatitis A	31	1.6	82	4.2	58	2.9	73	3.6	73	3.6	3.1	1.2
Listeria	11	0.6	8	0.4	9	0.5	4	0.2	13	0.64	0.4	1.6
Typhoid fever	5	0.3	10	0.5	5	0.3	7	0.3	11	0.54	0.35	1.5
Amoebiasis	11	0.6	7	0.4	8	0.4	8	0.4	5	0.24	0.45	0.5
STEC[1, 2]	4	0.2	2	0.1	1	0.05	12	0.6	3	0.15	0.24	0.6
Vibrio parahaemolyticus	6	0.3	3	0.15	3	0.15	0	0	3	0.15	0.15	-
Yersinia	3	0.2	3	0.15	1	0.05	2	0.1	3	0.15	0.12	-
Hepatitis E	0	0	0	0	2	0.1	3	0.1	1	0.05	0.05	-
Paratyphoid fever	5	0.3	0	0	13	0.7	4	0.2	1	0.05	0.3	1.7
Cholera	0	0	0	0	1	0.05	1	0.05	0	0	0.025	-
HUS[1]	0	0	1	0.05	1	0.05	1	0.05	0	0	0.04	-
Total	4298		4002		3845		4415		4224			

[1]Abbreviations: STEC: Shiga-toxin producing *E. coli*; HUS: Haemolytic Uraemic Syndrome [2]Shiga-toxin producing *E. coli* (STEC) and Cryptosporidiosis were made notifiable in 2001, rotavirus in July 2006 [3]Rate per 100,000 [4]Mean of rates between 2001 and 2005 where applicable [5]Ratio has not been calculated for diseases with a small number of cases; 6 Annual notification rate calculated using five months data.

Appendix 2. Effect of Introduction of Mandatory Laboratory Notification on Notification Rates

A2.1 Introduction

In Western Australia all enteric notifiable diseases are reported to the WA DOH and entered into the WANIDD. One of the reporting requirements is the source of the notification. There are three options:

- laboratory only notification
- doctor only notification and
- from both sources (laboratory plus doctor).

Prior to July 2006 laboratory notification of notifiable infectious diseases was not a legal requirement in Western Australia. All of the public laboratories and some of the private laboratories chose to notify the DOH, but some private laboratories did not notify. In July 2006 laboratory notification became a legal requirement.

The effect of the introduction of mandatory laboratory notification on enteric disease notification rates is discussed below. This analysis was only carried out for diseases that had greater than 100 notifications in 2006. These diseases were *Campylobacte*r, *Salmonella*, *Giardia*, *Cryptosporidium* and *Shigella* infections. Although there were greater than 100 rotavirus infections notified in 2006, this was excluded from the analysis because notification of rotavirus infections also only became mandatory in July 2006.

A2.2 Campylobacter

The source of the notification for *Campylobacter* infections was compared before and after the introduction of mandatory laboratory notification in July 2006, and this comparison is shown in Figure A2.1. There was a decline in doctor only *Campylobacter* notifications in the 3rd and 4th quarters of 2006, with an increase in both laboratory only and doctor plus laboratory notifications.

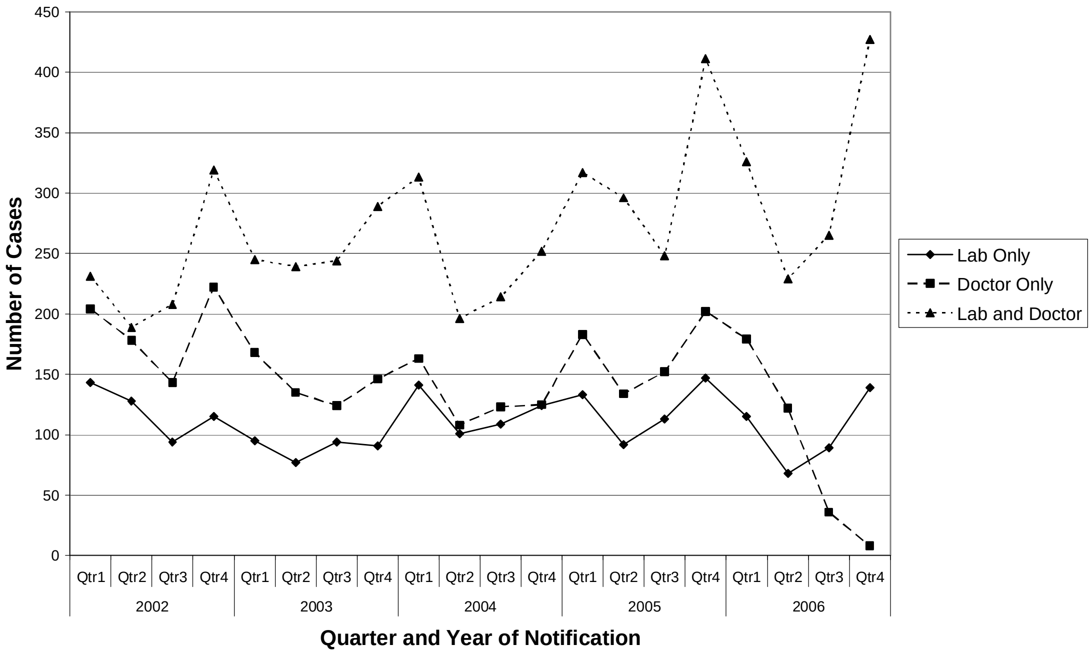

Figure A2. 1 Source of *Campylobacter* notifications, 2002-2006

If the effect of mandatory laboratory notification was to transfer notifications from doctor only to joint laboratory plus doctor, then this would not impact on overall notification rates. However an increase in laboratory only notifications could impact on overall rates. To examine whether this had occurred, the number of notifications from different notifying laboratories was compared for laboratory only notifications. Figure A2.2 shows laboratory only notifications for the 5 laboratories with the greatest number of notifications. This figure shows that two laboratories, that is, Private Lab 2 and Private Lab 3, only commenced regular notification of *Campylobacter* infections in the 3rd and 4th quarters of 2006. DOH received 56 laboratory only notifications from these two laboratories in the 4th quarter of 2006, which was 10% of the total of 574 *Campylobacter* notifications received in this quarter.

It therefore appears from this initial assessment that mandatory lab notification could increase annual *Campylobacter* notifications by approximately 10%. The impact of mandatory laboratory notification on 2006 data was less than this because laboratory notifications only increased in the second half of the year. In 2006 there were 77 laboratory only notifications from the two laboratories that commenced notification only after it became mandatory, which was 4% of the total of 2003 *Campylobacter* notifications.

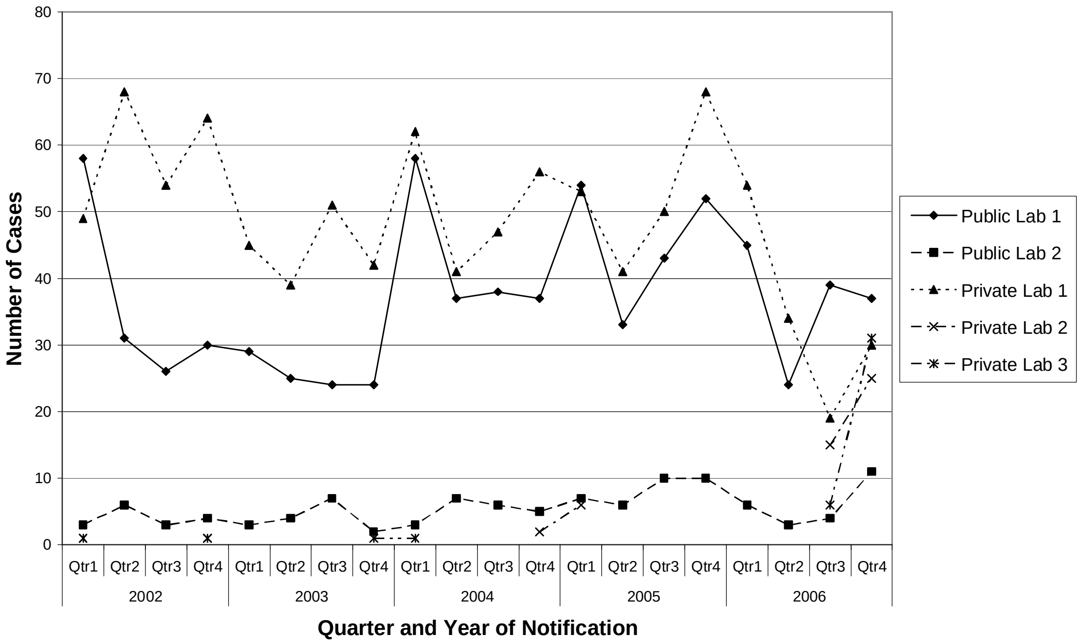

Figure A2. 2 Notifying laboratory for laboratory only notifications, for 5 major laboratories

A2.3 Salmonella

Historically there has been a requirement to send all *Salmonella* isolates to one of the public laboratories in Western Australia for typing. In the past this laboratory has notified DOH WA of the results, with a consequence that a high percentage of notifications have been from this public laboratory source. This process did not change after the introduction of mandatory laboratory notification. There was therefore no observable effect of mandatory laboratory notification on *Salmonella* notification results, as shown in Figure A2.3 below.

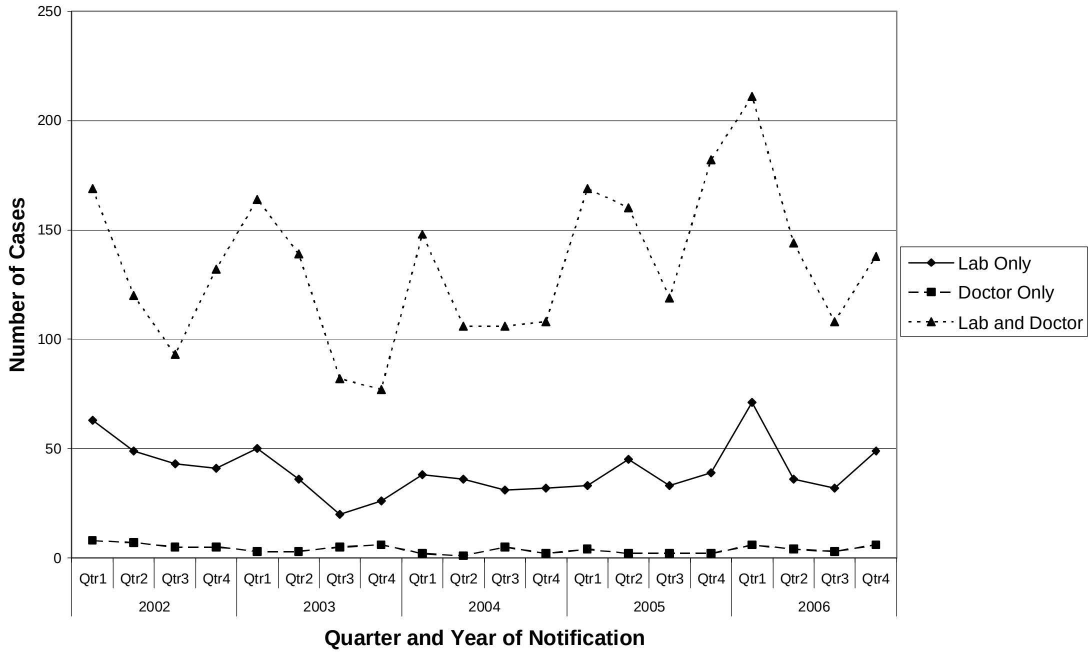

Figure A2. 3 Source of Salmonella notifications, 2002-2006

A2.4 Giardia

The effect of mandatory laboratory notification on *Giardia* notifications was similar to that described above for *Campylobacter*. Two private laboratories only started to notify DOH of *Giardia* infections after the introduction of mandatory lab notifications. In the 4th quarter of 2006 there were 16 laboratory only notifications from these two laboratories, which was 9% of the 184 *Giardia* notifications received in this quarter. It is therefore expected that mandatory laboratory notification will result in an approximately 9% increase in *Giardia* notifications in future years.

In 2006 laboratory notifications were only mandatory in the second half of the year. There were 21 notifications from the two private laboratories that were not previously notifying DOH of *Giardia* infections, which was 3% of the 785 notifications for 2006.

A2.5 Cryptosporidium

Mandatory laboratory notification had only a very small effect on *Cryptosporidium* notifications in 2006. Only one laboratory only notification was received in the second half of the year from the two laboratories that commenced laboratory notification only after it became mandatory.

A2.6 *Shigella*

There was no observable effect on *Shigella* notifications from the introduction of mandatory laboratory notification. Out of the 19 *Shigella* notifications in the 4th quarter of 2006 there was one laboratory only notification, which was from a public laboratory.

Appendix 3. Improving the Accuracy of Aboriginal and non-Aboriginal Disease Notification Rates Using Data Linkage

Medical practitioners in WA have a statutory obligation to notify patients with notifiable infectious diseases to the DOH using a Notifiable Infectious Diseases notification form. Information required as part of the notification includes the patient's name, date of birth, address and race (recorded as "Aboriginal or Torres Strait Islander" or "Other"). The CDCD at DOH collects these data, stores them securely and confidentially and uses them to generate age, sex, race and region-specific disease notification rates for the purposes of health policy and funding decisions.

A project was conducted to improve the accuracy of estimates of the rates of infectious diseases in Aboriginal and non-Aboriginal groups. Where the Aboriginality of cases in infectious disease notifications was recorded as "race unknown" data on race was sourced from other core DOH data collections. This was initially carried out for notifications of sexually transmitted infections and blood-borne viruses received in 2004 (described by Anon 2006), and was then extended to enteric infections received in 2004.

Of the 15,646 infectious disease notifications received in 2004, information on Aboriginality was missing in 4843 cases (31%). Cases for which there is no information on Aboriginality are usually excluded from calculations of Aboriginal and non-Aboriginal disease rates, thus, these disease rates may be highly inaccurate. This is especially so if Aboriginality is unknown in a substantial proportion of cases. As Aboriginal and non-Aboriginal disease rates are often used as the basis for policy and funding decisions, it is important for these rates to be calculated as accurately as possible.

A3.1 Method

The Data Linkage Unit in WA provided a unique opportunity to improve the accuracy of Aboriginal and non-Aboriginal disease rate calculations. The Data Linkage Unit in WA is a collaboration between the Health Information Centre of the Department of Health WA, the Centre for Health Services Research at the University of WA, the Centre for Health Informatics at Curtin University of Technology, and the Telethon Institute for Child Health Research. The Unit was established in 1995 to develop and maintain a system of linkages connecting data about health events for individuals in WA. These linkages are created and maintained using rigorous internationally accepted privacy-sensitive protocols, probabilistic matching and extensive clerical review.

The project was granted ethics approval from the Western Australian Aboriginal Health Information and Ethics Committee and the Confidentiality of Health Information Committee.

Cases were selected by searching the statutory notifiable infectious disease database for enteric notifications received between 1st January 2004 and 31st December 2004 in which information on Aboriginality was missing. The names, date of birth, sex and address of these cases were sent to the Data Linkage Unit where linkage to the mortality, hospital morbidity, midwives' notification and mental health databases was conducted to determine the cases' Aboriginality.

Data on Aboriginality obtained via data linkage were combined with data on Aboriginality obtained via the WA notifiable infectious disease database (WANIDD) to create the following new variables:

1. Sensitive definition of Aboriginal and/or Torres Strait Islander (sens-Aboriginal) – a person identified as Aboriginal and/or Torres Strait Islander in WANIDD or, if Aboriginality information is missing in WANIDD, a person identified as Aboriginal and/or Torres Strait Islander **at least once** via the data linkage process.
2. Specific definition of Aboriginal and/or Torres Strait Islander (spec- Aboriginal) - a person identified as Aboriginal and/or Torres Strait Islander in WANIDD or, if Aboriginality information is missing in WANIDD, a person identified **consistently** as Aboriginal and/or Torres Strait Islander via the data linkage process.
3. Sensitive definition of non-Aboriginal and/or Torres Strait Islander (sens-non-Aboriginal) – a person identified as not Aboriginal and/or Torres Strait Islander in WANIDD or, if Aboriginality information is missing in WANIDD, a person identified as not Aboriginal and/or Torres Strait Islander **at least once** via the data linkage process.
4. Specific definition of non- Aboriginal and/or Torres Strait Islander (spec-non-Aboriginal) - a person identified as not Aboriginal and/or Torres Strait Islander in WANIDD or, if Aboriginality information is missing in WANIDD, a person identified **consistently** as not Aboriginal and/or Torres Strait Islander via the data linkage process.

Data were analysed using SPSS for Windows version 12.0 and Microsoft® Excel software programs. Disease notification rates were calculated using the above-described definitions of Aboriginal and non- Aboriginal.

A3.2 Results

There were 3845 enteric notifications received in 2004. Data on Aboriginality was missing in WANIDD (ie, recorded as "unknown") in 49% of notifications. Camplylobacteriosis, the most commonly notified disease, had the highest proportion of cases (58%) with missing Aboriginality data.

Information on Aboriginality could be determined via data linkage for 1599 (85%) of the 1827 enteric notifications received in 2004 with missing Aboriginality data in WANIDD. This proportion varied from 83% for salmonellosis to 91% for crypotosporidiosis notifications.

Using data linkage, the proprotion of enteric notifications with missing Aboriginality data was reduced from 49% to 7.1% (see Table A3.1). After data linkage, there were negligible proportions of shigellosis and cryptosporidiosis notifications, and less than 10% of campylobacteriosis, giardiasis and salmonellosis notifications with missing Aboriginality data.

Table A3. 1 Number (%) of enteric notifications received in 2004 with missing Aboriginality data in WANIDD and after data linkage, by disease

Disease	Notifications with missing Aboriginality data in WANIDD, n (%)	Notifications with missing Aboriginality data after data linkage, n (%)
Shigellosis, n=110	37 (34)	4 (0.4)
Campylobacteriosis, n=1969	1138 (58)	161 (8.2)
Giardiasis, n=927	356 (38)	53 (5.7)
Salmonellosis (excl *S. typhi*), n=615	249 (48)	51 (8.3)
Cryptosporidiosis, n=121	45 (37)	4 (3.3)
Other enteric, n=43	2 (5)	0 (0)
Total, n=3785	1872 (49)	273 (7.1)

The proportion of campylobacteriosis notifications that occured in non-Aboriginal people more than doubled (from 39% to 88%) when either the sensitive or specific definition of non-Aboriginal was used compared with the proportion calculated using WANIDD Aboriginality data alone (see Table A3.2). Similar trends, but of smaller magnitude were seen with other enteric diseases. There was little difference in the numbers regardless of whether sensitive or specific definitions were applied.

Table A3. 2 Number and proportion of enteric notifications received in 2004, by Aboriginality according to WANIDD alone, and Aboriginality according to WANIDD and data obtained via data linkage, by disease.

Disease	Aboriginal (WANIDD) n (%)	sens-Aboriginal n (%)	spec-Aboriginal n (%)	non-Aboriginal (WANIDD) n (%)	sens- non-Aboriginal n (%)	spec- non-Aboriginal n (%)
Shigellosis, n=110	48 (44)	66 (60)	64 (58)	25 (23)	42 (38)	40 (36)
Campylobacteriosis, n=1969	56 (3)	82 (4)	72 (4)	775 (39)	1736 (88)	1726 (88)
Giardiasis, n=927	199 (22)	291 (31)	284 (31)	372 (40)	590 (64)	583 (63)
Salmonellosis (excl *S. typhi*), n=615	83 (14)	119 (19)	110 (18)	238 (39)	454 (74)	445 (72)
Cryptosporidiosis, n=121	48 (40)	63 (52)	61 (50)	28 (23)	56 (46)	54 (45)

Table A3. 3 Notification rates and rate ratios of enteric notifications received in 2004, by Aboriginality according to WANIDD alone, and Aboriginality according to WANIDD and data obtained via data linkage, by disease (per 100 000 population)

	Notification Rates and Rate Ratios				
	***Campylobacter* infection**	***Giardia* infection**	***Salmonella* infection**	***Cryptosporidium* infection**	***Shigella* infection**
WANIDD					
Aboriginal	160	569	237	137	137
Non-Aboriginal	80.9	38.8	24.8	2.92	2.61
Rate Ratio	2.0	14.7	9.5	46.9	52.5
Sensitive					
Aboriginal	234	831	340	180	189
Non-Aboriginal	181	61.6	47.4	5.8	4.39
Rate Ratio	1.29	13.5	7.17	31.0	43.0
Specific					
Aboriginal	206	812	314	174	183
Non-Aboriginal	180	60.9	46.5	5.64	4.18
Rate Ratio	1.14	13.3	6.75	30.9	43.8

Table A3.3 shows that notification rates calculated by excluding cases where Aboriginality data were missing from WANIDD (WANIDD rate) are an underestimate of the true rate in both Aboriginal and non- Aboriginal people. However notifications with missing Aboriginality data in WANIDD were more likely to be identified as non-Aboriginal by data linkage. The Aboriginal:non-Aboriginal rate ratios for the five major enteric infections decreased if Aboriginality data from data linkage were included when calculating rates and rate ratios. When Aboriginal:non-Aboriginal rate ratios were calculated using only information in WANIDD, the rates overestimated the true rate ratios by between 8% (for *Giardia*) to 35% (for *Campylobacter*).

A3.3 Limitations of this study

This study only addressed the issue of *completeness* of identification of Aboriginality. It did not seek to address the issue of *validity* of identification of Aboriginality. It is possible that Aboriginality as documented in WANIDD or any of the linked databases may be inaccurate, as identifying Aboriginality in the field can be problematic. For example, a person's Aboriginality is often ascertained by health staff, not by asking whether the patient identifies as being of Aboriginal and/or Torres Strait Islander descent, but rather by making a judgement based on their appearance or by referring to their past medical records.

A3.4 Conclusions

Using data linkage, the proprotion of enteric notifications with missing Aboriginality data was reduced from 49% to 7.1%. After data linkage, there were negligible proportions of shigellosis and cryptosporidiosis notifications, and less than 10% of campylobacteriosis, giardiasis and salmonellosis with missing Aboriginality data. Using the original WANIDD data for calculating rates and rate ratios resulted in an overestimation of the rate ratio Aboriginal:non-Aboriginal. This overestimation ranged from 8% to 35%, with the greatest overestimation for *Campylobacter* notifications.