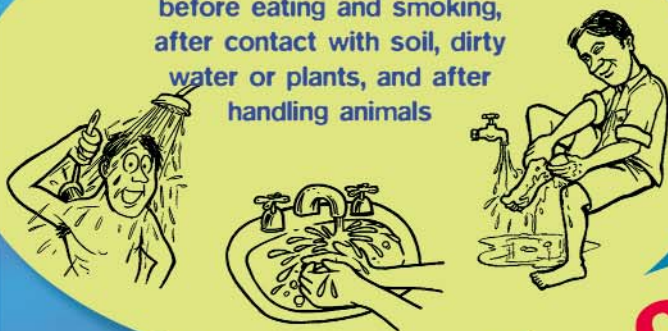


Leptospirosis

ANNUAL REPORT 2002

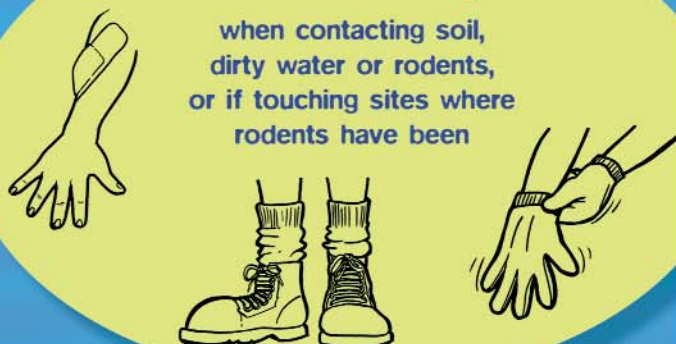
WASH

before eating and smoking, after contact with soil, dirty water or plants, and after handling animals



COVER

when contacting soil, dirty water or rodents, or if touching sites where rodents have been



CLEAN UP

to keep rodents away



SEE A DOCTOR

If you have flu-like symptoms, see a doctor immediately or you might get liver damage, kidney and lung failure



Authors

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Tropical Public Health Unit Network



Queensland
Government
Queensland Health

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1 Introduction

This report details the epidemiology of leptospirosis in North Queensland (NQ) in 2002. It also discusses the recent history of leptospirosis in the region, the research projects initiated and the community education program conducted during 2002.

2 About leptospirosis

Leptospirosis (or Weils' disease) is an acute, infectious disease caused by different types of one bacteria, of which there are over 200 strains worldwide. Twenty-three of these occur in Australia.

Leptospirosis is spread in the urine of infected animals (wild and domestic) and in water and soil contaminated with infected urine. It is not spread from person to person.

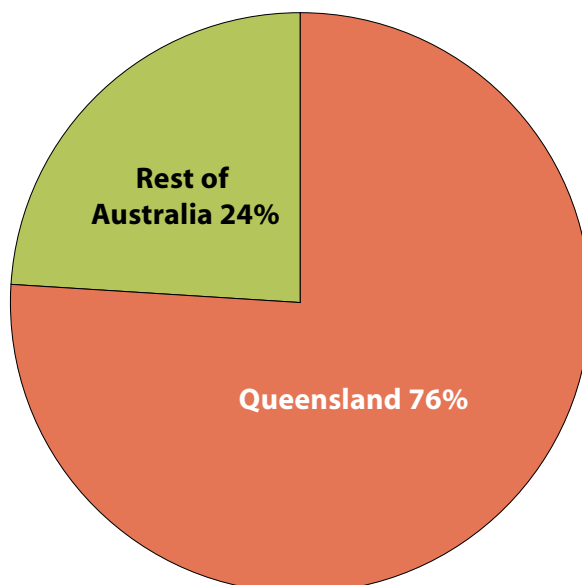
The infection usually enters through broken, grazed or cut skin (especially on the hands and feet) and sometimes through the linings of the mouth, nose and eyes. Swimming or wading in contaminated water is also considered a risk.

3 History

3.1 Geographic clusters

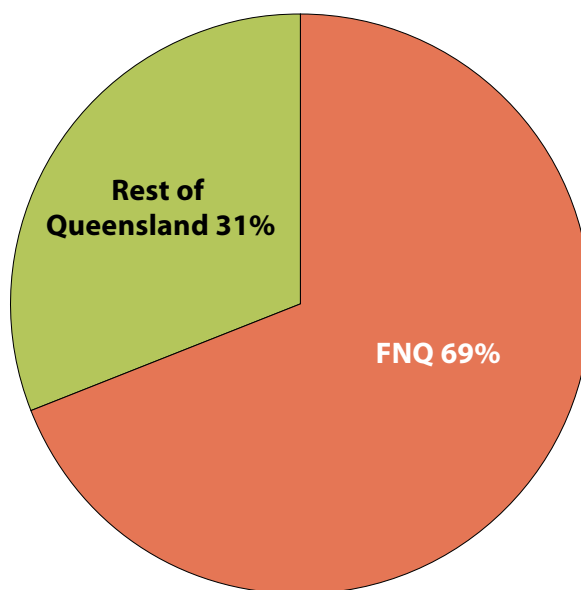
Most reported cases of leptospirosis in Australia are from Queensland. For example, in 2002, 103 (76%) of the 170 cases reported nationally were from Queensland (Communicable Diseases Network 2003).

Figure 1
Notified cases of leptospirosis:
Queensland vs rest of Australia, 2002



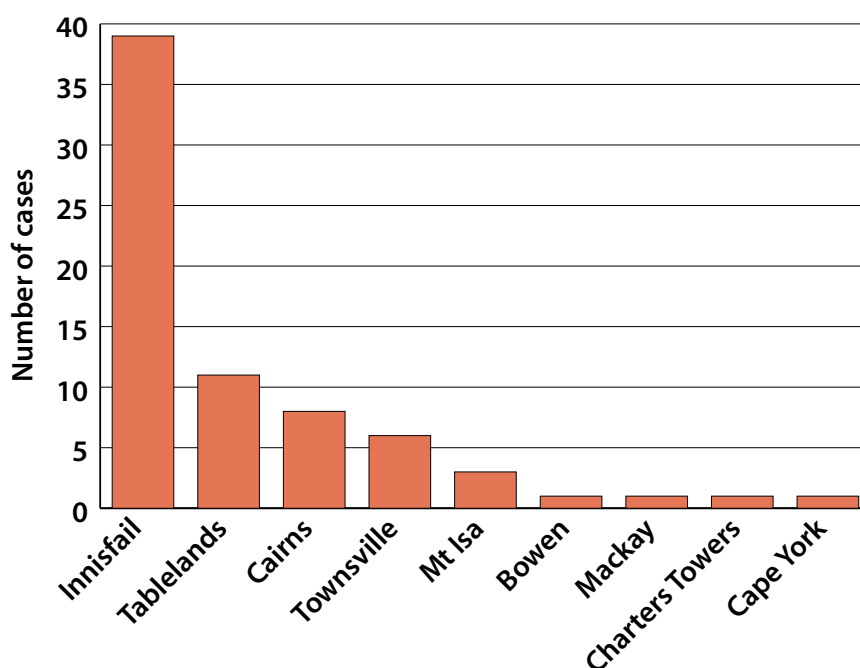
Within Queensland, most cases are from North Queensland (NQ)¹. In 2002, 71 (69%) of Queensland's cases were from NQ.

Figure 2
Notified cases of leptospirosis:
FNQ vs rest of Queensland, 2002



Within NQ, most cases are reported from Innisfail and Tableland Health Service Districts (HSDs). In 2002, 50 (70%) of the 71 NQ cases were from these two HSDs.

Figure 3
Distribution of Leptospirosis
in NQ by District, 2002 (n=71)



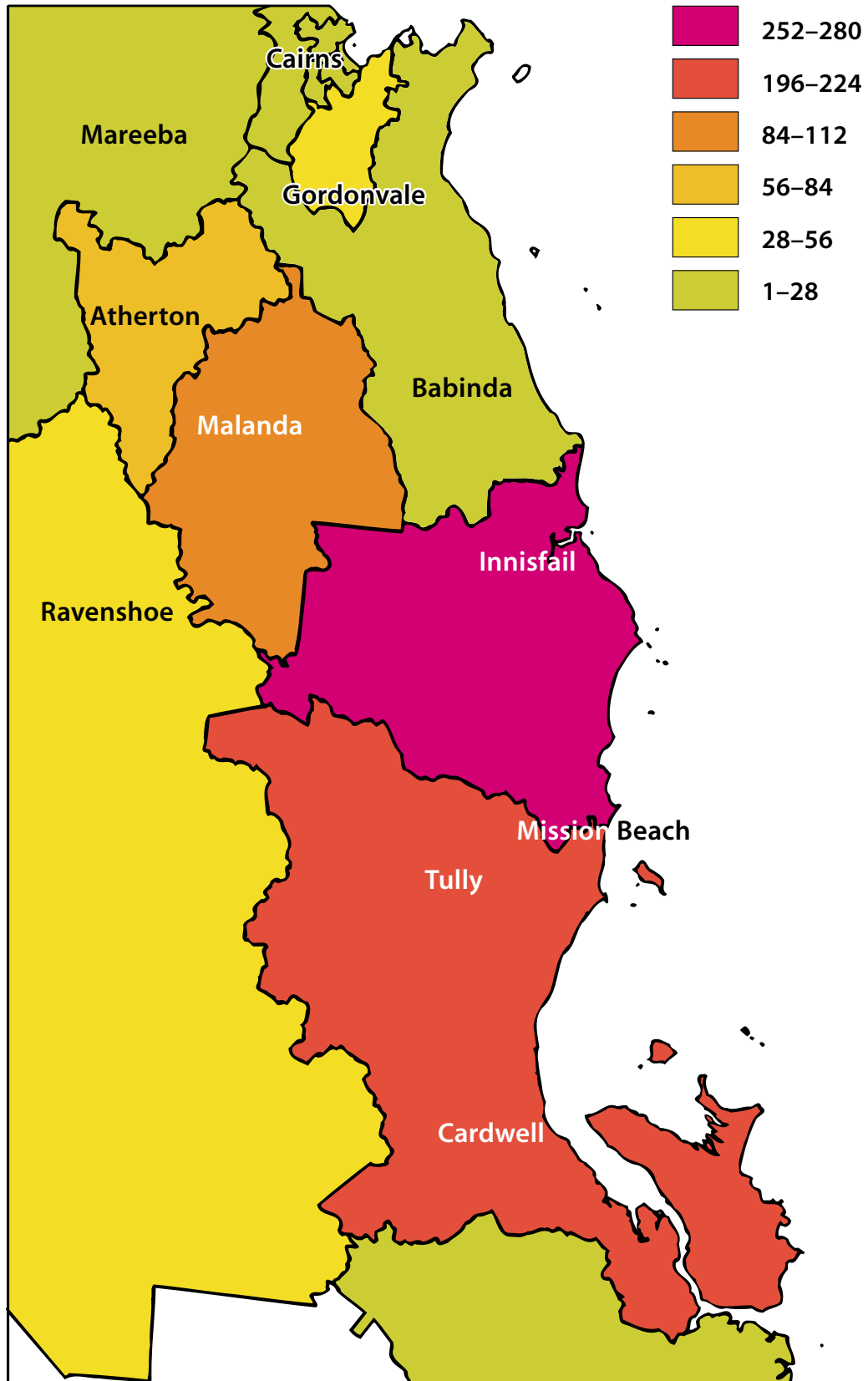
In summary, the Innisfail and Tablelands HSDs reported 29% of all Australia's notified cases of leptospirosis in 2002.

1 NQ is defined as Mackay to the Torres Strait islands and west to Mt Isa.

3.2 Number of reported cases and 1999 outbreak

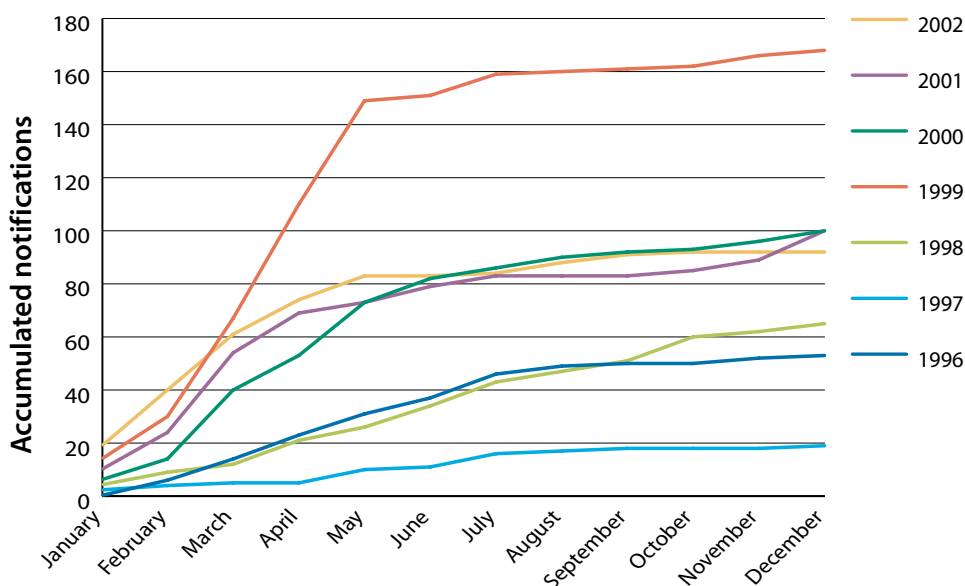
The number of cases of leptospirosis in NQ per capita between 1996 and 2001 is illustrated on the following map.

Figure 4
Notified cases of leptospirosis
per 100,000 people 1996–2001



Leptospirosis is endemic in NQ in the wet season (Jan-June). In the 'average' year about 60-100 cases are reported from NQ. However in 1999, 160 cases were reported. Post-cyclonic floods and a rodent plague are believed to have contributed to this 'epidemic' year.

Figure 5
Leptospirosis notifications
for NQ 1996–2002



3.3 Risk

Although fatalities are rare (with only one death in NQ in the last 10 years) the disease can be debilitating. As well as the need for immediate hospital care, some patients may take months to fully recover.

3.4 Queensland Health initiatives

In response to the 1999 outbreak Queensland Health convened a Leptospirosis Seminar in Innisfail in March 2001 and invited state and local government, key stakeholder groups (including banana and dairy industry representatives) and interested individuals to attend.

As a result of this seminar, a part-time Leptospirosis Project Officer was employed in 2001 and a Leptospirosis Action Committee (LAC) was established in early 2001. The LAC is comprised of representatives of key stakeholder groups, including the banana and dairy industries. The broad objectives of the LAC are to:

- raise the profile of leptospirosis as a public health issue
- improve knowledge about the transmission dynamics of leptospirosis in NQ
- improve the currently available risk reduction strategies, and
- ensure that there is ongoing awareness of leptospirosis, particularly in at-risk occupations.

4 2002 surveillance

4.1 Methodology

The Tropical Public Health Unit endeavours to contact each person who has been notified with leptospirosis and to complete follow up questionnaire (see Appendix One). This questionnaire ascertains factors that may have contributed to the individuals contracting the disease.

In 2002 this questionnaire was reviewed and enhanced to pinpoint occupational and recreational risk activities.

4.2 2002 surveillance results

In 2002, 10 of the 71 NQ notified cases were unable to be contacted for the questionnaire, however, hospital and doctors' records revealed that all 10 were banana workers.

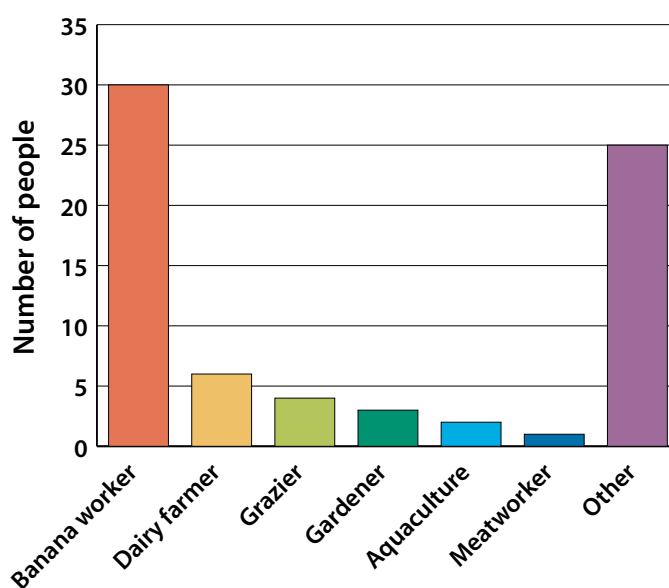
4.3 Age and sex

Sixty-five (93%) of the seventy-one notified cases in NQ were men. This is a male to female ratio of 10.8:1. The average was 35 years of age. The youngest person notified was 9 years of age and the oldest was 73 years of age. Cases in young children are quite rare. The next ten youngest cases notified were 16-20 years of age.

4.4 Occupations

Within the NQ, work in the banana industry is single most commonly reported occupation of notified cases of leptospirosis. In Figure 6 below, the occupations that are grouped under 'Other' were from all sectors of the community including: unemployed, cane farmer, baker, bus driver, charter boat operator, chef, electrician and home duties.

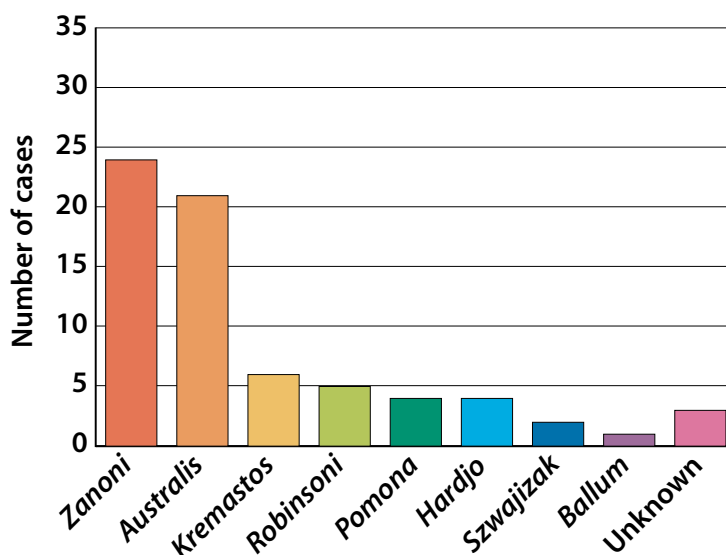
Figure 6
Occupations of
notified cases, 2002 (n=71)



4.5 Serovars

68 of the seventy-one cases had identifiable serovars. The most common serovars found were *zanoni* and *australis* which are both carried by rodents.

Figure 7
Serovars, 2002 (n=71)



4.6 How leptospirosis was acquired

Each of the 61 people that were interviewed were asked about risk activities that they engaged in whilst they were exposed to the disease. Exposure can occur anytime between 4 and 20 days before the onset of symptoms.

Risk activities have been identified by the Tropical Public Health Unit as:

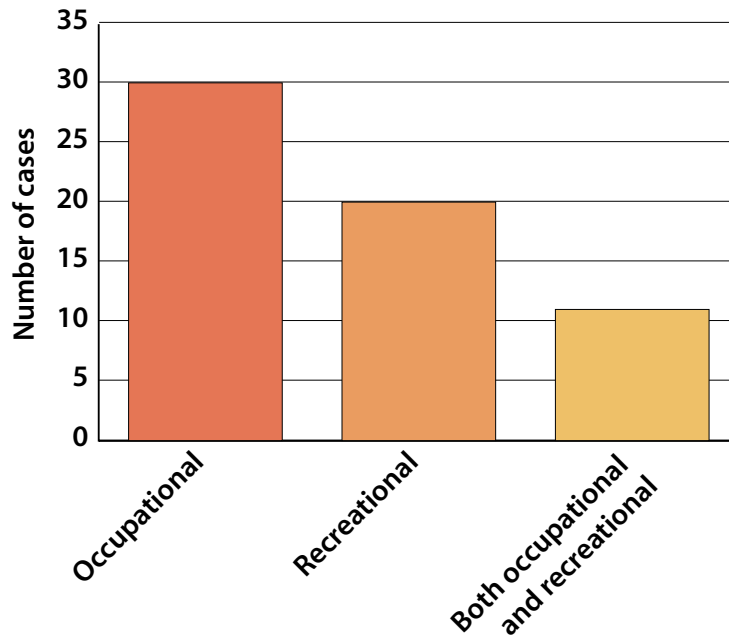
- working outdoors
- bushwalking
- camping
- water activities (swimming, boating, canoeing etc)
- hunting
- gardening
- rats or mice in the workplace or at home
- cleaning up after rats.

The respondents were then classified as follows:

- **Occupational risk factors** (49%)
 - respondents whose only risk activity was working outdoors.
- **Recreational risk factors** (33%)
 - respondents who did not work outdoors but did engage in other risk activities.
- **Both occupational and recreational risk factors** (18%)
 - those respondents who both worked outdoors and engaged in other risk activities.

Almost half (49%) of all respondents acquired leptospirosis through their occupations.

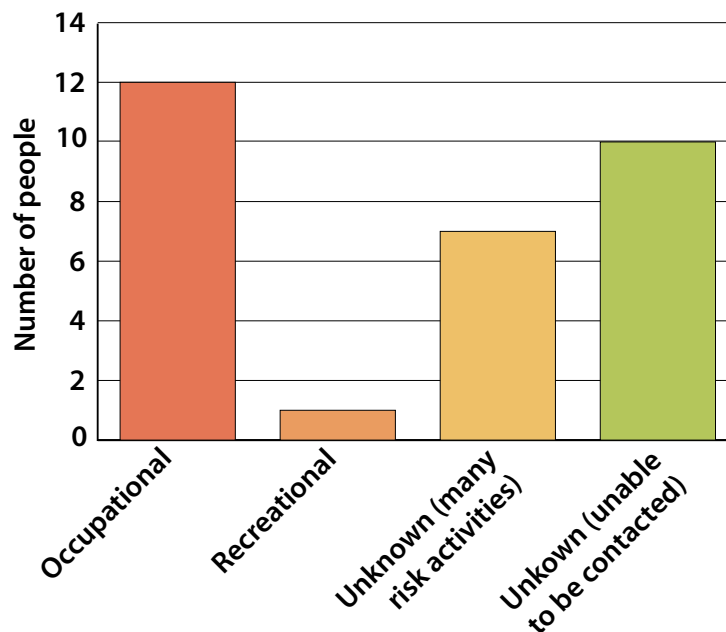
Figure 8
How leptospirosis was acquired (n=61)



4.6.1 Banana workers

Ten of the 30 banana workers who contracted leptospirosis in 2002 were unable to be contacted. Of the 20 that were contacted 12 (60%) of them contracted the disease occupationally, one recreationally (acquired at the same time as two other cases while swimming) and seven (23%) had both recreational and occupational risk activities.

Figure 9
How banana workers acquired leptospirosis (n=30)



4.6.2 'Other' professions

27 respondents were classified as working in 'other' professions (that is, other than banana worker, dairy farmer, grazier, gardener, aquaculture or meat worker). Three quarters or 19 (76%) of these respondents acquired leptospirosis recreationally and six (24%) acquired it occupationally. The professions of those who acquired it occupationally were:

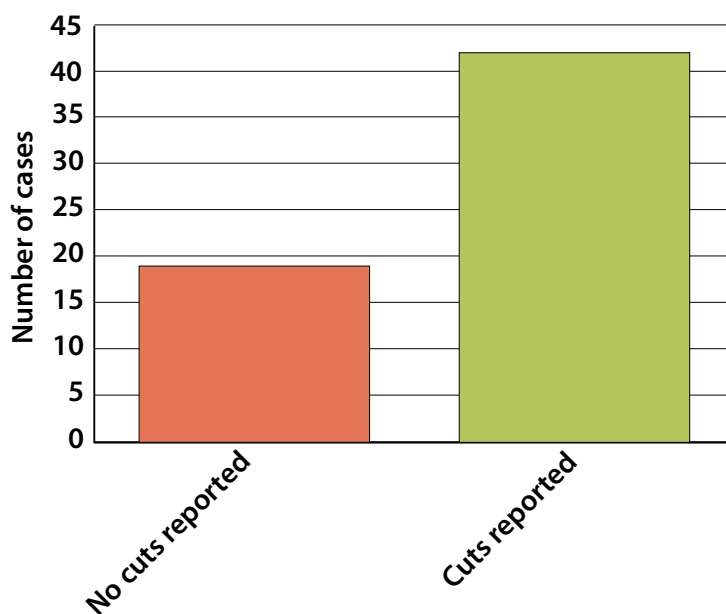
- charter boat operator
- Aboriginal and Torres Strait Islander project worker
- soldier
- electrician
- rodent trapper
- taro farmer.

4.7 Reporting of cuts

Each of the 61 people that were interviewed were asked if they had cuts on their skin during the time they were exposed to leptospirosis. One study of the disease in Thailand found the presence of more than two wounds on the body was independently associated with leptospirosis infection (Phraisuwan et al 2002).

A total of 69% of the respondents contacted in NQ reported cuts.

Figure 10
Number of people who reported cuts
at the time they were exposed to leptospirosis, 2002 (n=61)

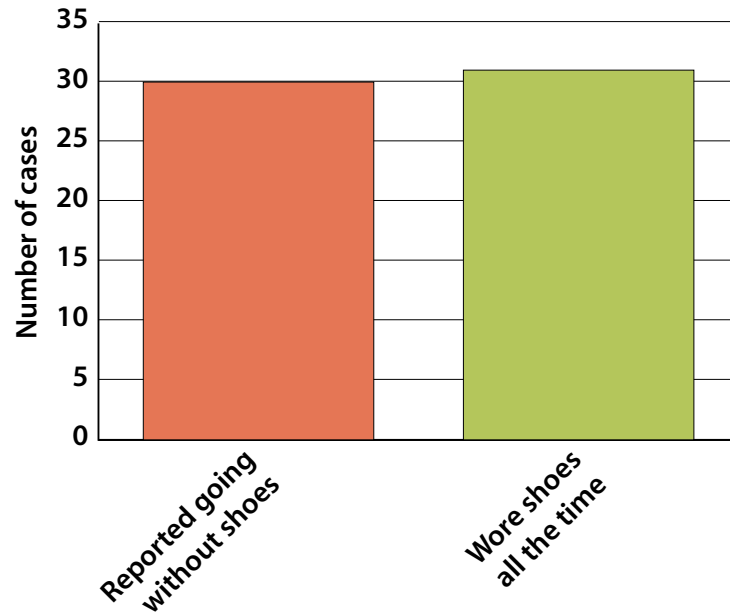


4.8 Footwear

Each of the 61 people interviewed was asked if he/she always wore footwear during the time they were exposed to leptospirosis. Fifty-one percent reported wearing shoes all the time. Forty-nine percent reported not wearing shoes all the time.

There seemed to be no correlation between wearing of footwear all the time of exposure and the incidence of the disease.

Figure 11
Footwear and leptospirosis cases, 2002 (n=61)



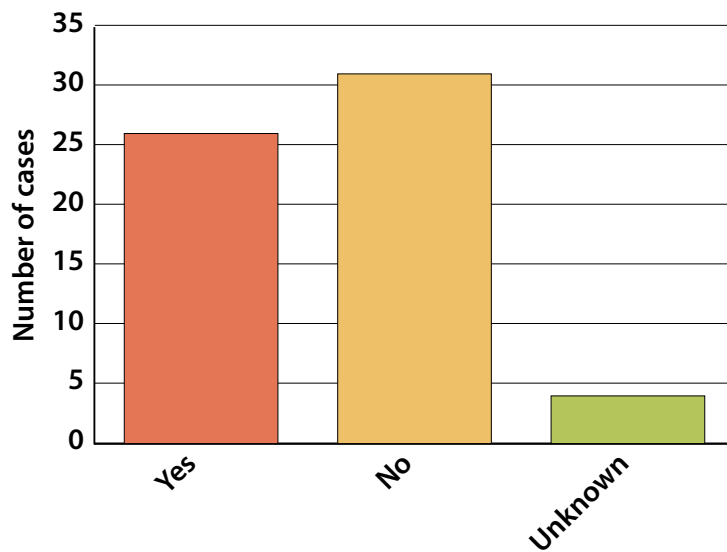
4.9 Smoking

The Queensland Health survey which was conducted in 1998 reported that 27% of males over 18 years of age in Queensland self-reported smoking (TPHU 2003). Each of the 61 people interviewed were asked if they smoked. Forty-three percent reported that they were smokers. This is 72% greater than the state average percentage of smokers.

Of the 20 banana workers contacted, 68.8% of them reported they were smokers.

Smoking may increase the risk of transmission of leptospirosis because it increases the frequency of hand-to-mouth contact.

Figure 12
Smoking and leptospirosis, 2002 (n=61)

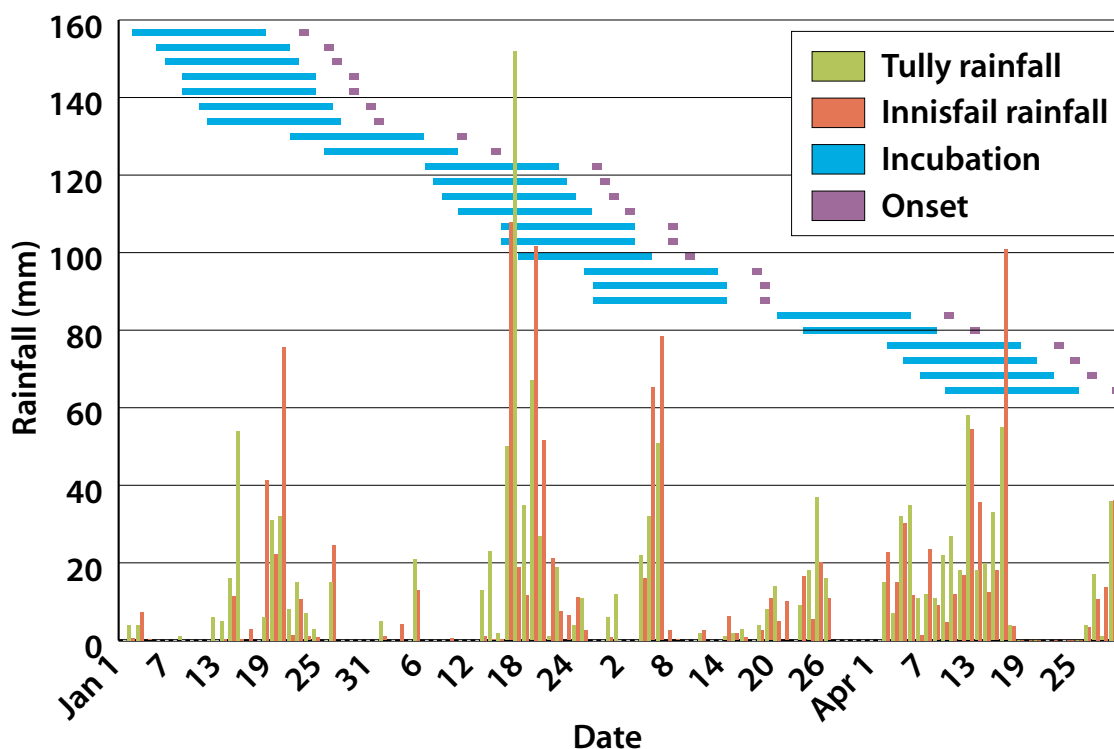


4.10 Rainfall

Most cases of leptospirosis in NQ occur during the wet season from November to May (see Figure 5 Leptospirosis notifications). The bacteria thrives in warm wet conditions. The following graph charts the rainfall in the Tully/Innisfail area during the first four months of 2002. Across the top of the graph, the incubation period (blue) and onset dates (red) have been charted for the 25 people who contracted leptospirosis in the Tully/Innisfail area between January and April 2002.

Periods of heavy rainfall especially in the second half of February (the middle of the graph) loosely correlate with an increase in cases.

Figure 13
Incubation period and onset date of Leptospirosis charted against rainfall
in Innisfail/Tully area, January–April 2002



4.11 Swimming/water activities

On 28 January 2002, three teenage boys presented to Tully hospital with a febrile illness. Two were confirmed with leptospirosis (the third did not return for a blood test). The only risk activity the three had in common was swimming at a water hole in a creek near Tully within days of heavy rain.

In NQ water activities, such as swimming, are rarely identified as the single risk activity engaged in by people who present with leptospirosis. However, overseas outbreaks have been conclusively caused by swimming in contaminated water (Haake et al, 2002).

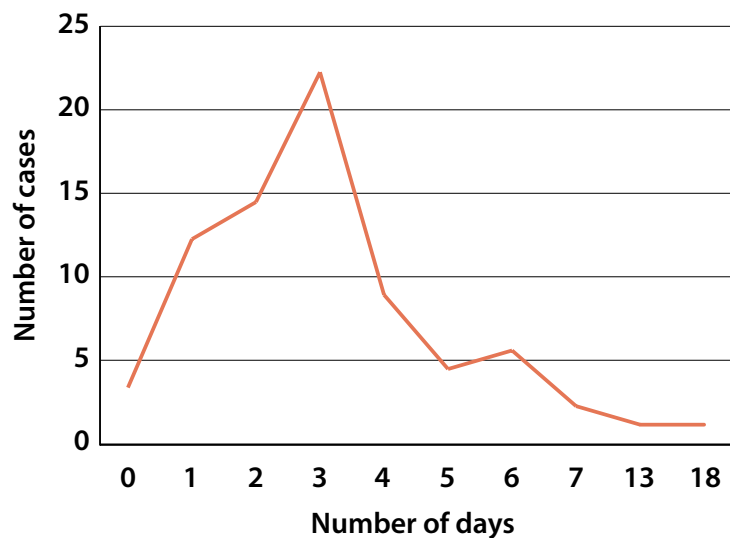
In NQ in 2002, 13 people engaged in water activities in the period that they contracted the disease, yet only 2 identified water activities as their one and only risk activity.

4.12 Number of days between onset and treatment

The greater the length of time between the onset of symptoms of leptospirosis and treatment may be a contributing factor to the severity of the disease.

This data was available for 68 of the 71 cases in NQ in 2002. The date of treatment was taken as the date that the patient received antibiotics, rather than the day they presented to a doctor or hospital, because some patients had a delay in receiving the antibiotics.

Figure 14
Number of days between onset
of illness and treatment, 2002 (n=68)

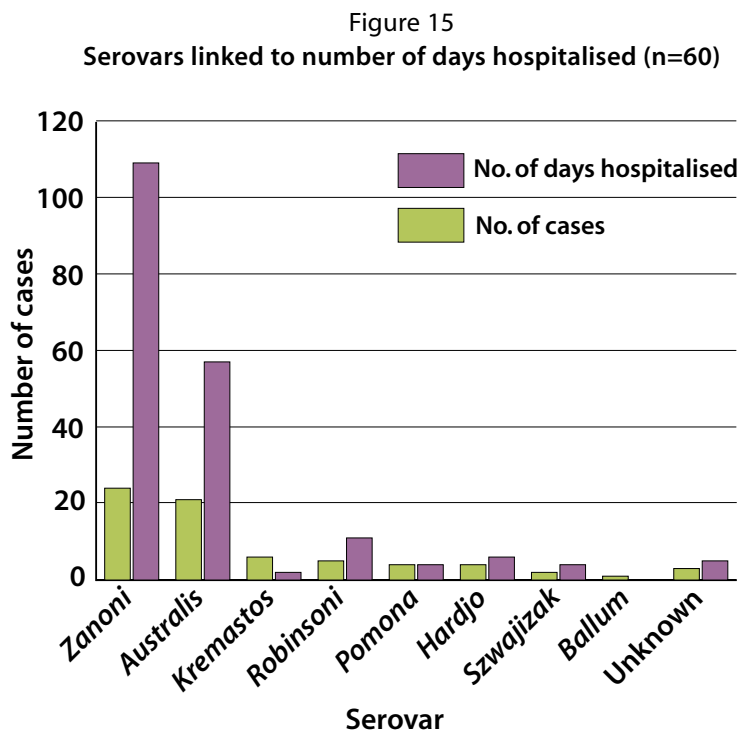


The average time between onset and treatment was 3.3 days. This data was compared to the amount of days spent in hospital (as an indicator of severity of illness) but no correlation was found.

4.13 Serovar and severity of illness

Hospitalisation data was available for 60 of the 71 NQ cases. 70% (42) of these 60 cases were hospitalised. The minimum stay was one day (6 people) and the maximum was 34 days (1 person). The average hospital stay was 4.8 days.

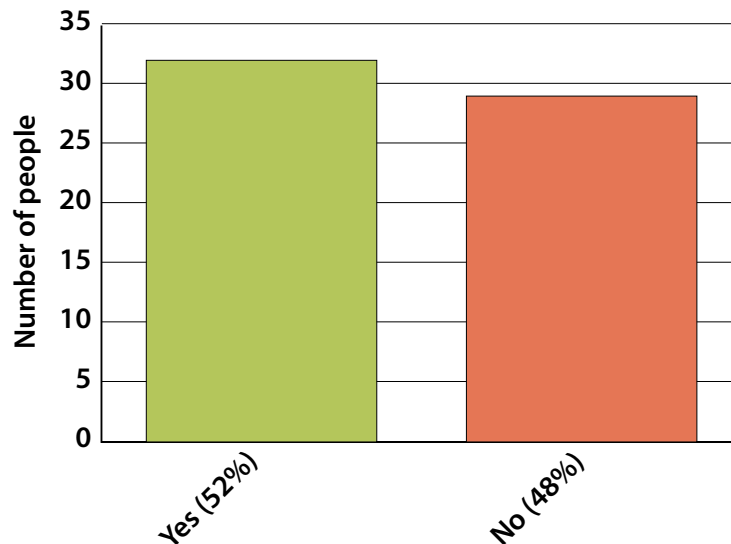
Severity of illness can be approximated by the amount of time a patient spent in hospital. The one person who spent 34 days in hospital had contracted the serovar *zanoni* and required a number of weeks in intensive care. *Zanoni*, *australis* and *robinsoni* all seem to be related to severity of illness.



4.14 Awareness of leptospirosis

Just over half of the 61 respondents contacted (52%) recalled hearing messages about leptospirosis. Of those who had heard messages, word of mouth, the poster, brochure and advertisements were all recalled.

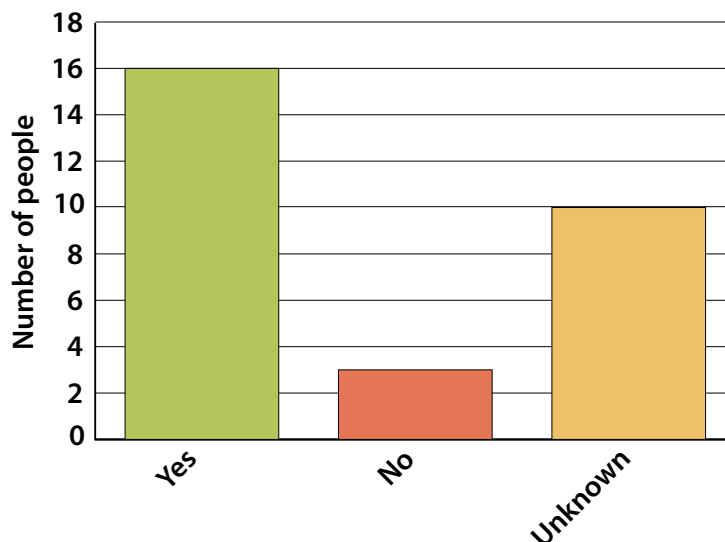
Figure 16
Awareness of leptospirosis message
amongst cases, 2002 (n=61)



The four dairy farmers and two graziers who contracted leptospirosis in 2002 had each heard messages about leptospirosis. Of the 20 banana workers contacted, 16 (80%) had heard messages, three had not and there was no record for one worker.

In 2002, banana and cattle workers indicated a much better awareness of leptospirosis amongst cases than other patients. This high exposure to messages in these workers compared to other patients can be partly attributed to the education campaign which targets the dairy and banana industry. However, we have yet to measure how well the messages are understood.

Figure 17
Awareness of leptospirosis message
amongst banana worker cases, 2002 (n=30)



The 2002 results for banana worker cases can be compared to a March 2002 study of 32 random banana workers which found that 18 people (56%) had heard radio messages about leptospirosis (Robertson 2002). The 32 people were divided into six groups and at least one primary prevention method was recalled unaided by five of these groups. In addition five of the six groups surveyed were able to recall the symptoms of leptospirosis correctly.

Similarly a June 2000 study of 42 random banana workers found that 69% of respondents had seen the leptospirosis poster (Lily and McCabe 2000). Despite high exposure to the poster in the 2000 study, 33% of respondents didn't know the symptoms of leptospirosis and 42% didn't know how the disease was spread.

Respondents were also asked how many years they had been residents of NQ and this information was correlated with whether they had heard any leptospirosis messages but no correlation was found.

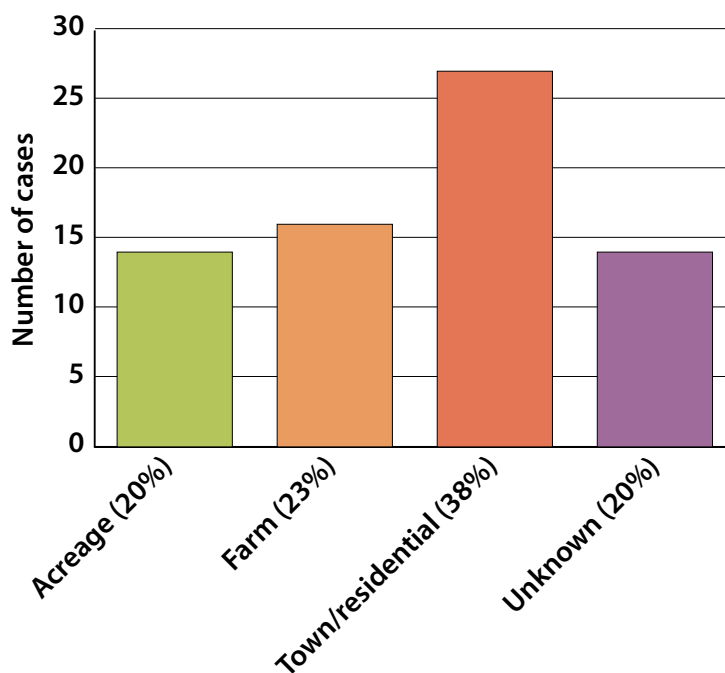
These results indicate that messages are reaching banana workers and dairy workers but stress the importance of continuing with the education campaign with the general public and itinerant workers. The results also don't indicate how well the messages are understood.

4.15 Place of residence

Respondents were asked whether their place of residence was acreage, farm or town/residential to see if there was any correlation between residence and incidence of leptospirosis.

Forty-seven percent of the 57 respondents contacted lived in an urban environment and 53% lived in a rural environment. The results indicated little correlation between incidence of the disease and place of residence. Occupation was found to be a far greater indicator of risk.

Figure 18
Place of residence, 2002 (n=71)



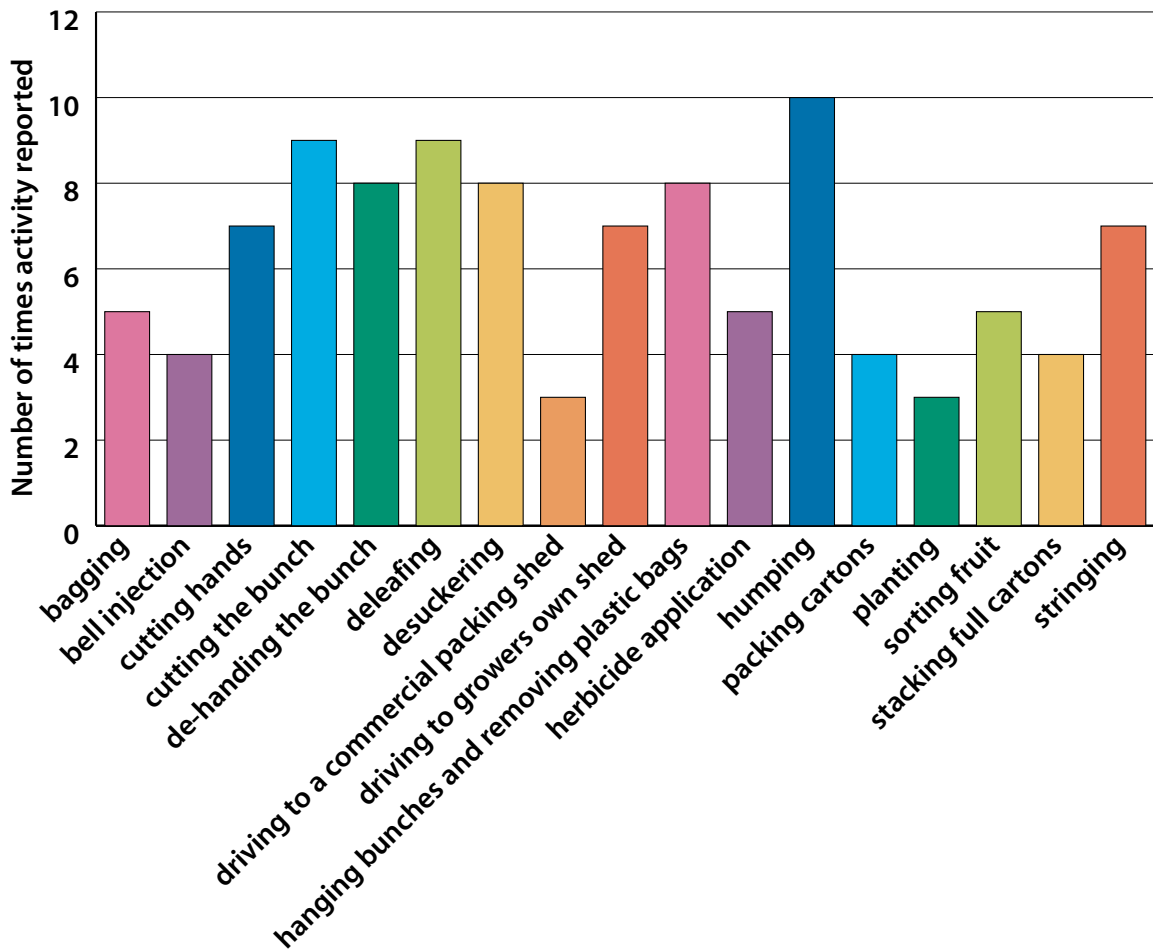
4.16 Banana Workers Activities

Banana workers were asked the types of activities they did on the farm during the weeks that they were exposed to leptospirosis. Of the 30 banana workers, 10 were unable to be contacted, one did not provide a response and one definitely acquired leptospirosis recreationally, so was not included in this count.

Seventeen activities on a banana farm were identified by the Queensland Fruit and Vegetable Growers (see Appendix One).

Of the 18 banana workers who provided responses, some had conducted 14 activities, some had conducted only one.

Figure 19
Reported activities by banana workers
during incubation of leptospirosis, 2002 (n=18)



The activities were divided into three headings according to the type of work. 'Tending the plants' were activities only slightly more commonly identified than the other two types of work.:

- tending to the plants (40%)
- harvesting (27%)
- in the shed (33%).

The most commonly recorded activity by respondents was humping (carrying the banana bunches over one shoulder from the tree to the truck).

Four respondents reported doing one activity exclusively. These exclusive activities were:

- humping
- deleafing
- bell Injecting
- bagging.

Each of these activities occurs in the plantation rather than in the shed.

One person reported doing two activities exclusively: dehanding and hanging bunches.

From these results there is no clear indication that some activities in the banana farm carry more risk than others. The findings of the environmental sampling research which located actual sources of leptospirosis (see Section 5.2) reveal more about the actual risk sites for the disease on banana farms.

5 Research

5.1 Economic analysis

The costs of leptospirosis to Queensland Health are high. In 2002 the University of Queensland's School of Natural and Rural Systems Management completed a study into the economic costs of leptospirosis to Queensland Health and the banana industry (Cook et al 2002). Queensland Health hospitalisation data was compiled by Fiona Tulip, Data Manager, Tropical Public Health Unit.

The study focused on the costs during the 1999 outbreak in the HSDs of Cairns, Innisfail and the Tablelands. In 1999 there were 160 cases reported in this NQ. By comparison there were 66 cases notified in 1998, and 96 notified cases in 2000.

The costs to Queensland Health in 1999 were \$368,630 and were as follows:

Table 1
Economic costs of leptospirosis outbreak
to Queensland Health, 1999

Category	Cost (\$)
Education and prevention	18,145
Diagnosis	23,295
Hospitalisation	322,866
Surveillance	4,324
Total	\$368,630

The cost of individual hospitalisation treatment ranged from \$670 up to \$43 899. Costs escalate markedly for intensive care treatment. Of the 86 individuals hospitalised in the three HSDs, five were admitted to an intensive care unit, with costs for these episodes totalling \$128 074 and ranging from \$15 195 to \$43 899 for a single admission.

The loss of productivity costs to the banana industry in NQ were estimated at \$51 675.32. In addition, \$11 732 in statutory payments were made by WorkCover Queensland to fruit workers for leptospirosis during the outbreak.

5.2 Environmental sampling

In March 2002, Lee Smythe and Michael Dohnt of the WHO/FAO/OIE² conducted environmental sampling of soil and water at seven banana farms in the Innisfail/Tully area. The aim was to:

- investigate for the presence of pathogenic leptospires in environmental samples
- determine the likely environmental sources in order to assist in prevention and management of the disease, both at the public health and work practice levels.
- identify any leptospiral isolates recovered from these samples to a presumptive serovar level.

2 Collaborating Centre for Reference and Research on Leptospirosis, Australia and Western Pacific Region, Queensland Health Pathology and Scientific Services.

Of the 107 samples taken samples 15 (14%) were found to be positive by PCR and 16 (15%) positive by culture. Six of the seven farms were found to have leptospirosis in their soil or water. The most common locations for leptospirosis were:

- 1 damp soil under banana trees and under leaf litter
- 2 tyre ruts filled with water
- 3 mud of the floor under the hose-down area and the sorting benches in the sheds.

No samples collected from banana bags or banana trees were found to be PCR positive. The results for these above-ground sources did not exclude these as a risk but suggested they provided a very much reduced opportunity for exposure to pathogenic leptospira for workers on the farm.

The ponding of water in and around sheds combined with muddy conditions and shade (if contaminated with leptospira) would provide conditions suitable for extended survival of the organism and a likely source of exposure. Tracking of mud from farm vehicle tyres into sheds and work areas could also pose a similar risk.

The results for this study must be considered in context of the seasonality, rodent numbers and number of samples. Also the work was a benchmark study with little or nil overseas studies conducted in this arena against which to compare results and strategies. Nevertheless it provided some interesting results and influenced the recommendations within the Leptospirosis Guidelines for the Banana Industry.

5.3 Ecological study

Very little is understood about the vectors that are the source of leptospirosis on banana farms. In September 2002, the University of Queensland in collaboration with the WHO/FAO/OIE and the Tropical Public Health Unit commenced an ecological study into small and medium-sized animals as sources of leptospirosis on banana farms in NQ.

The study comprised a dry season trapping (September 2002) and wet season trapping (March 2003) of rodents and bandicoots on two carefully selected banana farms, one in near Tully and one near Innisfail.

The aims of the project are to:

- identify species of medium and small terrestrial mammals on banana farms adjacent to sugar cane farms and rainforests.
- determine the distribution and relative abundance of the rodent species on the banana farms and the adjacent habitats.
- determine the strains of leptospira carried by their hosts.
- determine season changes in abundance and population structure of rodents and the seroprevalence of specific leptospira in the animals.

This results are intended to be used to:

- elucidate patterns and causes of the interaction of humans and leptospira hosts.
- develop management strategies to control the leptospira hosts and leptospirosis in the Innisfail/Tully area.

In the dry season trapping, a total of 302 small animals were captured. In the wet season trapping approximately 1000 animals were captured. The University of Queensland also used radio tracking on animals to determine the animal's movements over banana farms during the night. Results of the study are expected in late 2003.

6 Community Education

6.1 2000 resources

In 2000, Tropical Public Health Unit (TPHU) disseminated new leptospirosis resources (brochure and poster) to the banana industry.

These resources were evaluated and despite high exposure to the resources, 33% of respondents didn't know the symptoms of leptospirosis and 59% didn't know how the disease was spread.

6.2 2002 Resources and education campaign

6.2.1 Planning

In March 2001 the leptospirosis project officer reviewed the resources and developed four key messages: COVER, WASH, CLEAN UP and SEE A DOCTOR.

These messages formed the basis of a new general campaign targetting the general public in high-risk areas and specific campaigns targetting the banana and dairy industries. A media plan was developed outlining the advertising and public relations campaign.

The advertising and public relations campaign was run from January to April 2002 and recall was tested with banana workers in March 2002 (see next section).

Further resources (a poster, banana and dairy worker brochures and workplace health and safety guidelines) were developed in consultation with stakeholders throughout 2002.

6.2.2 Testing

Early drafts of the resources and workplace health and safety guidelines were tested with industry focus groups. Radio and newspaper advertisements were also evaluated with industry focus groups.

Overall banana industry respondents were very critical of the first draft of the resources and workplace guidelines which led to many important changes to content and design. Dairy industry respondents had fewer comments. Radio advertisements were recalled by 18 of the 32 banana industry individuals (56%). At least one primary prevention message was recalled by each of the five banana industry focus groups. Newspaper advertisements were poorly recalled by all groups surveyed.

As a result of the evaluation processes all resources were reviewed and redesigned to incorporate the focus group feedback.

Full details of the evaluation are documented in *Evaluation of the Health Education Campaign - Leptospirosis* (Robertson 2002).

6.2.3 Resource dissemination

Resource packs were disseminated in late 2002. These comprised:

- banana industry packs including worker brochure, posters and workplace health and safety guidelines sent to 750 banana farms.
- dairy industry packs including worker brochure, posters and workplace health and safety guidelines sent to 150 dairy farms.
- posters sent to hospitals, pharmacies, GP surgeries, backpackers, community health centres, local councils in the high-risk areas.

7 Discussion

7.1 2002 Surveillance

Data entry and processing of surveillance of cases in 2002 has reaffirmed some knowledge about leptospirosis in NQ and introduced some new points of interest.

7.1.1 Reaffirmed

- Males aged over 16 years are at highest risk.
- Banana industry is the highest risk occupation.
- *Zanoni* and *australis* are the most commonly recorded serovars and also more commonly require hospitalisation.
- The incidence of leptospirosis correlates with periods of heavy rainfall.

7.1.2 New points of interest

- At least half of respondents acquired leptospirosis occupationally.
- At least 60% of banana workers acquired leptospirosis occupationally.
- Most people working in low risk professions (eg. chef) were more likely to acquire leptospirosis recreationally (76%).
- There is a strong correlation between reporting of cuts and leptospirosis (69% of respondents reported cuts).
- Smoking may increase risk. Smoking was more common in those with leptospirosis than in the general population.
- Leptospirosis can be contracted from swimming in natural water holes.
- Awareness of leptospirosis messages is high in banana, dairy and cattle workers but is not high in the general population.
- No correlation could be found between wearing of footwear and leptospirosis.
- No correlation could be found between severity of illness and delay before treatment.
- Place of residence is not an indicator of risk of leptospirosis.
- No conclusions could be made about which banana work activities carry more risk.

7.1.3 Recommendations

Intense surveillance is an important tool that helps inform and support education and research strategies. For the purposes of NQ research into leptospirosis, some investigations can now cease and it is recommended that the surveillance questionnaire be redesigned.

Cease the following investigations in the Surveillance/Case Report form:

- place of residence (no relevance found)
- animal exposure (as this is anecdotal – a respondent may have no knowledge of exposure to animal urine)
- cuts or grazes (results indicate high indication of risk)
- length of time as resident of north Queensland (no relevance found)
- banana activities (no relevance found)
- presence of hand-washing facilities (as this doesn't indicate whether respondents use them or whether soap and clean towels/paper towels are provided). Also, any result would not influence the 'WASH' prevention message
- location of risk activities (results already clearly indicate the geographic clusters).

Re-assess the value of keeping the following investigations in the Case Report Form and thereby continuing record-keeping and investigations:

- laboratory diagnosis (as this data is kept by the WHO/FAO/OIE and on AUSLAB)
- clinical details (hospital admission date, complications, deceased, past history of leptospirosis and underlying medical condition)
- risk activities (results from 2002 indicate that occupational and recreational risk activities need to be addressed in health education campaigns)
- number of days hospitalised and delay before presentation (no correlation was found yet the SEE A DOCTOR prevention message should remain important regardless of this result)
- inoculating event (if kept, this should be the nurse's opinion, not a record of what the patient believes)
- smoking (results indicate it may be a risk activity).

Consider further studies:

- Boots/shoes (wearing shoes is a strong recommendation of the health education campaign. Any correlation between shoes and leptospirosis needs to be further investigated and the value of this message needs to be studied further).
- Messages heard about leptospirosis (more information needed about recall and understanding of messages).
- Control study with banana workers (that have not reported with leptospirosis) on risk activities, smoking, reported cuts, footwear. To ensure the control group is valid the respondents would need to be blood tested to ensure that they have not unknowingly contracted leptospirosis.

7.2 Research

7.2.1 Economic research

It is recommended that the economic research results be incorporated into a journal article about the costs of the 1999 leptospirosis outbreak to Queensland Health and submitted to a public health journal for publication.

7.2.2 Environmental research

It is recommended that a further environmental sampling program be conducted in a high rainfall wet season. 2002 was a relatively low rainfall wet season.

7.2.3 Health education campaign

It is recommended that focus group interviews be conducted with specific occupational groups (especially banana workers) and possibly the general public in Tully/Innisfail in early 2004 (mid wet season) to assess levels of awareness of leptospirosis and of the prevention messages. It is recommended that a control group study be conducted with banana workers at the same time on risk activities, smoking, reported cuts and footwear with consideration given to blood testing respondents.

It is recommended that the radio advertising campaign should be repeated annually. The press advertisements were poorly recalled and if they are re-run they should be evaluated with the general public. The media/public relations campaign should continue.

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10 Appendix: **Leptospirosis case report questionnaire**

LEPTOSPIROSIS CASE REPORT

PUBLIC HEALTH UNIT _____ Phone: 4050 3600 Fax: 4031 1440

Date notified _____ Notified by _____

Surgery/Hospital _____ Phone _____

PATIENT DETAILS

Patient's name _____ Phone _____

Current address _____

_____ Town/Residential Acreage Farm

DOB: ____/____/____ Age: ____yrs ____months Male Female

Aboriginal TSI Non-indigenous Unknown

Occupation _____ Full time / Part time / Casual

Name of Employer _____ Ph _____

Address of workplace _____

LABORATORY DIAGNOSIS

Hospital Ur: _____

Isolation of *Leptospiriosis spp.* Date sample ____/____/____ Serovar _____

MAT result

1 Date ____/____/____ IgM _____ Titre _____ Serovar _____

2 Date ____/____/____ IgM _____ Titre _____ Serovar _____

Onset of illness ____/____/____ Date first consult ____/____/____ Antibiotics started ____/____/____

CLINICAL DETAILS

Hospital _____

admitted ____/____/____ discharged ____/____/____ Days as in-patient _____

Complications Pulmonary haemorrhage Renal failure Hepatitis

Other _____

Deceased Yes No Date ____/____/____

Past history of leptospirosis Yes No When _____ Where _____

Any underlying medical condition Yes No _____

Do you smoke? Yes No

Exposure Period (onset-20 days to onset-4 days) = ____/____/____ to ____/____/____

RISK ACTIVITIES *in the two weeks before you became ill*

Hospital _____

Specific nature of work _____

Do you have hand-washing facilities at work? Yes No

ACTIVITY	Where	Cuts or grazes?	Waterproof dressings*	Boots/shoes*	Other protective clothing (specify)*	Handwashing before eating & smoking?*
Work						
Bushwalking						
Camping						
Water Activities						
Hunting						
Gardening						
Other _____						
Other _____						

**Specify: yes, sometimes or no*

ANIMAL EXPOSURE OR SAW EVIDENCE OF ANIMAL ACTIVITY *in the two weeks before you became ill*

TYPE	House	Garden	Shed	Farm	Workplace	Other	Any animals unwell?
Rats/mice							
Dairy cows							
Cattle							
Domestic pigs							
Feral pig							
Horses							
Goats							
Sheep							
Dogs							
Other*							

**Prompt: bats, bandicoots*

Comments _____

INOCULATING EVENT (if there was an apparent single event)

Where did event occur _____

Activities at time of event _____

Notable cuts or grazes _____

Date of event ____/____/____ Incubation period _____ days

Comments _____

How long have you lived in north Queensland _____

What messages have you heard about Lepto? _____

Did you get the information from Posters Radio Newspaper

Other _____

Tending to the plants

- Bell injection – injecting the bell (young bunch) with insecticide
- Bagging – applying the plastic bunch cover
- Stringing – tying the bunched plant to another plant so it does not fall down.
String is tied from up high on the bunched plant to near the ground on the support plant.
- Desuckering – cutting off excess suckers (new plants)
- Deleafing – cutting off diseased leaves
- Herbicide application
- Planting.

Harvesting

- Cutting the bunch
- Humping (carrying the bunch to the trailer)
- Driving the trailer or truck with fruit on it to growers own shed
- Driving exchangeable table tops to a commercial packing shed.

In the shed

- Hanging bunches and removing plastic bags from bunches
- De-handing the bunch – cutting hands off the bunch stem
- Sorting fruit in trough, removing damaged bananas
- Cutting hands of bananas into clusters of 3–4 fingers
- Packing cartons
- Stacking full cartons.