EVALUATION OF FOODBORNE DISEASE OUTBREAKS/HUMAN HEALTH SURVEILLANCE INTERFACE

Prepared as part of a New Zealand Food Safety Authority contract for scientific services

by

Dr Rob Lake
Rosemary Whyte
Carol Kliem

June 2005

Institute of Environmental Science & Research Limited
Christchurch Science Centre
Location address: 27 Creyke Road, Ilam, Christchurch
Postal address: P O Box 29 181, Christchurch, New Zealand
Website: www.esr.cri.nz

A CROWN RESEARCH INSTITUTE

Client Report
FW0522

EVALUATION OF FOODBORNE DISEASE OUTBREAKS/HUMAN HEALTH SURVEILLANCE INTERFACE

Kevin Taylor
Food Safety Programme Manager

Dr Rob Lake
Project Leader

Dr Graham MacBride-Stewart
Peer Reviewer

DISCLAIMER

This report or document ("the Report") is given by the Institute of Environmental Science and Research Limited ("ESR") solely for the benefit of the New Zealand Food Safety Authority ("NZFSA"), Public Health Services Providers and other Third Party Beneficiaries as defined in the Contract between ESR and the NZFSA, and is strictly subject to the conditions laid out in that Contract.

Neither ESR nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for use of the Report or its contents by any other person or organisation.

ACKNOWLEDGEMENTS

We would particularly like to thank the staff of Public Health Units who offered comments and advice about their surveillance practices.

Drs. Graham MacBride-Stewart and Naomi Boxall, ESR Population and Environmental Health Group, Kenepuru Science Centre, provided an advance copy of their report "A Review of Outbreak Reporting in New Zealand" prepared for the Ministry of Health.

Carolyn Nicol of the ESR Enteric Reference laboratory provided helpful comments and information.

Peter Cressey, ESR Food Group, assisted with the review of FoodNet and ESR Public Health laboratory activity.

CONTENTS

LIST OF TABLES IN APPENDIX 2

LIST OF FIGURES

SUMMARY

This report was commissioned by the New Zealand Food Safety Authority (NZFSA) to evaluate current foodborne disease surveillance in New Zealand as part of a programme to improve the quality of epidemiological information that is gained from foodborne disease surveillance, investigation and reporting.

The evaluation used the framework from "Updated Guidelines for Evaluating Public Health Surveillance Systems" published by the Centres for Disease Control (USA) 2001.

Human foodborne disease surveillance in New Zealand is primarily a subset of the enteric disease components of the communicable disease and outbreak surveillance system. The key sources of communicable disease surveillance data in New Zealand evaluated in this report are: national notifiable disease and outbreak surveillance system (EpiSurv), laboratory based surveillance, FoodNet, and the ESR Enteric Reference Laboratory.

Analysis of EpiSurv data was supplemented by information derived from interviews with a sample of Public Health Unit staff, and comments by ESR staff involved in preparing risk assessment and other reports for the NZFSA from a national perspective.

The usefulness of the surveillance system in relation to enteric disease is rated high.

Enteric disease is detected in a timely manner permitting effective management (e.g. of potential contacts in the workplace) and incidence and trends are captured and analysed, at both the local PHU and national levels.

There are some qualifications to this rating:

- There are a number of barriers to people with enteric disease presenting to the health system and being captured by the surveillance system. These contribute to underreporting of enteric disease. These factors include:
    - mild symptoms of self limiting disease;
    - lack of awareness by the public regarding who to contact;
    - socioeconomic barriers to seeking treatment;
    - cases with gastrointestinal symptoms for which GPs do not request a specimen;
    - laboratory confirmed cases for which GPs do not pass on information to PHUs;
    - self reported cases (to PHUs) that do not provide a specimen, and outbreaks that occur within a household (i.e. likely to be caused by person to person transmission) are less likely to be reported.
- Enteric disease outbreaks and dispersed events occurring across regions appear less likely to be recognised.
- There is an inherent bias in reporting in that cases where a pathogen has been identified are much more likely to be notified.

In terms of the surveillance of foodborne disease however, the usefulness of the surveillance system is rated low to medium. Foodborne disease is difficult to identify amongst the overall reporting of enteric disease (from all transmission routes). The system also provides little information regarding the magnitude of foodborne disease, detection of trends, and the assessment of the effect of risk management measures.

The main reasons are as follows:

- Not all potentially foodborne diseases are notifiable (although outbreaks of disease caused by non-notifiable pathogens may be identified);
- No risk factor information at all is collected or reported for a high proportion of potentially foodborne enteric disease cases;
- Food vehicles are rarely identified definitively, either for outbreak or sporadic cases; and,
- The reported information in defined fields can be at variance with that given in comments or free text fields.

In terms of providing information for risk assessment the surveillance system is also rated low to medium. Of considerable value is the national coverage, allowing comprehensive overviews of enteric disease incidence to be assembled for New Zealand. However, while foodborne transmission is often suspected, it is rarely confirmed by epidemiological or laboratory studies. There is limited information available to assign proportionality of foodborne transmission amongst other potential routes. Surveillance information must be reviewed carefully (often "line by line" and considering text comments) to assess the reliability of any conclusions drawn.

Comments regarding foodborne disease surveillance system attributes (as listed for review by CDC) are as follows:

System Attribute	Comment
Simplicity	The notifiable diseases surveillance system appears to be functioning well at the national and local level, suggesting that the complexity is not a barrier to PHU participation (except perhaps for outbreak reporting). FoodNet appears to be more complex, and the relationship with EpiSurv incomplete, thus inhibiting use of this database for surveillance purposes.
Flexibility	The notifiable diseases surveillance system appears to be highly flexible with opportunities for generic or unexplained illnesses ("gastroenteritis") reporting alongside the more well defined specific illnesses. The management of data on a national basis within a single organisation (ESR) readily allows modifications to be made in response to national or local needs. At a national level, EpiSurv data is readily collated and analysed for review for risk assessment. The fact that several PHUs have developed "in house" programmes to extract and analyse data at a local level suggests that analytical potential for them needs to be improved. One aspect of flexibility needs to be improved:

	EpiSurv reporting forms are primarily designed for data entry and database needs; tools for information collection and write-up at the PHU level need to be developed.
Data quality	Data quality is uneven. For enteric disease surveillance the data quality is high, with demographic and pathogen data reported for a high proportion of cases, and laboratory confirmation obtained for the vast majority. Timeliness for data entry is good, although delays between onset of symptoms and reporting are too long (however, this is outside the control of the surveillance system). Data quality for surveillance of foodborne disease is rated poor for the reasons given in Section 6.1 i.e. risk factor information is incomplete, food vehicles are rarely identified definitively, and the reported information may be internally contradictory..
Acceptability	The willingness of PHUs and laboratories to participate in the surveillance system appears to be very high. The failure to collect risk factor data for certain types of illness, or the lack of investigation, is a resourcing issue. There appear to be some barriers to participation by GPs, related to resources available to transmit information, or privacy issues.
Sensitivity	The sensitivity of the communicable disease surveillance system in terms of the proportion of cases of serious disease detected is generally high. Most, if not all cases of serious potentially foodborne illness will be captured by one of several reporting channels (GPs, laboratories, hospitals, PHUs). For potentially foodborne enteric infections where it is acknowledged there are many cases in the community which do not come to the attention of the health system, New Zealand reported rates of illness are similar (or higher) than other developed countries. It seems reasonable to conclude that the system will be sensitive to changes in rates. Considering sensitivity in terms of the ability to detect potentially foodborne outbreaks and unusual pathogens, this is also high, with PHUs regularly (daily or weekly) examining local notification data, and typing information from the Enteric Reference Laboratory augmenting notification data. An exception is dispersed events occurring across boundaries where a more intensive national overview appears to be desirable.
Predictive value positive	The predictive value positive of the communicable disease surveillance system is high, with almost all cases confirmed by laboratory identification of a pathogen.
Representativeness	The representativeness of the communicable disease surveillance system in terms of foodborne disease is poor. This derives from a number of factors: 1. Underreporting: not all cases of illness will come to the attention of the health and surveillance systems. This is due to a variety of reasons as described above.

	2. Not all potentially foodborne diseases are notifiable. 3. Risk factor information is collected and reported for only a proportion of potentially foodborne illness cases. 4. A transmission route of any kind is reported as "suspected" for only a small proportion of enteric illness cases, and rarely reported as "definite". 5. There is a variety of approaches to the follow-up and investigation of potentially foodborne illness; 6. Not all information related to investigations is captured by the national surveillance system, with write-ups at a PHU level not always being forwarded to EpiSurv; and, 7. Investigations that are carried out principally involve food premises, with illness associated with other settings rarely examined. 8. The opportunity to confirm or exclude a source of infection for notified cases through analysis of samples provided to the PHLs is not fully utilised, through incomplete connection between laboratory results, FoodNet, and EpiSurv. 9. Isolates submitted to the Enteric Reference Laboratory are a subset of those from human cases; most submitted isolates are matched to cases in EpiSurv to supplement other data, but for campylobacteriosis and yersiniosis few isolates are received.
Timeliness	The timeliness of reporting of potentially foodborne illness from a national perspective is rated good, with an Auckland study finding that the average reporting delay was 2 days, and most cases notified within one week. However, at a PHU level this is too slow, with daily updates being required for public health management. A similar comment applies to reporting channels from EpiSurv; monthly and annual summaries being acceptable for risk assessment purposes, but too slow for local issue management.
Stability	This system attribute is rated high, in terms of potentially foodborne disease. The surveillance system has been stable for several years (at least since the early 1990s), enabling the comparison of disease rates across time.

The communicable disease surveillance system has the potential to provide high quality foodborne disease surveillance, but incompleteness of data gathering/entry, as well as inconsistency in follow-up and investigative practices means that the available information from a national perspective is incomplete and of limited utility.

1 INTRODUCTION

The New Zealand Food Safety Authority (NZFSA) is seeking to improve the extent and quality of epidemiological information that is gained from foodborne disease investigations and ensure that such information is used to maximum effect in developing foodborne disease statistics and servicing risk assessment. As part of that process this project was initiated with the following goal:

"Evaluate current foodborne disease surveillance in New Zealand as a contribution towards future improvements in communicable disease surveillance"

The project specification states that the evaluation will be carried out according to criteria described by the guidelines for evaluating surveillance systems published by the United States Centres for Disease Control (CDC) (CDC, 2001). A related evaluation framework is that for surveillance systems for early detection of outbreaks (CDC, 2004).

The tasks listed in the guidelines for evaluation are:

A. Engage the stakeholders in the evaluation;
B. Describe the surveillance system to be evaluated (public health importance, purpose and operation, resources used);
C. Focus the evaluation design (purpose, stakeholders, actions, questions to be answered, standards for assessment);
D. Gather credible evidence regarding the performance of the surveillance system (level of usefulness, system attributes – simplicity, flexibility, data quality, acceptability sensitivity, predictive value positive, representativeness, timeliness, stability)
E. Justify and state conclusions, and make recommendations;
F. Ensure use of evaluation findings and share lessons learned.

The guidelines for evaluation of surveillance systems for early detection of outbreaks include the same tasks, and add assessment of timeliness and validity.

This report will be broadly structured according to these tasks.

In discussion with the NZFSA project leader it was clarified that this evaluation was only to assess the current system; recommendations, and ensuring the use of evaluation findings are not part of the project.

1.1 Definition of foodborne disease:

Foodborne hazards may be chemical, microbiological, or physical. One system of categories of foodborne disease has been published (Last and Wallace, 1992):

- Bacterial infections
- Bacterial poisons (e.g. staphylococcal or botulinal toxin)

- Viral infections
- Parasitic infections
- Chemical poisons
- Plant and fungal poisons
- Animal poisons (e.g. ciguatera)
- Radionuclides.

This project principally concerns surveillance for microbiological hazards, as it is concerned with communicable disease as stated in the goal. This includes the first four categories above. The principal clinical features of microbiological foodborne disease are enteric or intestinal illness, including nausea, vomiting, diarrhoea, abdominal pain and fever. The illnesses are usually mild and self limiting, but may be protracted, severe, and even occasionally fatal (Malcolm, 1994).

2 ENGAGEMENT OF STAKEHOLDERS

The CDC Guideline documents define stakeholders as "those persons who use data for the promotion of healthy lifestyles and the prevention and control of disease, injury or adverse exposure". These stakeholders will define questions to be addressed by the evaluation, and use its findings. Stakeholders will include those who provide data for surveillance, and also use the results from the system.

The key stakeholders for this evaluation are the NZFSA, the Ministry of Health, Public Health Unit personnel, and ESR. The NZFSA and ESR are engaged through developing and undertaking the project. Public Health Unit personnel were engaged in the process by:

- Including previous surveys and overviews of Public Health Unit involvement in the surveillance system; and,
- Specific discussions with Public Health Unit staff conducted during the course of the project.

The Ministry of Health is currently the funder of the communicable disease surveillance system. Engagement with the Ministry was achieved through liaison with NZFSA staff involved in the project.

3 DESCRIPTION OF SURVEILLANCE SYSTEM

Surveillance is the ongoing systematic collection, analysis and interpretation of outcome-specific data for use in the planning, implementation and evaluation of public health practice (Thacker and Berkelman, 1988). A surveillance system includes the functional capacity for data collection and analysis, as well as the timely dissemination of information derived from these data for effective prevention and control activities (Thacker, 2000).

This section of the report describes:

- The public health importance of the health-related event under surveillance; and,
- The purpose and operation of the system.

3.1 Public health importance

Microbiological foodborne disease is an important public health issue in New Zealand. In terms of the number of cases, it was estimated that approximately 119,000 cases of foodborne disease occur in New Zealand each year, including 19,000 general practitioner visits, 400 hospital admissions, 22 cases of long term illness and two deaths (Lake *et al.*, 2000). These estimates were based on data largely from 1998, and are dominated by foodborne cases of campylobacteriosis, estimated to be approximately 75,000. In 1998 the number of notified campylobacteriosis cases were 11573, and in 2003 and 2004 the numbers were 14790 and 12213 respectively. Therefore it is likely that the public health importance of foodborne disease has also increased (although not all of the increase in campylobacteriosis will be due to foodborne transmission).

In economic terms the burden of foodborne disease to New Zealand was estimated as approximately $55 million, using the estimated numbers of cases for 1998 (Scott *et al.*, 2000).

3.2.1 Purpose and operation of the system

3.2.1 Purpose

The main objectives for disease surveillance, as described in the Annual Surveillance Summary from EpiSurv (ESR, 2004) are:

- to identify cases of disease that require immediate public health control measures;
- to monitor disease incidence and distribution, and alert health workers to changes of disease activity in their area;
- to identify outbreaks and support their effective management;

- to assess disease impact and help set priorities for prevention and control activities;
- to identify risk factors for diseases to support their effective management;
- to evaluate prevention and control activities;
- to identify and predict emerging hazards;
- to monitor changes in disease agents through laboratory testing;
- to generate and evaluate hypotheses about disease; AND,
- to fulfil statutory and international reporting requirements.

These objectives fall into two broad categories: immediate identification and management of public health issues, and longer term policy decision making.

For public health activity, funding for surveillance activity by Public Health Unit staff is provided by both the Ministry of Health and NZFSA. The Ministry of Health supports communicable disease functions for the collation and database entry of information on cases of infectious intestinal disease. For public health management functions when these cases are identified as foodborne disease, such as investigations or recalls, then NZFSA resources are used.

For policy making, data on foodborne disease is a key input into the Risk Management Framework for food safety that provides the process by which the NZFSA addresses issues (Ministry of Health/Ministry of Agriculture and Forestry, 2000). Foodborne disease data are particularly important for risk profiling and risk ranking.

3.2.2 Operation: The communicable disease surveillance system

Human foodborne disease surveillance in New Zealand is primarily a subset of the enteric disease components of the communicable disease and outbreak surveillance system. This is a passive system i.e. the data collector is dependent on reporting by sources of information.

This section provides an overview of the communicable disease system concerning infectious intestinal (enteric) disease, and identifies those components that provide foodborne disease information, as well as contributions from other sources.

The description of the communicable disease surveillance system is an elaboration of the summary provided by the 2003 Annual Surveillance Summary (ESR, 2004a). Sections on surveillance of HIV & AIDS, sexually transmitted infections, the influenza sentinel surveillance system and the New Zealand Paediatric Surveillance Unit (NZPSU) have been omitted (although cases of HUS notified under the latter may be relevant to infections with STEC).

The key sources of communicable disease surveillance data in New Zealand are as follows.

National notifiable disease surveillance system

Under the Health Act 1956 and the Tuberculosis Act 1948, health professionals are required to inform their local Medical Officer of Health of any notifiable disease that they suspect or diagnose. These notifications provide the basis for surveillance and hence control of these diseases in New Zealand.

Patients presenting to a GP or other health professional are often asked to provide samples for clinical laboratory testing. The results of testing these samples are reported back to the GP, on a daily basis. Some samples will yield pathogens, which means that the patient is classed as a laboratory confirmed case. Details of laboratory confirmed cases who are identified as having a notifiable disease are then communicated to local Public Health Units (PHUs), usually by a practice nurse or receptionist by fax or telephone.

In addition to these notifications from health professionals, PHUs also receive reports directly from people who believe they have experienced an episode of foodborne disease, but have not presented to the health system (defined in this report as "self reported" cases). Some of these cases may be investigated and reported via the notification system.

Notification data are recorded by staff on a computerised database (EpiSurv) installed in each of the PHUs using disease specific forms. Each week, these data are sent to the Institute of Environmental Science and Research (ESR) Ltd where they are collated and analysed on behalf of the Ministry of Health. The data collected on each disease depend on the specific disease but include demography, outcome, basis of diagnosis, risk factor and some management information. Some of the diseases e.g. measles, yersiniosis, only became notifiable with the revised schedule of notifiable diseases which came into effect on 1 June 1996.

Data dissemination from the weekly analysis of EpiSurv data is achieved through electronic reports to the Ministry of Health and PHUs (to Medical Officers of Health). An annual surveillance summary for each calendar year is produced by ESR a few months into the following year. Annual and monthly summaries are publicly available on the ESR website.

The major components and information flow of the notifiable disease surveillance system is shown in Figure 1.

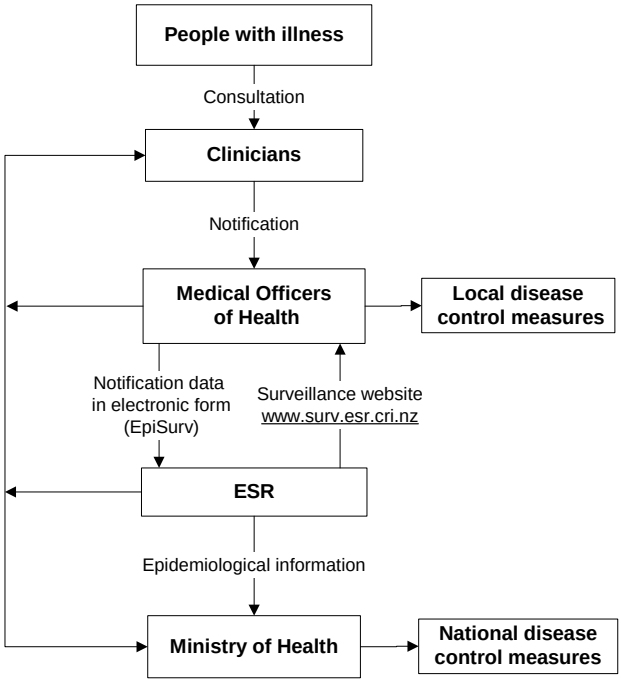

Figure 1: Notifiable disease surveillance system

Laboratory Based Surveillance and the Enteric Reference Laboratory

Laboratory based surveillance is the collection of laboratory data for public health purposes. Several of the communicable diseases diagnosed by clinical laboratories are either not covered adequately or not covered at all by the notifiable disease surveillance systems. Consequently data collected from laboratories augments the notification system. Examples of organisms covered by laboratory-based surveillance in New Zealand are antimicrobial resistant organisms, legionellae, leptospira, meningococci, respiratory syncytial virus (RSV), enteroviruses, adenoviruses, salmonellae, and streptococci.

Laboratory based surveillance in New Zealand principally occurs through the provision of isolates and other information by laboratories to the ESR Reference Laboratories at the Kenepuru Science Centre. This includes isolates of some potentially foodborne bacteria from notifiable human cases which are sent for further typing at the ESR Enteric Reference Laboratory (ERL). Although only limited data about the source are provided, these referrals provide the opportunity to identify clusters and outbreaks. Linkage with a notified case in EpiSurv is achieved Page: 7 by matching NHI number or name and date of birth fields.

Outbreak surveillance

ESR introduced an outbreak surveillance system in July 1996. The surveillance system has operated electronically since mid 1997 as an additional module of EpiSurv.

Outbreaks are defined as: two or more cases thought to be linked by a common exposure except when this common source is well established as a national epidemic and reporting it as a discrete event is no longer appropriate. However, if cases are more likely to have resulted from secondary transmission within a household, this is not an outbreak. Nor is it an outbreak wherein a single secondary case, or a small number of cases, has resulted from person-to-person transmission from a primary case (ESR, 2004b).

Outbreaks are identified in the community by the PHUs and members of the public. Once confirmed as an outbreak the PHUs record data on the standardised Outbreak Report form within the district electronic surveillance database. This information is downloaded on a weekly basis from the district database and sent to ESR. The national data is supplemented by data on outbreaks recorded in the foodborne disease database (FoodNet) and by ESR enteric reference and virology laboratories. PHU staff are asked to complete an Outbreak Report Form on outbreaks reported from these laboratory sources if appropriate.

The following system description is taken from an evaluation conducted by Graham MacBride-Stewart and Naomi Boxall of the ESR Population and Environmental Health Group.

The Outbreak module of EpiSurv is used by Health Protection Officers (HPOs) in the PHUs to record and report outbreaks to ESR. Reports are reviewed and collated before being compiled into a monthly report for the Ministry of Health (MOH).

There is a standard Outbreak Report Form (ORF). Outbreak reports provided by the PHUs are described as either interim or final. The contents of the ORF are entered into the EpiSurv programme and downloaded to ESR weekly together with other EpiSurv data.

At ESR the data is entered automatically into the EpiSurv data warehouse. It is then available for analysis and updating if further pertinent information from the PHUs becomes available. Responsibility for this rests with a staff member at ESR who prepares monthly summaries and an annual report for the Ministry of Health. The annual summaries are posted on the ESR surveillance website at www.surv.esr.cri.nz. Figure 1 is a diagram of the current outbreak reporting system.

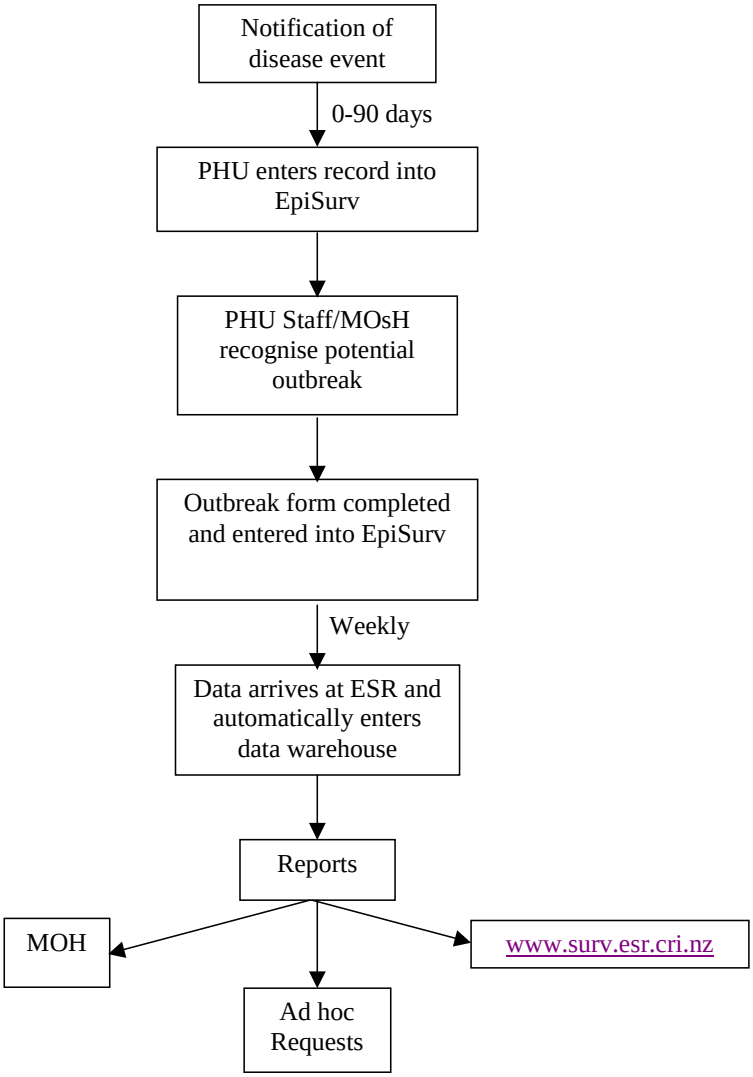

Figure 2. Current Outbreak Reporting System

Other National Systems that Inform Outbreak Reporting

z_ERAlert: z_ERAlert is an e-mail based alert system about unusual organisms that have been isolated or strain-typed by the Enteric Reference Laboratory at ESR. This alert is sent to the Ministry of Health and all Medical Officers of Health, and members of staff at ESR and the NZFSA. The alerts pertain to *S.* typhi, *S.* paratyphi, *V. cholerae*, *E. coli* 0157 and clusters of salmonellosis and shigellosis cases. Details about the case include geographic location (DHB) and age of case. If the case is known to be a contact of a previous case, this is also noted.

FoodNet: As an enteric disease case is entered into EpiSurv, a list of food premises maintained by FoodNet is available from which PHU staff can select. This convergent list is updated weekly. Within EpiSurv, if more than two cases occur and are linked to one food premise within a 7 day period, or if more than two occur within a 30 day period, PHU staff are alerted via an internal message from the system.

3.3 Components of the communicable disease surveillance system that provide information on foodborne disease

The notification system, laboratory based reporting and outbreak surveillance system all provide information on potentially foodborne disease.

3.3.1 Notifiable disease surveillance system (EpiSurv)

Notifiable diseases which may result from foodborne transmission are the following enteric infections:

Acute gastroenteritis
Botulism (notifiable as acute gastroenteritis)
Campylobacteriosis
Cholera
Cryptosporidiosis
Giardiasis
Hepatitis A
Listeriosis
Salmonellosis
Shigellosis
Toxic Shellfish Poisoning
Typhoid and paratyphoid
VTEC/STEC Infection
Yersiniosis

From 2000 PHUs have been encouraged to record all cases of gastroenteritis caused by non-notifiable or unknown foodborne intoxicants including self-reporting by the public. For only a few of these cases is a causative organism identified (30 (2.9%) in 2003), but most are potentially foodborne.

Information on these potentially foodborne notifiable illnesses is entered into the EpiSurv database using report forms. The majority of the potentially foodborne illnesses are reported using the Enteric Disease form, apart from Hepatitis A, Listeriosis, Toxic Shellfish Poisoning and VTEC/STEC Infection, all of which have their own specific forms.

These forms include a number of fields which have relevance to the identification of foodborne disease. The exception is TSP which is by definition a foodborne illness. The information requested (or questions asked) on these forms, that are relevant to identifying foodborne illness include food history, food premises, and source identification. More details are given in Appendix 1.

3.3.2 Laboratory based surveillance

New Zealand does not yet practice laboratory based surveillance for all potentially foodborne pathogens. Clinical laboratories do submit human isolates of certain

organisms, some of which may have been acquired by foodborne transmission, to the Enteric Reference Laboratory for typing. The organisms submitted are:

All *Salmonella* spp.
All *Shigella* spp.
Some *Yersinia* spp.
All VTEC (although the vast majority are *E. coli* O157 as most laboratories do not look for other VTEC)
Vibrio cholerae

Some *Campylobacter* spp. are also submitted, principally those suspected of being part of an outbreak and where there has been agreement between the Medical Officer of Health and the Ministry of Health that typing work is appropriate, as well as isolates from blood culture in cases of bacteraemia.

The time required to type isolates depends on the species, but is usually much less than 10 days.

3.3.3 Outbreaks

The Outbreak Report Form requests the provision of the following information relevant to identifying foodborne disease:

Circumstances of Exposure/Transmission:

outbreak recognition and type - cases linked to common source (e.g. food, water , environmental site)
setting
mode of transmission
vehicle
evidence for mode of transmission and vehicle source
factors contributing to outbreak

3.3.4 Hospitalisations and deaths: New Zealand Health Information Service (NZHIS)

The NZHIS collates information, *inter alia,* on hospitalisations and deaths in New Zealand coded according to the International Classification of Diseases. The classification system is based on illness, and does not provide information on source of infection. As such it is not useful for foodborne disease surveillance, but does provide information on numbers of hospitalisations associated with enteric illnesses pathogens, deaths, and long term sequelae that may result from infection.

3.3.5 FoodNet

FoodNet is a database originally established by the Ministry of Health and now administered by the NZFSA. The database is available to PHUs. It has a number of functions, principally related to activity by Health Protection Officers. An important

function is to maintain a list of registered food premises. The details recorded for such premises include licensing, Food Safety Programmes, and also linkage with notified cases on EpiSurv that report the premises under risk factors. However, access to information on premises implicated in suspected food poisonings is only available via FoodNet.

Incidents of suspect food poisoning may be recorded under the 'Food Complaints' module of FoodNet in any one of three different ways; as a food complaint, a notification or an outbreak. The origin of such cases is usually self reporting to the PHU. Details of the reporting formats for "Food Complaints" are given in Appendix 1.

3.3.6 ESR Public Health Laboratories

In addition to operating the EpiSurv database, ESR also provides an analytical service for food or clinical samples which are associated with potential cases of infection microbiological hazards (ESR undertakes testing for a number of microbiological hazards which are not covered by other clinical laboratories). These samples originate from self reported or notified cases, and sample management is via FoodNet. For samples associated with notified cases, attempts are made to always have an assigned EpiSurv case number. Records of results from these samples are recorded initially on the "in house" database "ESRLab" and then transmitted to FoodNet.

Food complaint samples are also provided by PHUs though these are rarely associated with cases of illness (most are foreign objects).

3.4 Resources used to operate the system

Although this is listed as part of the description of the system in the evaluation guidelines, the financial resources and personnel involved to operate the surveillance system is outside the scope of this project.

4 EVALUATION DESIGN

4.1 Purpose

As stated in the specification for this project the purpose of this evaluation is: to improve the extent and quality of epidemiological information that is gained from foodborne disease investigations and ensure that such information is used to maximum effect in developing foodborne disease statistics and servicing risk assessment.

4.2 Stakeholders, actions and questions to be answered

Stakeholders from NZFSA, Public Health Units, and ESR were all involved in evaluating the surveillance system. The evaluation of foodborne disease surveillance involves assessing the ability of the communicable disease surveillance system to fulfill its two primary functions: public health issue management, and supporting policy decision making through risk analysis.

Preliminary evaluation of communicable disease surveillance was undertaken by summarising existing reports of the performance of the surveillance system in areas relevant to foodborne disease:

- Foodborne disease surveillance review; a report by ESR for the Ministry of Health/Public Health Commission (Malcolm, 1994);
- Survey of Public Health Unit foodborne illness investigation practices (Whyte, 2003);
- Comments made in annual summaries of notifiable diseases and outbreaks
- EpiSurv data quality reports published in September 2003 and October 2004 (Eglinton *et al.*, 2003; Pirie *et al.*, 2004);
- "New Zealand's capacity to respond to outbreaks of foodborne illness" a paper written in 2004 by Dr Greg Simmons of the Auckland District Health Board
- A review of outbreak reporting in New Zealand prepared by ESR for the Ministry of Health (MacBride-Stewart and Boxall, 2005).
- Evaluation of acute gastroenteritis diagnostic practices of general practitioners (Sarfati *et al.*, 1997).
- Comparison of laboratory and General Practitioner based notification (Simmons *et al.*, 2002).

Further analyses were conducted for this project as follows.

To assess the notifiable disease information collated on EpiSurv, the data submitted via the forms discussed in Section 3.3 were analysed for:

- Completeness of reporting;
- Content relevant to foodborne disease; and,
- Strength of evidence for links between pathogens and food vehicles.

Analysis of foodborne disease information recorded on FoodNet was also undertaken.

To evaluate foodborne disease surveillance from the PHU perspective we discussed the surveillance system with PHU staff with responsibility for communicable disease and food safety. It was beyond the resources of the project to visit each of the PHUs in New Zealand. Instead, visits were made to Public Health Units in Christchurch (Community and Public Health), Auckland (Auckland Regional Public Health), Wellington (Regional Public Health) and the mid-North Island (Mid-Central Health). In addition discussions were held with Health Protection Officers attending Training Days organised by ESR and attended by staff from throughout New Zealand.

To assess the value of foodborne disease surveillance information for policy and decision making, risk assessment projects conducted by ESR for the NZFSA were reviewed. ESR staff involved in producing these documents provided comments on the information.

5 EVIDENCE FOR PERFORMANCE OF THE FOODBORNE DISEASE SURVEILLANCE SYSTEM

5.1 Existing evaluation commentary

5.1.1 Foodborne disease surveillance review (Malcolm, 1994)

Although this report is ten years old much of the material is still relevant. Deficiencies identified in the system were:

- Bias in the information collected: the system provides very little information about the number of cases of foodborne disease for which medical attention is not sought. Another source of bias is the selection, by the doctor or patient, of who will provide clinical samples for laboratory tests, and hence potentially become eligible for notification;
- Underreporting: failure by clinicians to notify cases of illness, despite the statutory requirement;
- Variability in laboratory practices with regard to testing for potentially foodborne pathogens;
- Absence of some foodborne diseases from the notifiable disease list;
- Problems with EpiSurv (these have since been largely eliminated as reporting and analysis has increasingly used computer technology);
- Divided responsibilities between Public Health Units and Local Authorities and communication gaps; AND,
- Variability in actions taken by PHUs in response to foodborne illness notifications.

5.1.2 Public Health Unit foodborne illness investigation practices (Whyte, 2003)

The aim of this survey was to provide the New Zealand Food Safety Authority with an understanding of how Public Health Units around New Zealand respond when:

1. A member of the public lodges a complaint about a suspected food-related illness, or
2. A GP or hospital notifies the Public Health Unit of a suspected foodborne illness.

A questionnaire was mailed to 21 Public Health Units and 18 responses were received. The answers revealed considerable variation in investigative response. This concerned:

- Recording of details from member of the public;
- Details collected;
- Policy regarding investigation/screening/request for faecal specimens of self-reported cases;
- Investigation of suspected foodborne illness notified by a GP or hospital: as for self reported cases;

- Review of suspect food poisoning data: a minority of PHUs conduct such reviews, with some using EpiSurv and some an "in house" system.
- Definition of an outbreak: most used the definition two or more cases linked by a common source.
- Communication between separate CD and Food Groups;
- Triggers for a food premises visit: aside from the food item identified and pathogen involved, decisions were largely made on practical grounds and history associated with the premises.
- Format for recording details of premises;
- All PHUs involved an EHO in the investigation process, and ESR staff in a laboratory investigation, and reported the result of the investigation to the complainant.

About half of the PHUs use the results of investigations as material for food safety promotion.

Promotion of contact details to the public to facilitate public awareness of the self reporting option appeared minimal. This report recommended that an 0800 number be set up to improve self-reporting by the public. Improved consistency of investigation practice, and data gathering and reporting was advocated through the development of common national forms and database.

5.1.3 Comments in Annual Surveillance Summaries

For calendar year 2002 (ESR, 2003): Analysis of data quality included campylobacteriosis and salmonellosis. Positive predictive value was high, as 98% and 95% of cases of campylobacteriosis and salmonellosis cases were culture confirmed. The correlation between hospitalisation rates and notifications on a geographic basis was medium for salmonellosis and poor for campylobacteriosis, suggesting that information from notification rates is not strongly representative of what is actually occurring. The completeness of data for campylobacteriosis and salmonellosis in terms of age, ethnicity, geocoding, date of onset, hospitalisation, death and overseas travel was generally high – the lowest being date of onset and hospitalisation for campylobacteriosis (50 and 62% respectively).

For calendar year 2003 (ESR, 2004): Completeness of date of birth, age, sex and ethnicity remains high (78-99%). As to timeliness, 95.5% of disease notifications were entered onto EpiSurv within one week of being reported to the PHU, and 97.7% were entered within two weeks.

5.1.4 Reports on the quality of EpiSurv data (Eglinton *et al.*, 2003; Pirie *et al.*, 2004)

These studies examined the quality of notifiable disease data supplied by PHUs to ESR. In 2003 the analysis was limited to the data provided through EpiSurv and measures of completeness, timeliness and accuracy/consistency (Eglinton *et al.*, 2003). Five years of data were analysed, 1998-2002.

Enteric diseases make up 84% of the total number of diseases notified and so dominate the analysis. Similarly the Auckland PHU comprises 33.1% of total notifications whereas the eight smallest PHUs make up only 9.4% of total notifications. The ESR report therefore used median measures due to the skewed nature of the data.

The completeness of date of birth, age, ethnicity and sex was generally high (always >75%, and usually >90%) for the period analysed. Date of onset was usually only recorded for approximately 60%% of cases. The median completeness for enteric diseases was higher for enteric cases (75%) than non-enteric (70%) in 2002.

Assignment of an NHI number was low but increasing (4.1% on 1998 to 20.8% in 2002). However, the completeness of the NHI number in enteric cases was significantly poorer for enteric diseases.

Timeliness was consistent across the analysis period, with approximately 95% of enteric cases entered within 1 week of the date reported to the PHU.

Geocoding increased markedly over the analysis period, with more than 70% of cases geocoded after 2000. Assignment of a TLA was also high: 94% consistently assigned.

Disease naming was very consistent, with only 38 cases out of 148638 appearing under misspelt or alternatively described disease categories.

The 2004 report (Pirie *et al.*, 2004) used the 2002 reporting year as a baseline to show changes between 2002 and 2003. The quality assessment reviewed:

- Timeliness: onset date recorded, reporting delay (between onset of symptoms and report to PHU), entry delay (from report to entry of data);
- Completeness: age, date of birth, ethnicity, sex, NHI, occupation, status (confirmed, probable, suspect); and,
- Accuracy: geocoding.

The median reporting delay for enteric illnesses was between 3 and 13 days, while the median entry delay was 0 days. The completeness of reporting was generally very high (>80%), apart from NHI numbers (still better than 2002 at 25%) and occupation (63% complete). Geocoding of residential addresses was also high (>80%).

In general, all measures improved from 2002 to 2003, which was attributed to the response and efforts of staff in the PHUs.

5.1.5 A Review of Outbreak Reporting in New Zealand (MacBride-Stewart and Boxall, 2005)

This report comments:

"There is significant diversity present in the information provided by the PHUs, suggesting differences in how outbreaks are recorded and reported. For example, a field within the "case" form of EpiSurv allows cases to be linked to an outbreak provided that the outbreak is of a notifiable disease. Theoretically, when an outbreak form is filled out with confirmed cases; these cases must also be entered into the case area of EpiSurv. In practice the linkage between the case area and the outbreak area is poor. PHUs may have already entered the individual case data into EpiInfo (or another software package) for analysis as part of the outbreak investigation and consequently they are reluctant to 'double enter' the case data.

The outbreak report form has been designed to capture **all** relevant information about outbreaks. This has led to a lengthy and complicated form with a significant number of fields not being completed or the outbreak not being reported at all. This reduces the value of the data that **is** collected."

Further comment on specific issues includes:

"Data Timeliness

The current data processing system only allows for weekly data downloads. This is not sufficiently frequent to capture data for conditions evolving rapidly or those requiring an urgent response. In such situations, information for decision-makers should be widely available, at least daily, including weekends. One of the factors influencing timeliness is the low level of automation within the system.

Data Analysis

In many PHUs there is no systematic analysis of the notification data to detect outbreaks. Several PHUs produce tables of weekly or monthly disease counts that are inspected by staff for suspected outbreaks and staff at ESR routinely inspect the weekly report of EpiSurv national surveillance data. When suspected abnormalities are detected ESR communicates this to the PHU and the situation is followed up within the PHU.

At ESR there is a prototype application of an Early Aberration Detection System. This could eventually be used by all PHUs.

Reporting Delays

There is no policy and little consistency of reporting by PHUs. Some send an interim report on suspicion of an outbreak whereas others send a report when the outbreak investigation is complete.

Data Links

PHUs cannot view each other's data. There is a limited informal system of alerting neighbouring PHUs, but this is dependant on individuals. PHUs need to be able to view national and neighbouring data.

Representativeness

Information collected from individual PHUs also indicates that many outbreaks that meet the definition are not formally reported. It is felt that this would lead to many reports of insignificant minor outbreaks that would create a lot of extra work for no real benefit. However, for the purposes of early detection of unusual and exotic conditions, all potential outbreaks should be reported formally. These would then be brought to the attention of the Medical Officers of Health (MOsH) who can then make a judgement about the response needed. Global experience suggests that this may become necessary for New Zealand in the future.

Data Completeness

Many fields on the ORF are not completed. The current report form is considered by the vast majority of PHU staff consulted to be irrelevant, too complex and/or too time consuming to complete fully. PHU staff report that because of these reasons, completing the ORF is not a high priority. The combination of under reporting of outbreaks together with incomplete data on those that are reported means that the overall information collected is of limited value.

The ORF needs to be made more user friendly thereby creating the opportunity for more complete reporting and enhanced data quality. Evidence supporting this recommendation has been obtained during PHU visits made by ESR staff, meetings held by the Public Health Surveillance Development Group (PHSDG), and the Annual Outbreak Report."

The report goes on to discuss improvements that could be made to the Outbreak Reporting Form. It also presents a set of recommendations covering other aspects of outbreak reporting.

5.1.6 New Zealand's capacity to respond to outbreaks of foodborne illness (Simmons, 2004)

This discussion document was privately circulated in May 2004. It was written following an OzFoodNet workshop in Canberra. Although the document largely discusses the response capacity for outbreaks, it also comments on surveillance and detection:

- There is confusion over the use of databases to report and record cases or outbreaks of foodborne illness. Some public health services use the NZFSA FoodNet database and in addition use the EpiSurv communicable disease database

- The quality of data entered at public health unit level is in some circumstances sub-optimal……..
- The surveillance system is passive and inefficient with an estimated 25% of laboratory confirmed foodborne illness cases not notified…….
- The sophistication and timeliness of surveillance across the health jurisdictions to detect dispersed outbreaks is limited.

To address these surveillance issues the following recommendations are made:

- A comprehensive system for laboratory-based notification needs to be introduced to ensure timely reporting of important cases e.g. STEC gastroenteritis
- Real-time web-based reporting of notification data is needed (ESR is currently trialling this system)
- FoodNet should be superceded as a surveillance tool for foodborne illness in NZ, by one surveillance system encompassing EpiSurv;
- Through active surveillance there needs to be enhanced use of data on foodborne illness at both local and national level, particularly in the assessment of serotype clusters and reviewing "outbreaks of outbreaks", to identify common themes on which to focus control activities;
- Epidemiologists dedicated to surveillance and analysis of foodborne illness should be utilised.

5.1.7 Diagnostic practices of general practitioners (Sarfati et al., 1997)

Laboratory confirmation of potentially notifiable cases of illness depends on provision of a sample for testing. This postal survey gathered replies from 151 general practitioners and found that the most important criteria for laboratory referral of a diarrhoeal specimen were:

- Prolonged duration of illness;
- Presence of blood in the stool;
- Recent history of overseas travel;
- Recent history of tramping or camping;
- Recent history of shellfish consumption;
- If the patient worked in the food, child care, or health care industries.

Most general practitioners reported that they would refer diarrhoeal specimens from less than 25% of their patients with acute gastroenteritis. Requests for viral testing other than rotavirus were rare, suggesting that foodborne viral gastroenteritis outbreaks were unlikely to be identified. However, this situation is likely to have improved since the study, as the capability and capacity to test food and clinical samples for norovirus has increased.

5.1.8 Laboratory based notifications (Simmons et al., 2002)

This study estimated the completeness and timeliness of notifications of seven potentially foodborne diseases in Auckland by comparing hospital and community laboratory confirmed cases against those notified to the Auckland Regional Public Health Service. The proportion of laboratory confirmed cases that were notified were:

- VTEC infection: 100%
- Shigellosis: 88%
- Yersiniosis: 79%
- Salmonellosis: 82%
- Hepatitis A: 65%
- Campylobacteriosis: 76%
- Listeriosis: 90%

The average notification delay was 2 days (between date of reporting of the positive laboratory test to the GP and the date of notification of the PHU by the GP). A change to laboratory based notification was advocated.

5.2 Analysis of database information (EpiSurv, FoodNet, ESRLab)

5.2.1 EpiSurv

The following analyses are only for the potentially foodborne diseases i.e. campylobacteriosis, cryptosporidiosis, gastroenteritis, giardiasis, paratyphoid, salmonellosis, shigellosis, typhoid, yersiniosis. Chemical food poisoning and cholera were omitted due to the low numbers of cases (2 each in 2004).

The analysis concerns notified cases of enteric disease for the 2004 year, and cases of listeriosis, infection with hepatitis A and VTEC, and outbreaks over the 5 year period 1999-2004.

Enteric disease notifications.

Sources of notifications

As expected the vast majority (79.4%) of cases are notified on the basis of information from GPs. An additional proportion (6.0%) derive from hospital based practitioners, while information provided by laboratories to PHUs (and then possibly cross checked with GPs) contributes 5.2% of cases.

Self reported cases represent a very small proportion of overall cases (607/17403, 3.5% in 2004) notified by PHUs. Across PHUs the percentage of self reported cases out of the total number notified cases is 0.0 – 4.9%.

This suggests that one or both of two things are happening:

- Not all self reported cases are followed up and entered into the EpiSurv system; this has been confirmed in discussion with PHU staff – the case is usually only entered if a sample is supplied (and usually then only when the sample is positive);
- There are barriers for the general public reporting incidents of foodborne illness directly to PHUs. Such cases are likely to be less severe cases not requiring a GP visit.

Most self reported cases are notified as "Gastroenteritis" as would be expected. Cases that provide a sample and from which a pathogen is identified, would be notified as that disease.

Cases notified as a result of an outbreak investigation represent 3.5% of the total (609 cases). The majority of these were reported as "gastroenteritis" (449 cases). The remaining 160 cases should correlate with outbreak cases reported as being caused by notifiable pathogens. In fact, in 2004, 299 cases were reported via the outbreak module as being caused by notifiable pathogens. This supports the comments by some PHUs that in outbreaks of notifiable disease, only the initial case is reported to the notification system.

Enteric illnesses

Identification of illness/pathogen (Addlab field)

The Addlab field describes the organism, species, sero/phage type, and toxin details. Details (to at least a species level) are reported for a high proportion of *Salmonella* and *Shigella* cases (about 70-80%), but for other illnesses (especially campylobacteriosis and yersiniosis) information beyond the genus is infrequently recorded. This may limit the value of this data source as distinctions between species may aid analysis.

In practice, EpiSurv data on some specific pathogens are supplemented by information from the clinical laboratories and the ESR Enteric Reference Laboratory and these are the main sources of information for annual reporting. The matching of typing information from isolates submitted to the Enteric Reference Laboratory to cases recorded in EpiSurv depends on the illness. Listeriosis data are matched on a weekly basis, while norovirus (outbreaks only), salmonellosis, shigella, typhoid, and VTEC/STEC infection cases are matched on a monthly basis. For other cases, such as campylobacteriosis and yersiniosis, no matching is done. This reflects that fact that only a small number of isolates from cases of these diseases are submitted to the Enteric Reference Laboratory.

Under the gastroenteritis category, of 1331 cases, only one *C. perfringens*, 22 norovirus, and two *S. aureus* cases are recorded. This indicates that few "other" (i.e. non-notifiable) pathogens are identified amongst these cases.

Basis for diagnosis:

Most notifications are reported as fitting the clinical description of the illness, with isolation from faeces the primary confirmation. In very few instances was the causative organism also isolated from food (as shown in Table 1, Appendix 2). This is also reflected in the number of definite food vehicles identified (see Table 2, Appendix 2).

Completeness of reporting risk factors

Notified cases in 2004 were examined to determine the numbers for which no risk factor information (of any kind) was reported (note that a "no" report for a risk factor was accepted as a reported result). Results are given in Table 1 and show that absence of risk factor information is particularly high for campylobacteriosis. Again this is consistent with PHU practices as below. For several PHUs no risk factor information is collected or reported for campylobacteriosis cases, unless the case is from a high risk group.

Reporting of Food Premises information was examined in more detail. This type of risk factor information is limited to up to 20% of cases apart from gastroenteritis where a premises is reported in approximately half the cases (see Table 1, Appendix 2). This probably reflects the motivation of self reporting cases.

Source Identification

The report form requests information on whether a source was identified (ContID) which can be reported as "definite", "suspected", "no", or "unknown". For the vast majority of enteric cases the report gives "no" or "unknown" (see Table 2, Appendix 2). When a source is definite or suspected, information is requested on the type of source (person-person, food or water, animal contact, other source). When one (or more) of these options are checked, details are requested. Often a source is reported as being suspected, but no source is detailed, either as one of the four type of source options, or as details.

Reviewing the details provided for suspected (and occasionally definite) sources suggests that most are potential exposures. "Animal contacts" are principally farm animal exposures, with some cases reported as having exposure to domestic pets; a few cases had contact with sick animals. Chicken/poultry, takeaway foods or foods consumed overseas are often suspected under "food/water contacts". Exposures suspected under the heading of "Other sources" are primarily food or water possibilities.

Hepatitis A

A small proportion of Hepatitis A infections are caused by foodborne transmission. From 1999 to 2004, of the 512 notified cases 11 were reported as definitely transmitted by food or water, while 77 were suspected. Of the remainder, 143 were reported as not transmitted by food or water, while 281 were reported as unknown.

However, confirmation of the "definite" cases was unclear; for only 2 cases was the source definitely identified by being part of an outbreak, while the mode of source identification was not given for the remaining 9 definite cases. A specific contaminated food or drink was reported for 10 definite cases; for 3 of these several food and water sources were listed. The comments fields for the definite cases revealed that the sources given were in fact "likely" or "probable".

Amongst the sources given for both definite and suspected food or water transmitted cases, water consumed in the Pacific Islands and other overseas countries, blueberries, and shellfish, were common.

Listeriosis

There were 128 cases of invasive listeriosis notified between 1999 and 2004. For 114 of these contaminated food or water was reported not to be a definite or suspected source of infection. For the remaining 14 cases a variety of suspected foods were reported, including cheese, processed meats, and salads.

However, the report form also asks how a source was identified; for only two cases were one of these three fields reported: for one the organism was identified in the food or drink consumed by the cases, and one was identified from a food history.

VTEC

Substantial amounts of risk factor data are requested on the VTEC reporting form, including food consumed during the week before the case became ill. There have been 473 cases between 1999 and 2004 in New Zealand. Completeness of reporting can be judged from the request for specific type, brand and source of foods consumed. It would be reasonable to expect most cases to have consumed dairy, meat/poultry or vegetables/fruit in the week prior to illness, but the number of cases for which no specific information is supplied for these foods is always more than 250 cases, and usually more than 400.

There is no source confirmation field on the VTEC reporting form. Reviewing the comments provided shows that a source is rarely, if ever located. This raises the question of the value of the risk factor information.

Outbreaks

From 1999 – 2004 1117 outbreaks of infection with potentially foodborne pathogens were reported to the outbreak module of EpiSurv. Reporting of outbreaks is predominantly from the three most populous regions: Auckland (620 outbreaks), Canterbury (143 outbreaks) and Wellington (81 outbreaks).

<u>Recognition of outbreaks</u>

Of these 1117 outbreaks, 469 were recognised by being part of a common event; 605 were recognised as being from a common source; 485 were recognised as involving

person to person transmission, and 149 were recognised as involving a common organism type/strain.

Transmission route:

Table 3, Appendix 2, indicates the "mode of transmission" for outbreaks reported to EpiSurv.

Foodborne transmission is assigned for most of the outbreaks involving *B cereus, C perfringens, S aureus.* Illnesses caused by these pathogens are not notifiable diseases and so the number of foodborne outbreaks suggests that notifiable disease surveillance is missing part of the foodborne illness picture for New Zealand.

Illness caused by norovirus, although less frequently assigned as foodborne, regularly causes the highest number of outbreak cases each year. Consequently it seems likely that many cases of this type of foodborne illness will be missing from the current surveillance picture.

Degree of confirmation of outbreak source and transmission route.

The reported evidence for determining the mode of transmission and vehicle/source of outbreaks is analysed in Table 4, Appendix 2.

For the majority of outbreaks the mode of transmission and vehicle/source are identified from a history of exposure to the implicated source. In only a few outbreaks is the mode of transmission and vehicle identified by the stronger evidence of an epidemiological investigation or identification of the hazard in the vehicle (or a food handler).

5.2.2 Commentary:

This analysis demonstrates that communicable disease surveillance, as currently practiced in New Zealand, provides only a partial picture of foodborne disease.

The reasons are:

- Risk factors (including potential food vehicles) are provided for only a proportion of notified cases;
- Several illnesses likely to be caused by foodborne transmission are reported only from outbreak situations as they do not form part of the notifiable diseases list.

Furthermore, the identification of foodborne disease as a component of communicable disease is supported by limited information:

- Only a few notified cases are identified by finding a pathogen in a food vehicle, or else are linked "definitely" to a vehicle;

- Only a few outbreaks have a mode of transmission confirmed by an epidemiological case-control or cohort study, or finding the hazard in the vehicle

5.2.3 FoodNet

An analysis was carried out of suspect food poisoning cases reported through FoodNet during the 2004 calendar year. Results are summarised in Table 5, Appendix 2, showing types and sources of these reports. Most are reported as food complaints (likely to be self reported cases), and derive mostly from a small number of PHUs. The Auckland PHU which provides over 33% of total enteric notifications, does not use FoodNet for this purpose. Review of cases reported on FoodNet during 2004 suggests that its use is decreasing; most cases were reported in the first half of that year.

Nine out of 83 of the incidents reported in FoodNet in relation to suspect food poisoning were also reported in Episurv, suggesting that most suspected food poisoning incidents do not produce positive results for notifications. Causative organisms were reported for four incidents, with one of these being concurrently reported in Episurv. This lack of overlap between FoodNet and EpiSurv is probably due to factors at the PHU level, but these have not been further investigated.

5.2.4 ESR Public Health Laboratories

Results from analysis of food or clinical samples by the PHLs are reported to FoodNet on completion and also provided in summary form every six months to the NZFSA. Individual HPOs may then add these results to the EpiSurv record. Results are also provided to EpiSurv staff for their review, and instigating inclusion by an HPO if appropriate. This channel allowing confirmation of a source of infection, appears to have potential for improvement through automation rather than manual handling.

5.3 Evaluation with respect to public health objectives

The following discussion is a distillation of comments made during discussions with PHU staff regarding their handling and reporting of notifications of enteric illness. The comments relate to the handling of enteric communicable disease in general, but are applicable to foodborne disease as a subset.

Self reported cases are a small proportion (<5%) of the total number of enteric illness cases that come to the attention of PHUs – most likely due to lack of awareness of this reporting option amongst the public. Decisions about follow-up of self reported cases are made on a case by case basis, with willingness to provide a clinical sample an important factor.

Following receipt of a notification from a GP (or laboratory – in some areas GPs are reluctant to notify illnesses citing privacy concerns), the follow-up by the PHU depends on a number of factors. A key factor is the pathogen involved.

While the handling of notifications varies between PHUs, there were three main approaches:

- All cases caused by pathogens other than *Campylobacter* are followed up by a telephone call to elicit further information including risk factors. For cases of campylobacteriosis (and sometime yersiniosis), the "risk" status of the case is determined. High risk cases (i.e. food handlers, staff of health care facilities or early childhood services, children aged under 5 years attending childhood services or other groups, older children at higher risk due to illness or disability, also water care workers) are followed up by telephone interview, while usually only demographic information is reported for low risk cases (about 90% of the total);
- Common enterics (*Campylobacter*, *Giardia*, *Cryptosporidium*, *Yersinia* and *Salmonella*) are posted disease specific questionnaires for cases to complete and mail back (or in rural cases contact is made by phone) while for other enterics (e.g. *S.* Paratyphi, *E. coli* O157, Cholera, Hepatitis A, *Listeria* and *Shigella*) contact is made by phone. Posted questionnaires usually include information about the disease and future avoidance. The response rate for posted questionnaires is varied, from 10% to greater than 50% in some areas.
- All notifications followed up by phone interview (this approach was only feasible in areas with fewer notification).

In an attempt to standardise approaches to handling notifications, some PHUs (especially Auckland) are working to locally developed protocols.

Association with a food premise is by far the most common trigger for a follow-up investigation by Food Team members, usually involving Local Authority (Environmental Health Officer) staff as well. Alerts that two or more cases have been associated (under risk factors) with a particular food premises are provided by EpiSurv and derived from the linkage between cases and premises listed on FoodNet. Follow-up might include: Site visit and investigation – with details of investigation later entered into the premises record on FoodNet, clearance testing for food service workers, further information collection by telephone.

Outbreak recognition is generally performed by individuals reviewing data. This includes HPOs and Medical Officers of Health, as well as data entry staff. Trend analysis is performed by two main methods. One involves review by local staff, the other uses "in house" computer systems, often developed by PHUs themselves. Regular review of information is performed by all PHUs consulted, usually at a weekly meeting of staff where linkages and common events are canvassed.

Outbreak investigations are reported to the EpiSurv module. However, the level of detail reported is restricted (e.g. the comments field is limited), and often further details remain with the local PHU. Where an "in house" write-up is produced (sometimes using locally designed templates) these reports are not always forwarded to ESR. The reasons are that insufficient cases are involved to conduct an epidemiological investigation, or else the write-up is too informal. In the large Auckland PHU, foodborne illness outbreak numbers are sufficient to allow analysis

for the region (Hannay, 2004). This study of outbreaks over the 2003-2004 year showed that most outbreaks were small (median 2 cases), mixed foods were the most common food vehicle, norovirus caused the most cases, and takeaways were the most common premises to be implicated.

FoodNet was not used frequently by PHU staff, apart from recording food complaints. Barriers to FoodNet use were the complexity of the system, and the wish to avoid double entry of information already reported via EpiSurv. At least two PHUs maintain their own database of food (and other) premises to track events and linked cases.

5.3.1 Feedback and value of surveillance:

The EpiSurv database provides weekly spreadsheets of reported illness numbers (to Medical Officers of Health), monthly summaries and annual summaries. These reports were generally of interest (and sometimes of value in answering media enquiries) but not of value for local management of issues due to lack of timeliness. Instead the value of the surveillance system included:

- allowance for consolidation of information so that local data could be extracted and analysed;
- opportunities to identify a local issue that the PHU may have missed (through application of computer based recognition tools or through the addition of extra information e.g. from ERL); and,
- opportunities for identification and inclusion in risk management of issues covering a number of regions.

5.3.2 Improvements:

Several PHUs commented that more intensive examination of notifications (preferably on a daily basis) by a public health professional with access to national information would aid in the identification of dispersed outbreaks/events, events occurring across regional boundaries, and unusual transmission vehicles. Communication from the Enteric Reference Laboratory (ERL) regarding unusual isolates or clusters, while much appreciated by PHUs, only partly fulfils this need.

A nationally consistent set of protocols for investigating and managing enteric illness was universally desired, along with training in their application. Training should include reporting procedures to increase standardisation of this aspect of surveillance.

The EpiSurv reporting forms were regarded as being most suited to formalising data entry. However, they were not suitable for:

- distribution to cases for completion;
- use as a guide for questioning during a telephone interview; or,
- writing up an investigation of an outbreak or incident.

Many PHUs have developed "in house" simplified versions of EpiSurv report forms to fulfil these needs. However, a nationally consistent set of such forms would improve reporting.

Greater feedback from surveillance data would be of value, including:

- the ability to identify linkages to regular but temporary food outlets (e.g. markets, barbeques) would assist identification of food poisoning incidents;
- a nationally based ranking of registered food premises according to risk would assist in targeting investigations;
- analysis of surveillance data to drive food safety promotion efforts; and,
- more timely access to serotyping and other ERL information.

5.4 Evaluation with respect to policy/risk analysis objectives

Surveillance data are a key input into the Risk Management Framework of the NZFSA, principally the first step: "Preliminary Risk Management Activity". It is likely that in the future foodborne disease surveillance will have an important role in Step 4: "Monitor and Review" of the effect of a risk management decision.

The ESR Food Group undertakes the majority of the scientific projects that provide information and analysis of food safety issues. These projects underpin the decision making by the NZFSA through the Risk Management Framework. Key projects for Step 1 of the Framework are Risk Profiling and Risk Ranking. Surveillance data are also interrogated to answer *ad hoc* food safety queries from the NZFSA (and occasionally the media).

The information used for these projects includes:

- Incidence of notifiable diseases;
- Risk factors reported for sporadic cases;
- Numbers of outbreaks attributed to a pathogen; and,
- Evidence for transmission route of the outbreak, and level of confirmation.

Incidence of notifiable diseases:

These data are accepted as underreporting the true incidence, by an unknown factor. Intercountry comparisons of reported rates of illness are very unreliable, as the surveillance system can markedly affect rates.

Risk factors reported for sporadic cases:

These are generally not explored during risk assessments, as they are regarded as generally being "suspected" only. The Episurv case/outbreak records are potentially a rich source of information, however, there is great variability in the way and the extent to which they are completed. Often the structured portion of the form may not identify any particular suspect source, while the PHL is

concurrently analysing food samples from the same investigation! Also the free text comments will sometimes clearly identify reporter suspicions which are not captured in the structured components of the form.

Numbers of outbreaks attributed to a pathogen:

It is more likely that a vehicle will be identified in an outbreak situation, and this type of information is examined in detail during the writing of risk profiles for particular food/hazard combinations. Results are reported, but caution must be applied as outbreaks and sporadic cases may have a different epidemiology.

Evidence for transmission route of the outbreak, and level of confirmation:

The evidence for food as a transmission vehicle is usually based on a common exposure. Greater weight is given to outbreaks where a vehicle was identified via an epidemiological study, or laboratory investigation that discovers the hazard in the suspected food. More detailed investigation reports (often obtained directly from PHUs rather than EpiSurv) and ad hoc studies (such as case-control or cohort studies) are often more valuable in this context. These studies examine more closely the links between transmission of a pathogen and a food. The demonstration of such links can augment and reinforce evidence for foodborne transmission from other sources, but absence of such information does not indicate that the food is not a transmission vehicle.

Surveillance data are also used for:

- Case and outbreak records are used to validate details associated with Public Health Laboratory lab-based investigations (and vice versa). Also, re-examination of these records to determine what risk factors were associated with the case/outbreak, mainly in association with risk profiles. Particular emphasis is placed on any mentions of specific food, overseas travel, risk occupations, etc.
- Information entered on the EpiSurv database is used to fill gaps in the information on submission forms that accompany samples sent in to ESR laboratories by HPOs as part of their foodborne illness investigations. Such information assists with decision making for selection of appropriate analyses.
- EpiSurv is also used to fill data gaps when we are preparing a summary of our lab database to send to KSC each week.
- Results from laboratory investigations are summarized into a report for the Ministry of Health and NZFSA every 6 months. EpiSurv is used at this time to try to complete the database.
- Summaries of PHL lab-based investigations (food complaints, suspected food poisonings or clinical specimens which are often case clearance samples), particularly the ongoing consolidation of this information.
- Similar data filling exercises, as described above, are carried out weekly and 6 monthly using the FoodNet database.

Comments by PHU staff that monthly and annual summaries of information from EpiSurv were of interest but not useful, may reflect a lack of awareness that their data contributions are valuable in compiling a national overview of foodborne disease. Awareness of the use of such data by ESR and the NZFSA in risk assessments from a national perspective could be promoted.

6 TECHNICAL EVALUATION

The evaluation of foodborne disease surveillance in New Zealand is complicated by the fact that such disease is not the primary focus of the surveillance system. A discussion of usefulness and system attributes, as recommended by the CDC guidelines, must be augmented by a discussion of the ability to identify foodborne disease within the communicable disease surveillance system, and the additional criteria created by the second objective of surveillance: as an input into risk assessment for decision making from a national perspective.

6.1 Level of usefulness

The CDC guidelines define a public health surveillance system as useful if it contributes to the prevention and control of adverse health-related events, including an improved understanding of the public health implications of such events. To be useful the system should address at least one of the following:

- Detect diseases in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate;
- Provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance;
- Detect trends that signal changes in the occurrence of disease, including the detection of epidemics and outbreaks;
- Permit assessment of the effect of prevention and control programmes;
- Lead to improved practices;
- Stimulate research.

The usefulness of the surveillance system in relation to enteric disease is rated high.

Enteric disease is detected in a timely manner permitting effective management (e.g. of potential contacts in the workplace) and incidence and trends are captured and analysed, at both the local PHU and national levels.

There are some qualifications to this rating:

- There are a number of barriers to people with enteric disease presenting to the health system and being captured by the surveillance system. These contribute to underreporting of enteric disease. These factors include:
    - mild symptoms of self limiting disease;
    - lack of awareness by the public regarding who to contact;
    - socioeconomic barriers to seeking treatment (Regional Public Health in the Wellington region are conducting a study that examines this issue);
    - cases with gastrointestinal symptoms for which GPs do not request a specimen;
    - laboratory confirmed cases for which GPs do not pass on information to PHUs;

- self reported cases (to PHUs) that do not provide a specimen, and outbreaks that occur within a household (i.e. likely to be caused by person to person transmission) are less likely to be reported.

- Enteric disease outbreaks and dispersed events occurring across regions appear less likely to be recognised.
- There is an inherent bias in reporting in that cases where a pathogen has been identified are much more likely to be notified.

In terms of the surveillance of foodborne disease however, the usefulness of the surveillance system is rated low to medium. Foodborne disease is difficult to identify amongst the overall reporting of enteric disease (from all transmission routes). The system also provides little information regarding the magnitude of foodborne disease, detection of trends, and the assessment of the effect of risk management measures.

The main reasons are as follows:

- Not all potentially foodborne diseases are notifiable (although outbreaks of disease caused by non-notifiable pathogens may be identified);
- No risk factor information at all is collected or reported for a high proportion of potentially foodborne enteric disease cases;
- Food vehicles are rarely identified definitively, either for outbreak or sporadic cases; and,
- The reported information in defined fields can be at variance with that given in comments or free text fields.

In terms of providing information for risk assessment the surveillance system is also rated low to medium. Of considerable value is the national coverage, allowing comprehensive overviews of enteric disease incidence to be assembled for New Zealand. However, while foodborne transmission is often suspected, it is rarely confirmed by epidemiological or laboratory studies. There is limited information available to assign proportionality of foodborne transmission amongst other potential routes. Surveillance information must be reviewed carefully (often "line by line" and considering text comments) to assess the reliability of any conclusions drawn.

The identification of foodborne transmission appears to be principally made on the basis of the implication of food premises, and investigations (alongside local authority activity) are readily instigated. Identification of foodborne transmission in other settings is less likely to be identified and addressed.

6.2 System attributes

The following discussion considers surveillance system attributes listed by the CDC guidelines, principally in terms of surveillance of foodborne disease.

6.2.1 Simplicity

The notifiable diseases surveillance system appears to be functioning well at the national and local level, suggesting that the complexity is not a barrier to PHU participation (except perhaps for outbreak reporting). FoodNet appears to be more complex, and the relationship with EpiSurv incomplete, thus inhibiting use of this database for surveillance purposes.

6.2.2 Flexibility

The notifiable diseases surveillance system appears to be highly flexible with opportunities for generic or unexplained illnesses ("gastroenteritis") reporting alongside the more well defined specific illnesses. The management of data on a national basis within a single organisation (ESR) readily allows modifications to be made in response to national or local needs.

At a national level, EpiSurv data is readily collated and analysed for review for risk assessment. The fact that several PHUs have developed "in house" programmes to extract and analyse data at a local level suggests that analytical potential for them needs to be improved.

One aspect of flexibility needs to be improved: EpiSurv reporting forms are primarily designed for data entry and database needs; tools for information collection and write-up at the PHU level need to be developed.

6.2.3 Data quality

Data quality is uneven. For enteric disease surveillance the data quality is high, with demographic and pathogen data reported for a high proportion of cases, and laboratory confirmation obtained for the vast majority. Timeliness for data entry is good, although delays between onset of symptoms and reporting are too long (however, this is outside the control of the surveillance system).

Data quality for surveillance of foodborne disease is rated poor for the reasons given in Section 6.1 i.e. risk factor information is incomplete, food vehicles are rarely identified definitively, and the reported information may be internally contradictory..

6.2.4 Acceptability

The willingness of PHUs and laboratories to participate in the surveillance system appears to be very high. The failure to collect risk factor data for certain types of illness, or the lack of investigation, is a resourcing issue.

There appear to be some barriers to participation by GPs, related to resources available to transmit information, or privacy issues.

6.2.5 Sensitivity

The sensitivity of the communicable disease surveillance system in terms of the proportion of cases of serious disease detected is generally high. Most, if not all cases of serious potentially foodborne illness will be captured by one of several reporting channels (GPs, laboratories, hospitals, PHUs). For potentially foodborne enteric infections where it is acknowledged there are many cases in the community which do not come to the attention of the health system, New Zealand reported rates of illness are similar (or higher) than other developed countries. It seems reasonable to conclude that the system will be sensitive to changes in rates.

Considering sensitivity in terms of the ability to detect potentially foodborne outbreaks and unusual pathogens, this is also high, with PHUs regularly (daily or weekly) examining local notification data, and typing information from the Enteric Reference Laboratory augmenting notification data. An exception is dispersed events occurring across boundaries where a more intensive national overview appears to be desirable.

6.2.6 Predictive value positive

The predictive value positive of the communicable disease surveillance system is high, with almost all cases confirmed by laboratory identification of a pathogen. This may also be a reflection of the surveillance bias whereby cases with a positive test are much more likely to be notified.

6.2.7 Representativeness

The representativeness of the communicable disease surveillance system in terms of foodborne disease is poor. This derives from a number of factors:

1. Underreporting: not all cases of illness will come to the attention of the health and surveillance systems. This is due to a variety of reasons as described in Section 6.1.
2. Not all potentially foodborne diseases are notifiable.
3. Risk factor information is collected and reported for only a proportion of potentially foodborne illness cases.
4. A transmission route of any kind is reported as “suspected” for only a small proportion of enteric illness cases, and rarely reported as “definite”.
5. There is a variety of approaches to the follow-up and investigation of potentially foodborne illness;
6. Not all information related to investigations is captured by the national surveillance system, with write-ups at a PHU level not always being forwarded to EpiSurv;
7. Investigations that are carried out principally involve food premises, with illness associated with other settings (e.g. domestic kitchens) rarely examined;
8. The opportunity to confirm or exclude a source of infection for notified cases through analysis of samples provided to the PHLs is not fully utilised, through incomplete connection between laboratory results, FoodNet, and EpiSurv;
9. Isolates submitted to the Enteric Reference Laboratory are a subset of those from human cases; most submitted isolates are matched to cases in EpiSurv to

supplement other data, but for campylobacteriosis and yersiniosis few isolates are received. This matching will be greatly facilitated in the near future as an automated process called EpiMatch, currently being piloted for meningococcal disease, is extended to other illnesses.

6.2.8 Timeliness

The timeliness of reporting of potentially foodborne illness from a national perspective is rated good, with an Auckland study finding that the average reporting delay was 2 days, and most cases notified within one week. However, at a PHU level this is too slow, with daily updates being required for public health management. A similar comment applies to reporting channels from EpiSurv; monthly and annual summaries being acceptable for risk assessment purposes, but too slow for local issue management.

6.2.9 Stability

This system attribute is rated high, in terms of potentially foodborne disease. The surveillance system has been stable for several years (at least since the early 1990s), enabling the comparison of disease rates across time.

6.3 Overall conclusions

The communicable disease surveillance system has the potential to provide high quality foodborne disease surveillance, but incompleteness of data gathering/entry, as well as inconsistency in follow-up and investigative practices means that the available information from a national perspective is incomplete and skewed. This is no reflection on PHUs – it is primarily a result of insufficient resources to achieve the level of reporting and investigation that PHU staff would like to achieve. While it is not the function of this project to make recommendations for change, it seems that either an increase in resources is needed, or else existing resources are targeted to investigate well defined single issues to provide reliable information.

7 REFERENCES

CDC (2001) Updated guidelines for evaluating public health surveillance systems. Recommendations from the Guidelines Working Group. Mortality and Morbidity Weekly (MMWR); 50 (RR13): 1-35.

CDC (2004) Updated guidelines for evaluating public health surveillance systems. Recommendations from the CDC Working Group. Mortality and Morbidity Weekly (MMWR); 53 (RR05): 1-11.

Eglinton M, MacBride-Stewart G, Pirie R. (2003) Report on the quality of EpiSurv data. Client Report FW0369. Prepared for the Ministry of Health. ESR: Kenepuru Science Centre, Porirua.

ESR (2004a) Notifiable and other diseases in New Zealand. Annual Report 2003. Client Report FW0426. Prepared for the Ministry of Health.

ESR (2004b) Annual summary of outbreaks in New Zealand 2003. Client Report FW0419. Prepared for the Ministry of Health.

Hannay E. (2004) Summary of foodborne illness outbreaks 30 June 2003 – 1 July 2004. Auckland District Health Board.

Lake RJ, Baker MG, Garrett N, Scott WG, Scott HM. (2000) Estimated number of cases of foodborne infectious disease in New Zealand. New Zealand Medical Journal; 113: 278-281.

Malcolm, M. (1994) Foodborne disease surveillance review; a report by ESR for the Ministry of Health/Public Health Commission. Client Report FW 94/16. ESR: Kenepuru Science Centre.

MacBride-Stewart G, Boxall N (2004) A review of outbreak reporting in New Zealand. Client Report FW04111. A report for the Ministry of Health. ESR: Kenepuru Science Centre, Porirua.

Ministry of Health/Ministry of Agriculture and Forestry. (2000) Food Administration in New Zealand: A Risk Management Framework for Food Safety. Wellington: Joint Ministry of Health and Ministry of Agriculture and Forestry Food Harmonisation Project.

Pirie R, Eglinton M, MacBride-Stewart G. (2004) EpiSurv Data Quality Report FW0490. Prepared for the Ministry of Health. ESR: Kenepuru Science Centre, Porirua.

Sarfati D, Bates MN, Garrett N, Baker MG. (1997) Acute gastroenteritis diagnostic practices of New Zealand general practitioners. New Zealand Medical Journal ; 110: 354-356.

Scott WG, Scott HM, Lake RJ, Baker MG. (2000) Economic cost to New Zealand of foodborne infectious disease. New Zealand Medical Journal; 113: 281-284.

Simmons G, Whittaker R, Boyle K, Morris AJ, Upton A, Calder L. (2002) Could laboratory-based notification improve the control of foodborne illness in New Zealand? New Zealand Medical Journal; 115: 237-240.

Simmons G. (2004) New Zealand's capacity to respond to outbreaks of foodborne illness. Private discussion paper.

Sneyd E, Baker M. (2003) Infectious diseases in New Zealand: 2002 Annual Surveillance Summary. ESR Client Report FW0332. Porirua: ESR.

Thacker, S. B. Historical Development. *In*: Principles and Practice of Public Health Surveillance. Teutsch, S. M. and Churchill, R. E., Eds., 2000. Page:1, Oxford University Press. New York, New York.

Thacker, S. B. and R. L. Berkelman. Public Health Surveillance in the United States. *Epidemiol Rev* 1988. Vol. 10:164.

Whyte, R. (2003) Public Health Unit foodborne illness investigation review. Report FW0313. Prepared for the New Zealand Food Safety Authority.

APPENDIX 1: EPISURV AND FOODNET REPORTING FORMATS RELEVANT TO FOODBORNE DISEASE

EpiSurv

Enteric Disease Form:

Are there associated food/water/environmental samples?
Risk factors:
Food history (self reported cases only): details of meals for the two days prior to onset of illness
Food premises: details if the case consumed food from a premises during the incubation period
Drinking water: water supply codes for current address and work/school/preschool
Recreational water contact
Human contact
Animal contact
Overseas Travel
Source: definite or suspect, and how the source was implicated (common source outbreak), organism or toxin of same type identified in food or drink consumed by case, other)
Case management (includes whether the case was high risk, including food handler)
Comments

Hepatitis A

Outbreak details (if applicable)
Contact with contaminated food or drink (definite or suspected, and how source was identified)

Listeriosis

Outbreak details (if applicable)
Risk factors include consumption of contaminated food or drink, and how source was implicated (common source outbreak), organism or toxin of same type identified in food or drink consumed by case, other)

VTEC/STEC

Outbreak details (if applicable)
Risk factors: Food (list of foods the case may have consumed in previous week), water (water supply code, recreational contact) and others (animal, human, travel, sewage)

FoodNet "Food Complaint" Reporting Formats:

Food Complaints

The 'Food Complaints' reporting form includes five components:

Complainant.

Name of the complainant, address and contact details, when and how the complaint was made, and when and where the food was purchased/obtained. Indicators of the willingness to give evidence are also included.

Complaint details.

Includes details of implicated food, narrative of the nature of the complaint, classification of the complaint (e.g. foreign matter, caused illness, etc.), evidence history (what has been done with any samples), likely offence (usually a reference to a section of the Food Act), assessment (investigating officers observations) and local code.

Food premises involved.

Trading name, contact name, phone number and result. A link can also be created here to other information related to the premises, including other complaints associated with the premises.

Chain of evidence.

Details of any samples taken and submitted for analysis. If analyses were carried out by ESR, then there is a link from here to the laboratory results exported from ESR.

Complaint resolution summary.

May contain a narrative or contain embedded documents, such as letters sent to food premises.

There is a section at the bottom of the form for 'Associated notifications' and 'Associated outbreaks', but this appears to be very rarely used.

Notifications

The 'Notifications' form contains seven components:

Complainant/case.
Disease & notification details.
Demography/type of person/location.
Samples from Case/Evidence/Results.
Suspected symptoms/Diagnosis/Meal time/Incubation.

Risk questions. Includes food, swimming, water, alcohol, chemicals, contact with ill people, overseas travel, and unusual incidents.
Food purchased & eaten.

Outbreaks

Includes two components:

Outbreak data. Transmission characteristics (defined group, common source, etc.), case number and age distribution, incubation and duration mean and distribution.

Food factors. Circumstances that may have lead to the outbreaks, such as undercooking, cross-contamination, etc.

APPENDIX 2: ANALYSIS OF EPISURV AND FOODNET DATA

Table 1: Data from selected fields of enteric notifications for 2004: basis for diagnosis and food premises

Disease	Total Cases	Organism Isolated From Food: Yes	No Risk Factor Information Reported (%)*	Food Premises: Reported	Food Premises: Confirmed	Food Premises: Exonerated	Food Premises: Suspected
Campylobacteriosis	12215	35	7804 (64)	1450	0	71	1019
Cryptosporodiosis	589	4	129 (21)	66	0	5	26
Gastroenteritis	1359	4	409 (55)	609	1	28	537
Giardiasis	1515	8	761 (51)	126	0	9	76
Paratyphoid	28	1	3 (11)	6	0	0	2
Salmonellosis	1079	7	211 (20)	212	1	3	105
Shigellosis	140	1	25 (18)	22	0	0	12
Typhoid	31	0	4 (13)	2	0	0	1
Yersiniosis	420	1	191 (46)	55	0	0	39

- Note that self reported cases are excluded from this analysis, this affects percentages, particularly for gastroenteritis cases

Table 2: Data from selected fields of enteric notifications for 2004: sources of infection

			Person to Person		Food or Water		Animal Contact		Other Source	
Disease	**Total Cases**	**Source Identified: No or Unknown**	**Source Suspected**	**Source Definite**	**Source Suspected**	**Source Definite**	**Source Suspected**	**Source Definite**	**Source Suspected**	**Source Definite**
Campylobacteriosis	12215	10602	115	1	890	3	560	3	200	5
Cryptosporodiosis	589	254	22	1	36	0	187	5	30	0
Gastroenteritis	1359	683	213	2	411	2	0	0	54	0
Giardiasis	1515	1219	111	0	104	2	50	0	57	3
Paratyphoid	28	15	0	0	4	0	3	1	3	1
Salmonellosis	1079	810	46	3	122	2	79	1	44	3
Shigellosis	140	86	19	0	34	0	1	0	10	3
Typhoid	31	21	4	0	0	0	0	0	6	1
Yersiniosis	420	370	3	0	21	0	23	0	6	0

Table 3: Reported transmission route for outbreaks 1999-2004

Causal pathogen/agent	Number of outbreaks	Foodborne transmission	Foodborne transmission plus other route(s)
B. cereus	33	30	3
Campylobacter (includes *C. jejuni* and other species)	265	105	21
C. perfringens	70	67	0
E coli	15	1	2
Hepatitis A	20	2	1
Histamine	8	8	0
Norovirus	437	71	53
Salmonella (includes *S.* Enteritidis and other species but not *S.* Paratyphi)	177	67	16
S. Paratyphi	4	1	0
Shigella (includes all species)	38	1	5
S. aureus	51	50	1
Yersinia (includes all species)	9	3	3

Table 4: Evidence for mode of transmission reported for outbreaks 1999-2004 as reported to the Outbreak module of EpiSurv.

		Evidence for mode of transmission						
Causal pathogen/agent	**Number of outbreaks**	**Epidemiological: History of exposure to implicated source**	**Epidemiological: Case control or cohort study**	**Laboratory: Hazard identified in implicated source**	**Laboratory: hazard identified in food handler**	**Environmental investigation: CCP failure**	**Other**	**No Evidence Obtained**
B. cereus	33	15	0	3	0	8	1	1
Campylobacter (includes *C. jejuni* and other species)	265	141	4	7	0	50	9	27
C. perfringens	70	41	2	7	0	21	4	2
E. coli	15	10	0	0	0	0	0	2
Hepatitis A	20	11	1	1	0	1	0	2
Histamine	8	6	0	5	0	1	0	0
Norovirus	437	253	15	12	5	19	23	28
Salmonella (includes *S.* Enteritidis and other species but not *S.* Paratyphi)	177	86	2	8	7	16	8	13
S. Paratyphi	4	1	0	1	0	0	0	1
Shigella (includes all species)	38	20	1	0	1	2	2	4
S. aureus	51	24	1	3	2	10	1	1
Yersinia (includes all species)	9	3	0	0	0	1	3	2

Table 5: Entry type and PHU source for suspect food poisoning cases reported through FoodNet in 2004.

Category	**Number of FoodNet files relating to SFP**
Total	83
By entry type	
Complaints	72
Notifications	10
Outbreaks	1
By PHU	
Palmerston North	20
Rotorua	14
Tauranga	10
Christchurch	9
Whangarei, Gisborne	7
Others	1-3