Acute Gastrointestinal Illness (AGI) Study: GENERAL PRACTICE STUDY

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

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August 2007

Acknowledgement:

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Client Report
FW0716

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ACKNOWLEDGEMENTS

The authors would like to gratefully acknowledge the General Practitioners throughout New Zealand who participated in this study.

The authors would like to thank Alokananda Bhattacharya for assisting with the statistical analysis, Dinusha Bandara for providing statistical advice, Julie Daly for assisting with the literature review, Morag McGibbon for assisting with the questionnaire graphic design and Catherine Tisch for assisting with mapping.

The authors would also like to acknowledge the advice and guidance provided by the AGI Steering Group: Dr Michael Baker, Pip Bridgewater, Dr Donald Campbell, Dr Nicole Coupe, Dr Simon Hales, Dr Rob Lake, Dr Graham MacBride-Stewart, Dr Alison Roberts, Dr Simon Ryder-Lewis and Dr Kerry Sexton.

CONTENTS

List of Tables

List of Figures

SUMMARY

Aim

The Acute Gastrointestinal Illness (AGI) General Practice Study is one of three studies, which aim to quantify the burden of AGI in New Zealand.

The specific objectives of the AGI General Practice Study include:

- To estimate the incidence of patients presenting to general practitioners (GPs) diagnosed with AGI
- To estimate the proportion of consultations for AGI resulting in a faecal specimen request
- To assess the influence of patient factors on GPs requesting faecal specimens for AGI patients
- To assess patient compliance with faecal specimen requests
- To assess GP notification of AGI to the Medical Officer of Health

Methods

An incidence study to estimate the rate of patients with AGI presenting to GPs was conducted over a consecutive seven week period from 20 May 2006 to 7 July 2006. All 105 practices recruited for the study participated in the HealthStat panel, a primary care surveillance network weighted by District Health Board population and covering a registered patient population of approximately 445,000 people. Anonymous data on GP consultations was downloaded weekly from the practice management system MedTech32 used by recruited practices.

The following datasets were extracted:

(i) GP consultations for AGI
(ii) Practice consultations with electronic requests for faecal pathogen testing
(iii) Practice consultations for all causes
(iv) Practice patient register data

A survey was also performed to assess GP knowledge and behaviour regarding the diagnosis and notification of AGI. A postal questionnaire was sent to all the GPs (approximately 360) who worked in the HealthStat panel.

Results

The principal findings for the incidence study include:

- AGI was implicated in 0.30% of all practice consultations.
- There was an annualised incidence rate of 18.01 AGI cases per 1,000 population for the seven week study period.
- Children aged less than 1 year and children aged 1 to 4 years were markedly over-represented in the total AGI cases presenting to a GP.
- The combined European/Other ethnic group was over-represented in the total AGI cases presenting to a GP.
- Approximately a quarter of all AGI encounters resulted in a request for faecal pathogen testing

The principal findings of the GP survey include:

- Key patient factors that influenced faecal specimen requests by GPs for AGI patients included clinical, transmission, exposure and other risk factors.
- The key clinical patient factors that influenced faecal specimen request included: blood in stool; duration of illness greater than 5 days; mucous in stool; and clinical dehydration.
- The key transmission risk factors that influenced faecal specimen request included: food industry worker; childcare worker; health care worker; rest home resident; and childcare attendee.
- The key exposure and other risk factors that influence faecal specimen request included: suspected outbreak or cluster; recent travel overseas; recent immigration; immunocompromised patient; suspect water consumption; suspect water consumption; suspect food consumption; recent camping trip; and farm worker.
- Relevant risk factor information commonly obtained by GPs included: suspect food consumption; other ill household members; others who are ill from the same possible source; overseas travel; and suspect water consumption.

- Almost half of GPs requested only one faecal specimen for AGI patients.
- Approximately two-thirds of patients were either "good" or "very good" with respect to compliance with faecal specimen requests according to GPs.
- GPs demonstrated some uncertainty about the routine faecal testing of enteric pathogens by the laboratory, in particular *Listeria*, *Vibrio (*cholera*)*, *Yersinia* and Norovirus.
- GPs most commonly specified faecal testing for bacterial pathogens and least frequently for toxins.

- Most GPs reported AGI due to a laboratory confirmed notifiable disease.
- GPs were less likely to report AGI without a laboratory confirmed pathogen, except in the event of a possible outbreak.
- Almost half of GPs did not routinely report AGI cases associated with high risk transmission factors involving occupation or setting.
- No major barriers to notification were identified, though a number of GPs believed that the laboratory reports notifiable diseases.

Conclusion

While the AGI General Practice Study was designed as one of three studies to quantify the burden of AGI in New Zealand, this study attempted to independently address a current gap in the New Zealand literature by estimating the population-based incidence of patients presenting to GPs with AGI. Related findings from the AGI Community Study raises questions regarding the validity of the incidence rates estimated in this study, which had various sources of non-quantifiable measurement error. However, estimates of faecal specimen requests from this study correlate well with international literature. As a consequence, this research will still serve to inform the notification pyramid for AGI in New Zealand.

1 INTRODUCTION

This general practice study is one component of a larger study investigating acute gastrointestinal illness (AGI) in New Zealand. The other components of the AGI Study include a community survey to determine the prevalence of AGI in the community and a laboratory survey to assess laboratory protocols and reporting practices in relation to faecal pathogen testing. The AGI Study is being conducted by the Institute of Environmental Science and Research (ESR) for the New Zealand Food Safety Authority (NZFSA).

The overall objectives for the AGI Study include:

- To determine the magnitude and distribution of self reported AGI in the New Zealand population
- To estimate the burden of disease associated with AGI
- To describe and estimate the magnitude of under-ascertainment of AGI at each stage in the national communicable disease surveillance process
- To identify modifiable factors affecting under-ascertainment that, if altered, could reduce case loss throughout the AGI component of the surveillance system

The specific objectives of the AGI General Practice Study include:

- To estimate the incidence of patients presenting to general practitioners (GPs) diagnosed with AGI
- To estimate the proportion of consultations for AGI resulting in a faecal specimen request
- To assess the influence of clinical and other patient factors on GPs requesting faecal specimens for AGI patients
- To assess patient compliance with faecal specimen requests
- To assess GP notification of AGI to the regional public health service

In order to address the study objectives, the AGI General Practice Study consisted of two separate parts. An incidence study was conducted to estimate the incidence of AGI at the patient-primary care interface. A survey was also performed to assess GP knowledge and behaviour regarding the diagnosis and notification of AGI.

2 BACKGROUND

The annual economic cost of AGI in New Zealand has been estimated at $216 million (Scott *et al.*, 2000), which reinforces the importance of accurately quantifying the occurrence of AGI in the community. While there is a reliance on routine notifiable disease surveillance data to describe the epidemiology of enteric diseases, there is little argument that such data underestimates the community incidence of AGI due to limitations in the notification process. A further complicating factor is the contribution of non-notifiable enteric pathogens to the national burden of AGI. During 2005, there were almost 19,000 notifications for enteric pathogens in New Zealand (ESR, 2006), though it has been estimated that the total number of AGI cases could be as high as 823,000 per year (Lake *et al.*, 2000).

Each step in the notification chain contributes to the under-ascertainment of community levels of AGI. Currently, notification of enteric pathogens in New Zealand requires an individual to seek medical attention, a medical professional to request a faecal specimen, a laboratory to isolate a pathogen, and finally a medical professional to notify the regional public health service. As a common entry point to the health system, GPs are integral to this notification process, though there is lack of quantitative research regarding the role of GPs with respect to assessment and notification of AGI in New Zealand.

A national GP postal survey was conducted in 1996, which examined acute gastroenteritis with respect to patient factors resulting in faecal specimen requests, frequency of faecal specimen requests, and patient compliance with faecal specimen requests (Sarfati *et al.*, 1997). This study has been reviewed elsewhere in this report as it contributes to the understanding of GP diagnostic practices in relation to AGI in New Zealand.

The Waikato Medical Care Survey (WaiMedCa) and the National Primary Medical Care Survey (NatMedCa) provide some indication of the burden of AGI within general practice in New Zealand. WaiMedCa was conducted from 1991 to 1992 and ascertained that digestive "presumed infection" accounted for 2.5% of all GP encounters (McAvoy *et al.*, 1994). NatMedCa is a similar national survey conducted between 2001 and 2002, which demonstrated that approximately 1.5%[1] of all GP visits were linked to bacterial food poisoning (Ministry of Health, 2004). While these studies provide a valuable insight, population incidence rates of AGI at the patient-primary care interface could not be ascertained. The results of the AGI General Practice Study detailed in this report address this apparent gap in the New Zealand literature.

[1] Estimate calculated from figures presented in the published report.

3 METHODOLOGY – INCIDENCE STUDY

3.1 Study Design

The incidence study was designed to estimate the number and rate of patients with AGI presenting to GPs. A nationwide incidence study was conducted in New Zealand over a seven week period from Saturday 20 May 2006 to Friday 7 July 2006. Data on GP consultations was downloaded weekly from the practice management system MedTech32[2] used by recruited practices. The study population was the registered patient population for each recruited practice.

3.2 Recruitment of Practices

The incidence study recruited all general practices participating in the HealthStat panel, a primary care surveillance network managed by CBG Health Research Ltd. Each practice received a small financial disbursement in recognition of time and effort expended on this study.

At the time of data collection, the HealthStat panel consisted of 105 practices with 364 GPs, covering a total registered population of approximately 470,000 people. These practices represented a random sample of 960 MedTech32 practices (from 1,267 MedTech32 practices in New Zealand), which were weighted by District Health Board (DHB) population. The sample included Accident and Medical clinics if they provided general medical services to a registered population. Institutional clinics were excluded from the HealthStat panel.

3.3 Data Collection

A weekly download was conducted to extract anonymous data from MedTech32 for each practice throughout the study period.

AGI was defined for GPs as "acute onset of diarrhoea and/or vomiting with a suspected infectious cause". Each GP in participating practices was required to code all consultations for AGI in MedTech32. The following MedTech32 Read codes were used for AGI: A0 (infectious gastroenteritis); J4 (gastroenteritis); and 19F (diarrhoea as a symptom).

A structured query language (SQL) query was designed in order to extract routine data on computerised laboratory requests for faecal pathogen testing.

[2] MedTech32 is a patient management system run by approximately 80% of New Zealand general practices in order to manage consultation notes, record investigations and referrals, write prescriptions and bill for consultations.

3.4 Datasets

The following datasets were collected from the study practices:

(i) GP consultations for AGI
(ii) Practice consultations with electronic requests for faecal pathogen testing
(iii) Practice consultations for all causes
(iv) Practice patient register data.

The first three datasets were derived from weekly data downloads. The dataset for practice consultations for all causes included GP consultations, nurse consultations, telephone consultations and prescription requests. The practice patient register dataset was derived from data routinely collected from HealthStat practices every 3 months. The variables in each dataset are described in Appendix 1.

Data on the frequency of practice downloads was collected during the study period as a measure of data quality.

3.5 Case Definitions

For the purpose of the analysis, a distinction was made between GP consultations for the same versus separate episodes of AGI for any given patient.

An AGI **encounter** was defined in this study as:

a) Any consultation during the study period where the following Read codes were assigned in MedTech32: A0 (infectious gastroenteritis); J4 (gastroenteritis); and 19F (diarrhoea as a symptom).

AND/OR

b) Any consultation during the study period with a laboratory request for faecal pathogen testing.[3]

An AGI **case** was defined in this study as:

a) Any AGI encounter during the study period (as defined above).

EXCLUDING

b) Any AGI encounter if within 7 days of a previous AGI encounter for the same patient.

3.6 Data Analysis

The data on the frequency of practice downloads was reviewed. Practices without download data available for every week throughout the study period were excluded from the data analysis.

[3] The assumption was made that all consultations with an electronic request for faecal pathogen testing, even in the absence of an appropriate MedTech32 Read code, constituted an AGI encounter.

The proportion of AGI *encounters* of all practice consultations and associated 95% confidence intervals were calculated for the total seven week study period. Moving four week average proportions were also ascertained. Practice consultation data for all causes was used as the denominator for this analysis. AGI encounters recorded for practices without practice consultation data for all causes were excluded from the analysis.

The annualised incidence rate for AGI *cases* and associated 95% confidence intervals were calculated for the total seven week study period. Moving four week average incidence rates were also calculated. Practice patient register data was used as the denominator for this analysis. Annualised incidence rates were also determined for the following sub-groups: practice DHB; sex; age group; and ethnic group.

The characteristics of the AGI cases were described by calculating proportions for the following demographic sub-groups: sex; age group; ethnic group; and socio-economic deprivation. Socio-economic deprivation was determined using quintiles based on the New Zealand Index of Deprivation 2001 (NZDep01), where quintile one is the least deprived group and five is the most deprived.

All statistical procedures were performed using SAS Version 9.13 software.

4 METHODOLOGY - SURVEY

4.1 Study Design

This survey was designed to assess GP behaviour and knowledge with respect to AGI. A postal questionnaire was sent to GPs throughout New Zealand in July 2006.

4.2 Sampling Frame

The sampling frame used for this survey was the HealthStat panel, which consisted of 364 GPs from 105 randomly selected practices weighted by DHB population (refer to methodology of incidence study).

4.3 Study Protocol

A letter explaining the GP survey was sent to each of the 105 HealthStat practices. An appropriate number of survey questionnaires was posted to the contact person for each practice (such as practice managers) to distribute to the GPs. The practice contact person compiled completed surveys to post back. Two follow-up phone calls were conducted in July and August 2006 to increase the response rate.

4.4 Survey Instrument

The survey questionnaire was developed in consultation with the steering group for the AGI Study (see Appendix 2). A final draft was piloted on a group of ten GPs, which resulted in some minor changes to the final questionnaire.

The survey questionnaire included items that assessed the following areas:

- GP characteristics
  - Sex
  - Age group
  - Ethnic group
- Risk factors for AGI
  - Patient factors influencing faecal specimen request
  - Questioning patient about risk factors
- Faecal specimens and testing
  - Number of faecal specimens routinely requested
  - Patient compliance with faecal specimen requests
  - GP awareness of faecal pathogens routinely tested
  - GP requests for specific faecal testing (bacteria/viruses/protozoa/toxins)
- Notification
  - Notification practices related to AGI
  - Barriers to notification in general

4.5 Data Analysis

Proportions were ascertained for variables and sub-categories of variables where appropriate.

For variables with sub-categories relating to frequency (always, usually, sometimes, rarely, never), the sub-categories were grouped as follows: (i) “always” plus “usually”; (ii) “sometimes”; and (iii) “rarely” plus “never”.

5 RESULTS – INCIDENCE STUDY

5.1 Characteristics of Study Practices

Of the total 105 HealthStat practices, 14 (13.3%) were excluded from the study due to incomplete download data in accordance with the study protocol. Data analysis was conducted on the remaining 91 practices that covered a registered population of approximately 445,000 people.

The geographical distribution of the 91 study practices by DHB was mostly similar to that of the total HealthStat panel, which is weighted by DHB population (see Table 1). The number of study practices in Waikato and Counties Manukau DHBs is notably less than the number of practices in the HealthStat panel.

Table 1: Geographical distribution of study practices by District Health Board

DHB	No. of practices in HealthStat (%)		No. of practices in study (%)	
Northland	3	(2.9%)	3	(3.3%)
Waitemata	10	(9.5%)	10	(11.0%)
Auckland	8	(7.6%)	8	(8.8%)
Counties Manukau	14	(13.3%)	10	(11.0%)
Waikato	9	(8.6%)	3	(3.3%)
Bay of Plenty	8	(7.6%)	8	(8.8%)
Lakes	3	(2.9%)	3	(3.3%)
Tairawhiti	3	(2.9%)	3	(3.3%)
Taranaki	2	(1.9%)	2	(2.2%)
Whanganui	1	(1.0%)	1	(1.1%)
Hawkes Bay	6	(5.7%)	4	(4.4%)
MidCentral	4	(3.8%)	4	(4.4%)
Wairarapa	1	(1.0%)	1	(1.1%)
Hutt Valley	4	(3.8%)	3	(3.3%)
Capital & Coast	8	(7.6%)	8	(8.8%)
Nelson Marlborough	3	(2.9%)	3	(3.3%)
Canterbury	8	(7.6%)	8	(8.8%)
South Canterbury	3	(2.9%)	3	(3.3%)
West Coast	3	(2.9%)	2	(2.2%)
Otago	3	(2.9%)	3	(3.3%)
Southland	1	(1.0%)	1	(1.1%)
Total	**105**	**(100%)**	**91**	**(100.0%)**

5.2 AGI Encounters: GP Consultations for the Same or Separate Episodes of AGI

5.2.1 Proportion of AGI encounters

A total of 1,122 AGI encounters were recorded by 63 practices during the seven week study period. After excluding the AGI encounters for practices without practice consultation data for all causes, there were a total of 1,044 AGI encounters remaining. Overall, AGI was implicated in 0.30% (1,044/343,662) of all practice consultations over the study period (see Table 2). The 4 week moving average proportion ranged from 0.29% to 0.32%. While there appeared to be a downward trend in the sequential moving average proportion, this trend was not found to be statically significant using poisson regression modelling (analyses not shown).

Table 2: Proportion of AGI encounters by time period

Time period (weeks)		No. of AGI encounters*	No. of total practice consultations†	Proportion of AGI encounters (95% CI)	
Total	(Wks 1-7)	1044	343662	0.30	(0.29, 0.32)
1	(Wks 1-4)	618	193341	0.32	(0.29, 0.34)
2	(Wks 2-5)	614	193283	0.32	(0.29, 0.34)
3	(Wks 3-6)	576	193958	0.30	(0.27, 0.32)
4	(Wks 4-7)	581	200000	0.29	(0.27, 0.31)

* Number of AGI encounters for practices with practice consultation data for all causes.
† Total practice consultations for all causes include GP consultations, nurse consultations, telephone consultations and prescription requests.

5.3 AGI Cases: GP Consultations for Separate Episodes of AGI

5.3.1 Incidence of AGI cases

According the study case definition, the number of AGI cases recorded during the study period was 1,081. Over the total seven weeks, the annual incidence rate of AGI cases presenting to the GP was 18.01 per 1,000 population (see Table 3). The 4 week moving average rate ranged between 17.29 to 18.72 AGI cases per 1,000 population. Similar to AGI encounters, a downward trend in the sequential moving average rate was observed for AGI cases, though poisson regression modelling indicated that this trend was not statistically significant.

Table 3: Incidence rate of AGI cases per 1,000 population by time period

Time period (weeks)	No. of AGI cases	Annual rate* of AGI cases per 1,000 population (95% CI)	
Total (Wks 1-7)	1081	18.01	(16.94, 19.08)
1 (Wks 1-4)	642	18.72	(17.28, 20.16)
2 (Wks 2-5)	622	18.14	(16.72, 19.57)
3 (Wks 3-6)	593	17.29	(15.90, 16.68)
4 (Wks 4-7)	598	17.43	(16.04, 18.84)

* Annualised incidence rates were calculated for each time period using a total practice population of 445,847 ascertained from practice patient register data.

5.3.2 Incidence of AGI cases by practice DHB

Hawkes Bay DHB had the highest annual rate of AGI cases presenting to GPs over the seven week study period (65.98 AGI cases per 1,000 population), followed by Bay of Plenty DHB (38.17 AGI cases per 1,000 population) (see Figure 1 and Table 4). Other DHBs with high rates of AGI cases included Otago, Midcentral, Hutt Valley and Wairarapa (see Figure 2). No cases of AGI were reported in Southland, Taranaki and Whanganui DHBs during the entire study period.

Figure 1: Incidence rate of AGI cases per 1,000 population by DHB

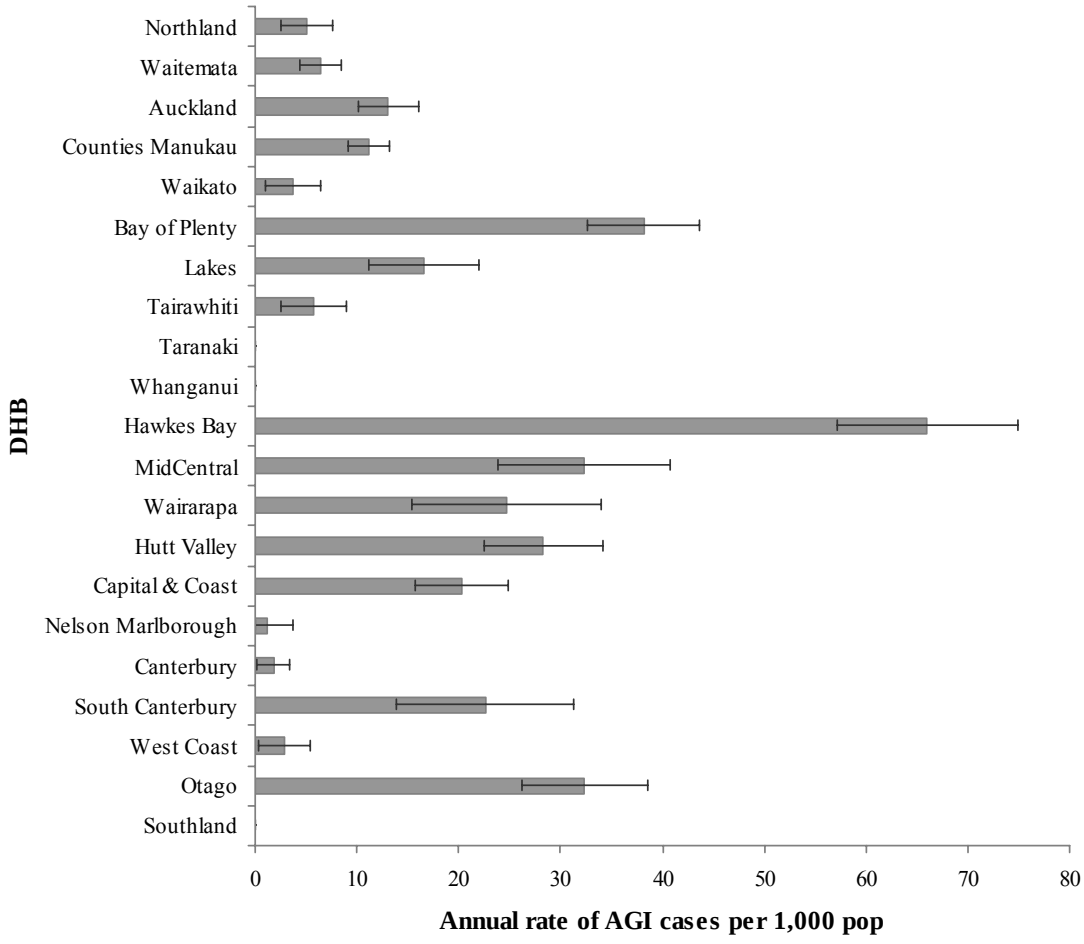
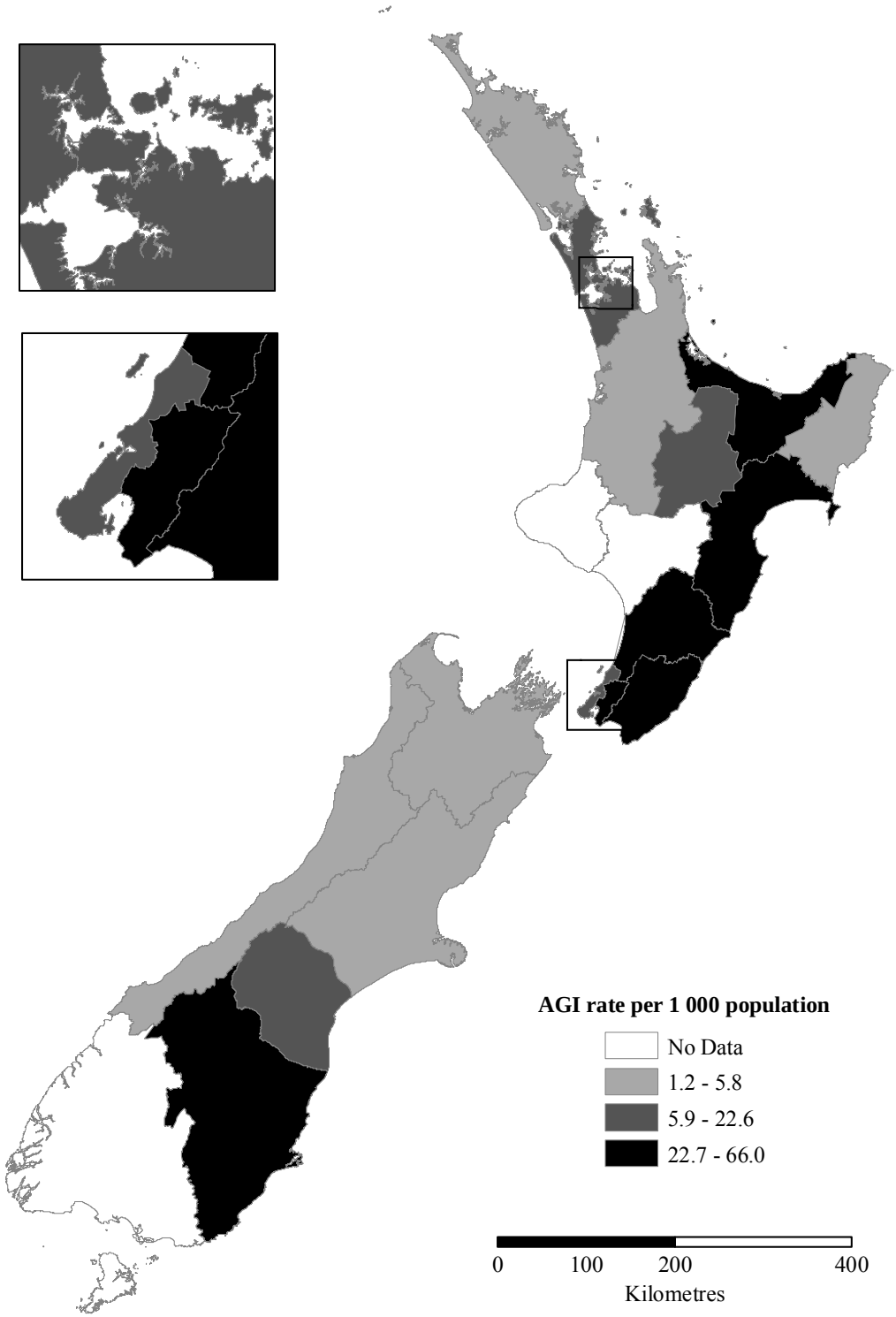


Table 4: Incidence rate of AGI cases per 1,000 population by DHB and time period

DHB	Annual rate* of AGI cases per 1,000 population (95% CI)				
	Period 1 (Wks 1-4)	Period 2 (Wks 2-5)	Period 3 (Wks 3-6)	Period 4 (Wks 4-7)	Total (Wks 1-7)
Northland	4.71 (1.45, 7.97)	4.12 (1.07, 7.17)	3.53 (0.71, 6.35)	5.29 (1.84, 8.75)	5.04 (2.49, 7.59)
Waitemata	7.74 (4.82, 10.66)	6.31 (3.67, 8.94)	6.88 (4.13, 9.63)	6.02 (3.45, 8.59)	6.39 (4.38, 8.39)
Auckland	14.02 (9.97, 18.07)	13.10 (9.19, 17.02)	12.19 (8.41, 15.97)	14.63 (10.49, 18.76)	13.06 (10.11, 16.02)
Counties Manukau	13.30 (10.35, 16.25)	10.06 (7.50, 12.63)	7.50 (5.29, 9.72)	8.19 (5.87, 10.50)	11.21 (9.16, 13.25)
Waikato	5.60 (1.12, 10.07)	4.66 (0.58, 8.75)	1.87 (0.00, 4.45)	2.80 (0.00, 5.96)	3.73 (0.97, 6.49)
Bay of Plenty	38.69 (31.34, 46.05)	35.41 (28.37, 42.44)	38.33 (31.01, 45.65)	36.50 (29.36, 43.64)	38.17 (32.66, 43.69)
Lakes	15.33 (8.44, 22.22)	15.33 (8.44, 22.22)	12.10 (5.98, 18.22)	15.33 (8.44, 22.22)	16.60 (11.18, 22.01)
Tairawhiti	7.57 (2.62, 12.51)	5.89 (1.53, 10.24)	4.20 (0.52, 7.89)	3.36 (0.07, 6.66)	5.77 (2.50, 9.03)
Taranaki	–	–	–	–	–
Whanganui	–	–	–	–	–
Hawkes Bay	65.43 (53.70, 77.16)	74.23 (61.74, 86.71)	68.73 (56.71, 80.74)	65.98 (54.20, 77.75)	65.98 (57.10, 74.87)
MidCentral	37.00 (24.93, 49.06)	38.02 (25.79, 50.26)	33.91 (22.36, 45.47)	29.80 (18.97, 40.64)	32.30 (23.78, 40.81)
Wairarapa	19.23 (8.36, 30.10)	20.83 (9.51, 32.14)	24.03 (11.88, 36.18)	32.04 (18.02, 46.07)	24.72 (15.41, 34.03)
Hutt Valley	31.18 (23.02, 39.33)	31.73 (23.51, 39.96)	26.72 (19.17, 34.28)	27.84 (20.13, 35.55)	28.31 (22.44, 34.19)
Capital & Coast	19.22 (13.34, 25.10)	19.22 (13.34, 25.10)	23.44 (16.95, 29.93)	20.63 (14.54, 26.72)	20.36 (15.79, 24.93)
Nelson Marlborough	–	–	–	2.15 (0.00, 6.38)	1.23 (0.00, 3.64)
Canterbury	0.63 (0.00, 1.86)	0.63 (0.00, 1.86)	2.51 (0.05, 4.97)	3.14 (0.39, 5.89)	1.79 (0.22, 3.37)
South Canterbury	18.29 (7.95, 28.63)	21.34 (10.17, 32.50)	19.81 (9.05, 30.57)	24.38 (12.45, 36.32)	22.64 (13.95, 31.33)
West Coast	4.05 (0.08, 8.02)	4.05 (0.08, 8.02)	3.04 (0.00, 6.48)	3.04 (0.00, 6.48)	2.89 (0.36, 5.43)
Otago	33.44 (25.13, 41.75)	32.90 (24.65, 41.15)	32.90 (24.65, 41.15)	31.28 (23.24, 39.32)	32.36 (26.19, 38.54)
Southland	–	–	–	–	–

* Annualised incidence rates were not calculated for DHBs where no AGI cases presented to a GP.

Figure 2: Map of incidence rate of AGI cases per 1,000 population by DHB



5.3.3 Incidence of AGI cases by patient demography

AGI cases by sex

Although case numbers were slightly higher in females, the rate of AGI cases presenting to the GP was almost identical for both sexes (see Table 5).

Table 5: Incidence rate of AGI cases per 1,000 population by sex

Sex	No. of AGI cases (%)		No. in register (%)		Annual rate* of AGI cases per 1,000 population (95% CI)	
Female	520	(51.9%)	230371	(51.8%)	16.77	(15.33, 18.21)
Male	481	(48.1%)	214229	(48.2%)	16.68	(15.19, 18.17)
Total	1001	(100.0%)	444600	(100.0%)	–	

* Annualised incidence rates were calculated for the total 7 week time period.

AGI cases by age group

Children aged less than 1 year and children aged 1 to 4 years were markedly over-represented in the total AGI cases presenting to a GP with annual rates of 58.78 and 56.47 per 1,000 population respectively (see Table 6). The lowest rate was observed for the 5 to 14 year age group (11.06 per 1,000 population).

Table 6: Incidence rate of AGI cases per 1,000 population by age group

Age group	No. of AGI cases (%)		No. in register (%)		Annual rate* of AGI cases per 1,000 population (95% CI)	
<1 yr	54	(5.4%)	6825	(1.5%)	58.78	(43.16, 74.39)
1-4 yrs	203	(20.3%)	26703	(6.0%)	56.47	(48.73, 64.21)
5-14 yrs	115	(11.5%)	77237	(17.4%)	11.06	(9.04, 13.08)
15-24 yrs	113	(11.3%)	67840	(15.2%)	12.37	(10.09, 14.65)
25-44 yrs	240	(24.0%)	125566	(28.2%)	14.20	(12.40, 15.99)
45-64 yrs	178	(17.8%)	95478	(21.5%)	13.85	(11.82, 15.88)
65+ yrs	99	(9.9%)	45388	(10.2%)	16.20	(13.01, 19.39)
Total	1001	(100.0%)	445037	(100.0%)	–	

* Annualised incidence rates were calculated for the total 7 week time period.

AGI cases by ethnic group

The combined European/Other ethnic group had the highest annual incidence rate of AGI cases presenting to a GP (19.56 per 1,000 population), followed by Maori (15.58 per 1,000 population) and Asians (13.88 per 1,000 population). Pacific peoples had the lowest rate of 6.66 per 1,000 population.

Table 7: Incidence rate of AGI cases per 1,000 population by ethnic group

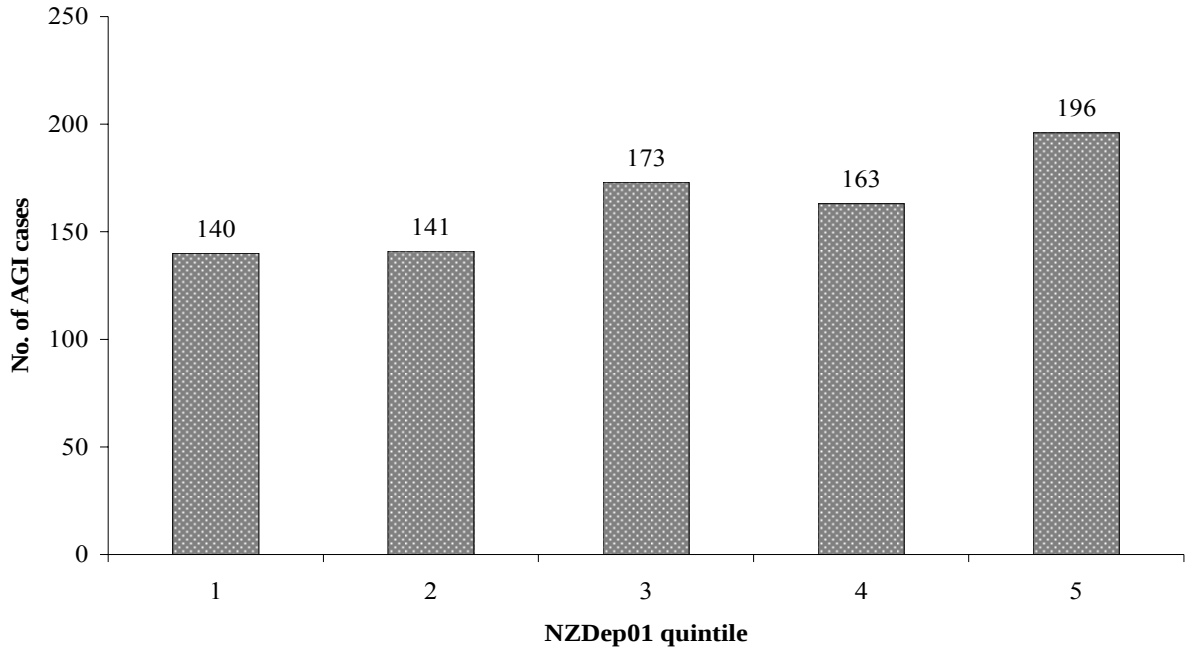
Ethnic group	No. of AGI cases (%)		No. in register (%)		Annual rate* of AGI cases per 1,000 population (95% CI)	
Maori	171	(17.6%)	81536	(19.2%)	15.58	(13.25, 17.91)
Pacific	41	(4.2%)	45728	(10.8%)	6.66	(4.62, 8.70)
Asian	55	(5.7%)	29437	(6.9%)	13.88	(10.21, 17.54)
European/Other	703	(72.5%)	266999	(63.0%)	19.56	(18.12, 21.00)
Total	970	(100.0%)	423700	(100.0%)	-	

* Annualised incidence rates were calculated for the total 7 week time period.

AGI cases by socio-economic status

The proportion of AGI cases more or less increased across increasing levels of socio-economic deprivation (see Figure 3). Almost a quarter (196/813) of AGI cases belonged to the most deprived group (quintile 5). Incidence rates were not calculated due to the absence of patient quintile data in the practice patient register dataset.

Figure 3: Number of AGI cases by socio-economic status



5.4 Requests for Faecal Pathogen Testing

The total number of electronic requests for faecal pathogen testing during the study period was 260. Over the seven week duration of the study, 23.2% (260/1122) of all AGI encounters resulted in a request for faecal pathogen testing (95% CI: 20.7, 25.6).

6 RESULTS – SURVEY

6.1 Response Rate

The written questionnaire was distributed to the 364 GPs who worked in the 105 practices part of the HealthStat panel. The response rate after two follow-up telephone reminders was 28.8% (100/364).

6.2 GP Characteristics

The sex, age group and ethnic group of the participating GPs are described below (see Table 8). Dominant characteristics in the surveyed GPs included: European ethnic group (79%); male sex (65%); and 40 to 49 year age group (47%).

Table 8: GP characteristics

Characteristic	No. of GPs in sample (%)	
Sex		
Female	35	(35.0%)
Male	65	(65.0%)
Age		
30-39 yrs	17	(17.0%)
40-49 yrs	47	(47.0%)
50-59 yrs	27	(27.0%)
60+ yrs	9	(9.0%)
Ethnic group		
Maori	2	(2.0%)
Pacific	0	(0.0%)
Asian	13	(13.0%)
European	79	(79.0%)
Other	4	(4.0%)
Missing	2	(2.0%)
Total	**100**	**(100.0%)**

6.3 Risk Factors for AGI

6.3.1 Patient factors influencing faecal specimen request

In order to assess patient factors that influenced GPs when requesting a faecal specimen, GPs were asked how likely they were to request a faecal specimen for an AGI patient based on a selection of patient factors. These patient factors included: clinical factors; demographic factors; transmission risk factors; exposure and other risk factors.

Clinical factors

There appeared to be four key clinical factors that were used by GPs as a basis to request faecal specimens. Most GPs would either "always" or "usually" request a faecal specimen for AGI patients with blood in stool (82.8%), a duration of illness greater than 5 days (76.0%), mucous in stool (44.9%), and clinical dehydration (42.4%) (see Table 9).

Table 9: Likelihood of requesting a faecal specimen by clinical factor

Clinical factor	No. of GPs (%)						
	Always/Usually (80-100%)		Sometimes (21-79%)		Rarely/Never (0-20%)		Total
Blood in stool	82	(82.8%)	14	(14.1%)	3	(3.0%)	99
Duration of illness >5 days	76	(76.0%)	21	(21.0%)	3	(3.0%)	100
Mucous in stool	44	(44.9%)	34	(34.7%)	20	(20.4%)	98
Clinical dehydration	42	(42.4%)	33	(33.3%)	24	(24.2%)	99
Fever (T>38°)	29	(29.6%)	38	(38.8%)	31	(31.6%)	98
Abdominal pain	18	(18.4%)	40	(40.8%)	40	(40.8%)	98
Watery diarrhoea	15	(15.6%)	43	(44.8%)	38	(39.9%)	96
Severe vomiting	12	(12.4%)	44	(45.4%)	41	(42.3%)	97
Duration of illness <5 days	8	(8.3%)	33	(34.3%)	55	(57.3%)	96

Demographic factors

The age group of the patient did not appear to be a key factor that influenced faecal specimen requests. Only a third of GPs would "always" or "usually" request a faecal specimen from a patient with AGI aged less than 1 year (see Table 10).

Table 10: Likelihood of requesting a faecal specimen by demographic factor

Demographic factor	No. of GPs (%)						
	Always/Usually (80-100%)		Sometimes (21-79%)		Rarely/Never (0-20%)		Total
Age of patient <1 yr	32	(33.3%)	37	(38.5%)	27	(28.1%)	96
Age of patient 1-4 yrs	23	(23.7%)	39	(40.2%)	35	(36.1%)	97
Age of patient 5-15 yrs	11	(11.3%)	49	(50.5%)	37	(38.1%)	97
Age of patient 65+ yrs	27	(27.8%)	49	(50.5%)	21	(21.6%)	97

Transmission risk factors

All the transmission factors listed in the table below appeared to represent key patient factors that encourage GPs to request a faecal specimen (see Table 11). Food industry worker was a particularly important transmission risk factor with 78% of GPs "always" or "usually" requesting faecal specimens for this occupational group.

Table 11: Likelihood of requesting a faecal specimen by transmission risk factor

Transmission risk factor	No. of GPs (%)						
	Always/Usually (80-100%)		Sometimes (21-79%)		Rarely/Never (0-20%)		Total
Food industry worker	78	(78.0%)	17	(17.0%)	5	(5.0%)	100
Childcare worker	65	(65.0%)	28	(28.0%)	7	(7.0%)	100
Health care worker	60	(60.0%)	32	(32.0%)	8	(8.0%)	100
Rest home resident	53	(53.5%)	35	(35.5%)	11	(11.1%)	99
Childcare attendee	45	(45.5%)	38	(38.4%)	16	(16.2%)	99

Exposure and other risk factors

All of the exposure and "other" risk factors emerged as key patient factors that influence faecal specimen requests, with the exception of recent antibiotic use (see Table 12). Only 27.6 % of GPs would "always" or "usually" request a faecal specimen for an AGI patient with a history of recent antibiotic use.

Table 12: Likelihood of requesting a faecal specimen by exposure or other risk factor

Exposure/Other risk factor	No. of GPs (%)						
	Always/Usually (80-100%)		Sometimes (21-79%)		Rarely/Never (0-20%)		Total
Suspected outbreak or cluster	82	(82.0%)	9	(9.0%)	9	(9.0%)	100
Recent immigration	80	(80.0%)	14	(14.0%)	6	(6.0%)	100
Recent travel overseas	80	(80.0%)	12	(12.0%)	5	(5.0%)	100
Immunocompromised patient	77	(77.8%)	15	(15.2%)	7	(7.1%)	99
Suspect water consumption	75	(75.8%)	16	(16.2%)	8	(8.1%)	99
Suspect food consumption	72	(72.0%)	12	(12.1%)	15	(15.2%)	99
Recent camping trip	59	(59.6%)	30	(30.3%)	10	(10.1%)	99
Farm worker	43	(43.0%)	43	(43.0%)	14	(14.0%)	100
Recent antibiotic use	27	(27.6%)	33	(33.7%)	38	(38.8%)	98

6.3.2 Questioning patient about risk factors

In order to assess the extent to which GPs obtained risk factor information, GPs were asked how likely they were to question a patient with AGI about associated risk factors. The majority of GPs either "always" or "usually" asked AGI patients about all the risk factors listed (see Table 13). Risk factor information was most frequently obtained for: suspect food consumption; other ill household members; others who are ill from the same possible source; overseas travel; and suspect water consumption. Risk factors of lesser importance were animal contact, rest home residence and childcare attendance.

Table 13: Likelihood of questioning AGI patient by risk factor

Risk factor	No. of GPs (%)						
	Always/Usually (80-100%)		Sometimes (21-79%)		Rarely/Never (0-20%)		Total
Suspect food consumption	94	(94.9%)	4	(4.0%)	1	(1.0%)	99
Other ill household members	91	(91.9%)	7	(7.1%)	1	(1.0%)	99
Others ill from same source	83	(84.7%)	14	(14.3%)	1	(1.0%)	98
Overseas travel	82	(82.8%)	16	(16.2%)	1	(1.0%)	99
Suspect water consumption	79	(79.8%)	15	(15.2%)	5	(5.1%)	99
Occupation	70	(71.4%)	22	(22.4%)	6	(6.1%)	98
Tramping/camping	64	(65.3%)	28	(28.6%)	6	(6.1%)	98
Antibiotic use	56	(57.1%)	35	(35.7%)	7	(7.1%)	98
Childcare attendance	55	(56.1%)	30	(30.6%)	13	(13.3%)	98
Rest home residence	51	(53.7%)	29	(30.5%)	15	(15.8%)	95
Animal contact	46	(46.9%)	34	(34.7%)	18	(18.4%)	98

6.4 Faecal Specimens and Testing

6.4.1 Number of faecal specimens routinely requested

High proportions of GPs reported requesting either two faecal specimens (23.5%) or three faecal specimens (33.7%) from a patient with AGI, although 42.9% of GPs requested only one faecal specimen (see Table 14).

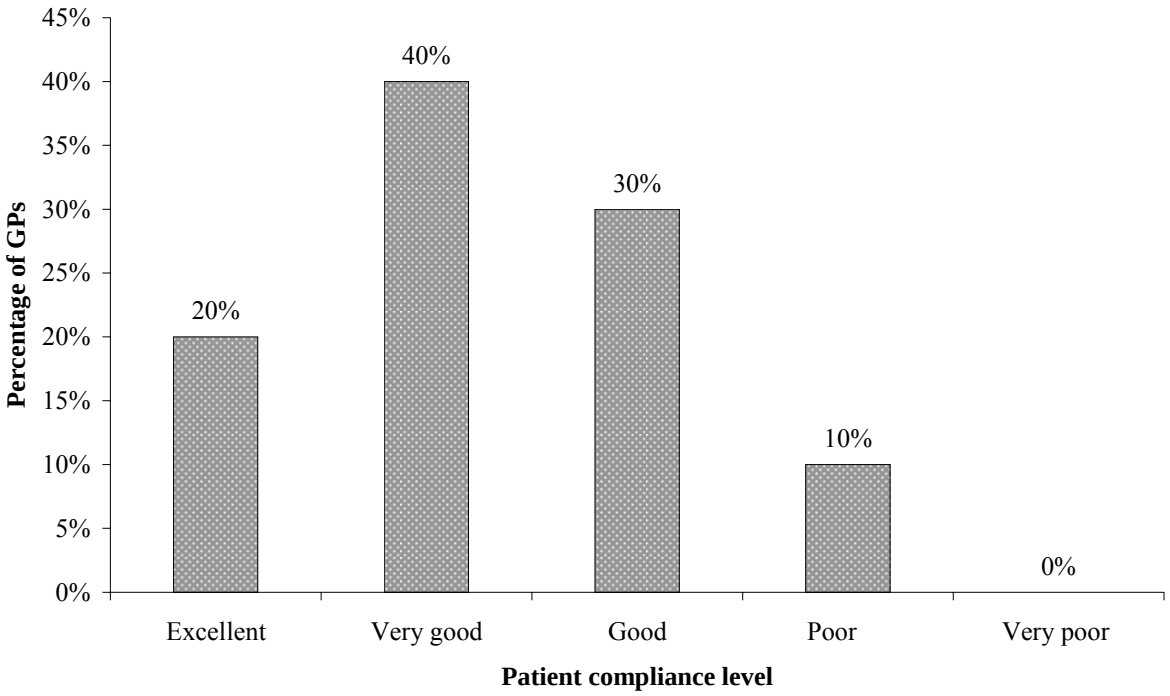
Table 14: Number of faecal specimens routinely requested for AGI patient

No. of requested faecal specimens	Number of GPs (%)	
1	42	(42.9%)
2	23	(23.5%)
3	33	(33.7%)
Total	98	(100.0%)

6.4.2 Patient compliance with faecal specimen requests

Approximately two-thirds of GPs estimated that patients were either "good" or "very good" with respect to compliance with faecal specimen requests (see Figure 4). Only 10% of GPs estimated that patients had "poor" compliance.

Figure 4: Number of GPs estimating patient compliance with faecal specimen requests



6.4.3 GP awareness of faecal pathogens routinely tested

It should be noted that laboratories in New Zealand may not test for the same faecal pathogens routinely. Hence, there is no definitive list of faecal pathogens that are routinely tested nationally. While this survey assessed GP awareness of the faecal pathogens that are routinely tested, this was related to GP assumptions and uncertainty rather than correct knowledge.

The vast majority of GPs surveyed assumed that *Campylobacter*, *Salmonella* and *Shigella* were routinely tested by the laboratory (see Table 15). Fewer GPs assumed that *Giardia*, *Vibrio* (cholera), norovirus and *Listeria* were routinely tested.

Table 15: GP assumptions of faecal pathogens routinely tested by pathogen

Pathogen	No. of GPs who assume pathogen is routinely tested (%)	
Campylobacter	99	(99.0%)
Salmonella	94	(94.0%)
Shigella	89	(89.0%)
E.coli O157 VTEC	63	(63.0%)
Cryptosporidium	54	(54.0%)
Yersinia	51	(51.0%)
Rotavirus	46	(46.0%)
Giardia	36	(36.0%)
Vibrio (cholera)	35	(35.0%)
Norovirus	22	(22.0%)
Listeria	21	(21.0%)

Over a quarter of GPs were uncertain whether *Listeria*, *Vibrio (*cholera*)*, *Yersinia* or Norovirus were routinely tested by the laboratory (see Table 16).

Table 16: GP uncertainty of faecal pathogens routinely tested by pathogen

Pathogen	No. of GPs who are uncertain that pathogen is routinely tested* (%)	
Listeria	34	(34.0%)
*Vibrio (*cholera*)*	32	(32.0%)
Yersinia	30	(30.0%)
Norovirus	27	(27.0%)
Cryptosporidium	22	(22.0%)
E.coli O157 VTEC	21	(21.0%)
Rotavirus	16	(16.0%)
Giardia	11	(11.0%)
Salmonella	6	(6.0%)
Shigella	5	(5.0%)
Campylobacter	1	(1.0%)

* Includes "not sure" responses and missing responses, due to the assumption that a missing response was due to GP uncertainty

6.4.4 Requesting specific faecal testing

Over two-thirds (70.7%) of GPs would "always" or "usually" specify faecal testing for bacteria (see Table 17). Faecal testing for viruses and parasites were less frequently requested by GPs. The majority of GPs would either "rarely" or "never" request faecal testing for toxins.

Table 17: Frequency of requesting faecal testing by pathogen/toxin

Pathogen/toxin	No. of GPs (%)			
	Always/Usually (80-100%)	Sometimes (21-79%)	Rarely/Never (0-20%)	Total
Bacteria	70 (70.7%)	9 (9.1%)	20 (20.2%)	99
Parasites	25 (25.5%)	45 (45.9%)	28 (28.6%)	98
Viruses	21 (21.4%)	40 (40.8%)	37 (37.8%)	98
Toxins	3 (3.2%)	15 (15.8%)	77 (81.1%)	95

6.5 Notification

6.5.1 Notification practices

In order to assess GP knowledge regarding the notification of AGI, GPs were asked how often they would report AGI to the regional public health service based on various scenarios (see Table 18).

Almost all GPs (98.0%) either "always" or "usually" reported AGI due to a notifiable disease that was laboratory confirmed. Most GPs did not report AGI due to a non-notifiable disease or AGI without a laboratory confirmed pathogen. In the event of a possible outbreak, approximately three-quarters (77.8%) of GPs would report AGI with an identified pathogen, though only half of GPs would report AGI without an identified pathogen despite a possible outbreak. With the exception of food industry workers, most GPs surveyed did not notify AGI based on potential transmission factors. Over 40% of GPs either "rarely" or "never" notified AGI in childcare workers/attendees, health care workers or rest home residents

Table 18: Frequency of reporting AGI cases to the public health service by scenario

Scenario	No. of GPs (%)			
	Always/Usually (80-100%)	Sometimes (21-79%)	Rarely/Never (0-20%)	Total
Isolated case				
Notifiable disease (lab confirmed)	98 (98.0%)	0 (0.0%)	2 (2.0%)	100
Suspected food poisoning	16 (16.0%)	23 (23.0%)	61 (61.0%)	100
Non-notifiable disease (lab confirmed)	6 (8.2%)	19 (26.0%)	72 (98.6%)	73
Unknown pathogen	5 (5.2%)	9 (9.4%)	82 (85.4%)	96

Table 18: Frequency of reporting AGI cases to the public health service by scenario (continued)

Scenario	No. of GPs (%)			
	Always/Usually (80-100%)	Sometimes (21-79%)	Rarely/Never (0-20%)	Total
Possible outbreak				
Identified pathogen	77 (77.8%)	10 (10.1%)	12 (12.1%)	99
Suspected food poisoning	55 (56.1%)	19 (19.4%)	24 (24.5%)	98
Unknown pathogen	49 (50.5%)	17 (17.5%)	31 (32.0%)	97
Transmission factors				
Food industry worker	42 (43.8%)	21 (21.9%)	33 (34.4%)	96
Childcare worker/attendee	31 (32.3%)	21 (21.9%)	44 (45.8%)	96
Health care worker	29 (30.2%)	23 (24.0%)	44 (45.8%)	96
Rest home resident	28 (29.5%)	25 (26.3%)	42 (44.2%)	95

6.5.2 Barriers to notification

No major barriers to notification were identified (see Table 19). A number of GPs believed that laboratories report notifiable diseases (13.0%).

There were 62 GPs who stated that they "always notify". The frequency of reporting AGI cases by scenario for this sub-group of GPs were similar when compared to the total sample of GPs described in Table 18 above (analysis not shown).

Table 19: Reasons for NOT reporting notifiable diseases

Reason	No. of GPs* (%)
Time	14 (14.0%)
Belief that laboratory reports notifiable diseases	13 (13.0%)
Lack of feedback regarding notifications	9 (9.0%)
Amount of paper work involved	6 (6.0%)
Lack of knowledge of which diseases to notify	5 (5.0%)
Lack of financial incentives	4 (4.0%)
Lack of motivation	4 (4.0%)
Notification form difficult to use	3 (3.0%)
Lack of practice support	1 (1.0%)
Not applicable – I always notify	62 (62.0%)

* GPs were permitted to select multiple responses

7 DISCUSSION

The AGI General Practice Study was one of three studies that investigated AGI in a general practice, community and a laboratory setting. A final report will collectively analyse, interpret and discus the results of these studies in order to estimate the burden of AGI and inform the notification pyramid associated with AGI in New Zealand. As a consequence, the discussion of the AGI General Practice Study, presented below, is limited to principal findings, study strengths and limitations, and comparisons to existing literature.

7.1 Principal Findings

7.1.1 Incidence study

The principal findings for the incidence study include:

- AGI was implicated in 0.30% of all practice consultations.
- There was an annualised incidence rate of 18.01 AGI cases per 1,000 population for the seven week study period.
- Children aged less than 1 year and children aged 1 to 4 years were markedly over-represented in the total AGI cases presenting to a GP.
- The combined European/Other ethnic group was over-represented in the total AGI cases presenting to a GP.
- Approximately a quarter of all AGI encounters resulted in a request for faecal pathogen testing.

7.1.2 Survey

The principal findings of the GP survey include:

- Key patient factors that influenced faecal specimen requests by GPs for AGI patients included clinical, transmission, exposure and other risk factors.
- The key clinical patient factors that influenced faecal specimen request included: blood in stool; duration of illness greater than 5 days; mucous in stool; and clinical dehydration.
- The key transmission risk factors that influenced faecal specimen request included: food industry worker; childcare worker; health care worker; rest home resident; and childcare attendee.
- The key exposure and other risk factors that influence faecal specimen request included: suspected outbreak or cluster; recent travel overseas; recent immigration; immunocompromised patient; suspect water consumption; suspect water consumption; suspect food consumption; recent camping trip; and farm worker.
- Relevant risk factor information commonly obtained by GPs included: suspect food consumption; other ill household members; others who are ill from the same possible source; overseas travel; and suspect water consumption.

- Almost half of GPs requested only one faecal specimen for AGI patients.
- Approximately two-thirds of patients were either "good" or "very good" with respect to compliance with faecal specimen requests according to GPs.
- GPs demonstrated some uncertainty about the routine faecal testing of enteric pathogens by the laboratory, in particular *Listeria*, *Vibrio (*cholera*)*, *Yersinia* and Norovirus.

- GPs most commonly specified faecal testing for bacterial pathogens and least frequently for toxins.

- Most GPs reported AGI due to a laboratory confirmed notifiable disease.
- GPs were less likely to report AGI without a laboratory confirmed pathogen, except in the event of a possible outbreak.
- Almost half of GPs did not routinely report AGI cases associated with high risk transmission factors involving occupation or setting.
- No major barriers to notification were identified, though a number of GPs believed that the laboratory reports notifiable diseases.

7.2 Strengths and Limitations

7.2.1 Incidence study

There were various limitations associated with the incidence study, which related primarily to measurement error. The under-ascertainment of AGI was likely, as demonstrated by a sub-study of the Infectious Intestinal Disease (IID) Study conducted in the UK (Sethi *et al.*, 1999).

Data on AGI encounters were received from only 69% (63/91) of the study practices. It was not possible to determine whether the remaining 28 practices were not coding AGI or had not seen any AGI over the study period. If these practices had not been coding AGI, this would have the effect of lowering the observed AGI incidence rate. However, these practices were not excluded from the study due to the assumption that these practices had actively participated in the study, but had simply not seen any AGI. This assumption was partly based on the fact that none of these practices submitted any electronic requests for faecal pathogen testing, an action that is likely to be more routine than coding for AGI. The assumption is further reinforced by research that indicates up to a quarter of GPs may not see a patient with AGI in any given week (Hennessey *et al.*, 2004; Lalor and Gregory, 2003).

It is possible that there were variable levels of coding AGI by GPs within each practice, which would result in measurement error. The occurrence and extent of this could not be ascertained.

Due to variable coding practices, the MedTech32 Read codes used to define AGI were "infectious gastroenteritis", as well as "gastroenteritis" and "diarrhoea as a symptom". This may have resulted in some misclassification of AGI, for example coding gastrointestinal symptoms due to inflammatory bowel disease as AGI. Such misclassification would ultimately inflate the observed AGI incidence rate.

It is possible that some AGI encounters were patients outside the registered practice population, the extent of which could not be ascertained. Such additional events would have been partly offset by registered patients with AGI not consulting their regular doctor for various reasons and therefore not being counted in the study. Consequently, the assumption was made that all AGI encounters were patients from the registered practice population.

It should be noted that the AGI incidence study analysed data collected over a consecutive seven week study period from May to July 2006. Based on national notification surveillance data, it is likely that the rate of AGI patients presenting to a GP during this period will be

lower than annual figures[4]. It is therefore to be expected that the annualised incidence rates calculated for this study will be lower than those ascertained for other studies of a longer duration.

Despite the limitations mentioned above, this study provided a good opportunity to assess the extent to which the community presented to a GP for AGI through the quantitative analysis of patient data linked to practice patient populations. Analyses on demographic groups (sex, age group, ethnic group) were also made possible due to the availability of demographic data on individual patients as well as practice populations.

The study utilised a pre-existing sample of practices that was randomly selected and weighted by DHB population. Complete datasets were received from 86.7% (91/105) of practices, the geographical distribution of which was similar to the original sample of practices. This increases the generalisability of the study results.

Unlike the other studies identified in the literature review, the incidence study attempted to account for returning AGI patients presenting with the same episode of AGI. However, the results indicate that the differentiation between AGI patients who present to a GP with the same versus separate episodes of AGI did not have a large impact on results. According to the case definitions used in this study, only 3.7% (41/1,122) of all AGI encounters were due to a returning patient with the same episode of AGI. In addition, there were similar annual incidence rates observed for AGI cases presenting to a GP (18.0 per 1,000 population) compared to AGI encounters presenting to a GP (18.7 per 1,000 population).

7.2.2 Survey

The response rate for the GP survey was only 28.8% (100/364) despite two follow-up telephone reminders. Consideration was given to conducting an additional telephone survey with a random sample of non-responders using the same questionnaire. However, obtaining a random sample of non-responders proved problematic because the completed postal surveys were anonymous. Because the purpose of the GP survey was to provide an indication of GP behaviour and practice with respect to AGI, it was concluded that the results of the GP survey would still be valuable in spite of the low response rate.

7.3 Comparisons to existing literature

This study demonstrated that AGI was implicated in 0.30% of all practice consultations. This figure is over ten times lower than international studies that required GPs to estimate the number of patients seen either in the last 7 days (Food Safety Promotion Board, 2003; Lalor and Gregory, 2003) or in the last 30 days (Health Canada, 2002). This figure is also considerably lower in comparison to the findings of WaiMedCa and NatMedCa, which used more robust methodologies than the overseas studies (McAvoy *et al.*, 1994; Ministry of Health, 2004). While this discrepancy in findings may be due to the under-ascertainment of AGI in this study, as discussed above, it is important to note that practice consultation data for all causes, used as a denominator in this study, included nurse consultations, telephone consultations and prescription requests, as well as GP consultations. For the HealthStat panel of practices, nurse consultations account for 30% of all consultations and telephone consultations account for 5% to 10% of all consultations[5]. New Zealand research has shown that 6.5% of all consultations are for prescriptions alone (McAvoy *et al.*, 1994). While the

[4] Monthly averages were calculated using 5 years of surveillance data on enteric pathogens obtained from ESR.
[5] Information obtained via personal communication with CBG Health Research Ltd.

use of such an inclusive denominator gives a picture of the total burden of AGI within a practice, it makes comparisons with other studies that only include GP consultations problematic.

With the exception of studies conducted in the Netherlands (De Wit *et al.*, 2001; van den Brandhof *et al.*, 2006), the rate of patients presenting with AGI is approximately two to three fold higher in other international incidence studies compared to the rate observed in this study (Kendall and Tanner, 1982; Palmer *et al.*, 1996; Tuckman *et al.*, 1962; Wheeler *et al.*, 1999). Attempts to explain these differences may not be useful, since new research has raised questions regarding the validity of the incidence rates estimated by the AGI General Practice Study.

Results from the AGI Community Study on healthcare service utilisation showed that the unadjusted incidence rate for AGI cases in the community attending a GP was 231.19 per 1,000 population in New Zealand (Adlam *et al.*, 2007). This represents a marked fifteen fold difference when compared to the findings of the AGI General Practice Study. Due to the seasonal variation of AGI, it was anticipated that rates extrapolated from the seven week general practice study would be lower than rates calculated for studies of a longer duration, such as the AGI Community Study, which was conducted over 12 months. However, the seasonal variation of AGI does not adequately account for the observed difference.

Approximately one in four patients presenting to a GP with AGI were requested to submit a faecal specimen. Similar findings have been shown in some international studies (Health Canada, 2002; Wheeler *et al.*, 1999), while other research based in general practice has demonstrated both higher and lower figures for faecal specimen requests (Hennessey *et al.*, 2004; Lalor and Gregory, 2003; van den Brandhof *et al.*, 2006). Such divergent findings are perhaps to be expected given the international context of these studies. The practice of requesting faecal specimens for AGI patients in a country may be influenced by the availability of and adherence to national diagnostic and laboratory guidelines.

With respect to faecal specimen requests, the results of the AGI Community Study again diverge from the AGI General Practice Study. The community study found that of all AGI cases with diarrhoeal illness attending a GP, 40% (20/49) were asked to submit a faecal specimen. However, it is possible that this finding is an overestimate due to small numbers. Comparable community studies conducted in Australia, Canada, Ireland and the United States showed similar results for faecal specimen requests as the AGI General Practice Study (Scallan *et al.*, 2005).

The survey results revealed key patient factors that provide the basis for GPs requesting faecal specimen requests for AGI patients. The findings of other research show pronounced similarities in key clinical factors such as blood in stool (Sarfati *et al.*, 1997; Hennessey *et al.*, 2004; Lalor and Gregory, 2003; Health Canada, 2002) and longer duration of illness (Sarfati *et al.*, 1997; Hennessey *et al.*, 2004; Lalor and Gregory, 2003; Food Safety Promotion Board, 2003; Health Canada, 2002; van den Brandhof et al., 2006). Other key patient factors that are consistent with the existing literature include an association with an outbreak or cluster (Lalor and Gregory, 2003; Health Canada, 2002), overseas travel (Sarfati *et al.*, 1997; Lalor and Gregory, 2003; Food Safety Promotion Board, 2003; Health Canada, 2002), immunocompromised patient (Hennessey *et al.*, 2004; Lalor and Gregory, 2003; Health Canada, 2002) and occupation (Sarfati *et al.*, 1997; Lalor and Gregory, 2003).

7.4 Conclusion

While the AGI General Practice Study was designed as one of three studies to quantify the burden of AGI in New Zealand, this study attempted to independently address a current gap in the New Zealand literature by estimating the population-based incidence of patients presenting to GPs with AGI. Related findings from the AGI Community Study raises questions regarding the validity of the incidence rates estimated in this study, which had various sources of non-quantifiable measurement error. However, estimates of faecal specimen requests from this study correlate well with international literature. As a consequence, this research will still serve to inform the notification pyramid for AGI in New Zealand.

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APPENDIX 1: INCIDENCE STUDY DATASETS

1. GP consultations for AGI
   - Date
   - Unique patient identifier
   - Diagnostic code (Read codes A0, J4, 19F)
   - Age
   - Sex (Female, Male, Missing)
   - Ethnic group (Maori, Pacific, Asian, Other, Missing)
   - Deprivation code (Quintiles 1,2,3,4,5,)
   - Unique practice identifier
   - Suburb of practice
   - DHB of practice

2. Practice consultations with electronic request for faecal pathogen testing
   - Date
   - Unique patient identifier
   - Request for faecal pathogen testing (Yes, No)
   - Age
   - Sex (Female, Male, Missing)
   - Ethnic group (Maori, Pacific, Asian, Other, Missing)
   - Deprivation code (Quintiles 1,2,3,4,5)
   - Unique practice identifier
   - Suburb of practice
   - DHB of practice

3. Practice consultations for all causes
   - Total number per week
   - Unique practice identifier

4. Practice patient registers
   - Total number by age group (<1 yr, 1-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ yrs, age missing)
   - Total number by gender (Female, Male, Missing)
   - Total number by ethnic group (Maori, Pacific, Asian, Other, Missing)
   - Unique practice identifier
   - Suburb of practice
   - DHB of practice

5. Practice MedTech32 downloads
   - Number of days of downloads per week
   - Unique practice identifier

APPENDIX 2: SURVEY QUESTIONNAIRE

The Acute Gastrointestinal Illness GP Study

QUESTIONNAIRE

The contents of this survey are anonymous.

1. What is your gender?

- ☐ Male
- ☐ Female

2. Which ethnic group do you belong to?

- ☐ New Zealand European
- ☐ Māori
- ☐ Samoan
- ☐ Cook Island Maori
- ☐ Tongan
- ☐ Niuean
- ☐ Chinese
- ☐ Indian
- ☐ Other (please specify) _____

3. What is your age?

- ☐ <30 yrs
- ☐ 30-39 yrs
- ☐ 40-49 yrs
- ☐ 50-59 yrs
- ☐ 60+ yrs

4. How many full-time equivalents (FTE) are you directly involved in patient care within general practice? (Full-time is 1.0 FTE, half-time is 0.5 FTE etc)

_____

5. Is your practice a rural general practice (i.e. a practice with a Rural Ranking Score of 35 or greater)?

- ☐ Yes
- ☐ No

For the purposes of the following questions, acute gastrointestinal illness is defined as acute onset diarrhoea and/or vomiting with a suspected infectious cause.

6a. For patients diagnosed with acute gastrointestinal illness, how often would you request a stool sample based on the following factors?

	Always (100%)	Usually (80-99%)	Sometimes (21-79%)	Rarely (1-20%)	Never (0%)
Symptoms/signs					
Duration of illness (<5 days)	☐	☐	☐	☐	☐
Duration of illness (5+ days)	☐	☐	☐	☐	☐
Watery diarrhoea	☐	☐	☐	☐	☐
Blood in stool	☐	☐	☐	☐	☐
Mucous in stool	☐	☐	☐	☐	☐
Severe vomiting	☐	☐	☐	☐	☐
Abdominal pain	☐	☐	☐	☐	☐
Fever (T >38°)	☐	☐	☐	☐	☐
Clinical dehydration	☐	☐	☐	☐	☐
Demographics					
Age of patient <1 year	☐	☐	☐	☐	☐
Age of patient 1-4 years	☐	☐	☐	☐	☐
Age of patient 5-15 years	☐	☐	☐	☐	☐
Age of patient 65+ years	☐	☐	☐	☐	☐
History					
Recent camping trip	☐	☐	☐	☐	☐
Recent travel overseas	☐	☐	☐	☐	☐
Recent immigration	☐	☐	☐	☐	☐
Suspicious food consumption	☐	☐	☐	☐	☐
Suspicious water consumption	☐	☐	☐	☐	☐
Patient associated with suspected outbreak or cluster	☐	☐	☐	☐	☐
Medical history					
Recent antibiotic use	☐	☐	☐	☐	☐
Immunocompromised patient	☐	☐	☐	☐	☐
Social factors					
Food industry worker	☐	☐	☐	☐	☐
Childcare worker	☐	☐	☐	☐	☐
Health care worker	☐	☐	☐	☐	☐
Farm worker	☐	☐	☐	☐	☐
Rest home resident	☐	☐	☐	☐	☐
Childcare attendee	☐	☐	☐	☐	☐

6b. Please list any other factors that would influence your decision to ask for a stool sample e.g. gender, socioeconomic factors, ethnic group, clinical factors etc

7. Do you routinely ask patients with acute gastrointestinal illness any of the following?

	Always (100%)	Usually (80-99%)	Sometimes (21-79%)	Rarely (1-20%)	Never (0%)
Suspect food consumption	☐	☐	☐	☐	☐
Suspect water consumption	☐	☐	☐	☐	☐
Animal contact	☐	☐	☐	☐	☐
Overseas travel	☐	☐	☐	☐	☐
Tramping/camping	☐	☐	☐	☐	☐
Other household members who are ill	☐	☐	☐	☐	☐
Other people who are ill, possibly from same source	☐	☐	☐	☐	☐
Antibiotic use	☐	☐	☐	☐	☐
Occupation	☐	☐	☐	☐	☐
Rest home residence	☐	☐	☐	☐	☐
Childcare attendance	☐	☐	☐	☐	☐

8. According to your understanding, which of the following pathogens are included in the "faeces culture" tick box on the electronic laboratory form?

	Yes	No	Not Sure
Campylobacter	☐	☐	☐
Cryptosporidium	☐	☐	☐
E. coli O157 (VTEC)	☐	☐	☐
Giardia	☐	☐	☐
Listeria	☐	☐	☐
Norovirus	☐	☐	☐
Rotavirus	☐	☐	☐
Salmonella	☐	☐	☐
Shigella	☐	☐	☐
Vibrio (cholera)	☐	☐	☐
Yersinia	☐	☐	☐
Other pathogen (please specify)			

9. Of the stool samples that you request, how often do you specifically ask the laboratory to test for the following?

	Always (100%)	Usually (80-99%)	Sometimes (21-79%)	Rarely (1-20%)	Never (0%)
Bacteria	☐	☐	☐	☐	☐
Viruses	☐	☐	☐	☐	☐
Parasites	☐	☐	☐	☐	☐
Toxins	☐	☐	☐	☐	☐

10. In general, how many stool samples do you request for each patient with acute gastrointestinal illness?

☐ 1
☐ 2
☐ 3

11. What best describes the rate of patient compliance in submitting a stool sample once it has been requested?

- ☐ Excellent (80-100%)
- ☐ Very good (60-79%)
- ☐ Good (40-59%)
- ☐ Poor (20-39%)
- ☐ Very Poor (0-19%)

12. How often would you report acute gastrointestinal illness to the local Medical Officer of Health in the following situations?

	Always (100%)	Usually (80-99%)	Sometimes (21-79%)	Rarely (1-20%)	Never (0%)
Isolated cases					
A notifiable disease (laboratory confirmed) e.g. *Salmonella* infection	☐	☐	☐	☐	☐
Other non-notifiable disease (laboratory confirmed) e.g. Rotavirus infection	☐	☐	☐	☐	☐
Unknown pathogen, isolated case	☐	☐	☐	☐	☐
Suspected food poisoning, isolated case	☐	☐	☐	☐	☐
Possible outbreak					
Identified pathogen, part of possible outbreak	☐	☐	☐	☐	☐
Unknown pathogen, part of possible outbreak	☐	☐	☐	☐	☐
Suspected food poisoning, part of possible outbreak	☐	☐	☐	☐	☐
Social factors					
Food industry worker	☐	☐	☐	☐	☐
Childcare worker/attendee	☐	☐	☐	☐	☐
Health care worker	☐	☐	☐	☐	☐
Rest home resident	☐	☐	☐	☐	☐

13. If you do <u>not</u> always report a notifiable disease to the local Medical Officer of Health, what are your reasons?

- ☐ Not applicable - I always notify
- ☐ Time
- ☐ Amount of paper work involved
- ☐ Belief that laboratory reports notifiable diseases
- ☐ Lack of financial incentive
- ☐ Lack of knowledge which diseases to notify
- ☐ Notification form difficult to use
- ☐ Lack of motivation
- ☐ Lack of practice support
- ☐ Lack of feedback regarding notifications
- ☐ Other (please specify)

Thank you for your participation in this survey.

APPENDIX 3: LITERATURE REVIEW

Methodology

A literature review was conducted to identify epidemiological studies that investigated:

(i) Incidence of patients presenting to GPs with AGI
(ii) Burden of AGI within general practice
(iii) Proportion of AGI patients with faecal specimen requests
(iv) Diagnostic practices of GPs (faecal specimen requests and laboratory faecal test requests) for AGI patients
(v) Notification of AGI cases

Eligible studies included GP based studies that investigated patients presenting to a GP diagnosed with AGI (and related terms). Studies were excluded from the literature review if AGI was not a primary study outcome or if a subset of AGI was assessed only, such as bacterial food poisoning. Otherwise, studies were not restricted by study design, study population or case definition.

The electronic database used to search for eligible studies was MEDLINE (1966-2007). The MeSH terms used in the search included: gastrointestinal diseases; gastroenteritis; colitis; dysentery; enteritis; enterocolitis; gastritis; intestinal disease; food poisoning; diarrhea; vomiting; family practice; and primary healthcare. The keywords also used in the search included: acute gastroenteritis; acute gastrointestinal illness; diarrhoeal illness; diarrheal illness; and general practice. Searches were restricted to English language articles only.

Reference lists of identified articles were also hand-searched for further eligible studies. Other relevant international reports (published and unpublished) were identified via existing networks for enteric and foodborne disease.

The identified studies that fulfilled the eligibility criteria were tabulated with respect to study design, case definition and key findings. Brief comments on each study were also included based on a critical appraisal of identified articles.

Evidence Table

Study	Case definition	Key findings	Comments
van den Brandhof (2006), Netherlands Incidence study that analyses data supplied by sentinel GP network of 45 practices covering a representative sample (1%) of the Dutch population in 2001 and 2002. Follow-up questionnaire sent to GPs to obtain further data on gastroenteritis patients.	Gastroenteritis No case definition reported.	• 2867 gastroenteritis patients consulting a GP (over 2 yrs) • 12% of gastroenteritis patients had laboratory tests ordered (over 2 yrs) • Rate of patients with gastroenteritis consulting a GP 95.0 per 10,000 person yrs *(9.5 per 1,000 population per year)* • 6% (15/258) of gastroenteritis patients did not submit faecal sample when requested • 37% (90/243) gastroenteritis patients had more than one reason reported for requesting laboratory diagnostics • Reasons for requesting laboratory diagnostics: o Duration of complaints 58% o Severity of complaints 22% o Visit to specific country 17% o Reassurance of parents 17% o Specific complaints 10% o Profession 2% • Pathogens included in test request: o Bacteria 90% (of all test requests) o Parasites 51% o Viruses 12%	Large study covering a patient population of approximately 160,000 representative of Dutch population (size of study population not reported, but deduced from the 2001 Dutch Census). Study conducted over 2 years. No case definition reported. Quantitative data supplied by existing sentinel GP network. Follow-up questionnaire based on actual gastroenteritis patients seen by GP, as opposed to usual practice of GP with any gastroenteritis patient. Methodology did not account for cases presenting with same episode of gastroenteritis. Possible issues with recall bias as questionnaire sent 3 weeks after gastroenteritis patients seen.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Food Safety Promotion Board (2005), Ireland Postal survey of 1,204 randomly selected GPs (604 in North and 600 in South) conducted in mid 2002. Focus groups and semi-structured interviews with GPs also conducted.	Acute gastroenteritis Symptoms of acute diarrhoea or vomiting.	• 4.5% of all consultations (surgery, phone and patients' home) in last 7 days were acute gastroenteritis consultations • 3.6% of all surgery consultations in last 7 days were acute gastroenteritis consultations • 9.3% of GPs would "usually" request stool sample from gastroenteritis patients seen in last 7 days • Factors influencing decision to request stool sample: o Prolonged or persistent symptoms o Frequent or severe symptoms o Recurrent symptoms o Recent foreign travel o Suspected food poisoning • 13.5% GPs in South and <1/3 GPs in North would usually notify suspect case of food poisoning. • 7.4% GPs in South and 19.5% of GPs in North would usually notify suspect case of gastroenteritis in child aged <2 years	Large nationwide survey of randomly selected GPs with a response rate of 57.1%. Quantitative component dependent on accurate recall of number of patients seen, number of acute gastroenteritis patients seen and stool samples requested over the previous seven days. Estimates of incidence based on approximations over last seven days only. Methodology did not account for cases presenting with same episode of acute gastroenteritis.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Hennessy (2004), USA Population-based mail survey of 5,000 randomly selected physicians in four FoodNet surveillance areas conducted in 1996.	Acute diarrhea ≥3 loose stools during a 24-h period that lasted <7 days before presentation.	• 73% treated ≥1 patient with acute diarrhea in last 7 days • 44% requested stool culture for last patient seen with acute diarrhea • Reasons for requesting a stool culture for last patient with diarrhea: o Bloody diarrhea 93% (of physicians whose last patient had bloody stools) o Diagnosis of AIDS 65% o Duration of diarrhea >3 days 61% o Presence of fever 39% o History of travel in a developing country 38%	Large postal survey of randomly selected physicians conducted over each quarter of 1996. Sampling frame included all physicians with non-surgical speciality likely to treat patient with acute diarrhea (internal medicine, obstetrics and gynaecology, pediatric medicine, emergency medicine and family practice). Detailed methodology described. Response rate of 56%. Detailed characteristics of physicians surveyed reported. Aggregate data reported, not by quarter. Dependent on accurate recall of last patient seen with acute diarrhea in previous 7 days.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Lalor (2003), Australia Postal survey of 1,000 GPs randomly selected and weighted by rural and metropolitan populations in Victoria conducted in 2002.	Gastroenteritis/infectious gastroenteritis/gastrointestinal illness No case definition provided in questionnaire.	• 4% (2,677/67,435) of all patients seen in last 7 days diagnosed with gastroenteritis • 13% (351/2,677) of gastroenteritis patients seen in last 7 days had faecal specimen request • 17% (88/517) of GPs diagnosed no patients with infectious gastroenteritis in last 7 days • Factors influencing collection of faecal specimens (always/often): o Associated with suspected outbreak/cluster 82% o Bloody diarrhoea 79% o Overseas travel 78% o Immunocompromised patient 78% o Food handler/childcare worker/heath care worker/aged care worker 57% o Symptoms >5 days duration 51%	Large postal survey of randomly selected GPs weighted for rural and metropolitan populations with response rate 55.7%. No case definition provided. Quantitative component dependent on accurate recall of number of patients seen, number of acute gastroenteritis patients seen and faecal specimens requested over the previous seven days. Methodology did not account for cases presenting with same episode of gastroenteritis.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Health Canada (2002), Canada Pilot postal survey of all (329) "actively practising" family physicians and paediatricians in the new City of Hamilton with a resident population of 500,000 conducted in 2001	Acute gastrointestinal illness ≥3 loose stools in 24 hours; or diarrhea with 2 additional gastrointestinal symptoms (vomiting, nausea, fever, abdominal cramps, abdominal pain, blood in stool); or vomiting with two additional gastrointestinal symptoms (diarrhea, nausea, fever, abdominal cramps, abdominal pain, blood in stool) preceded by a period of 2 weeks symptom-free.	• 3.35% (1,298/38,727) of all patients seen in last 30 days had acute GI • 22.34% of patients diagnosed with acute GI in last 30 days were requested to submit stool sample • Signs and symptoms that would prompt a stool sample request (always/often): o Bloody diarrhea 84.9% o Immunocompromised pt 76.9% o Recent travel overseas 75.3% o Occupational situation 68.5% o Outbreak associated 65.9% o Recent camping trip 57.0% o Duration of illness >5 days 44.6% • 29.0% of GPs reported that >80% acute GI patients in last 30 days complied with a stool specimen request • Physician requests for specific stool sample testing (always/often): o Parasites 86.0% o Bacteria 79.6% o Viruses 17.9% • Physician contact with local Public Health Unit (always/often): o Reportable GI illness 89.2% o Non-reportable GI illness 3.4% o Suspect food poisonings 32.2% o Acute GI, unknown organism, isolated case 8.9% o Acute GI, unknown organism, household cluster 17.6% o Acute GI, unknown organism, part of poss foodborne outbreak 57.3% o Acute GI and food handler 53.8%	Pilot survey of all "actively practising" paediatrician and family physicians in one region in Canada conducted over two months with response rate of 29.2%. Survey did not require physicians to refer to their patient records, therefore quantitative data based on approximations only. Complex case definition for a postal survey based on physician approximations. Quantitative component dependent on accurate recall of number of patients seen, number of acute GI patients seen and stool samples requested over the previous 30 days. Methodology did not account for cases presenting with same episode of acute gastrointestinal illness.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
De wit (2001), Netherlands Incidence study of approximately 44 practices from a sentinel GP network that covers 1% of Dutch population, representative regarding age, gender, regional distribution and degree of urbanisation, conducted from 1996 to 1999.	Gastroenteritis >3 loose stools in 24 hours; or diarrhea with two additional gastrointestinal symptoms (vomiting, nausea, fever, abdominal cramps, abdominal pain, blood in stool, mucus in stool); or vomiting with two additional gastrointestinal symptoms (vomiting, nausea, fever, abdominal cramps, abdominal pain, blood in stool, mucus in stool) preceded by a symptom free period of 2 weeks.	• 2,264 cases of gastroenteritis reported (over 3 yrs) • Incidence of gastroenteritis: o Overall 58.0 per 10,000 person yrs *(5.8 per 1,000 population per yr)* o Females 63.4 per 10,000 person yrs *(6.3 per 1,000 population per yr)* o Males 56.8 per 10,000 person yrs *(5.7 per 1,000 population per yr)* o <1 yr 360.4 per 10,000 person yrs *(36.0 per 1,000 population per yr)* o 1-4 yrs 221.5 per 10,000 person yrs *(22.2 per 1,000 population per yr)* o 5-14 yrs 65.1 per 10,000 person yrs *(6.5 per 1,000 population per yr)* o 15-24 yrs 51.7 per 10,000 person yrs *(5.2 per 1,000 population per yr)* o 25-39 yrs 55.9 per 10,000 person yrs *(5.6 per 1,000 population per yr)* o 40-64 yrs 36.5 per 10,000 person yrs *(3.7 per 1,000 population per yr)* o ≥65 yrs 47.7 per 10,000 person yrs *(4.8 per 1,000 population per yr)*	Large study covering a patient population of approximately 160,000 representative of Dutch population (size of study population not reported, but deduced from the 2001 Dutch Census). Quantitative data collected for 3 year time period and supplied by existing sentinel GP network. Methodology did not account for cases presenting with same episode of gastroenteritis. Incidence estimates adjusted for list inflation and partially for non-participation.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Wheeler (1999), England Incidence study of 70 practices with a practice population of approximately 500,000 patients, selected from a research framework and stratified by population, conducted over 1993 to 1996. Enumeration component involved 36 randomly selected practices where GPs followed normal clinical practice in requesting laboratory investigations. Case-control component involved remaining 34 practices where all cases and selected controls were required to complete risk factor questionnaire and submit stool sample.	Infectious intestinal disease (IID) People of all ages with loose stools or significant vomiting (>1 in 24 hours, incapacitating, or accompanied by cramps or fever) lasting <2 weeks, in the absence of a known non-infectious cause and preceded by a symptom free period of 3 weeks.	• 8,770 cases of IID presenting to GPs over one year (for total 70 practices) • Rate of IID patients presenting to GPs 3.3 per 100 person years (corrected for list inflation and under-ascertainment) • Rate of IID patients presenting to GPs (uncorrected) 1.91 per 100 person years • 27% (1,262/4,747) of IID patients had stool samples requested (for 36 practices in enumeration component) • 74% (2,962/4,026) of IID patients submitted a stool sample once requested (for 34 practices in case control component)	Large incidence study of a representative patient population. Detailed methodology. Data collected from each participating practice for one year. Methodology did not appear to account for cases presenting with same episode of infectious intestinal disease.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Sarfati (1997), New Zealand Postal survey of 209 GPs randomly selected throughout New Zealand conducted in 1996.	Acute gastroenteritis Sudden onset of diarrhoea (at least 4 bouts per day), with or without other symptoms, such as nausea, vomiting and stomach cramps.	• Criteria influencing GP decision to send stool specimens to the laboratory (always/often): o Presence of blood in stool 78% o Temperature >38ºC 48% o Patient clinically dehydrated 48% o Presence of mucus in stool 47% o Illness longer than 2 weeks 97% o Illness between 1-2 weeks 95% o Illness between 5-7 days 80% o Age of patient <1 year 42% o Overseas travel last 2 wks 85% o Tramping/camping last 2 wks 75% o Shellfish ingestion in last wk 61% o Eating in restaurant in last wk 45% o Works in food industry 85% o Works in childcare industry 69% o Works in health care industry 60% o Works in farming industry 41% o Family members also ill 64% o Child who goes to day care 41% o Patient lives in a rest home 40% • 78% of GPs reported that <20% patients did not supply a stool specimen when requested. • 42% of GPs would send stool samples for <25% patients with acute gastroenteritis aged >5 yrs	Good survey response rate (72%). Dates of survey not reported. Characteristics of GPs surveyed not reported. Survey based on usual practice of GP with any gastroenteritis patient.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Palmer (1996), Wales Incidence study of four large urban practices with a practice list size of 43,138 over two study periods covering 5 months in 1992 (January to March and mid-August to mid-October). Two practices (Group A) managed cases as usual, remaining two practices (Group B) requested faecal samples from each case. Data on patients with acute gastroenteritis obtained from register and questionnaire.	Acute gastroenteritis/gastrointestinal illness Case definition for inclusion in study: acute onset of diarrhoea and/or vomiting. Case definition for analysis: three of more loose stools or watery stools in a 24 hour period.	• 601 consultations for GI illness (over 5 months) • Average consultation rate for GI illness (for total practice pop) 0.3% per month *(33 per 1,000 population per yr)* • 26% (64/243) of patients provided faeces samples (Group A practices only) • Factors associated with sampling (Group A practices only): o Severity of diarrhoea o Duration of illness	Urban practices that were not randomly selected. Conducted over two different study periods over a total of 5 months. Size of patient populations for Group A practices versus Group B practices not stated. Methodology did not account for cases presenting with same episode of acute gastroenteritis. Quantitative data on GP illness consultations from register, not estimated. Questionnaire based on actual gastroenteritis patients seen by GP. Data presented for each study period. Data on factors associated with sampling not reported fully.
Kendall (1982), England Incidence study involving one GP in urban general practice with an average practice population of 2,796 over the study period 1978 to 1980.	Acute diarrhoea/diarrhoea/diarrhoeal disease/acute enteritis Passage of ≥3 liquid stools over a period of at least 48 hours.	• 405 patients with diarrhoea (over 3 yrs) • Consultation rate for acute enteritis (corrected for holiday periods with no observations): o Overall 5.6 % per annum *(56 per 1,000 population per yr)* o 0-4 years 20.2% per annum *(202 per 1,000 population per yr)* o 5-14 years 4.0% per annum *(40 per 100 person yrs)* o 15-24 years 8.2% per annum *(82 per 1,000 population per yr)* o 25-44 years 5.0% per annum *(50 per 1,000 population per yr)* o 45-64 years 3.6% per annum *(36 per 1,000 population per yr)* o 65+ years 5.0% per annum *(50 per 1,000 population per yr)*	Small study of practice population registered to single GP conducted over 3 years. Details of age distribution of practice population reported, but not gender distribution. Methodology did not account for cases presenting with same episode of acute enteritis. Consultation rates adjusted for holiday periods when no observations made. Average rates reported as well as by year of study.

Evidence Table (continued)

Study	Case definition	Key findings	Comments
Tuckman (1962), England Incidence study of a single group general practice with five GPs and a practice population of approximately 7,000 in Kent conducted in 1957 to 1958	Acute infection of gastrointestinal tract/food poisoning All patients seen either in home or consulting room with suspected diagnosis of acute infection of gastrointestinal tract or food poisoning unless symptoms had been present for >7 days when first seen or antibiotics were being taken at the time of onset of symptoms.	• 738 cases of gastrointestinal illness over 2 year study period • Incidence of gastrointestinal illness: o Overall 5.2% per annum *(52 per 1,000 population per yr)* o 0-4 years 16.7% per annum *(167 per 1,000 population per yr)* o 5-14 years 6.9% per annum *(69 per 1,000 population per yr)* o 15-39 years 3.0% per annum *(30 per 1,000 population per yr)* o 40+ years 2.1% per annum *(21 per 1,000 population per yr)*	Small study conducted in 1950s using a single group general practice. Details of age and gender distribution of practice population reported. Data collected over a 2 year study period. GP consultations performed in patient's home also included. Methodology did not account for cases presenting with same episode of gastrointestinal illness.