The Burden of Acute Gastrointestinal Illness in Grenada

May, 2011

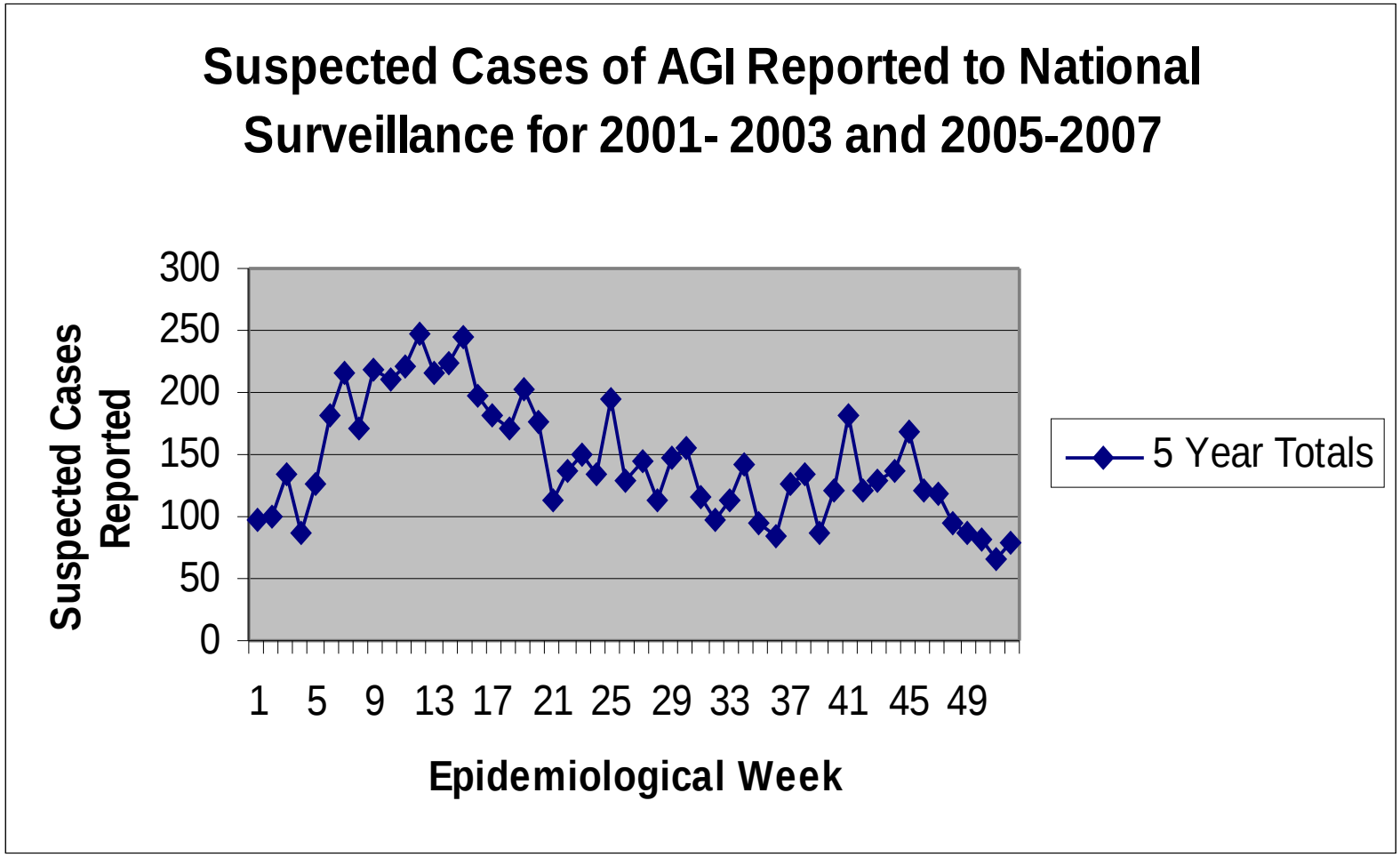
AGI in Grenada

Suspected Cases Reported to EPIDEMIOLOGY UNIT			
Year	**<5**	**>5**	**TOTAL**
2006	1029	885	1914
2007	958	605	1563
2008	666	843	1509
2009	1111	1708	2819
2010	857	1559	2416

AGI in Grenada

	2005	2006	2007
Number of stool samples received by laboratory	361	393	544
Number of stool samples tested	317	350	488
Number of stools positive for FBD pathogen	2	2	4
Confirmed Salmonella	2	2	4
Confirmed Shigella	0	0	0
Confirmed outbreaks	0	0	0

Trend of AGI


Suspected Cases of AGI Reported to National Surveillance for 2001- 2003 and 2005-2007
Suspected Cases Reported
300
250
200
150
100
50
0
1
5
9
13
17
21
25
29
33
37
41
45
49
Epidemiological Week
5 Year Totals

However, the “true” burden of diarrheal disease remains greatly underestimated

Definition of AGI Used in the Study

An acute (sudden) onset of diarrhea, with or without fever (>38C or 100.4F), presenting with 3 or more loose or watery stools in the past 24 hours, with or without dehydration, vomiting and or visible blood.

- WHO definition proposed by the Food borne Disease Burden Epidemiology Reference Group (FERG) (report of meeting held 26-28 Nov. 2008)

Methodology – Pop and Lab survey

- **Retrospective cross-sectional population-based survey** was conducted in two phases
  - October 12-30, 2008 (low AGI season, weeks 38-41)
  - April 5-20, 2009, (high AGI season, weeks 15-16)
  - Minimum sample size calculated was 1,060
  - 650 surveys administered during each phase

  - Recall period – 4 weeks
- **National laboratory survey** : 1 year

  October 2008-September 2009
- Analysis conducted for *Salmonella*, *Shigella* and *Campylobacter, Norovirus*

Methodology - **Sampling Frame**

Seven Parishes. Carriacou & PM designated as a parish)

1300 proportionately distributed among EDs based on No. of households

Randomly selected household numbers

Person with next birthday in selected households

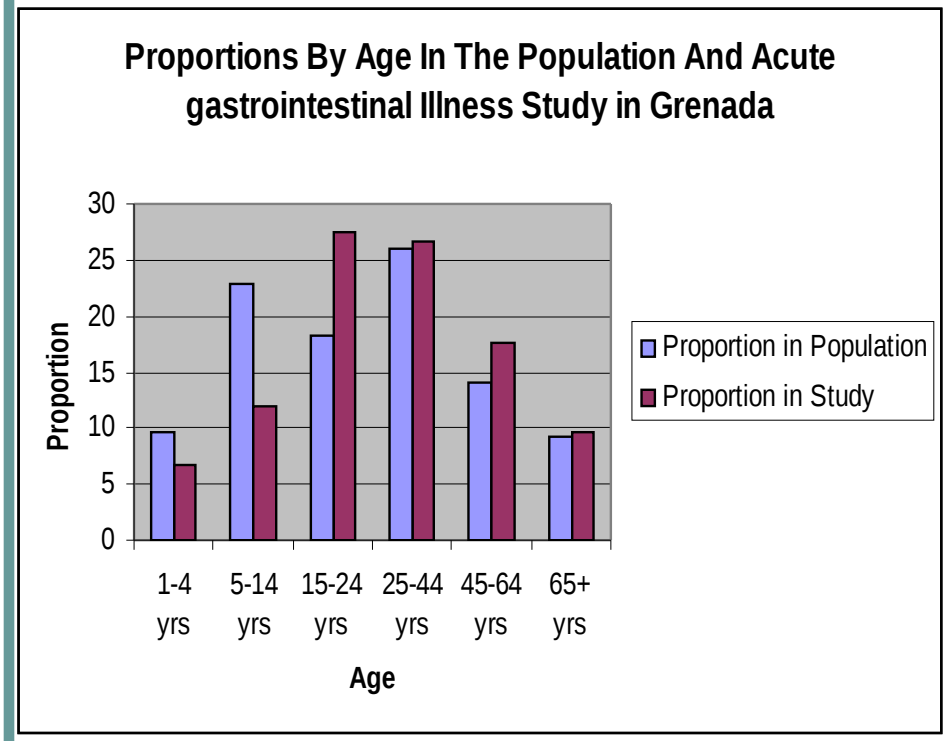
Methodology - **Exclusion criteria**

- Children who were less than 1 year old
- Persons who were unwilling or unable to participate
- Persons not physically present
- Persons who were less than 18 years and did not receive parental consent
- Prisoners and mentally disabled persons
- Residents at guest houses and hotel

Results – Response Rate

- Response Rate
  - 1,300 questionnaires administered
  - 1,232 surveys returned (94.8%)
  - 1,207 surveys used in analysis (92.8%)
  - For calculations, **N = 1,207**

Results: Demographics, **Age**



N=1207

	Population	Study
1-4	9.62%	6.7%
5-14	22.84%	11.9%
15-24	18.16%	27.5%
25-44	26.05%	26.7%
45-64	14.14%	17.6%
65+	9.18%	9.6%

Results: Demographics, **Water Source**

N=1207 95% CI

Harvested rainwater/cistern	**7.8%**
Pipe	**88.6%**
Bottled water	**2.7%**

Results: **Hygiene Practices**

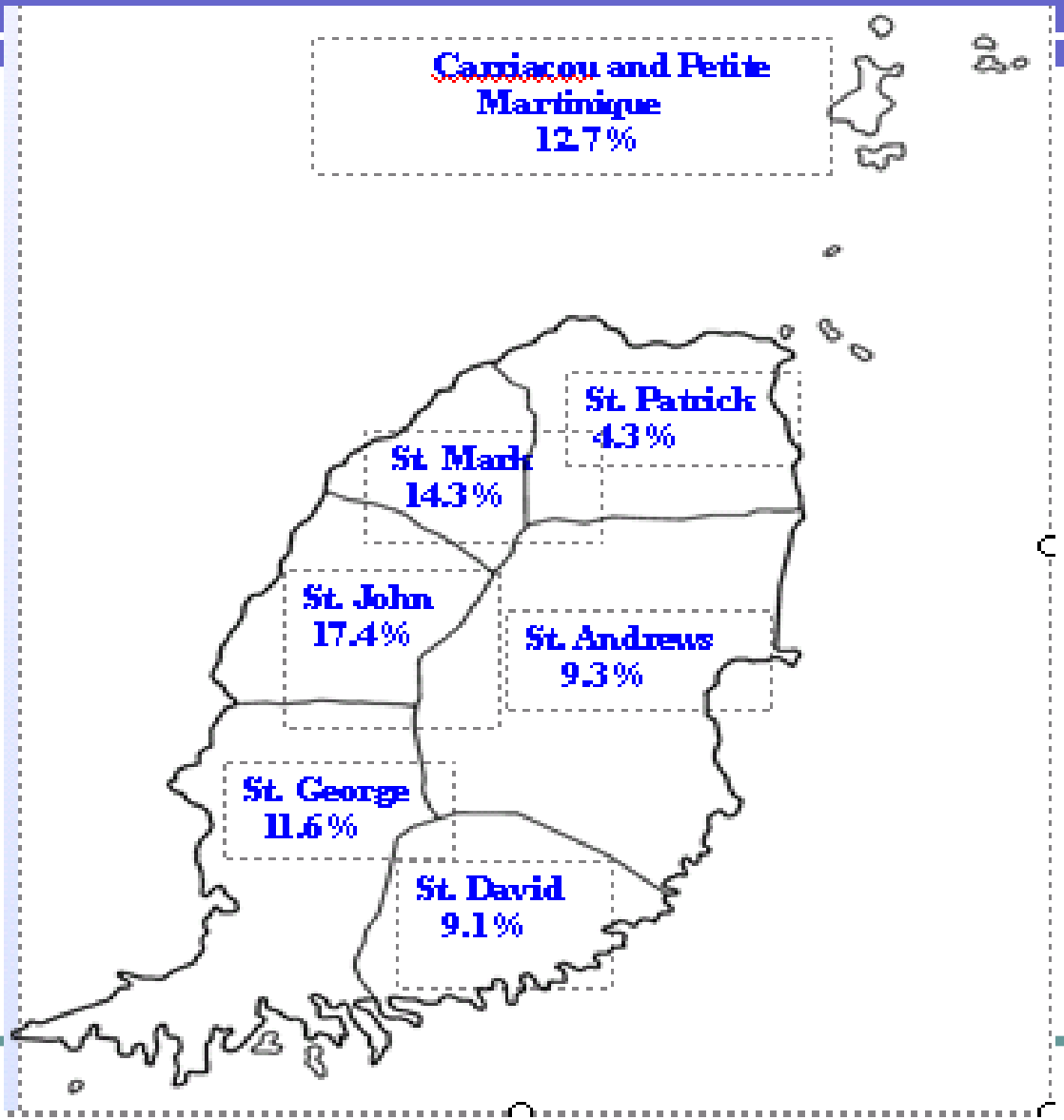
- **Lack of Hand washing practices had a significant association with being an AGI case (P<0.01).**
- **Hand washing with soap after using the toilet also had a significant association with AGI (p<0.01).**

Results: Prevalence of AGI

Overall

- **monthly prevalence of AGI was 10.7% (95% CI: 9.0-12.6)**
- **1.4 episodes per person-year.**

Results: **Distribution of Self-reported Cases**



Results: **Distribution of Self-reported Cases by Gender**

Variable	**Respondents (n=)**	**Monthly Prevalence of AGE**	**95% Confidence Intervals**
Sex (n=1207) (P=0.20)			
Male	532	9.4 %	7.1-12.3
Female	675	11.7%	9.4-14.4

Results: **Distribution of Self-reported Cases by Age group**

Variable	Respondents (n=)	Monthly Prevalence of AGE	95% Confidence Intervals
Age (years) (n=1207); (p<0.001)			
1-4	81	23.5%	14.8-34.2
5-14	144	14.6%	9.3-21.4
15-24	332	10.8%	7.8-14.8
25-44	322	10.9%	7.8-14.9
45-64	212	5.7%	3.0-9.7
65+	116	5.2%	1.9-10.9

Results: **Distribution of Self-reported Cases by Income Levels**

Variable	**Respondents (n=)**	**Monthly Prevalence of AGE**	**95% Confidence Intervals**
Income (EC) (n=900) (p=0.18)			
Low income (0-1000)	345	12.2	9.0-16.2
Medium income (1001-2000	343	13.7	10.3-17.9
High income (>2000)	212	8.5	5.1-13.1

Results – **Medical care & treatment**

	Number	%	95% CI
Number of cases seeking medical care (N=129)	**40**	**31.0**	**23.2-39.7**
Number taking ORF (prescribed) (N=32)	**21**	**65.6**	**46.8-81.4**
Number taking antibiotics (prescribed) (N=40)	**4**	**10**	**-**
Number of cases asked to submit specimen (N=40)	**5**	**12.5**	**4.2-26.8**
Number submitting specimen (N=5)	**5**	**100**	**100.0-100.0**
Number taking non-prescribed medications (N=129)	**58**	**45.0**	**36.2-54.0**

Results: **Laboratory Survey**

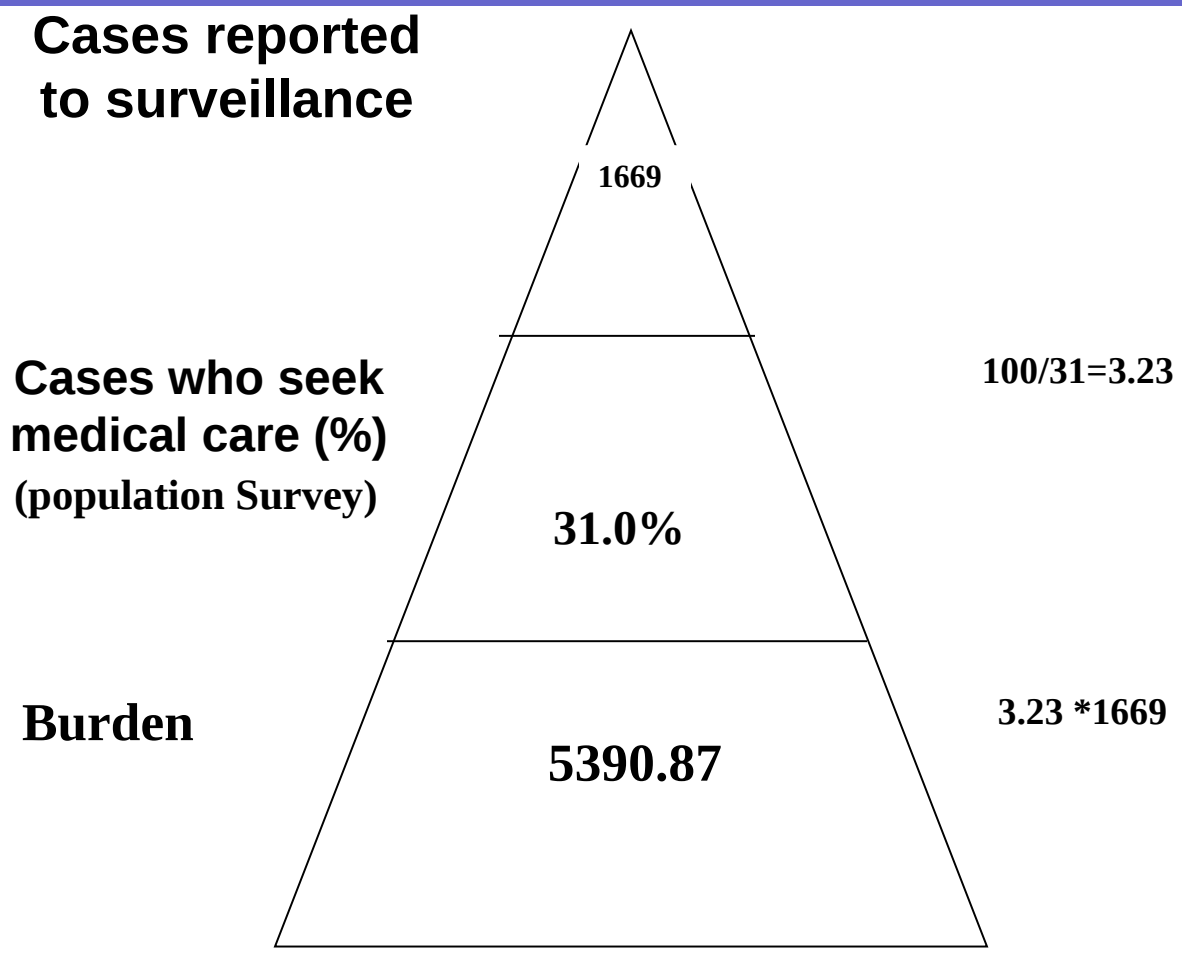
October 2008-September 2009	Total number of diarrheal samples tested	Total number of samples testing positive	Positive Salmonella enteritidis	Positive Salmonella (unidentified specie)	Positive norovirus
Total	**141**	**17 (12.06)**	**13 (9.22%)**	**2 (1.42%)**	**2 (13.33)/ (1.42%)**

Estimating the underreporting and Burden of AGI

3 approaches

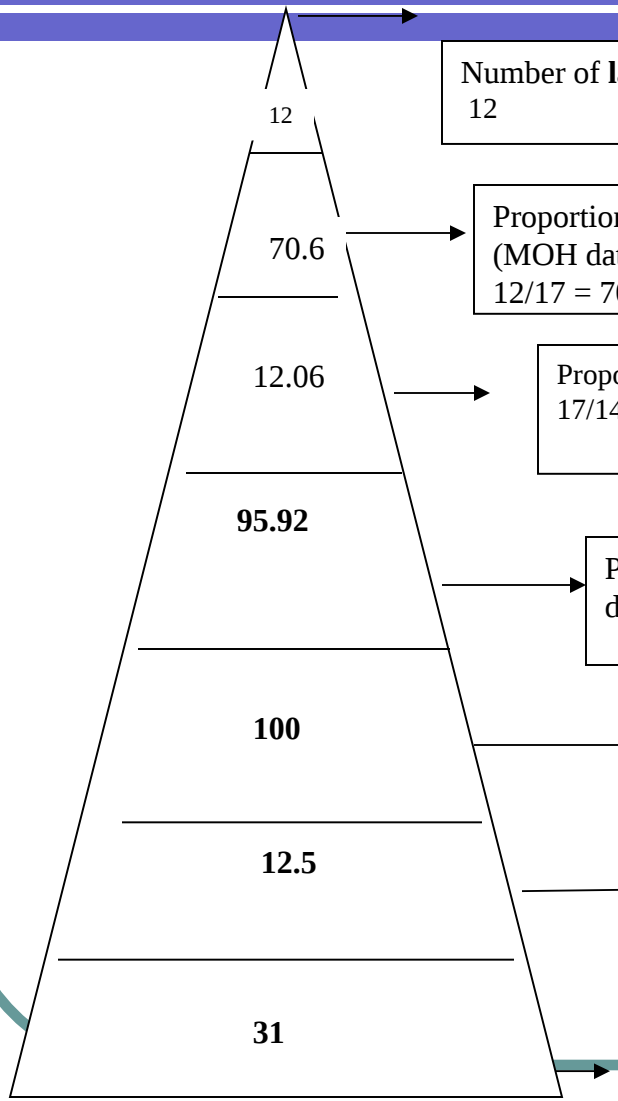
- Using syndromic AGI data (*assuming country only has syndromic surveillance)*
- Using reported lab confirmed AGI (*assuming country only has laboratory surveillance)*
- Using reported syndromic and lab confirmed AGI (*assuming country has total integrated system)*

Underreporting and Burden of Syndromic AGI



Assuming country only have syndromic surveillance the underreporting factor is 3 (5391/1669)

Underreporting and Burden of Laboratory Confirmed AGI



Number of **lab-confirmed** AGI reported to MOH (MOH data)
12

Proportion of **laboratory-confirmed** AGE cases **reported** to MOH (MOH data)
12/17 = 70.59% . **Multiplier = 100/70.59=1.42**

Proportion of **Positive /lab confirmed** AGE samples (Lab data)
17/141=12.06% **Multiplier = 100/12.06=8.29**

Proportion of AGE samples **tested** at laboratory (Lab data) 141/147=95.92% **Multiplier = 100/95.92=1.04**

Proportion of AGE samples **submitted** (Pop survey)
5/5 =100% **Multiplier = 100/100=1**

Proportion of AGE samples **Requested?** (Pop survey) 5/40=12.5% **Multiplier = 100/12.5=8**

Proportion of AGE cases seeking medical care (Pop survey)
40/129=31.00%. **Multiplier = 100/31=3.23**

Underreporting and Burden of Laboratory Confirmed AGI

- Lab confirmed AGE reported for the year period: 12
- Overall underreporting multiplier: 1.42 x 8.29 x 1.04 x 1 x 8 x 3.23 = 316.35
- There is therefore an underreporting factor of 316.35
- **For every lab confirmed case of AGE reported to the Ministry of Health, there are 316 more cases in the population**
- Estimated burden of lab confirmed AGE cases in the population is : 12 x 316.35**=3796.2 cases**

Economic Impact

- **Burden of AGI on the (patient) was estimated to cost the economy in the range US$ 703,950 - $2,440,360**
- **Workers may lose on average between US $11 and $30 for each day that they are unable to attend work. Calculating for the median of 3 days without performing routine activities, employees may loss between $33 and $180 over three days due to diarrheal illness**

Other IMPACT of Study

- Strengthening of laboratory capacity of national laboratory (*previous to study, there were no reported lab confirmed FBD pathogens for over 5 years)*
- Significant Gaps in surveillance identified
- Enhance relations *and collaboration between lab and epi and between MOH and SGU*

Gaps in the National Surveillance System identified in the Study

- **Infrequent Request from doctors for Stool Specimens Collected for testing (only 5 of 129 cases)**
- **Significant time lag between collection and Transport of Specimen to Laboratory (range 6hr -2 days)**
- **Significant Time lag Between Receipt of Samples and Conduct of Tests (6hrs- 4 days)**
- **Untimely and incomplete Reporting of Laboratory Data to Surveillance Unit (*e.g. weeks/mths) / 12 reported vs.. 17 isolated)***
- **Dissemination of Results by Epidemiology Unit and Use of Results for Action**
- **No testing of Food Samples, limited water usually fecal and total coliforms and fecal streptococcus**

Discussion

- Diarrheal illness is common in Grenada with approximately 11% of the population being affected annually.
- Incidence rate at 1.4 episodes per person per year.
- Comparable prevalence with Cuba (Grenada 10.7%, Cuba 10.6%) (19).

Discussion

- The burden of AGI estimated ranged from 411 to 5391,
- these relatively high rates of under reporting highlights the need for urgent attention to address the potential huge burden of AGI in Grenada
- the huge difference in the underreporting factors in syndromic versus lab based (3 vs. 316), indicating the need to improve lab based surveillance and the significant gap in reporting lab confirmed data to the Ministry of Health.

Recommendations

- **Enhance surveillance of AGI including enhanced stool collection and laboratory detection of pathogens, and timely notification and reporting.**
- **Public education programs, particularly in schools to promote proper hygiene practices.**
- **Improve personal hygiene among residents, particularly hand washing with soap before meals and after using the toilet.**
- **Strengthening of monitoring systems for food preparation and consumption**
- **further studies to understand the contributions to AGI from different critical sources and national impact of the disease**

Acknowledgements

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