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Risk Factors for Group B Streptococcal Colonization: Potential for Different Transmission Systems by Capsular Type

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Abstract

Purpose—Group B *Streptococcus* (GBS) is a common inhabitant of the bowel and vaginal flora, with known transmission routes including sexual contact and vertical transmission from mother to infant. Foodborne transmission is also possible, as GBS is a known fish and bovine pathogen. We conducted a prospective cohort study in order to identify risk factors for acquisition.

Methods—We identified risk factors for GBS acquisition among college women (n=129) and men (n=128) followed at 3-week intervals for 3 months.

Results—A doubling in sex acts significantly increased incidence of capsular type V by 80% (95% CI: 1.19, 2.58), and other non-Ia or Ib types combined by 40% (95% CI: 1.00, 2.06; incidence of capsular type Ia (OR=1.2; 95% CI: 0.71, 1.88 p=0.57) and Ib (OR=1.5, 95% CI: 0.75, 2.86, p=0.27) were elevated although not significantly. After adjustment for sexual activity and sexual history, gender, and eating venue, fish consumption increased risk of acquiring capsular types Ia and Ib combined 7.3 fold (95% CI: 2.34, 19.50), but not other capsular types. Beef and milk were not associated with GBS incidence.

Conclusions-Different GBS capsular types may have different transmission routes.

Keywords

Group B Streptococcus; Fish; Sexual Behavior; Epidemiology; Capsular Type; Transmission

GBS is a common inhabitant of the bowel and vaginal flora, with known transmission routes including sexual contact and vertical transmission from mother to infant. Colonization usually does not lead to disease except in vulnerable populations [1], such as the elderly and newborns. Evidence that GBS is a sexually transmitted infection (STI), includes its association with recent sexual activity, younger (adult) age, and more than one sex partner in the past 30 days [2], and the fact that it is found more frequently among patients attending STI than other clinics [3,4, 6]. In addition, colonization rates are much lower among children aged 3 to 10 (4%) [12], and among adults who have never engaged in sexual activity (17% in women, 13% in men) [10] than among sexually active adults (38% in women, 24% in men) [10], However, GBS

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colonization has not been associated with increased lifetime numbers of sex partners or previous history of other STIs, traditional STI risk factors [5,6]. Within-couple transmission has been clearly demonstrated in both pregnant [7,8] and non-pregnant [9] cohorts. By contrast, transmission of GBS following casual contact is low, as shown in studies of college roommates [10,11].

As GBS is a common bowel inhabitant, and a known bovine and fish pathogen, it is possible that GBS is transmitted through food or by the fecal-oral route. GBS was originally isolated as the causative agent of mastitis in cows, and is a pathogen of both wild and captive fish [13,14]. Further, a comparison of the whole cell protein and physiological patterns of GBS serotype Ib isolated from fish and humans were highly similar, suggesting a common ancestor [13]. We previously identified associations of GBS colonization with eating certain foods, but the results were inconsistent [5,10]. However, these studies were cross-sectional, so it is impossible to discern if the foods led to acquiring GBS or maintaining existing GBS carriage.

To investigate risk factors for GBS colonization, we conducted a prospective longitudinal cohort study among male and female college students living in a single dormitory.

Methods

Study Protocol

As described previously [10,11], 738 students who lived in a first year dormitory at the University of Michigan between January and February 2001 were invited to participate via an advertisement in their dormitory mailbox. We randomly sampled dormitory floors, and invited all inhabitants on the selected floors to participate (n=738). Overall, 63% (216 males and 246 females) consented and completed the enrollment protocol Following informed consent, participants completed a self-administered questionnaire and provided a throat and mouth (cheek) culture, self-collected initial-void urine, anal orifice and vaginal specimens. For anal orifice specimens, the swab did not pass the anal sphincter. Non-responders were sent up to three e-mail reminders and contacted by telephone. All participants positive for GBS and a random sample of those negative at enrollment were invited to return for four additional visits at 3, 6, 9 and 12 weeks post-enrollment. At each follow-up visit additional specimens were collected and participants completed a self-administered questionnaire. The study protocol was approved by the Institutional Review Board at the University of Michigan.

Of the 149 men and 150 women invited to participate in the follow-up study, 257 of the 299 (86%) completed the first follow-up; 82%, 80% and 79% completed the second, third and fourth follow-ups, respectively. Follow-up rates were virtually the same by gender. Participants were compensated for participation, with a bonus for completing all four follow-ups.

GBS Isolation

Specimens were self-collected as described previously [10] using the Culture Swab Plus Collection System [Baltimore Biological Labs (BBL); Sparks, MD] with Amies transport media. Following collection, rectal and vaginal specimens were inoculated in selective broth media containing gentamicin and nalidixic acid, incubated overnight at 37°C with CO₂, subcultured onto trypticase soy agar (TSA) with 5% sheep blood, and incubated overnight. Urine specimens were subcultured directly to TSA. Suspect isolates were confirmed serologically as described in previous studies [5,9].

Pulsed-field gel electrophoresis (PFGE)

We used PFGE to determine whether participants colonized in multiple sites carried identical GBS strains, and to distinguish between continuous carriage and new infection with a different strain. PFGE methods were described previously [5,9].

Capsular typing

We classified isolates into capsular types Ia, Ib, and II to VIII using DNA dot blot hybridization, as previously described [15]. For a subset of isolates, however, DNA hybridization was performed using an alternative anti-fluorescein-AP antibody, according to the manufacturer's protocol (Roche Diagnostics, Penzberg, Germany), as the reagents used previously had been discontinued. Nontypeable isolates were probed for the presence of the GBS 16S RNA gene to verify that chromosomal DNA was present on the membrane when it was initially probed with the capsular-specific gene probes. DNA extraction for two isolates was found to be inadequate for capsular typing after repeated attempts and they were excluded from the analysis. When more than one isolate from a single individual had the same PFGE pattern, we assumed the isolates had the same serotype [16]. Thus, for each person, we capsular-typed only one randomly selected isolate from each PFGE band pattern observed. Serotype distributions of this collection have been presented previously [17].

Data Analysis

We estimated the 3-week incidence of GBS, by capsular type, for each putative risk factor and tested for statistical significance using the chi square test for dichotomous predictors and the Mantel-Haenszel chi square test for trend for ordinal predictors. We estimated the incidence using GBS at any colonization site. If an infected individual became colonized with a second capsular type, they were counted as an incident case for the second capsular type. The number of incident cases for capsular type Ib was small (n=5); as the associations of risk factors with capsular type Ib were very similar to those observed for capsular type Ia (n=14), we present the capsular-specific risk factors with capsular types Ia and Ib combined. There were 21 incident cases of capsular type V, and 19 incident cases of all other capsular types (not 1a, 1b, or V) combined.

We stratified by all variables where we observed a strong association with GBS incidence (risk ratio \geq 2.0), and checked for confounding and effect modification. To simultaneously assess the effects of multiple variables, we fit a series of logistic regression models predicting the 3-week incidence of each GBS capsular type, and all capsular types combined. Initially we included all variables significant in the univariate analyses, and then added other variables one at a time. Non-significant variables were deleted, except for those retained for interpretation purposes. Since an individual can be colonized with more than one capsular type, all individuals without a particular capsular type were considered at risk. Further, if an individual cleared a capsular type, they were considered at risk to acquire it again. We had 4 individuals who cleared infection and became re-infected. To adjust for the effects of repeated measures, we repeated the final regression models included in the manuscript using generalized estimating equations (GEE). As these gave essentially the same results as those not adjusted using GEE, only the unadjusted models are presented.

As a follow-up to the previous models, we further investigated food choices, which are not necessarily independent. To determine the food(s) most associated with GBS incidence overall and by capsular type, we fit a series of logistic regression models including all foods measured, as well as variables significant in the previous analysis. We selected the variables most predictive of GBS incidence using the method of "all possible regressions" [18], which considers all possible subset models, and displays the best models at each step, first considering a single covariate, then considering two covariates, etc. From these listings of comparator

models, the most predictive variables can be identified for further testing in more targeted models.

Because the frequencies of the various sexual activities (vaginal intercourse, anal intercourse, and passive and active oral sex) were highly correlated, and we observed an increase in GBS incidence with increasing frequency of each individual type of sexual activity, we created a summary variable of sexual activity: the maximum frequency among all types of sex acts reported in the interval. As the distribution of the maximum frequency of sex acts was highly skewed, we transformed this variable using log base 2, so the odds ratio is interpreted as the ratio of the odds of GBS incidence for a doubling in the number of sex acts. For example, an odds ratio of 1.5 corresponds to a 50% increase in the odds of GBS incidence with 4 versus 2 sex acts. All analyses were conducted using SAS 9.1. [19]

Results

Most of the 257 participants were white (86% of women 85% of men), and aged 19 years; all were residents of a single freshman dormitory. Most had engaged in sexual activity (84% of women and 70% of men), defined as vaginal, oral or anal intercourse, with a median age of first sex of 16 years for women and 17 years for men. In the baseline survey [10], 34% of the women and 20% of the men were colonized with GBS at one or more sites. As previously reported, the overall 3-week incidence of GBS was 11.3% (95% CI: 7.4 to 15.2%) among women and 8.8% (95% CI: 5.8 to 11.8%) among men; the most common capsular types were Ia and V [11]. The 3-week incidence of type Ia was 2.3% women and 2.4% for men, Ib was 1.6% for women and 0.9% for men and type V was 4.7% for women and 3.5% for men [11]. Since an individual can be colonized with more than one capsular type, all individuals without a particular capsular type were considered at risk. Further, if an individual cleared a capsular type, they were considered at risk to acquire it again.

Risk of Acquiring GBS by Sexual Activity

Engaging in any sexual activity, defined as vaginal, oral or anal intercourse during the previous three weeks was significantly associated with an increased incidence of GBS overall, and of all capsular types with the exception of types Ia and Ib, although the trend was in the same direction (Table 1). A significantly increased incidence of GBS with increasing frequency of vaginal intercourse, frequency of active and passive oral intercourse, the maximum frequency of the all types of sex acts measured, number of sex partners in the last 3 weeks, and number of sex partners in the past 12 months was observed overall and for capsular types excluding 1a, 1b or V. (The numbers engaging in anal intercourse were too small to provide stable estimates.) Using a condom was not associated with incidence, nor was sex with a new partner.

For an infection that is transmitted via sexual contact, we can indirectly measure risk of contact with an infected individual by inquiring about initiating a new sexual relationship. Because there is a transmission probability associated with each sex act, more sex acts with an infected partner increases risk. As the duration of GBS carriage is short, colonization among partnerships of longer duration may have already cleared from both partners, thus we anticipated observing a higher risk of GBS acquisition with a new than an existing partner, Further exploration of the apparent lack of association between acquiring a new partner and GBS risk revealed that frequency of sexual activity with a new sex partner in the previous interval was low. Indeed, no individuals reporting new sex partners in the previous interval reported a frequency of vaginal intercourse greater than 1 to 2 times per week (data not shown). However, for existing partners, the 3-week GBS incidence increased with increasing frequency of the maximum of sex acts measured (Figure 1). For new partnerships, the opposite trend was observed, although the confidence intervals are very wide. The highest incidence among those with a new partner occurred among those who reported no sex. Unfortunately, we did not

measure other forms of intimate contact, such as kissing, that may lead to transmission, and there was no association with frequency of hands on partners genitals (p=0.40; data not shown).

Risk of Acquiring GBS by Eating Selected Foods, Places Ate and Hand Washing

There was no increase in the 3-week GBS incidence by capsular type or overall with eating pork, beef, chicken or eggs or drinking milk (Table 2). However, we observed a trend of greater incidence of capsular types Ia and Ib with eating fish more frequently, and for all capsular types combined. There was also a trend of eating yogurt and incidence of capsular types Ia and Ib but no other capsular type; cheese and ice cream showed no trends with any capsular type. There was little association with eating fresh or canned fruit, but eating raw vegetables was associated with an increased incidence of capsular type Ia and Ib with eating cooked vegetables. In the vast majority (99%) of the risk periods, students reported eating at least once a week in their dormitory in the previous interval; however, those that did not had almost four times the incidence of GBS. Those who ate at a 'sit down' restaurant one or more times a week were also more likely to acquire GBS.

The strong association with sexual activity and previous studies [4-7,9,10] suggests that sexual transmission occurs. Therefore, we stratified the associations for each food item by sexual activity in the past 3 weeks to identify possibly modification or confounding by sexual activity. After stratification, the association with eating fish, but no other food item, remained (Figure 2). Among those engaging in sexual activity in the previous 3 weeks, we observed an increased risk of GBS for each capsular type grouping with fish consumption. However, among those who reported no sexual activity in the previous interval, fish consumption increased the incidence only for capsular types Ia and Ib combined (incidence among fish eaters 10.3% out of 58 risk periods versus 1.6% out of 319 risk periods among non-eaters; among those engaging in sexual activity the corresponding incidences were 16.7% out of 18 risk periods versus 2.5% out of 198 risk periods).

Multivariable Analysis

We further explored these associations by fitting a series of multivariable logistic regressions, modeling the incidence of each capsular type grouping as the outcome, as well as the incidence of all capsular types combined (Table 3). Fish consumption twice or more times a week was associated with a 7.3 fold increase (95% CI: 2.78, 18.90) in the odds of acquiring capsular types Ia and Ib combined, after adjusting for frequency of sex acts (the log base 2 of the maximum of frequency of vaginal sex and oral sex), number of sex partners in the previous year, frequency of eating in the dormitory, and gender. When we ran models for capsular types Ia and Ib separately, including only frequency of sex acts, gender, and fish consumption in the model, the odds ratios for fish eating remained significant for capsular type Ia (OR=7.8; 95% CI: 2.6, 23.1) and marginally so for capsular type Ib (OR=5.5; 95% CI: 0.9, 34.2), reflecting the small number of incidence capsular type Ib acquisitions. The frequency of sexual acts was not statistically significantly associated with acquiring either capsular type Ia (OR=1.2; 95% CI: 0.71, 1.88 p=0.57) or Ib (OR=1.5, 95% CI: 0.75, 2.86, p=0.27).

By contrast, there was no statistically significant association between fish consumption and acquiring capsular type V or other capsular types. The frequency of sex acts in the previous 3 weeks was, however, strongly associated with increased risk of acquiring capsular type V and all non-Ia, Ib or V capsular types, but not types Ia or Ib. Number of sex partners in the previous year was also a significant predictor of acquiring capsular types other than V, Ia or Ib.

After adjustment for sexual activity and fish consumption, there was no longer a significant association of yogurt (OR=1.1; 95% CI: 0.8, 1.5) and raw vegetables (OR=1.1; 95% CI: 0.4,

2.8) with overall or capsular-specific GBS incidence (data not shown). Adjustment for sexual activity did not change the associations between other food variables and GBS incidence either overall or by capsular type. Repeating the models adjusting for repeated measures using generalized estimating equations also did not change the observed associations.

Discussion

In a prospective cohort study of 257 healthy male and female college students living in a single college dormitory followed at 3 week intervals for 12 weeks, we observed sexual activity, particularly frequency of vaginal or oral intercourse, to be the strongest predictor of GBS incidence for capsular types V and all types other than Ia, Ib, and V. However, even among those not sexually active the rate of GBS was surprisingly high, leading us to consider other sources of exposure. The finding of a 7.3 fold increase (95% CI 2.78, 18.90) in GBS capsular types Ia and Ib incidence with fish consumption two or more times a week in the previous 3 weeks, after adjustment for frequency of sex acts during the previous 3 weeks, gender, number of sex partners in the previous year and frequency of eating in the dormitory, led us to consider the potential of fish as a foodborne source of GBS. We found no associations with other food items, including beef, milk and milk products, which in theory also might be a source of GBS, perhaps because milk from cows with clinical mastitis is not sold. We also found no significant association with handwashing practices, although there was a trend toward decreasing incidence with increased frequency of handwashing for capsular type V and all capsular types combined.

We are aware of no other reports of GBS risk factors by capsular type or of an association between GBS acquisition and fish consumption. Although the results require confirmation, transmission of GBS via fish is biologically plausible, as GBS serotype Ib is a known fish pathogen [13], and when strains colonizing fish were compared to human strains they had identical whole protein and physiologic patterns [20]. GBS of unknown serotypes also colonize fish [13], which may explain why we observed an association between fish consumption and capsular type Ia. Should this result be confirmed, the findings have public health implications for the diet of individuals at high risk of GBS disease, e.g., pregnant women and adults with underlying chronic conditions.

GBS serotype Ib has been isolated from a wide variety of fish, both farm raised and wild, including tilapia, mullet and bluefish [13]. However, we found no reports describing colonization rates among apparently healthy fish; although farm raised fish are vaccinated against GBS disease this may not affect colonization. We estimate that if the association were causal in our sample, 86% of all persons colonized with capsular type Ia or Ib who ate fish could attribute their colonization to eating fish. Given that serotypes Ia and Ib cause ~20% of all neonatal disease and adult disease [21-23], if serotype Ia is also found in fish, fish consumption may account for as much as 17% (86% of 20%) of the cases of GBS disease among neonates and adults. It remains to be determined the extent that food preparation influences risk of acquisition, as we had no information regarding how the fish was prepared. It seems likely that eating fish raw would pose a greater risk than cooked. We did note an increase in GBS acquisition among students who reported eating in "sit down" restaurants, although we did not inquire about the food or the restaurant type. Whether GBS is found among commercially sold fish and survives normal cooking temperatures is unknown.

Despite the supporting evidence and biological plausibility, this is first report of an association between eating fish and acquiring GBS, and thus should be viewed with caution until replicated in other studies. Given that we tested the association with 13 food items, in addition to many other variables, there is always the possibility that this finding is an alpha error.

Acquisition of capsular types other than Ia and Ib was strongly associated with frequency of sexual intercourse during the previous 3 weeks. This finding is consistent with a Pittsburgh study, which followed 1089 women and found sexual activity in the 5 days prior to culture and frequent sexual intercourse in the previous 4 months predicted vaginal acquisition of GBS, although the authors did not report associations by capsular type [6]. Acquisition of types Ia and Ib appear to be essentially independent of sexual activity, or any effect was too small to detect given our sample size. Although GBS has been strongly associated with sexual activity, it is unclear what type(s) of sexual activity confer the highest risk. Unfortunately, the frequencies of sexual behaviors measured in our study were highly correlated, so we can provide no further insight. The lack of a protective effect with condom use was surprising. However, as GBS is a common bowel inhabitant and can be transmitted by the fecal oral route, it may be that oral sex is more important for transmission than vaginal intercourse. Because we studied sites in addition to the vagina, any locally protective effect of condoms may have been dwarfed by transmission through other routes. Alternatively, normal condom use may be insufficient to protect against GBS transmission.

Although we observed strong effects, our association was with GBS colonization, not disease, and was conducted among healthy young college students. Pregnant women or adults with underlying chronic conditions may be more or less susceptible to colonization following exposure either from eating fish or via sexual intercourse, which would modify the observed risk of colonization. Further studies confirming that GBS found in fish can colonize humans and cause human disease are required.

Acknowledgements

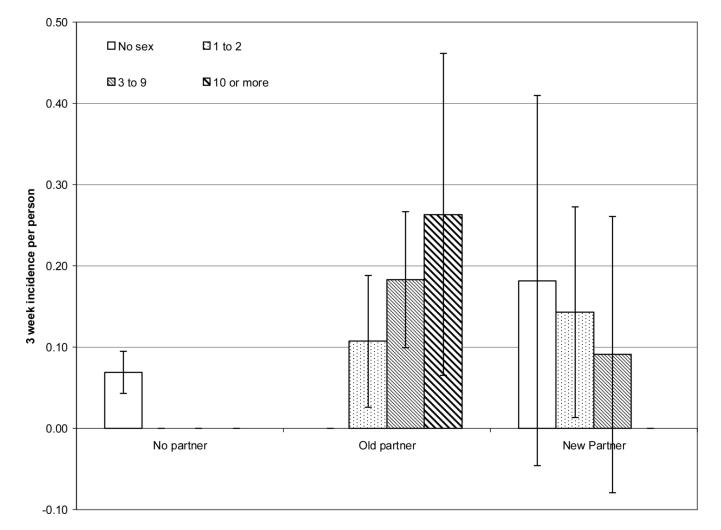
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References

- 1. Schuchat A. Group B streptococcal disease: from trials and tribulations to triumph and trepidation. Clinical Infectious Diseases 2001;33:751–756. [PubMed: 11512078]Epub 2001 Aug 10
- 2. Hill, HR. Group B streptococcal infections.. In: Holmes, KK., et al., editors. Sexually transmitted diseases. Second Edition. McGraw-Hill; New York: 1990. p. 851-861.
- Baker CJ, Goroff DK, Alpert S, Crockett VA, Zinner SH, Evrard JR, et al. Vaginal colonization with Group B *Streptococcus*: a study in college women. Journal of Infectious Diseases 1977;134:392–397. [PubMed: 321702]
- 4. Newton ER, Butler MC, Shain RN. Sexual behavior and vaginal colonization by group B *Streptococcus* among minority women. Obstetrics and Gynecology 1996;88:377–82.
- Bliss SJ, Manning SD, Tallman P, Baker CJ, Pearlman MD, Marrs CF, et al. Group B Streptococcus colonization in male and non-pregnant female university students: A cross sectional prevalence study. Clinical Infectious Diseases 2002;34:184–190. [PubMed: 11740706]
- Meyn LA, Moore DM, Hillier SL, Krohn MA. Association of sexual activity with colonization and vaginal acquisition of Group B *Streptococcus* in nonpregnant women. American Journal of Epidemiology 2002;155:949–57. [PubMed: 11994235]
- Yamamoto T, Nagasawa I, Nojima M, Yoshida K, Kuwabara Y. Sexual transmission and reinfection of group B streptococci between spouses. Journal of Obstetrics and Gynaecological Research 1999;25:215–9.
- Weindling AM, Hawkins JM, Coombes MA, Stringer J. Colonisation of babies and their families by group B streptococci. British Medical Journal of Clinical Research Ed 1981;283:1503–5.
- 9. Manning SD, Tallman P, Baker CJ, Gillespie B, Marrs CF, Foxman B. Determinants of co-colonization with Group B. Streptococcus among heterosexual college couples. Epidemiology 2002;13:533–539. [PubMed: 12192222]

- Manning SD, Neighbors K, Tallman P, Gillespie B, Marrs CF, Borchardt SM, et al. Prevalence of group B *Streptococcus* colonization and potential for transmission by casual contact in healthy, young men and women. Clinical Infectious Diseases 2004;39:380. [PubMed: 15307006]
- Foxman B, Gillespie B, Manning SD, Howard L, Tallman P, Zhang L, et al. Incidence and Duration of Group B Streptococcus by Capsular Type Among First Year Male and Female College Students Living in a Single Dormitory. American Journal of Epidemiology 2006;163:544–551. [PubMed: 16421237]
- Hammerschlag MR, Baker CJ, Alpert S, Kasper DL, Rosner I, Thurston P, et al. Colonization with group B streptococci in girls under 16 years of age. Pediatrics 1977;60:473–476. [PubMed: 333366]
- 13. Evans JJ, Klesius PH, Gilbert PM, Shoemaker CA, Al Sarawi MA, Landsberg J, et al. Characterization of β-haemolytic Group B *Streptococcus* agalactiae in culture seabream, *Sparus auratus* L., and wild mullet, *Liza klunzingeri* (Day), in Kuwait. Journal of Fish Diseases 2002;25:505–513.
- Berridge BR, Bercovier H, Frelier PF. Streptococcus agalactiae and Streptococcus difficile 16S-23S intergenic rDNA: genetic homogeneity and species-specific PCR. Veterinary Microbiology 2001;78:165–73. [PubMed: 11163706]
- Borchardt SM, Foxman B, Chaffin DO, Rubens CE, Tallman PA, Manning SD, et al. A Comparison of GBS Capsular Typing Methods: DNA Dot Blot Hybridization vs. Lancefield's Capillary Precipitin Method. Journal of Clinical Microbiology 2004;42:146–150. [PubMed: 14715745]
- Tenover FC, Arbeit RD, Goering RV, Mickelsen PA, Murray BE, Persing DH, et al. Interpreting chromosomal DNA patterns produced by pulsed-field gel electrophoresis: Criteria for bacterial typing. Journal of Clinical Microbiology 1995;33:2233–2239. [PubMed: 7494007]
- Borchardt SM, Zhang L, McCoy SI, Tallman PA, DeBusscher JH, Marrs CF, et al. Frequency of Antimicrobial Resistance among Invasive and Colonizing Group B Streptococcal Isolates. BMC Infectious Diseases 2006;6:57. [PubMed: 16549015]
- Myers, RH. Classical and Modern Regression with Applications. 2nd edition. Duxbury Press; Belmont, CA: 1990.
- 19. SAS V9.1. Copyright (c) 2002-2003. SAS Institute Inc.; Cary, NC, USA:
- Elliott JA, Facklam RR, Richter CB. Whole-cell protein patterns of nonhemolytic group B, type Ib, streptococci isolated from humans, mice, cattle, frogs, and fish. Journal of Clinical Microbiology 1990;28:628–630. [PubMed: 2182678]
- Persson E, Berg S, Trolfors B, Larsson P, Ek E, Backhaus E, et al. Serotypes and clinical manifestations of invasive group B streptococcal infections in western Sweden 1998–2001. Clinical Microbiology and Infection 2004;10:791–6. [PubMed: 15355409]
- 22. Davies HD, Raj S, Adair C, Robinson J, McGeer A. Alberta GBS Study Group. Population-based active surveillance for neonatal group B streptococcal infections in Alberta, Canada: implications for vaccine formulation. Pediatric Infectious Disease Journal 2001;20:879–84. [PubMed: 11734768]
- Berg S, Trolfors B, Lagergard T, Zackrisson G, Claesson BA. Serotypes and clinical manifestations of group B streptococcal infections in western Sweden. Clinical Microbiology and Infection 2000;6:9–13. [PubMed: 11168030]

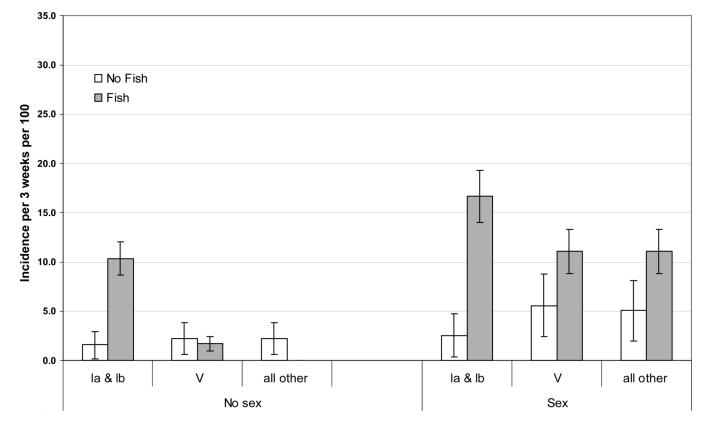
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1.

Three-week incidence rate of Group B *Streptococcus* of any capsular type, by maximum frequency of vaginal or oral intercourse in the previous 3 weeks, for those with no current partner, an existing partner or a new sex partner in the previous 3 weeks. Ticked lines indicate 95% confidence intervals. 129 female and 128 male freshmen college students living in a single dormitory.

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2.

Three-week incidence rate of Group B *Streptococcus* by capsular type, fish consumption and sexual activity in the previous 3 weeks. Ticked lines indicate 95% confidence intervals. 129 female and 128 male freshmen college students living in a single dormitory.

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Incidence of Group B Streptococcus by capsular type /3 weeks/100 persons, by selected sexual behaviors in the previous 3 weeks (participants followed in 3 week intervals). 129 female and 128 male freshmen college students living in a single dormitory

Characteristic	Person intervals	% Capsular type la	% Capsular type V	% Non la, lb or V	% All capsular type
		01 110		capsulat types	complica
Gender					
Male	340	2.9	3.2	2.7	8.8
Female	256	3.5	3.9	3.9	11.3
Sex in last 3 weeks					
No	377	2.9	2.1	1.9	6.9
Yes $v^2 = \dots v^{1/2}$	210	3.7	0.0	0.0	5.CI
A p-value Regimency of yoginal interconnea mayions 3 weaks		0.00	TOTO	TOTO	TANA
ricquency of vaginal intercourse previous 2 weeks None	447	67	7.2	18	74
1 to 2	51	7.8	2.0	5.9	15.7
3 to 9	76	1.3	7.9	7.9	17.1
10 or more	17	5.9	5.9	11.8	23.5
Test for trend [*]		0.75	0.10	0.001	0.002
Frequency of active oral sex in past 3 weeks					
None	439	3.6	2.3	2.5	8.4
1 to 2 3 to 0	93	1.1	8.6 5.5	4.3 7 7	14.0
5 tu 5 10 or more	сс 4	25.0	C.C 0	0.0 050	50.0
Test for trend	-	0.39	0.23	0.00	0.005
Frequency of passive oral sex in past 3 weeks					
None	435	3.5	2.1	2.3	7.8
1 to 2	88	1.1	11.4	4.6	17.1
3 to 9	61	3.3	3.3	6.6	13.1
10 or more	9	16.7	0	16.7	33.3
Test for trend		0.27	0.48	0.007	0.008
Maximum frequency of all sex acts in past 3 weeks		•		ļ	ī
None	595 84	2.8	C.2 2.5	3.6	1.7
3 to 9	93	2.2	7.5	7.5	17.2
10 or more	20	10.0	5.0	10.0	25.0
Test for trend*		0.17	0.12	0.003	0.0004
Number of sex partners in last 3 weeks					
None	378	2.9	2.4	1.9	7.1
-	191 11	3.7 0 1	6.3 0	5.2 0 1	15.2
2 3 or more	10				8.3 8.3
Trend test	1	0.71	0.27	0.01	0.02
Number of sex partners in past 12 months					
None	191	2.1	1.6	1.6	5.2
(219	3.2	4.6	3.2	11.0
2 or more	001	4.4 6.0	9.0 3.0	7.4 7.0	16.0
Test for trend	1001	0.12	0.32	0.03	0.005
Used a condom past 3 weeks					
No	499	3.4	2.8	2.8	9.0
Yes v2	94	2.1	7.5	5.3	14.9
X ⁻ p-value Sex with new nartner in previous 3 weeks?		70.0	0.03	0.20	0.08
No sex	380	3.9	6.1	1.8	6.8
Sex old partner	164	5.8	6.1	2.1	15.9

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Characteristic	Person intervals	Person intervals % Capsular type la or lb	% Capsular type V	% Non Ia, Ib or V capsular types	% All capsular types combined
Sex new partner	52	3.9	3.7	2.9	13.5
X ² p-value		0.60	0.03	0.05	0.005

Foxman et al.

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Incidence/3 weeks/100 persons of Group B Streptococcus by capsular type, by eating selected foods 1 or more times per week, places ate and hand washing practices in the previous 3 weeks participants followed in 3 week intervals. 129 female and 128 male freshmen college students living in a single dormitory Table 2

Nit Nit <th>Week Inservects 32 37 34 mens/veck mens/veck mens/veck 133 237 34 mens/veck mens/veck 133 237 34 week mens/veck 131 56 337 35 week mens/veck 131 56 53 53 week mens/veck 131 254 233 53 week mens/veck 237 131 234 233 week mens/veck 237 131 234 233 week mens/veck 233 20 235 235 week mens/veck 233 20 235 236 week mens/veck 233 20 235 236 week 136 132 23 236 week 133 23 23 23 week 133 23 23 23 week 133 23 23 24 week 133 23 23 24</th> <th>Food</th> <th>Person intervals</th> <th>% Capsular type la or lb</th> <th>% Capsular type V</th> <th>% Non Ia, Ib or V capsular types</th> <th>% All capsular typ combined</th>	Week Inservects 32 37 34 mens/veck mens/veck mens/veck 133 237 34 mens/veck mens/veck 133 237 34 week mens/veck 131 56 337 35 week mens/veck 131 56 53 53 week mens/veck 131 254 233 53 week mens/veck 237 131 234 233 week mens/veck 237 131 234 233 week mens/veck 233 20 235 235 week mens/veck 233 20 235 236 week mens/veck 233 20 235 236 week 136 132 23 236 week 133 23 23 23 week 133 23 23 23 week 133 23 23 24 week 133 23 23 24	Food	Person intervals	% Capsular type la or lb	% Capsular type V	% Non Ia, Ib or V capsular types	% All capsular typ combined
Mathematical mathmathmathmatical mathematical mathematical mathematical m	New 323 373 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
New 23 37 31 23 New 11 35 37 31 33 31 23 New 11 35 37 31 33 31 33 New 11 35 34 35 33 33 New 23 24 33 33 33 33 New 24 23	Week 32 37 31 mess/week 14 3 0 43 0 mess/week 14 3 0 43 0 43 week 11 3 0 43 0 44 44 4	Pork					
Novel 14 27 34 44 000 000 000 000 000 000 000 000 000 000 000 000 000 0000 0000 000 000 000 000 000 0000 000 010 000 010 000 000 0000 010 010 010 010 010 010 0000 010 010 010 010 010 010 0000 010 010 010 010 010 010 0000 010 010 010 010 010 010 0000 000 010 010 010 010 010 0000 000 010 010 010 010 010 0000 000 0000 000 010 <	Workki neredia 148 2.7 34 Orenedia 119 5.0 34 Norderk 119 5.0 35 Norderk 119 5.0 35 Norderk 119 5.0 35 Norderk 118 2.3 35 Norderk 118 2.3 0.37 Norderk 118 2.3 0.37 Norderk 118 2.3 0.37 Norderk 118 2.3 0.37 Norderk 2.3 2.4 2.3 Norderk 2.3 2.4 2.3 Norderk 2.3 2.3 2.3 Norderk 2.3 2.3 2.3 Norderk 2.3 2.3 2.3 Norderk 1.3 2.3 2.3 Norderk 1.3 2.3 2.3 Norderk 1.3 2.3 2.4 Norderk 1.3 2.3 2.4 <	None	322	3.7	3.1	2.8	9.6
mesole 10 30 <th< td=""><td>mes/vek 10 30 93 rrend* 119 50 53 vek 119 50 53 mes/vek 119 50 53 mes/vek 119 50 53 mes/vek 118 53 53 mes/vek 235 24 4 53 mes/vek 23 23 23 23 mes/vek 136 13 0.3 0.3 mes/vek 138 13 0.3 0.3 mes/vek 130 0.3 0.3 0.3 mes/vek 130 0.3 0.3 0.3 mes/vek 130 0.3 0.3 0.3</td><td>1 time/week</td><td>148</td><td>2.7</td><td>3.4</td><td>4.1</td><td>10.1</td></th<>	mes/vek 10 30 93 rrend* 119 50 53 vek 119 50 53 mes/vek 119 50 53 mes/vek 119 50 53 mes/vek 118 53 53 mes/vek 235 24 4 53 mes/vek 23 23 23 23 mes/vek 136 13 0.3 0.3 mes/vek 138 13 0.3 0.3 mes/vek 130 0.3 0.3 0.3 mes/vek 130 0.3 0.3 0.3 mes/vek 130 0.3 0.3 0.3	1 time/week	148	2.7	3.4	4.1	10.1
000_{-4} 00	mote 1 0.0 0.0 wirend 111 3.6 3.5 wirend 111 3.6 3.5 wirend 113 3.4 0.47 wirend 113 3.4 0.73 0.75 wirend 113 2.4 0.37 0.75 wirend 113 2.4 0.37 0.75 wirend 113 2.4 0.73 0.75 wirend 2.7 2.1 2.1 2.1 wirend 2.7 2.3 2.3 2.3 wirend 1.7 2.3 2.3 2.3 wirend 1.8 1.1 2.3 2.3 wirend 1.1 2.3 2.3 2.4 wirend 1.1 2.3 <t< td=""><td>2–3 times/week</td><td>101</td><td>3.0</td><td>5.9</td><td>4.0</td><td>12.9</td></t<>	2–3 times/week	101	3.0	5.9	4.0	12.9
α retard 0.43 0.47 0.73 0.47 0.73 0.74 0.73 0.74 0	artend* 0.43 0.47 veek 111 5.6 2.5 neokveek 111 5.6 5.5 5.5 neokveek 111 5.6 5.5 5.5 5.5 neokveek 111 5.6 5.5 5.5 5.5 5.5 veek 111 5.7 0.75 0.75 0.75 0.75 neokveek 2.7 2.17 0.71 0.75 0.75 0.75 neokveek 2.7 2.7 0.71 0.75 0.75 0.75 neokveek 2.7 2.7 2.7 0.75 0.75 0.75 neokveek 2.7 2.7 0.75 0.75 0.75 neokveek 170 2.7 2.7 0.74 0.74 neokveek 170 0.73 2.7 0.74 0.74 neokveek 170 0.73 2.7 0.74 0.74 neokveek 170 0.73 2.7 </td <td>4 or more</td> <td>16</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td>	4 or more	16	0.0	0.0	0.0	0.0
New 119 50 23 50 5	New 119 50 25 norweek 118 2.4 5.6 5.5 norweek 118 2.4 5.6 5.5 2.5 norweek 118 2.4 5.6 5.5 2.5 2.5 Neek 2.7 2.4 5.1 2.5 2.5 2.5 Neek 2.7 2.4 2.1 2.5 2.5 2.5 norweek 2.7 2.1 2.7 2.5 2.5 2.5 norweek 2.7 2.7 2.6 2.5 2.6 2.5 norweek 170 5.3 2.6 2.5 2.6 2.6 Neek 170 5.3 2.6 2.6 2.7 2.6 2.6 2.7 2.6	Test for trend [*]		0.43	0.47	0.75	0.87
Work work Work monode 119 50 23 33 34 35 <td>week 119 5.0 25 nrend* 118 2.4 3.6 3.8 nrend* 118 2.4 0.37 0.35 3.8 nrend* 46 6.5 2.2 3.8 3.8 3.8 week 47 0.37 0.35 2.2 3.8</td> <td>Beef</td> <td></td> <td></td> <td></td> <td></td> <td></td>	week 119 5.0 25 nrend* 118 2.4 3.6 3.8 nrend* 118 2.4 0.37 0.35 3.8 nrend* 46 6.5 2.2 3.8 3.8 3.8 week 47 0.37 0.35 2.2 3.8	Beef					
Anceck 141 3.6 3.5 2.1 menode 118 2.3 2.3 3.8 2.3 menode 118 2.3 2.3 3.8 3.8 menode 2.3 2.4 6.5 2.3 3.8 3.8 menode 2.3 2.4 6.5 2.3 3.8 3.8 menode 2.3 2.4 5.3 2.3 3.8 3.8 menode 2.3 2.4 5.3 0.3 <t< td=""><td>Neek 141 3.6 3.0 artend* 118 2.4 3.6 3.5 artend* 4.6 6.5 2.3 3.8 artend* 4.6 6.5 2.3 2.3 artend* 2.47 0.07 2.3 2.3 Artek 2.47 0.07 2.3 2.3 Arted* 2.47 0.73 0.35 2.3 Arted* 2.37 2.3 2.3 2.3 Arted* 2.37 2.3 0.3 2.3 Arted* 2.3 2.3 0.3 2.3 Arted* 1.10 3.3 0.3 3.3 Artend* 1.38 1.3 0.3 3.3 Artend* 1.38 1.3 3.3 3.3 Artend* 1.38 3.3 3.3 3.3 Artend* 1.38 1.3 3.3 3.3 Artend* 1.3 3.3 3.3 3.3</td><td>None</td><td>119</td><td>5.0</td><td>2.5</td><td>5.0</td><td>12.6</td></t<>	Neek 141 3.6 3.0 artend* 118 2.4 3.6 3.5 artend* 4.6 6.5 2.3 3.8 artend* 4.6 6.5 2.3 2.3 artend* 2.47 0.07 2.3 2.3 Artek 2.47 0.07 2.3 2.3 Arted* 2.47 0.73 0.35 2.3 Arted* 2.37 2.3 2.3 2.3 Arted* 2.37 2.3 0.3 2.3 Arted* 2.3 2.3 0.3 2.3 Arted* 1.10 3.3 0.3 3.3 Artend* 1.38 1.3 0.3 3.3 Artend* 1.38 1.3 3.3 3.3 Artend* 1.38 3.3 3.3 3.3 Artend* 1.38 1.3 3.3 3.3 Artend* 1.3 3.3 3.3 3.3	None	119	5.0	2.5	5.0	12.6
Methods 13 2.4 3.8<	mes/wekk 213 2.4 3.8 mes/wekk 4 6 5 2.3 2.3 week 4 6 5 2.3 2.3 week 4 6 5 2.3 2.3 mes/week 27 2.4 3.8 2.3 mes/week 27 2.3 2.3 2.3 mes/week 272 2.4 3.6 0.7 mes/week 272 2.1 2.3 2.3 2.3 mes/week 272 2.1 2.3 2.3 2.3 2.3 mes/week 7 7 3.6 0.07 2.4 3.3 mes/week 170 5.3 0.07 2.4 2.3 mes/week 110 3.3 0.7 2.4 2.4 mes/week 110 3.3 0.6 0.6 0.6 mes/week 110 3.5 2.4 2.4 2.4 mes/week	1 time/week	141	3.6	5.0	2.1	10.6
Offer 118 2.5 2.5 3.4 artrendi 1 2.5 2.5 2.3 2.3 wivek 4 6 5 2.1 2.3 2.3 wivek 237 2.4 2.3 2.4 2.3 2.3 wivek 237 2.1 2.3 2.3 2.3 2.3 2.3 wivek 237 2.1 2.3	meter 118 2.5 2.5 2.5 Arreck 4.6 6.5 2.7 0.78 meterk 2.5 2.4 2.1 2.1 meterk 2.7 0.73 0.35 2.1 meterk 2.7 2.1 2.1 2.1 meterk 2.7 2.3 0.35 2.3 meterk 2.7 2.1 2.1 2.1 meterk 2.7 2.1 2.1 2.1 meterk 2.7 2.1 2.3 0.35 meterk 2.7 2.3 2.6 2.3 meterk 170 5.3 0.35 3.3 meterk 76 1.3 0.35 3.3 meterk 1.1 1.2 2.3 3.3 meterk 3.1 1.1 0.35 3.3 meterk 3.1 1.1 2.3 3.4 meterk 3.1 1.1 3.5 3.4 <t< td=""><td>2–3 times/week</td><td>213</td><td>2.4</td><td>3.8</td><td>2.8</td><td>8.9</td></t<>	2–3 times/week	213	2.4	3.8	2.8	8.9
Trend [*] 0.37 0.38 0.08 Neek ************************************	rtend ⁷ 0.37 0.37 0.37 0.38 week mes/week mes/week noted $\frac{1}{3}$ 44 6.5 5.3 2.3 mes/week mes/week mes/week mes/week mes/week mes/week mes/week mes/week mes/week mes/week mes/week 239 2.0 3.3 Aread mes/week mes/week mes/week mes/week mes/week mes/week mes/week mes/week 239 2.0 2.0 Aread mes/week mes/week mes/week mes/week mes/week mes/week 1.3 0.0001 0.07 0.07 Aread mes/week mes/week 1.3 2.3 2.4 2.4 2.4 Aread mes/week 1.7 0.83 0.54 2.5 2.4 Aread mes/week 1.1 1.2 2.3 2.4 Aread mes/week 0.14 0.55 2.4 2.7 Aread mes/week 1.1 2.3 2.4 2.7 2.6 Aread mes/week 0.14 0.35 0.55 2.4 2.7 2.6 Aread mes/week 1.1 2.3 2.4 2.7 2.7 2.4 Aread mes/week 1.1 2.5	4 or more	118	2.5	2.5	3.4	8.5
Aveck Network merkowski	Week trend 46 65 23 24 23 23	Test for trend [*]		0.37	0.78	0.68	0.33
New 46 65 23 24 55 23	Week tores 46 6.5 5.2 0.01 0.73 0.73 0.73 0.33 0.01 0.73 0.73 0.33 0.33 0.01 0.73 0.73 0.33 0.33 0.01 0.73 0.73 0.33 0.33 0.01 0.72 0.73 0.33 0.34 0.01 0.01 0.01 0.07 0.33 0.01 0.01 0.01 0.07 0.34 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.02 0.01 0.01 0.01 0.01 0.02 0.01 0.01 0.01 0.01 0.02 0.02 0.01 0.01 0.01 0.02 0.01 0.02 0.01 <td>Chicken</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Chicken					
Areack Area Area Area	Areek Areek <th< td=""><td>None</td><td>46</td><td>6.5</td><td>2.2</td><td>2.2</td><td>10.9</td></th<>	None	46	6.5	2.2	2.2	10.9
Newek 235 24 31 35 35 rtend* rtend* 0.3 </td <td>mesweek 235 24 51 mesweek 0.3 0.3 0.3 veek 19 20 week 72 97 21 week 72 97 20 20 mesweek 72 97 23 23 mesweek 72 97 20 250 artend* 72 900 0.07 250 artend* 170 53 0.07 250 artend* 170 53 0.07 250 week 170 53 0.54 0.07 mesweek 170 53 0.53 0.54 week 170 53 0.53 0.54 week 170 53 0.53 0.54 mesweek 132 20 33 0.54 mesweek 133 20 0.53 33 mesweek 133 20 33 20 mesweek 133 20 33 27 mesweek 133 23 23 27 mesweek 133 23 23 26 mesweek 133 23 26</td> <td>1 time/week</td> <td>47</td> <td>0.0</td> <td>4.3</td> <td>0.0</td> <td>4.3</td>	mesweek 235 24 51 mesweek 0.3 0.3 0.3 veek 19 20 week 72 97 21 week 72 97 20 20 mesweek 72 97 23 23 mesweek 72 97 20 250 artend* 72 900 0.07 250 artend* 170 53 0.07 250 artend* 170 53 0.07 250 week 170 53 0.54 0.07 mesweek 170 53 0.53 0.54 week 170 53 0.53 0.54 week 170 53 0.53 0.54 mesweek 132 20 33 0.54 mesweek 133 20 0.53 33 mesweek 133 20 33 20 mesweek 133 20 33 27 mesweek 133 23 23 27 mesweek 133 23 23 26 mesweek 133 23 26	1 time/week	47	0.0	4.3	0.0	4.3
orte 24 4.1 2.0 1.1 rtrend 7 9.1 0.3 0.3 0.3 riveck 7 9.7 0.3 0.3 0.3 0.3 riveck 7 9.7 2.0 0.3 0.3 0.3 0.3 riveck 7 9.0 20 2.0 0.3	11 21 21 21 21 22 11 werk 21 21 21 22 23 <t< td=""><td>2–3 times/week</td><td>255</td><td>2.4</td><td>5.1</td><td>5.5</td><td>12.9</td></t<>	2–3 times/week	255	2.4	5.1	5.5	12.9
rtend 0.13 0.53 0.71 0.72 0.73 <	vred 0.13 0.13 0.35 $vred$ 112 2.0 2.0 $vred$ 299 2.0 2.0 $vred$ 299 2.0 2.3 $vred$ 20001 0.07 2.3 $vred$ 215 3.2 2.6 $vred$ 156 1.3 2.6 $vred$ 170 5.3 0.07 $vred$ 170 5.3 0.07 $vred$ 170 5.3 0.3 $vred$ 130 0.8 0.65 $vred$ 3.3 0.3 0.3 $vred$ 3.1 12.2 2.4 $vred$ 3.1 2.2 2.4 $vred$ 3.1 2.2 2.4 $vred$ 3.3 0.3 0.3 $vred$ 3.1 2.2 2.4 $vred$ 3.1 2.2 2.4 $vred$ 3.1 2.4 0.5 $vred$ 3.1 0.14 0.5 $vred$ 3.5 5.	4 or more *	.247	4.1	2:0	1.6	1.1
New Inserved, messived,	Week Interview 299 2.0 <th2.0< th=""></th2.0<>	Test for trend		0./3	0.50	SC.U	0.40
Week Total Total <th< td=""><td>Week interveck interveck Trend interveck 212 bits 110 bits 235 bits 236 bits <t< td=""><td>FISH None</td><td>000</td><td>0 6</td><td>00</td><td>3 3</td><td>N</td></t<></td></th<>	Week interveck interveck Trend interveck 212 bits 110 bits 235 bits 236 bits 236 bits <t< td=""><td>FISH None</td><td>000</td><td>0 6</td><td>00</td><td>3 3</td><td>N</td></t<>	FISH None	000	0 6	00	3 3	N
miss/weak 72 97 23 22 23	miss/weak one times a trend a trend a trend a trend weak 7.2 box 9.7 box 2.8 box 2.8 box <th< td=""><td>1 time/week</td><td>C1C</td><td>1 9</td><td>5.1 V</td><td></td><td>10.9</td></th<>	1 time/week	C1C	1 9	5.1 V		10.9
ore times 4 500 25,0 00	ore times 4 500 250 250 $rrend$ $rrend$ 16 0001 007 007 $rveck$ 18 16 03 0.07 0.07 0.07 $rveck$ 18 16 0.83 0.54 0.07 0.07 $nesweek$ 170 122 0.83 0.54 0.54 $nesweek$ 110 0.83 0.54 0.54 0.54 $nesweek$ 110 0.33 0.54 0.55 0.54 $nesweek$ $nesweek$ 0.14 0.55 0.55 0.55 $nesweek$ $nesweek$ 0.14 0.55 0.55 0.55 0.55 0.55 $0.$	2 –3 times/week	72	9.7	2.8	2.8	15.3
$Trend^*$ 0.001 0.07 0.73 0.71 0.73 0.71 0.73 0.71 0.74 0.73 0.71	$r tend^*$ 0.001 0.07 $v teck$ 156 3.2 2.6 $w veck$ 170 5.3 0.6 $m s v veck$ 170 5.3 0.6 $m s v veck$ 7 0.83 0.34 $r trend^*$ 7 0.83 0.54 $r veck$ 170 5.3 0.6 $m s v veck$ 7 0.83 0.54 $w veck$ 132 2.0 3.9 $w veck$ 132 2.0 3.9 $m s v veck$ 132 2.3 3.0 $m s v veck$ 0.14 0.55 2.7 $w veck$ 136 1.5 4.4 $w veck$ 3.5 5.5 5.5 $m s v veck$ 0.14 0.55 0.14 $w veck$ 136 1.5 4.4 $m s v veck$ 0.14 0.55 0.55 $m s veck$ 0.65 0.65 0.91 $m s veck$ 113 3.5 5.5 $m s veck$ 0.65 0	4 or more times	4	50.0	25.0	0.0	75.0
Neek 15 32 2.6 19 mes/week 170 5.3 0.6 3.7 mes/week 170 5.3 0.6 3.7 mes/week 0.83 0.34 0.73 nreek 112 2.2 2.4 7.3 Neek 113 2.0 3.9 2.4 7.3 Neek 113 2.0 3.9 0.73 0.73 Neek 132 2.0 3.9 0.73 0.73 mes/week 132 2.0 3.9 0.77 0.73 mes/week 132 2.3 3.9 0.9 3.9 nreud* 2.1 2.8 3.1 4.1 2.3 Neek 7.3 0.14 0.55 0.9 0.9 mes/week 7.3 0.14 0.55 0.9 0.9 nes/week 7.3 0.14 0.55 0.9 0.9 nes/week 113 3.5	Wverk mes/week 3.2 2.6 3.0 5.3 0.6	Test for trend [*]		0.0001	0.07	0.77	0.001
veck 32 2.6 31 19 nes/week 138 13 0.6 3.1 nrend* 76 13 0.5 0.73 3.1 nrend* 170 5.3 0.6 3.1 0.73 nrend* 0.83 0.54 0.73 3.1 4.1 nrend* 110 12.2 2.4 7.3 3.6 nreweek 110 0.23 3.0 0.9 3.1 4.1 nreweek 110 0.3 2.7 3.0 0.9 3.6 nreweek 110 0.3 2.3 0.3 0.0 0.9 nreweek 73 5.5 0.14 0.55 0.9 0.0 nreweek 136 1.5 1.4 0.55 0.9 0.0 nreweek 113 3.3 0.14 0.55 0.9 0.0 nreweek 113 3.5 0.15 0.1 0.2 0.0 <td< td=""><td>(veck mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 33 mes/veck 33 mes/veck</td><td>Eggs</td><td></td><td></td><td></td><td></td><td></td></td<>	(veck mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 32 mes/veck 33 mes/veck	Eggs					
Week Tweek 10 0.9 3.7 ore $*$ 76 1.3 3.9 0.54 0.73 ore $*$ 0.83 0.54 0.73 2.6 3.7 ore $*$ $*$ 170 1.2 2.6 3.7 2.6 3.7 week $*$ $*$ 1.2 2.3 3.9 2.6 3.7 week 1.3 2.3 3.9 2.7 3.9 2.7 3.9 $mes/week 1.10 0.3 2.7 3.9 2.7 3.6 mes/week 1.10 0.3 2.7 3.8 3.1 4.1 mes/week 1.13 2.8 3.1 0.55 0.99 0.0 mes/week 1.13 2.8 3.1 0.55 0.99 0.0 mes/week 1.13 5.5 5.5 0.91 0.22 0.99 mes/meek$	Week 108 1.6 0.0 mes/week 0.83 0.64 0.63 0.54 nrend* 76 1.3 0.54 0.54 α veck 51 1.2 2.4 0.54 α week 51 2.0 3.9 0.54 α week 51 2.0 3.9 0.54 α week 132 2.0 3.0 3.0 α week 132 2.0 3.0 3.0 α week 0.14 0.55 4.2 4.4 α week 7.3 5.5 5.5 5.5 5.5 α mes/week 113 3.5 5.5 5.5 5.5 α mes/week 113 3.5 5.5 5.5 5.5 α mes/week 113 3.5 5.5 5.5 5.5 α mes/week 0.65 0.61 0.91 0.91 α mes/week 0.65 0.66 9.3 3.5 <	None	156	3.2	2.6	1.9	L.L.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		1 time/week	188	1.0	0.9	5.7	12.2
$eq:linear_line$	$\label{eq:rtend} \begin{tabular}{c} \label{eq:rtend} \end{tabular} \en$	4 or more	20	1.3	3.9	2.6	7.9
Week411222.47.3Nwek512.03.93.0Sweek1122.33.03.0mes/week1122.33.03.0mes/week1100.92.73.6 $mes/week3.53.14.13.6mes/week3.12.83.14.1mes/week3.212.83.14.1mes/week3.22.83.14.1mes/week13.61.54.42.9mes/week1133.55.55.3mes/week1133.55.53.1mes/week1133.55.53.1mes/week1133.55.53.1mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week1133.53.53.3mes/week3.53.53.5mes/week3.53.53.5mes/week3.53.53.5mes/mes3.53.53.5mes/mes3.53.53.5mes/me$	h week4112.22.4 h week512.03.9 h week512.03.9 h week1322.33.0 h week3.13.14.2 h week3.212.83.1 h week3.212.83.1 h week3.212.83.1 h week3.212.83.1 h week0.050.050.91 h week0.050.053.5 h week0.020.053.5 h week0.020.053.5 h week0.020.053.5 h week0.020.053.5 h week0.020.053.5 h week0.020.020.07	Test for trend		0.83	0.54	0.73	0.95
Wreek4112.22.47.3Neekans/week3.93.93.9mes/week1322.03.93.6mes/week1100.90.93.6mes/week2613.52.33.0 $nes/week2110.350.993.6nes/week2113.52.83.1nes/week2613.52.83.1nes/week3.12.83.14.1nes/week1361.52.83.1nes/week3.50.140.550.99nes/week0.61.53.14.1nes/week0.61.53.14.1nes/week0.61.53.33.1nes/week0.61.53.33.1nes/week0.63.50.91nes/week0.63.53.3nes/week0.63.53.3nes/week0.63.53.3nes/week0.63.53.5nes/week0.63.53.5nes/week0.220.91nes/week0.220.92nes/week0.770.96$	41 12.2 2.4 51 2.0 3.9 $mes/week$ 132 2.3 3.9 $mes/week$ 132 2.3 3.0 $mes/week$ 110 0.9 2.7 $nes/week$ 261 3.5 4.2 $nes/week$ 136 1.5 4.2 $nes/week$ 73 5.8 3.1 $nes/week$ 73 5.8 3.1 $nes/week$ 11.5 2.8 3.1 $nes/week$ 0.05 0.05 0.91 $nes/week$ 0.05 0.05 0.91 $nes/week11.33.53.5nes/week0.050.050.91nes/week10.93.53.5nes/week10.93.50.91nes/week0.050.64.3nes/week0.050.62.5nes/week0.220.770.77$	Milk					
Neek512.0 3.9 3.9 3.9 mes/week 132 2.3 3.0 0.0 mes/week 110 0.9 2.7 3.6 mes/week 110 0.9 2.7 3.6 $nes/week0.140.550.93.6nes/week3.12.83.14.1nes/week7.35.55.50.99nes/week7.80.160.650.02nes/week0.650.050.910.22nes/week0.650.621.53.1nes/week0.650.620.910.22nes/week0.650.620.910.22nes/week0.650.620.770.96nes/week0.220.770.96$	Neek512.0 3.9 mes/week1322.3 3.0 mes/week1100.92.3nes/week2613.54.2 210 3.50.140.55 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.83.1 321 2.80.91 321 2.80.91 321 3.50.05 332 0.654.0 355 0.654.0 356 0.654.0 356 0.653.5 356 0.652.5 350 0.220.77 350 0.220.77	None	41	12.2	2.4	7.3	22.0
ms/week 132 2.3 3.0 0.0	mes/week 132 2.3 3.0 mes/week 110 0.9 2.7 3.0 ruend* 261 3.5 4.2 2.7 $Nweek$ 21 0.14 0.55 4.2 $Nweek$ 136 1.5 4.4 4.4 $Nweek$ 73 5.5 5.5 4.4 $mes/week$ 65 6.2 1.5 0.91 $n 113 3.5 5.5 0.91 n 113 3.5 0.05 0.91 n 0.65 0.65 0.55 0.55 n 113 3.5 3.5 0.7 n 0.66 4.0 3.5 0.91 n 0.65 0.66 4.3 0.7 n<$	1 time/week	51	2.0	3.9	3.9	9.8
ms/week 110 0.9 2.7 3.6 3.6 $r \operatorname{tend}^*$ 261 3.5 4.2 3.6 3.8 0.99 0.99 0.99 0.99 0.99 0.00 0.9 3.1 0.22 0.9	mes/week 110 0.9 2.7 $r trend^*$ 261 3.5 4.2 $r trend^*$ 0.14 0.55 4.4 $h week$ 136 1.5 4.4 $h week$ 73 5.5 5.5 $n es/week$ 65 6.2 1.5 $n es/week$ 0.05 0.01 0.9 $n trend^*$ 0.05 0.05 0.91 $n veek$ 113 3.5 3.5 3.5 $h week$ 0.65 0.05 0.91 0.77 $n veek$ 113 3.5 3.5 0.77 $n real *$ 0.22 0.77 0.77	2–3 times/week	132	2.3	3.0	0.0	5.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4–6 times/week	110	0.0 2.5	2.7	3.6	7.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		107	0.0 11	7:4	5.8 0.00	CII C
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	321 (week 2.8 3.1 mes/week 1.5 5.5 4.4 mes/week 6.2 1.5 5.5 ore 6.2 0.05 0.91 m 11.3 3.5 0.91 m 11.3 3.5 0.91 m 11.3 3.5 0.91 m 0.05 0.05 0.05 m 0.02 0.05 0.05 m 0.02 0.02 0.07 m 0.022 0.02 0.77	Test for trend		0.14	cc.0	0.99	co.0
$\sqrt{\text{week}}$ $\frac{1}{2.6}$ $\frac{1}{2.6}$ $\frac{1}{2.1}$ $\frac{1}{2.9}$ mes/week $\frac{1}{36}$ 5.5 5.5 5.5 3.1 or trend^* 6.2 1.5 0.01 0.22 or trend^* 0.05 0.01 0.22 0.01 0.22 mes/week 113 3.5 3.5 3.5 0.22 week 113 3.5 3.5 3.5 0.91 0.22 mes/week 119 5.0 2.5 3.5 3.4 or trend^* 0.22 0.77 0.96	Neek 221 220 231 231 231 231 311 mes/week 73 5.5 5.5 5.5 5.5 or trend* 65 6.2 1.5 0.91 m 113 3.5 0.91 m 113 3.5 3.5 week 162 0.6 4.3 mes/week 202 4.0 3.5 or trend* 0.22 0.22 0.77	r ogurt Nono	331	0	2 1	- 7	10.01
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\pi_{\rm exc}$ $\pi_{\rm exc$	1 time/week	321 136	0 V -	1.5	-:- 0 C	0.01 8 8
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	ore 65 62 1.5 or trend* 0.05 0.01 m 113 3.5 0.05 0.01 m 113 3.5 0.06 4.3 0.05 0.6 4.3 0.05 4.0 3.5 0.05 0.6 4.3 0.05 0.6 2.5 0.77 0.77	2-3 times/week	73	i v v		00	11.0
or trend* 0.05 0.91 0.22 m 113 3.5 3.5 0.9 v/veek 162 0.6 4.3 6.2 ms/veek 162 0.6 3.5 5.0 or trend* 0.22 0.06 3.5 5.0 or trend* 0.22 0.22 0.91 0.91	0.05 0.01 m 0.05 0.91 m 113 3.5 3.5 $0.0ek$ 113 3.5 3.5 $0.0ek$ 113 202 4.0 3.5 $0.0ek$ 119 5.0 2.5 $0.0ek$ 0.22 0.77	4 or more	65 65	6.2	1.5	3.1	10.8
m 113 3.5 3.5 0.9 //week 162 0.6 4.3 6.2 ms/week 119 5.0 2.5 3.4 or e 119 5.0 2.5 3.4	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Test for trend*		0.05	0.91	0.22	0.73
//week 113 3.5 3.5 0.9 //week 162 0.6 4.3 6.2 mus/week 202 4.0 3.5 2.0 nore 119 5.0 2.5 3.4 or trend* 0.22 0.77 0.96	γ veck 113 3.5 3.5 γ veck 162 0.6 4.3 $mes week$ 202 4.0 3.5 ore 119 5.0 2.5 $orted^*$ 0.22 0.77	Ice Cream					
/week 162 0.6 4.3 6.2 mus/week 202 4.0 3.5 2.0 nore 119 5.0 2.5 3.4 or trend* 0.22 0.77 0.96	<pre>/week 162 0.6 4.3 mes/week 202 4.0 3.5 mes/week 202 4.0 3.5 ore 119 5.0 2.5 or trend*</pre>	None	113	3.5	3.5	0.9	8.0
mcs/week 202 2.0 3.5 2.0 0.0 0.0 2.0 0.0 0.0 0.0 0.0 0.0 0.0	mcs/week 202 4.0 3.5 nce 119 5.0 2.5 or trend [*] 0.22 0.77	1 time/week	162	0.6	4.3	6.2	11.1 1
or trend* 119 5.0 2.5 5.4 5.4 0.22 0.77 0.96	or trend [*] 119 5.0 2.5 0.77 or trend [*]	2–3 times/week	202	0.7	0.0 0.1	2.0	9.5
or trend 0.77 0.79	or trend 0.22 0.17	$\frac{4}{2}$ or more	119	5.0	2.2 2.2	3.4	10.9
	Cheese	Test for trend		0.22	0.77	0.90	10.0

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	Food	Person intervals	% Capsular type la or lb	% Capsular type V	% Non la, lb or V capsular types	% All capsular types combined
27 0.0 184 133 2.3 2.3 2.3 134 0.3 0.3 0.3 135 0.3 0.3 0.3 135 0.3 0.3 0.3 135 0.3 0.3 0.3 136 0.3 0.3 0.3 137 0.3 0.3 0.3 137 0.3 0.3 0.3 0.3 137 0.3 0.3 0.3 0.3 0.3 138 0.3 0.3 0.3 0.3 0.3 0.3 139 0.3 0.3 0.3 0.3 0.3 0.3 0.3 131 1.3 0.3 0.3 0.3 0.3 0.3 0.3 145 0.3 0.3 0.3 0.3 0.3 0.3 0.3 146 0.3 0.3 0.3 0.3 0.3 0.3 0.3 131 0.3	None	15	13.3	0	13.3	26.7
Mathematical Mathematical<	1 time/week	27	0.0	18.4	3.7	22.2
Mathematical Mathematical<	2-5 times/week 4 or more	200	C.2 4.6	3.4	3.4	6.0 10.2
35 37 0 106 33 33 107 33 33 108 64 33 109 64 33 109 64 33 113 13 13 123 24 0 133 24 33 133 24 33 133 24 34 133 24 34 133 24 34 133 24 34 133 24 34 133 24 34 133 24 34 141 26 27 134 34 34 134 34 34 134 34 34 134 34 34 134 34 34 135 34 34 134 34 34 135 34 <td>Test for trend*</td> <td>2</td> <td>0.51</td> <td>0.39</td> <td>0.76</td> <td>0.74</td>	Test for trend*	2	0.51	0.39	0.76	0.74
Mathing Solution	Fresh fruit	2	t 1	c		Ċ
350 bit 350 bit <t< td=""><td>None 1 time/week</td><td>55 56</td><td>5.7</td><td>0</td><td>2.9</td><td>8.0</td></t<>	None 1 time/week	55 56	5.7	0	2.9	8.0
196 3.6 3.6 3.1 3.8 27 1.3 4.1 3.3 4.1 3.3 179 4.1 3.3 4.1 3.3 4.1 179 6.4 3.3 3.3 4.1 3.3 170 2.5 2.2 3.3 4.1 3.3 170 1.2 2.4 3.6 0.9 170 1.2 0.6 0.9 0.9 173 0.6 0.6 0.6 0.9 173 1.2 0.6 0.7 0.8 173 0.7 0.6 0.7 0.8 173 0.6 0.6 0.7 0.8 173 0.6 0.3 0.8 0.8 173 0.6 0.3 0.8 0.8 174 2.3 0.6 0.3 0.8 175 0.6 0.3 0.3 0.7 184 2.3 0.3 0.3 0.3 195 0.7 0.8 0.3 0.7 194 2.7 0.7 0.9 0.7 194 3.4 3.4 3.3 0.7 196 0.7 0.7 0.9	1 unite/week 2-3 times/week	239	0.0 3.8	4.0 2.5	2.9	0.0 9.2
0.27 0.23 0.33 0.31 129 1 3 4 3 129 2 4 3 4 3 129 2 3 3 4 3 129 2 3 3 4 3 129 2 2 3 3 4 3 170 1 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 6 <td>4 or more</td> <td>196</td> <td>3.6</td> <td>5.1</td> <td>3.6</td> <td>12.2</td>	4 or more	196	3.6	5.1	3.6	12.2
237 1.3 3.4 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.3 3.4 3.4 3.3 3.4 <td>Test for trend[*]</td> <td></td> <td>0.27</td> <td>0.23</td> <td>0.81</td> <td>0.13</td>	Test for trend [*]		0.27	0.23	0.81	0.13
tot total total t	Canned fruit	L2C		7 7	0.0	9 L
100 6.1 3.7 118 120 2.4 3.7 118 122 2.4 5.6 0.3 123 2.4 5.6 0.3 178 6.2 0.63 0.3 178 6.3 0.63 0.3 178 0.03 0.62 0.3 178 0.03 0.63 0.3 178 0.03 0.63 0.3 178 0.03 0.63 0.3 178 0.03 0.63 0.3 178 0.03 0.3 0.3 179 0.03 0.3 0.3 111 0.0 0.4 0.6 111 0.0 0.65 0.3 111 0.3 0.3 0.3 111 0.4 0.6 0.6 111 0.6 0.6 0.6 111 0.4 0.6 0.6 111 0.4 0.6	Nolle 1 time/week	621 107	C.1 7.4	9.4 0.6	0.0	13.2
120 2,5 3,3 3,3 123 2,4 5,6 0,09 0,08 1730 1,2 2,4 5,6 0,0 1730 1,2 2,4 5,6 0,0 1730 1,2 0,03 0,65 3,3 1730 1,2 0,03 0,62 3,6 1730 2,3 2,6 2,4 2,5 1730 0,03 0,03 0,84 0,87 196 5,6 2,7 2,3 3,3 233 2,3 3,3 0,48 0,37 100 0,3 0,49 0,66 0,1 114 2,6 0,3 0,2 0,1 114 2,6 0,3 0,3 0,1 114 2,6 0,3 0,3 0,1 114 2,6 0,3 0,3 0,3 120 0,3 0,3 0,3 0,3 121 0,3 0,3 0,3 0,3 123 0,3 0,3 0,3 0,3 124 2,7 0,3 0,3 0,3 129 0,3 0,3 0,3 0,3 130 0,3	2–3 times/week	109	6.4	3.7	1.8	11.9
	4 or more *	120	2.5	3.3	3.3	9.2
	Test for trend		0.36	0.92	0.98	0.54
	None None	501	ç	y v	C	00
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1 time/week	122	2.5	1.6	2.5	6.7
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2–3 times/week	170	1.2	0.6	5.3	7.1
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4 or more *	178	6.2	6.2	3.9	16.3
	Test for trend		0.03	0.62	0.06	0.007
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Cooked vegetables	26	36	v	1 0	10.7
	1 time/week	00 111	0.0	5.4	3.6	9.01
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2–3 times/week	232	2.6	2.2	3.5	8.2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4 or more $_{*}$	196	5.6	3.6	3.1	12.2
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Test for trend		0.03	0.84	0.87	0.26
	Ate at dormitory	Y	167	0	167	33.3
tioy $\begin{array}{cccccccccccccccccccccccccccccccccccc$	Vec	282	3.1	ۍ د ش	3.1	0.4
tioy $\begin{array}{cccccccccccccccccccccccccccccccccccc$	X^2 p-value	100	0.06	0.65	0.06	0.05
	Ate at another dormitory					
330 5.9 2.4 2.7 utrant 146 2.7 2.1 0.71 445 3.4 3.2 0.71 0.71 146 2.7 2.1 0.7 445 3.4 3.2 4.0 114 2.6 0.9 0.9 467 3.4 3.9 0.11 0.67 0.11 0.11 0.11 0.85 3.3 3.3 3.3 361 3.9 3.9 3.9 150 1.3 3.1 0.11 0.67 0.11 0.11 0.11 0.67 0.67 0.11 0.11 0.61 3.3 3.3 3.3 150 0.56 0.18 0.96	No	245	2.5	2.5	3.3	8.2
0.32 0.32 0.30 0.11 146 2.7 2.1 0.7 445 3.4 3.2 4.0 0.71 0.49 0.6 0.71 0.49 0.6 0.71 0.49 0.6 0.71 0.69 0.0 0.71 0.67 0.11 0.67 0.11 0.11 0.67 0.11 0.11 0.67 0.11 0.11 0.61 3.3 3.3 3.61 3.3 3.3 3.61 3.3 3.3 0.56 0.11 0.11 0.67 0.11 0.11 0.67 0.11 0.11 0.67 0.12 3.3 0.56 0.18 0.96	Yes v ² a volue	330	5.9 0 20	2.4	1.7	9.1 0.70
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	A p-value Ate at fast food restaurant		70.0	0.70	0./1	00
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	No	146	2.7	2.1	0.7	5.5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Yes	445	3.4	3.2	4.0	10.6
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	X^2 p-value		0.71	0.49	0.05	0.07
467 3.4 3.9 3.9 3.9 vashing 75 2.7 0.11 0.11 75 2.7 6.7 2.7 361 3.9 3.3 3.3 150 1.3 2.7 6.7 2.7 0.16 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.12 0.36 0.18 0.96	Ate at sit down restaurant No	11/	36	0.0	0.0	VV
vashing 0.67 0.11 0.11 vashing 75 2.7 6.7 2.7 361 3.9 3.3 3.3 3.3 150 1.3 2.7 3.3 3.3 0.36 0.36 0.18 0.96	Yes	467	3.4	3.9	3.9	11.1
vashing 75 2.7 6.7 2.7 361 3.9 3.3 3.3 150 1.3 2.7 3.3 0.36 0.18 0.96	X^2 p-value		0.67	0.11	0.11	0.03
75 2.7 0.7 2.7 361 3.9 3.3 2.3 150 1.3 2.7 3.3 0.36 0.18 0.96	Frequency of hand washing	t	t	ť	t	
150 1.3 2.7 3.3 0.36 0.18 0.96	<5 times/day 3 to 5 times/day	د <i>ر</i> 361	2.7	0.7	2.7	10.5
0.36 0.18 0.96	6 or more times/day	150	1.3	2.7	3.3	7.3
	Test for trend		0.36	0.18	0.96	0.22

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 $\stackrel{*}{P}$ value for the Mantel-Haenszel Chi square test for trend

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Risk factors for acquiring Group B Streptococcus by capsular type. Logistic regression model predicting incidence of a capsular type or capsular type grouping, using all other data as reference. 129 female and 128 male freshmen college students living in a single dormitory. Table 3

Risk factor	DCIA				I VALUE
Cansular type la or lh					
Log frequency of sex acts	0.172	0.220	1.2	(0.77, 1.83)	0.43
Number of sex partners previous year	0.079	0.149	1.1	(0.81, 1.45)	0.59
Eats fish 2 or more times per week	1.982	0.489	7.3	(2.78, 18.90)	<0.001
Frequency eats in the dormitory	-0.220	0.277	0.80	(0.47, 1.38)	0.43
Male gender	-0.100	0.509	0.90	(0.33, 2.45)	0.84
Capsular type V					
Log frequency of sex acts	0.560	0.198	1.8	(1.19,2.58)	0.001
Number of sex partners previous year	-0.244	0.202	0.8	(0.53, 1.16)	0.23
Eats fish 2 or more times per week	0.538	0.659	1.7	(0.47, 6.23)	0.41
Frequency eats in the dormitory	0.786	0.520	2.2	(0.79, 6.07)	0.13
Male gender	-0.313	0.495	0.73	(0.38, 1.93)	0.53
All other capsular types					
Log frequency of sex acts	0.362	0.184	1.4	(1.00, 2.06)	0.05
Number of sex partners previous year	0.328	0.117	1.4	(1.1, 1.75)	0.005
Eats fish 2 or more times per week	-0.134	0.786	0.88	(0.19, 4.08)	0.87
Frequency eats in the dormitory	-0.504	0.253	0.6	(0.37, 0.99)	0.05
Male gender	-0.024	0.508	0.9	(0.36, 2.64)	0.96
All capsular types, combined					
Log frequency of sex acts	0.383	0.119	1.5	(1.16,1.85)	0.001
Number of sex partners previous year	0.142	0.082	1.2	(0.98, 1.36)	0.08
Eats fish 2 or more times per week	1.113	0.354	3.0	(1.51, 6.10)	0.002
Frequency eats in the dormitory	-0.136	0.183	0.9	(0.61, 1.25)	0.46
Male gender	-0.085	0.301	0.9	(0.51, 1.66)	0.78

* Log base 2 of maximum (frequency oral sex, vaginal sex), interpreted as the ratio of the odds of GBS incidence for a doubling in the number of sex acts. For example, an OR of 1.7 is interpreted as a 70% increase in odds of GBS with a doubling in the number of sex acts.