**MEMORANDUM**

**PROJECT:** SWISSRE STOMACH CANCER

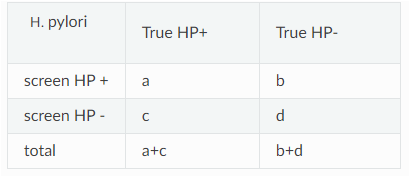
**FROM**: Nicole Young, Research Scientist

**DATE**: 20th January 2021

**RE**: Stomach/Gastric cancer (GC) equations.

Solve #1: true prevalence of HP

To solve for the true prevalence of HP from the screen-detected prevalence of HP from the literature, we have the following 2x2 contingency table and 4 equations



1. Sensitivity =0.95
2. Specificity =0.95
3. HP prevalence by screen = 0.4457 (95%CI: 0.4141 to 0.4778)\*
4. a+b+c+d = 10,000 (this is just an easy whole number to work with)

\*use normal distribution

Solving for the 4 unknowns

= 0.95

a = 0.95a + 0.95c

0.05a = 0.95c

a = 19c

=0.95

d = 0.95b + 0.95d

0.05d = 0.95b

d = 19b

Substitute a and d from equations in yellow into equation 4

a+b+c+d = 10,000

19c + b + c + 19b = 10,000

20c + 20b = 10,000

b + c = 500

a + d = 9500

From equation 2

a+b = 0.4457 (95%CI: 0.4141 to 0.4778) x 10,000

a + b = 4457 (4141 to 4778)

c + d = 10,000 - 4457 (4141 to 4778)

d = 10,000 - 4457 (4141 to 4778) - c

Using a + d = 9500 to solve for c

19c + 10,000 - 4457 (4141 to 4778) – c = 9500

**18c + 500 = 4457 (4141 to 4778)**

Once c is solved, you can solve the rest

**a = 19c**

**b = 500 – c**

**d = 19b**

Let us try it for the mean value of 4457

18c + 500 = 4457

c = 220

a = 4180

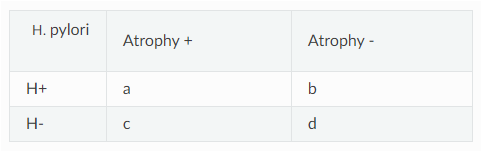
b = 280

d = 5320

Once you have a to d solved, the true prevalence of HP is tada! For the mean = 0.44

Solve #2: fraction of atrophic state that is H. pylori + by age group

For an age group:



1. True prevalence of HP = True prevalence of HP as solved above by draw- level
2. = age specific prevalence of atrophy (p\_atrophy+) from Wang 2020 table
3. a +b + c + d = 10,000 (arbitrary easy whole number to work with)
4. = OR = 3.8 (95%CI: 3.054 - 4.631)

Now let’s solve for a, b, c, d

Php-true x 10,000 = H

10,000 - H = N

Patrophy x 10,000 = A

a + b = H

a + c = A; a = A - c

b - c = H - A b = H - A + c

c + d = N d = N - c

Now write the odds ratio equation in terms of c in terms of c

= OR

= OR

= OR

=

Solve quadratic equation for c, then solve for the rest:

a = A – c

b= H - A + c

d = N – c

Fraction of atrophy positive that is HP positive is

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Let’s try it out:

If Php-true = 0.44, then H = 4400

Then N = 5600

For age group 40-59, the mean prevalence of atrophy is 0.0145, therefore A = 145

The quadratic equation is thus 2.8c2 + 21914c – 812,000

Plugging it into an online quadratic equation solver, c = 36.88 ~ 37

Then, a = 107, b = 4293, d = 5562

Checking OR: = 3.75

107+4293+37+5562 = 9,999

Prevalence of atrophy: = : 0.0144

Prevalence of H. pylori: = = 0.44

**f\_atrophy+** = = = 0.743 This is the fraction of people with atrophic gastritis in age group 40-59 who have H. pylori

**f\_atrophy-** = = = 0.4356 This is the fraction of people *without* atrophic gastritis in age group 40-59 who have H. pylori.