Prevalence of *H. Pylori* Infection by birth year

A meta regression analysis

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METHODS

Data sources and extraction

- **PubMed** and **Embase** were searched for studies reported prevalence of *H. pylori* infection among Japanese population (until 30 June, 2016).
- 43 papers
  + JPHC Cohort II
  + JPHC-NEXT Cohort Study

  included for meta-regression analysis (Table 1).
- Prevalence of *H. pylori* infection reported by birth year group of participants[1~7].
- 38 studies reported prevalence with age groups.
  - 34 studies reported data collection period:
  - Example:
    60-70 years old group;
    data collection done in 1990;
    birth year should be 1920~1930.
  - 4 studies reported age groups with data collection year unavailable, year of publication was used instead of data collection period.

[1] Ueda J. ***Helicobacter.*** 2014; [2] Watanabe M. ***Cancer Sci.*** 2015;
[3] Reploge M.L. ***Int J Epidemiol.*** 1996; [4] Shimoyama T. ***Gastric Cancer.*** 2012;
[5] Shimatani T. ***J Gastroenterol Hepatol.*** 2005; [6] JPHC Cohort II; [7] JPHC-NEXT

STATISTICAL ANALYSIS

273 Data Points from 45 Studies were available for meta-regression

Show 100 entries

Search:

No	Author	adultdults.or.childhildren	Source.population	Specimen.type	kit.
1	Kikuchi, 1998	adult	General	serum	fc
1	Kikuchi, 1998	adult	General	serum	fc
1	Kikuchi, 1998	adult	General	serum	fc
1	Kikuchi, 1998	adult	General	serum	fc
2	Fujisawa, 1999	adult	General	serum	fc
	Fujisawa				

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Step 1: Weight Calculation

```r
library(meta)

library(metafor)

library(mgcv)


meta <- metaprop( event = Number_of_Positive,
                  n     = Number_of_Subjects_in_the_corresponding_group,
                  byvar = Birth_Year,
                  sm    = "PLOGIT",    # Logit transformation
              method.tau = "REML")      # Restricted Maximum-likelihood
                                        # estimator to estimate the
                                        # between-study variance


weight<-meta$w.random # Weight of each data point extracted
```

Step 2: Meta-regression (Generalized Additive Mixed Model, GAMM)

```
#########################   MODEL 1  ################################
res1 <- gam(cbind(event,n) ~ s(Birth_Year, bs="cr") +
                                  # Cubic Spline Regression 三次スプライン曲線
              s(Study_ID, bs="re") +  # Study ID as random effect
              Source_of_population +  # Community OR Clinical based
              Specimen_type        +  # Serum OR Others (urinary, salivary, st
              Kit.from             +  # Antigen derived from demostic or forei
              early,                  # Data collection period, cutoff = 2000
              data = data, weights=weight,
              family="binomial"(link=logit), method="REML")
#########################   MODEL 2 ################################
res2 <- gam(cbind(event,n) ~ s(Birth_Year, bs="cr") +
              s(Study_ID, bs="re") +
              Specimen_type,
              data = data, weights=weight,
              family="binomial"(link=logit), method="REML")
#########################   MODEL 3 ################################
res3 <- gam(cbind(event,n) ~ s(Birth_Year, bs="cr") +
              s(Study_ID, bs="re"),
              data = data, weights=weight,
              family="binomial"(link=logit), method="REML")
```

TABLE 2. Informations for tested models.			
	AIC	**BIC**	**LogLik**
Model 1: Logit(P) = s(birth year) + r(study ID) + f(source of population) + f(diagnostic test) + f(ELIZA kits) + f(research year)	1716.444	1895.216	-808.6935 (df=49.53)
Model 2: Logit(P) = s(birth year) + r(study ID) + f(diagnostic test)	1730.349	1904.178	-817.0157 (df=48.16)
Model 3: Logit(P) = s(birth year) + r(study ID)	1731.451	1906.366	-817.2658 (df=48.46)
Abbreviations and definitions: AIC: Akaike's information criterion; BIC: Bayesian information criterion; LogLik: Log-likelihood; P: prevalence; s: penalized cubic spline; r: random effect; f: fixed effect; df: degree of freedom.			

Summary from Model 1 comparable to Table 3

```
##
## Family: binomial
## Link function: logit
##
## Formula:
## cbind(mp, n_total - mp) ~ s(birth.year_high, bs = "cr") + s(No,
##     bs = "re") + Source.population + Specimen.type + kit.from +
##     early
##
## Parametric coefficients:
##                           Estimate Std. Error z value Pr(>|z|)
## (Intercept)               -0.17064    0.14022  -1.217   0.2236
## Source.populationPatient   0.28630    0.20234   1.415   0.1571
## Specimen.typeother        -0.41271    0.19256  -2.143   0.0321 *
## kit.fromforeign            0.01836    0.16847   0.109   0.9132
## kit.fromunknown           -0.11517    0.25923  -0.444   0.6569
## earlylate                 -0.25471    0.15813  -1.611   0.1072
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                        edf Ref.df Chi.sq p-value
## s(birth.year_high)  7.372  8.158   4255  <2e-16 ***
## s(No)              34.754 38.000   1910  <2e-16 ***
```

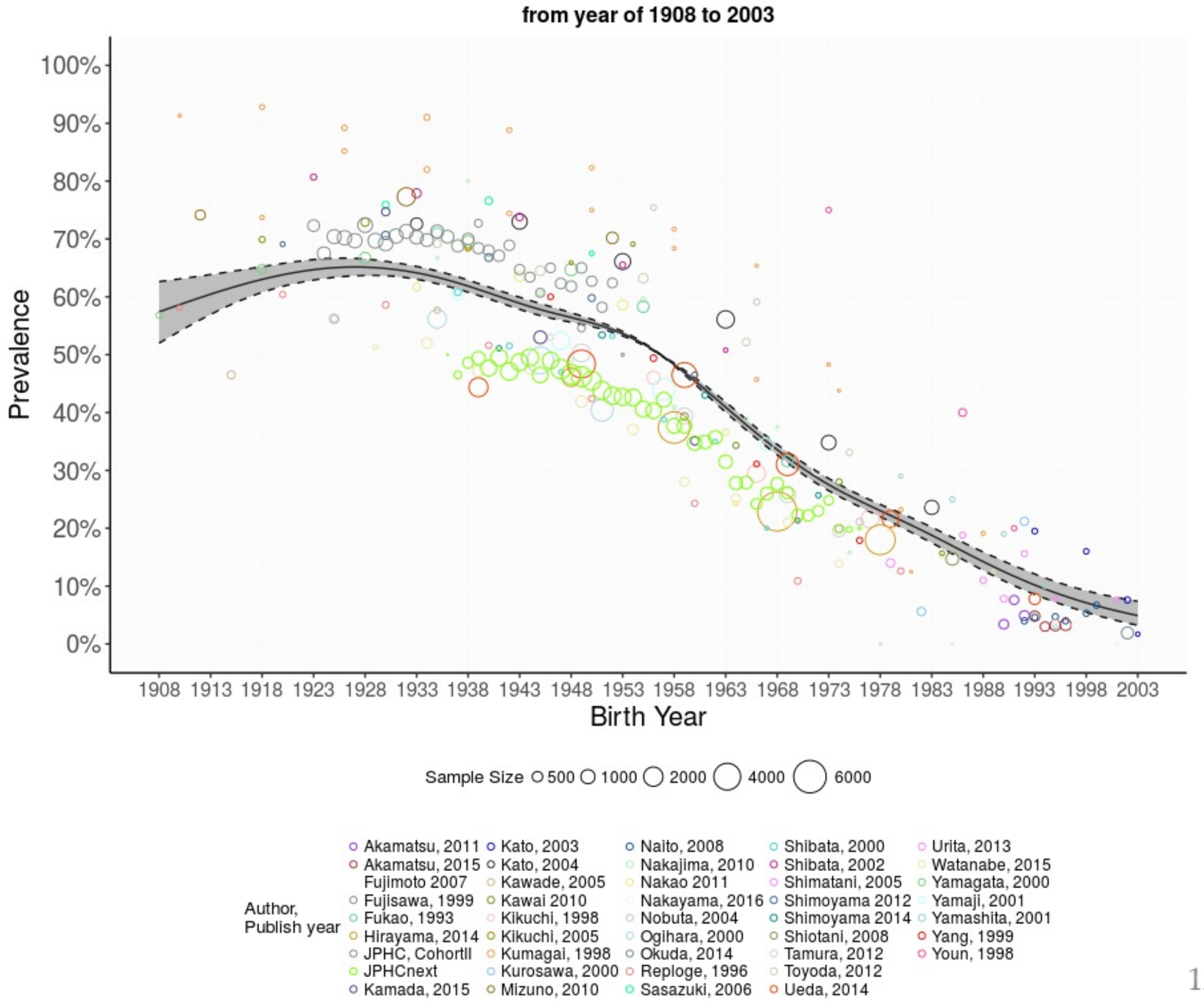
Table 4 Predicted Prevalence of *H. pylori* infection from 1908 to 2003

Show 100 entries Search:

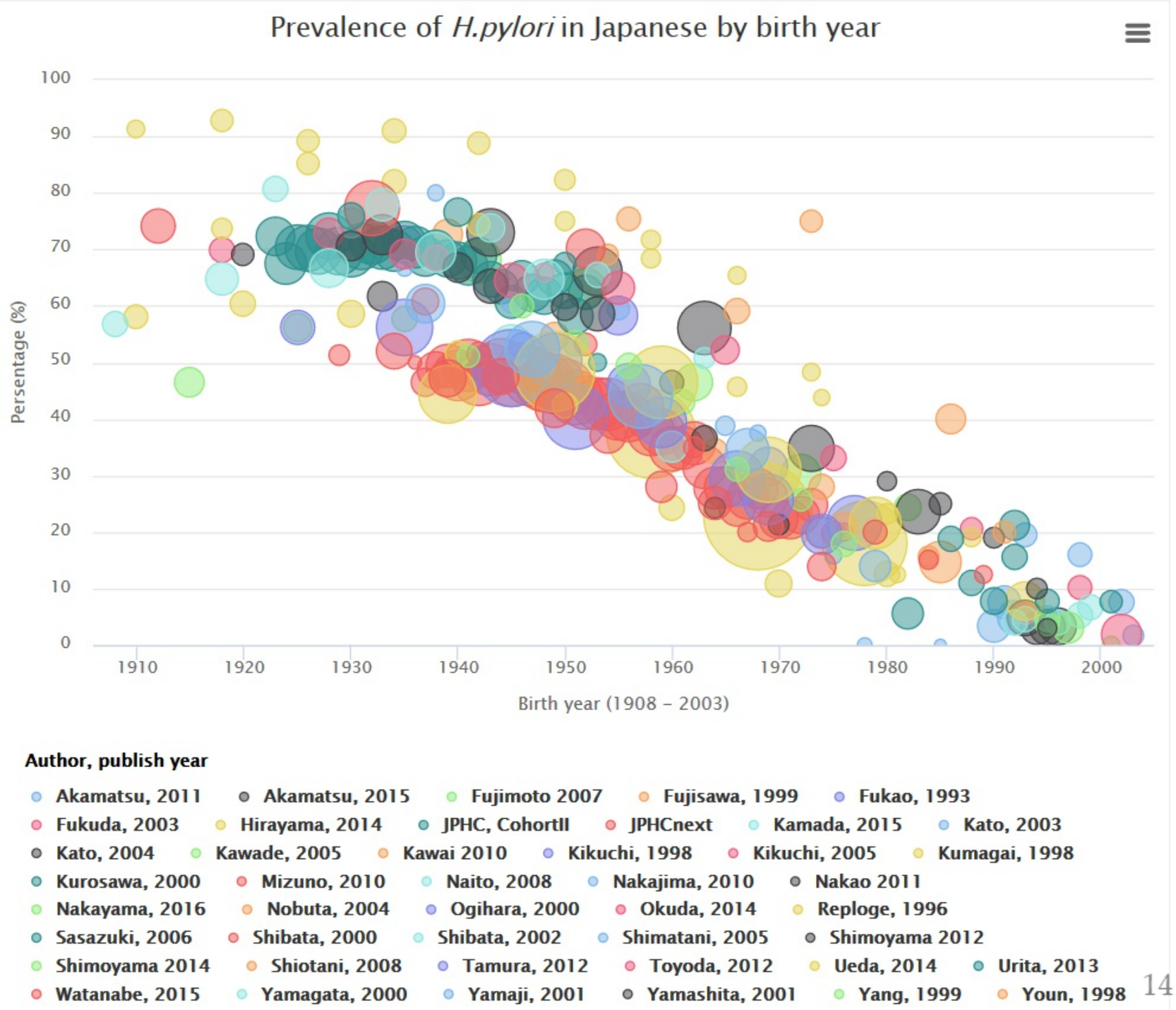
Birthyear	Prevalence	95%CI_low	95%CI_high
1908	0.574	0.520	0.626
1909	0.580	0.530	0.628
1910	0.586	0.540	0.631
1911	0.592	0.549	0.633
1912	0.597	0.559	0.635
1913	0.603	0.567	0.638
1914	0.609	0.576	0.640
1915	0.614	0.584	0.643
1916	0.619	0.591	0.645

PLOT

Figure 2. Multivariable adjusted prevalence of *H. pylori* infection in Japanese by birth year



Interactive PLOT


Prevalence of *H.pylori* in Japanese by birth year
Persentage (%)
100
90
80
70
60
50
40
30
20
10
0
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Birth year (1908 – 2003)
Author, publish year
Akamatsu, 2011
Akamatsu, 2015
Fujimoto 2007
Fujisawa, 1999
Fukao, 1993
Fukuda, 2003
Hirayama, 2014
JPHC, CohortII
JPHCnext
Kamada, 2015
Kato, 2003
Kato, 2004
Kawade, 2005
Kawai 2010
Kikuchi, 1998
Kikuchi, 2005
Kumagai, 1998
Kurosawa, 2000
Mizuno, 2010
Naito, 2008
Nakajima, 2010
Nakao 2011
Nakayama, 2016
Nobuta, 2004
Ogihara, 2000
Okuda, 2014
Reploge, 1996
Sasazuki, 2006
Shibata, 2000
Shibata, 2002
Shimatani, 2005
Shimoyama 2012
Shimoyama 2014
Shiotani, 2008
Tamura, 2012
Toyoda, 2012
Ueda, 2014
Urita, 2013
Watanabe, 2015
Yamagata, 2000
Yamaji, 2001
Yamashita, 2001
Yang, 1999
Youn, 1998

Thanks!

Slides made by using `xaringan` package

Slides address:
https://winterwang.github.io/For_Inoue_pylori/#1