

# Changing trends in the prevalence of *H. pylori* infection in Japan (1908-2003): a systematic review and meta-regression analysis of 170,000 individuals

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## BACKGROUND

- ▶ Gastric cancer burden remains high in Japan, approximately 50,000 deaths/year in Japan (2nd leading cause of cancer deaths).
- ▶ Evidence supports a central role for *H. pylori* in the development of upper-gastrointestinal diseases, including peptic ulcer and noncardia gastric cancer.
- ▶ Studies have suggested that the prevalence of *H. pylori* infection increases with age, while the whole picture remains obscure.
- ▶ We systematically reviewed the existing literature that presented estimates of the prevalence of *H. pylori* infection in the Japanese population.
- ▶ The objectives are:
  1. to derive a robust prevalence estimate of *H. pylori* infection by birth year;
  2. to clarify whether *H. pylori* infection exhibits a birth-cohort pattern.

## DATA SOURCES AND SEARCH STRATEGY

- ▶ The PRISMA statement for preferred reporting of systematic reviews and meta-analyses was used as a guide to conduct this study. (Fig.1. Flowchart of Study Selection)
- ▶ **PubMed** (“*Helicobacter*”[Mesh] OR “*Helicobacter pylori*”[title/abstract]) AND (“Prevalence”[Mesh] OR “prevalence”[title/abstract]) AND (“Japan”[Mesh] OR “Japan”[title/abstract] OR “Japanese”[title/abstract])
- ▶ **EMBASE** (“prevalence”/exp OR prevalence:ab, ti) AND (“Japan”/exp OR “Japan: ab, ti” OR “Japanese: ab, ti”) AND (“*helicobacter*”/exp OR “*helicobacter pylori*”: ab, ti) AND (humans)/lim.
- ▶ We also scrutinised the reference lists, and searched for unpublished data by contacting the head of known ongoing projects.
- ▶ The risk-of-bias assessment was independently performed by two authors (LY and WC) using the **Joanna Briggs Institute Prevalence Critical Appraisal Tool**<sup>a</sup>.

<sup>a</sup>[http://joannabriggs.org/assets/docs/critical-appraisal-tools/JBI\\_Critical\\_Appraisal-Checklist\\_for\\_Prevalence\\_Studies.pdf](http://joannabriggs.org/assets/docs/critical-appraisal-tools/JBI_Critical_Appraisal-Checklist_for_Prevalence_Studies.pdf)

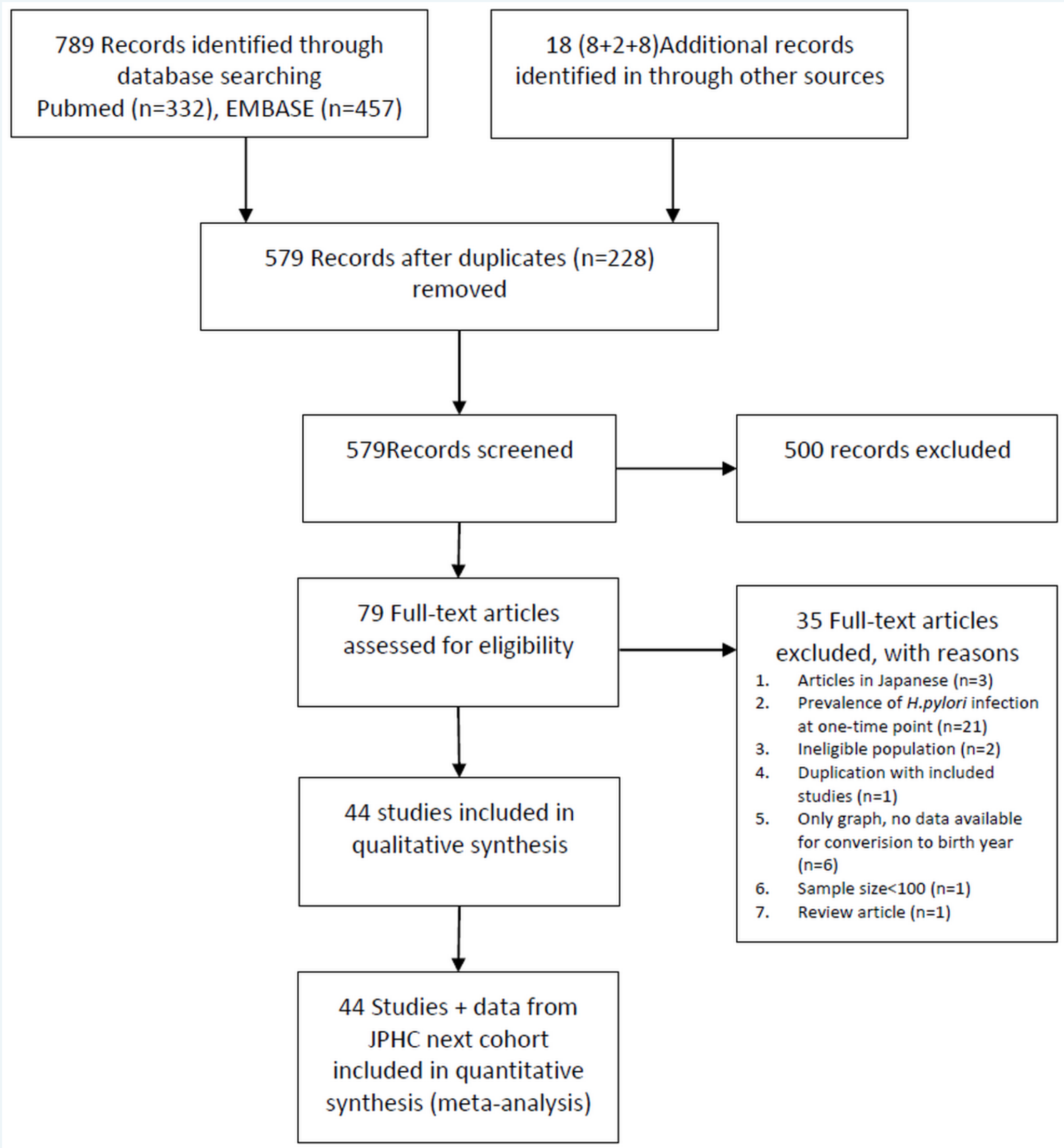


Figure 1: Flowchart of Study Selection

## STATISTICAL ANALYSIS (1)

- ▶ More details on how to estimate prevalence of *H. pylori* by birth year can be found **here**<sup>a</sup>.
- ▶ Prevalence by birth year were extracted from 45 studies (273 data points).
- ▶ Penalized cubic spline was used to model the prevalence as a function of birth year in the framework of generalized additive mixed model (GAMM) implemented in the *mgcv* package in R.

<sup>a</sup>[https://winterwang.github.io/For\\_Inoue\\_pylori/](https://winterwang.github.io/For_Inoue_pylori/)

## STATISTICAL ANALYSIS (2)

- ▶ Pre-specified explanatory variables included in the meta-regression were as follows:  
Study ID, birth year, population source (community-based or clinical-based), diagnostic testing (serological test, or others; others: urinary assays, salivary assays, stool antigen tests, and gastric biopsy), types of ELISA kits for measuring *H. pylori* positivity (antigen derived from domestic or foreign strains), and data collection period (prior to the year 2000, or later than 2000), with **study ID as a random effect** and **other variables as fixed effects**.
- ▶ Observations weighted by the inverse of the sum of the within-study variance and the residual between-study variance using the *meta* package.

## RESULTS

- ▶ Details/characteristics of the studies included in the current meta-regression analysis are available **online**<sup>a</sup>
- ▶ Summary of the results of risk of bias diagnosis is available **here**<sup>b</sup>

<sup>a</sup><http://rpubs.com/winterwang/288338>

<sup>b</sup><http://rpubs.com/winterwang/riskofbias>

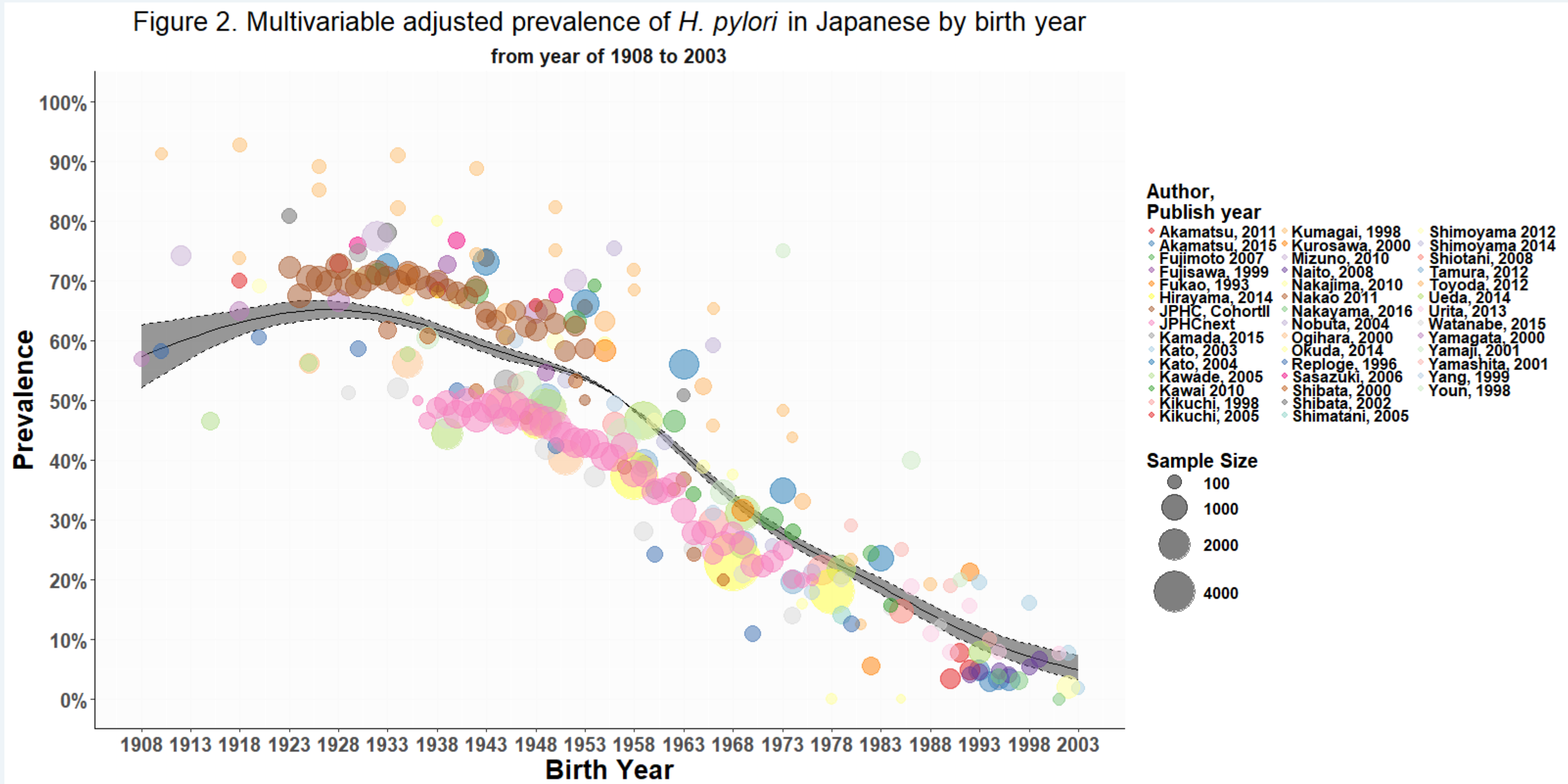


Table 1. Estimated prevalence of *H. pylori* infection by birth year

| Birth Year | 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       |
| ...        | ...        | ...        | ...         |
| 1925       | 0.650      | 0.634      | 0.667       |
| 1926       | 0.651      | 0.635      | 0.667       |
| 1927       | 0.652      | 0.636      | 0.666       |
| 1928       | 0.651      | 0.637      | 0.665       |
| 1929       | 0.651      | 0.637      | 0.664       |
| ...        | ...        | ...        | ...         |
| 1996       | 0.080      | 0.064      | 0.100       |
| 1997       | 0.075      | 0.059      | 0.095       |
| 1998       | 0.070      | 0.054      | 0.091       |
| ...        | ...        | ...        | ...         |
| 2002       | 0.053      | 0.036      | 0.076       |
| 2003       | 0.049      | 0.032      | 0.074       |

## CONCLUSION

- ▶ Prevalence of *H. pylori* infection exhibits a **birth cohort effect** in Japan, with prevalence decreasing steadily in individuals born in successive years, **from 55.6% in 1950 to 12.8% in 1990**.
- ▶ Given the fact that the birth-cohort pattern of *H. pylori* shapes the trends of gastric cancer over time, our findings help to inform screening efforts aimed at prevention and early detection of gastric cancer in Japan.

## COI Declaration: None