

Disentangling the youth gateway of e-cigarettes: findings from three different data sources



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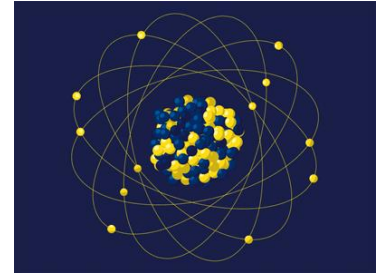
 [@LionShahab](https://twitter.com/LionShahab)

Declaration of interest

- I have received research funds and have undertaken consultancy for companies that develop and manufacture smoking cessation medications and advise the pharmaceutical industry (Pfizer, Johnson & Johnson, and Atlantis Health Care)
- My salary is funded by UCL via the Higher Education Funding Council for England
- I have never received any funding from the tobacco or e-cigarette industry
- **I am a vaper**

A priori considerations

- Concern that EC lead to smoking in youth
- Best way to assess causality is via an RCT
 - But impractical and **unethical**
- Direct observation is not possible
 - Need to infer likely association using different methodological approaches
- Will look at UK and US datasets to determine whether we should be concerned about “the gateway”
 - 1) Individual-level analysis, using synthetic (PSM) and real-world controls
 - a. Retrospective matched control design (NYTS)
 - b. Prospective matched control design (PATH)
 - 2) Population-level analysis, using descriptive and inferential statistics
 - a. Epidemiological trends (NYTS and STS)
 - b. Time-series analysis of UK data (STS)



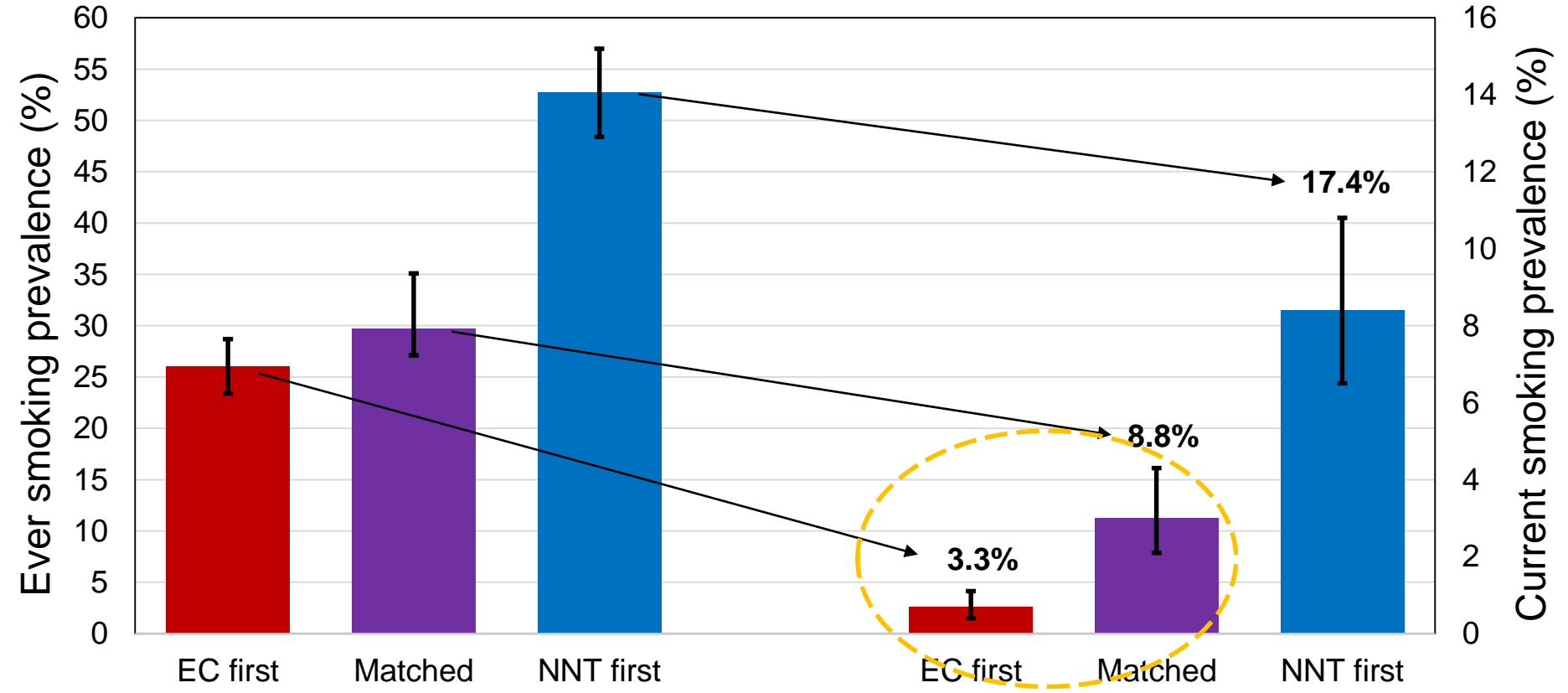
Propensity score matching

- Retrospective analysis of NYTS data
 - In 2014/15 only (N=37,417) adolescents (aged 9+) were asked which product (if any) they had used first
 - **Cases:** initial EC use (3.2%)
 - **Real world control:** initial non-combustible, non-cigarette tobacco (NNT) use, i.e. chewing tobacco, snus or dip (1.4%)
 - **Synthetic control:** use propensity score matching to select adolescents who are similar to those with initial EC use (**cases**) from whole dataset (2014-17) in terms of various characteristics (including smoking susceptibility)
- Prospective analysis of PATH data
 - Three waves (2013-16; N=7,595) to define covariates (w1), exposure (w2) and outcome (w3)
 - **Cases:** EC use at wave 2, no tobacco use at wave 1 or cigarette use at wave 2 (5%)
 - **Real world control:** use of non-combustible, non-cigarette tobacco (NNT) at wave 2, no tobacco use at wave 1 or cigarette use at wave 2 (1%)
 - **Synthetic control:** use propensity score matching to select adolescents who are similar to those with EC use at wave 2 (**cases**) in terms of wave 1 characteristics (including smoking susceptibility)
- Main outcome: ever and current (100+ life-time cigarettes and past 30-day use) cigarette smoking

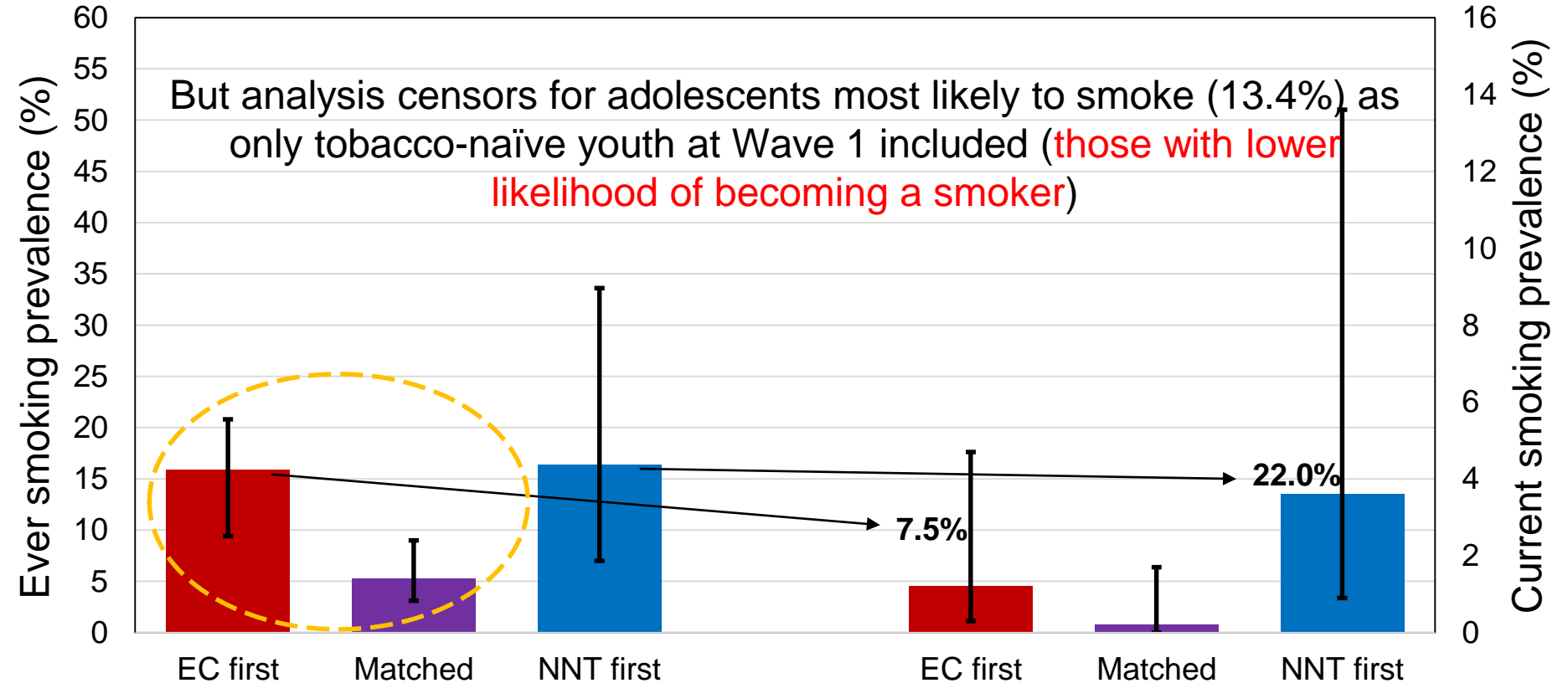
1) Individual level

a) Matched control design (retrospective, NYTS)

Association of initial e-cigarette and other tobacco product use with subsequent cigarette smoking in adolescents: a cross-sectional, matched control study
Lion Shahab, ^{1,2} Emma Beard, ^{1,2} Jamie Brown ^{1,2}

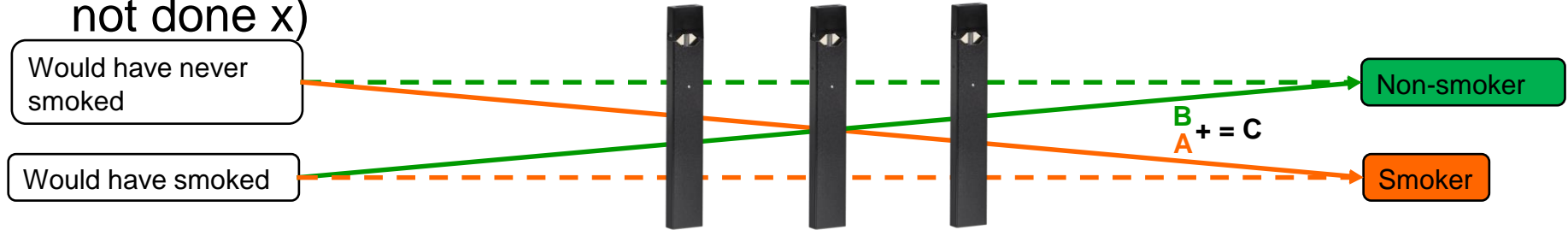


b) Matched control design (prospective, PATH)



Individual level data - implications

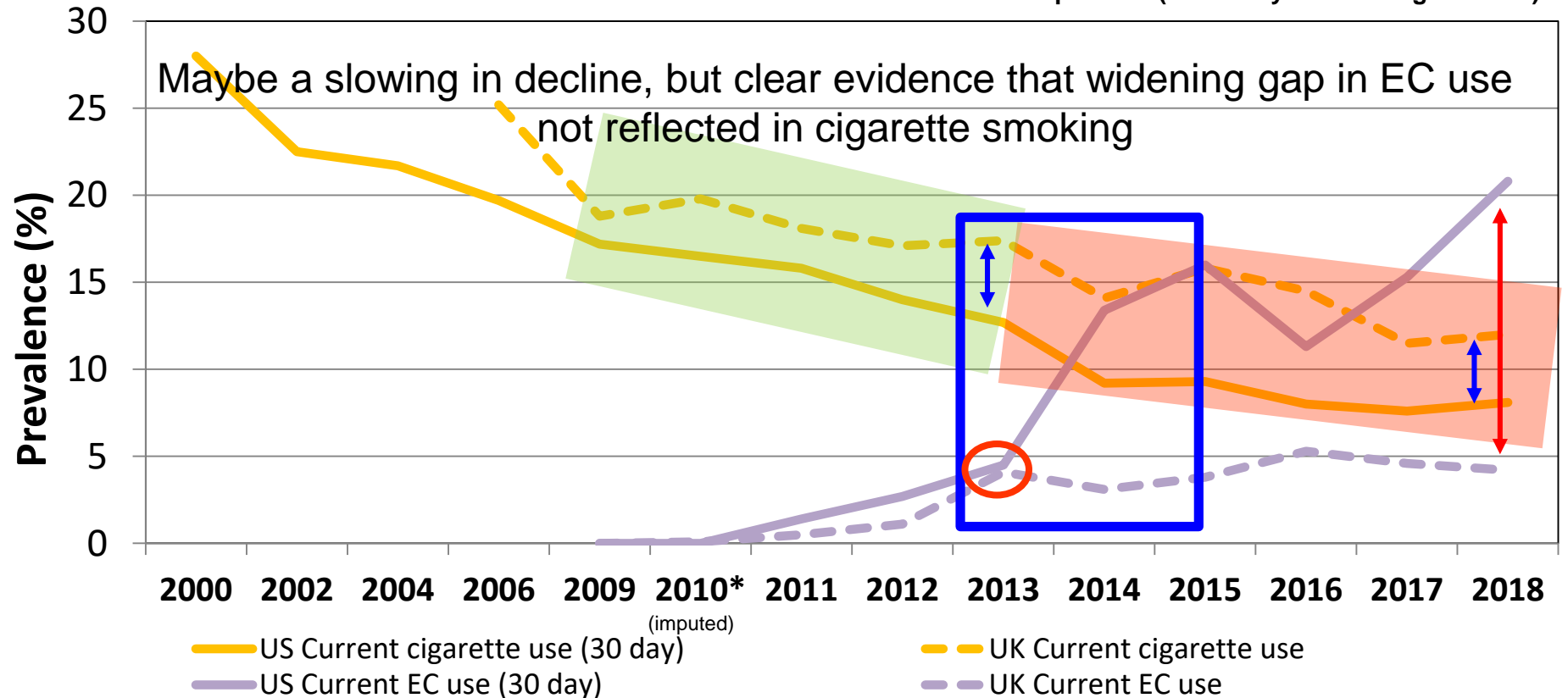
- Depending on sample selection, e-cigarettes can be either protective (for those likely to smoke) or harmful (for those unlikely to smoke)
- Gateway concept is problematic because it requires counterfactual scenario to be tested (what would have happened if someone had not done x)



- Individual-level analysis cannot provide information about aggregate effect as effect likely conditional on underlying population
- Need to look at population-level data to gauge likely net outcome

Trends in EC and cigarette use among adolescents

Base: Total Population (all 16-18 year olds/High School)

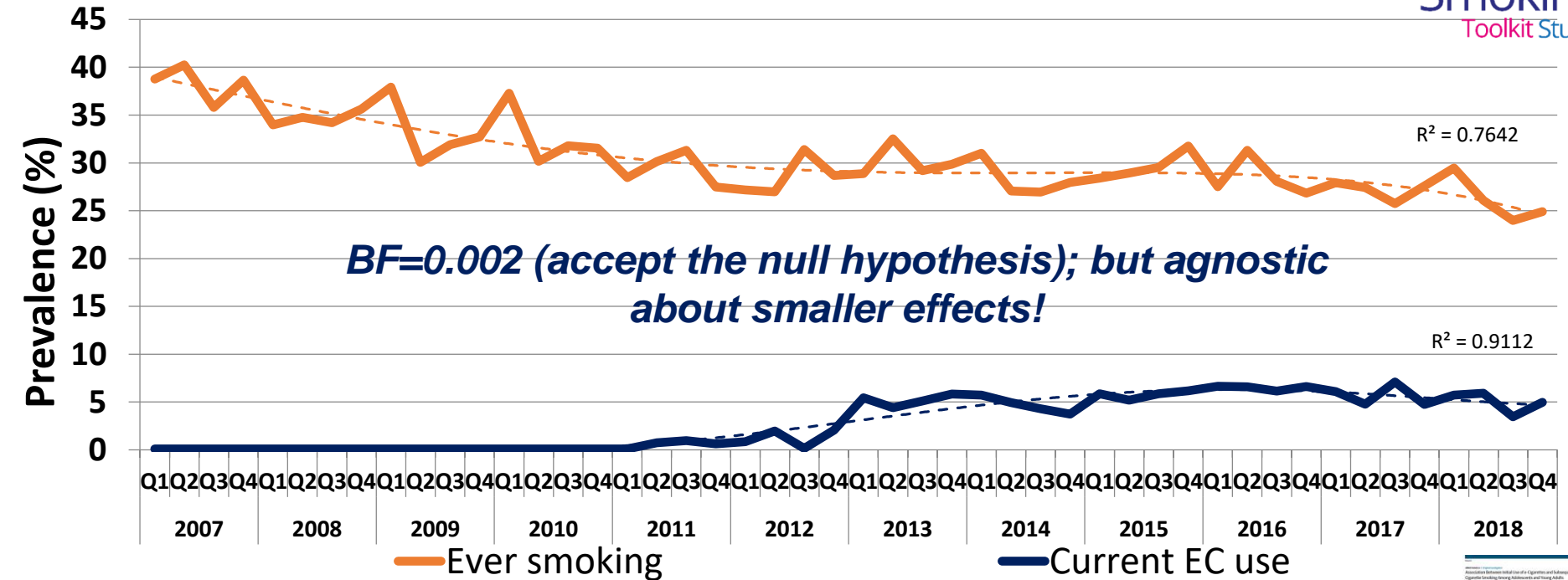


a) Time-series of UK data

- ARIMAX to investigate association of EC use with ever smoking prevalence among 16-24 year olds (as measure of uptake)
 - Smoking Toolkit Study data from 2007-2018 (N=37,105)
 - Explanatory variable
 - Prevalence of EC use in population
 - Outcome variable
 - Prevalence of ever smoking in population
 - Covariates
 - Advertising expenditure on tobacco control and Affordability
 - Tobacco policy changes (smoking ban, increase in age of sale, change in commissioning of stop smoking services)

2) Population level

a) Time-series of UK data

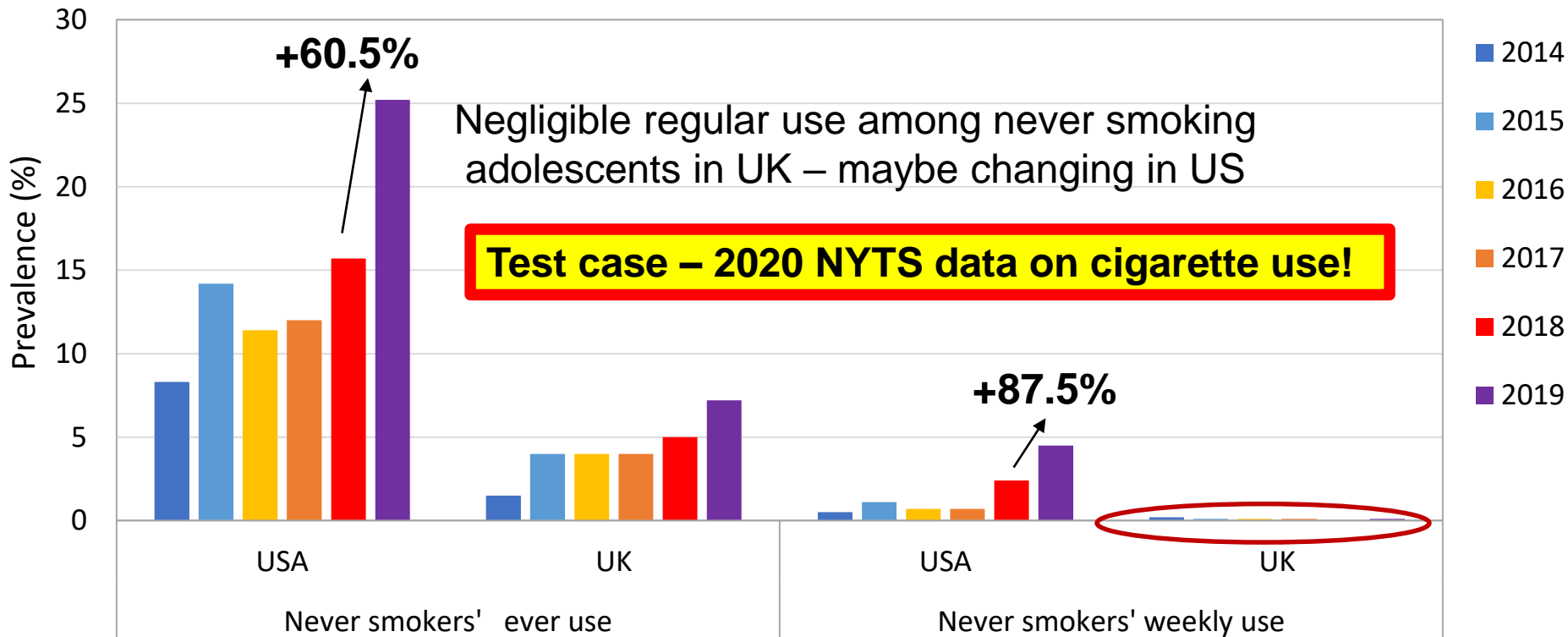


- No evidence of an association
 - $\beta=0.015$ 95%CI -0.046 to 0.016; **p=0.341**

OR=3.5

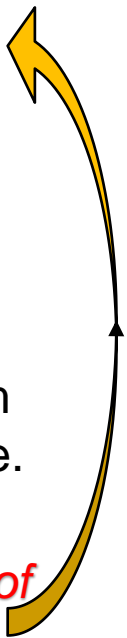
BUT recent change in use pattern in never-smoking adolescents

Use of e-cigarettes by 11-18 year olds in USA and UK



Data sources: National Youth Tobacco Survey; ASH Smokefree GB Youth Survey

Conclusions

- Individual gateway - based on matched control design, evidence suggests trivial truth:
 - Adolescents who likely would have never smoked at increased risk of smoking uptake following EC use
 - Adolescents who likely would have smoked at decreased risk of smoking uptake following EC use
 - Population gateway – based on descriptive trends and time-series analysis suggests that
 - Despite sizeable divergence in adolescent EC use in US and UK, data seem to suggest that the aggregate effect of EC use is similar in both countries, i.e. negligible (if any) and not consistent with large postulated negative effects
 - *However, continued need to monitor data and cross-validate results in light of recent changes in the composition of types of EC users in the US (vs UK)*
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- Emma Beard
- Jamie Brown
- Robert West



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