Effects of a large-scale alcohol ban on alcohol intake, weight, blood pressure, blood glucose, and domestic violence in India

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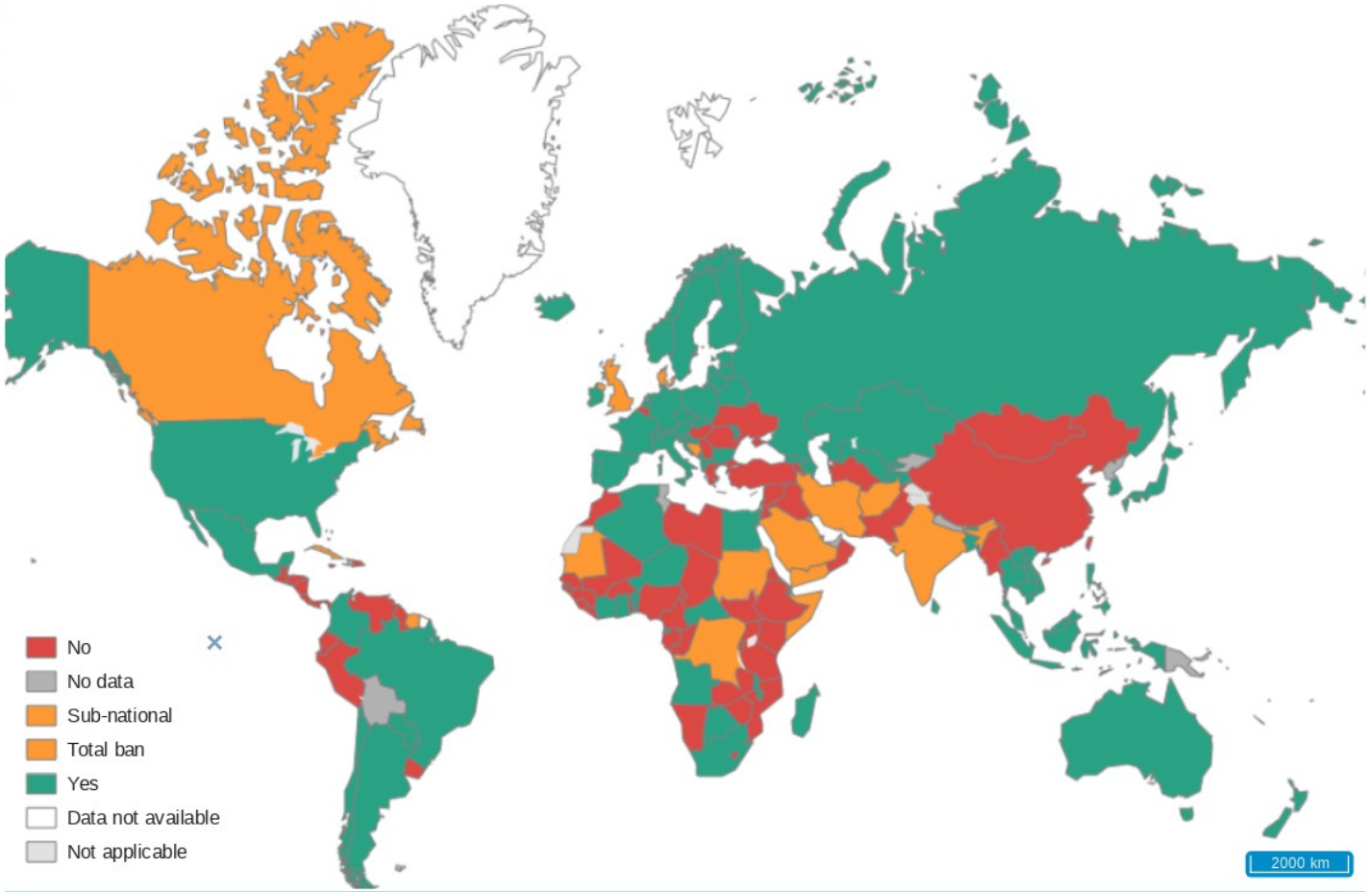
Alcohol is a leading risk factor for deaths and DALYs

- Causal factor in more than 200 diseases, injuries and other health conditions (Griswold et. al., 2016; Murray et. al., 2019; Forouzanfar et. Al., 2016).
- The World Health Organization Global Alcohol Action Plan 2022–2030 seeks to reduce the harmful use of alcohol as a public health priority.

Global regulation on alcohol

- In 2016, 80 countries - national alcohol policies
- 11 countries - total ban on alcohol.

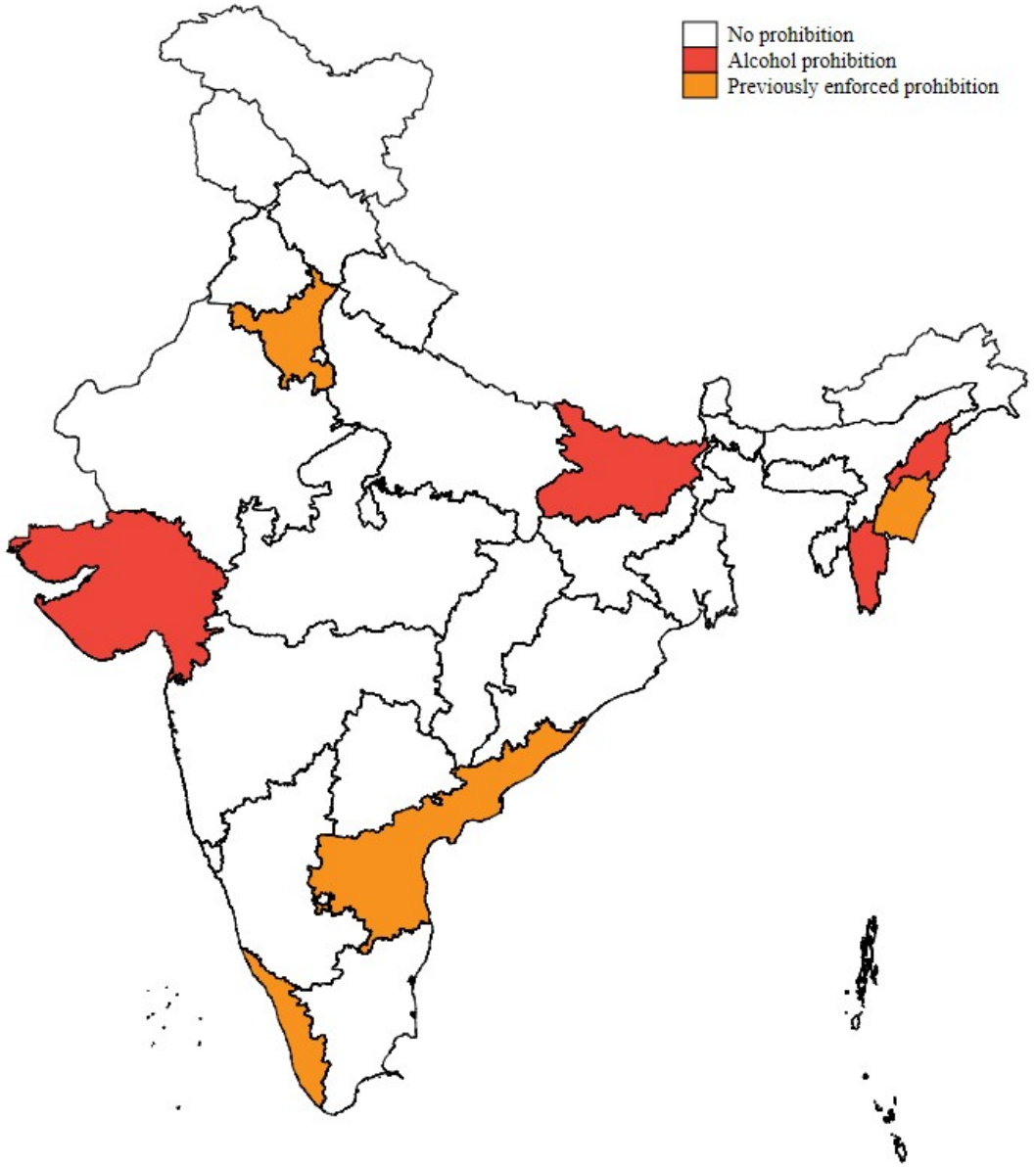
Adopted written national policy on alcohol



Source: WHO (2023) Dashboard "*Adopted written national policy on alcohol*". Retrieved October 2023 from https://www.who.int/data/gho/data/indicators/indicator-details/GHO/adopted-written-national-policy-on-alcohol

Alcohol prohibition in India

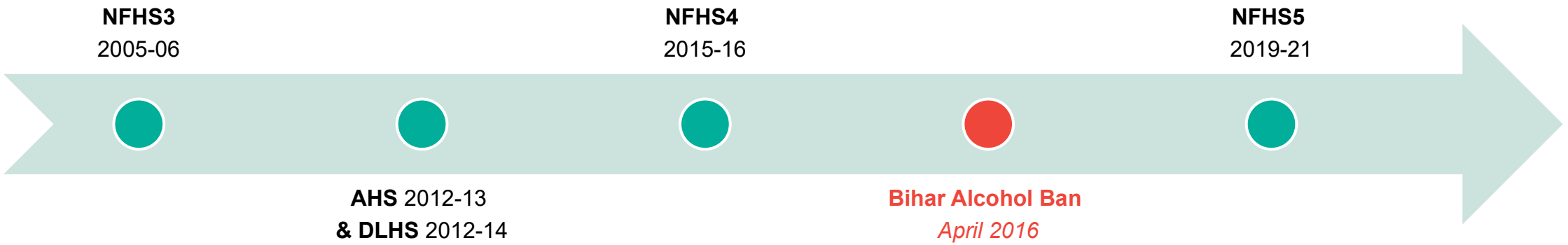
- In April 2016, **Bihar** banned the complete manufacture, transport, sale, and consumption of alcohol.
- Several studies have examined the effect of the ban on crime, and domestic violence.[1]
- No study has examined the health effects of the alcohol ban in Bihar.



[1]Debnath et. al., 2023; Eashwar et. al., 2020; Chaudhuri et. al., 2018

Data

- Indian National Family Health Surveys –
  - 2005-06 (NFHS3), 2015-2016 (NFHS4) and 2019-2021 (NFHS5)
- Additional state representative data
  - 2012-13 Annual Health Survey & the 2012-14 District Level Household Survey.



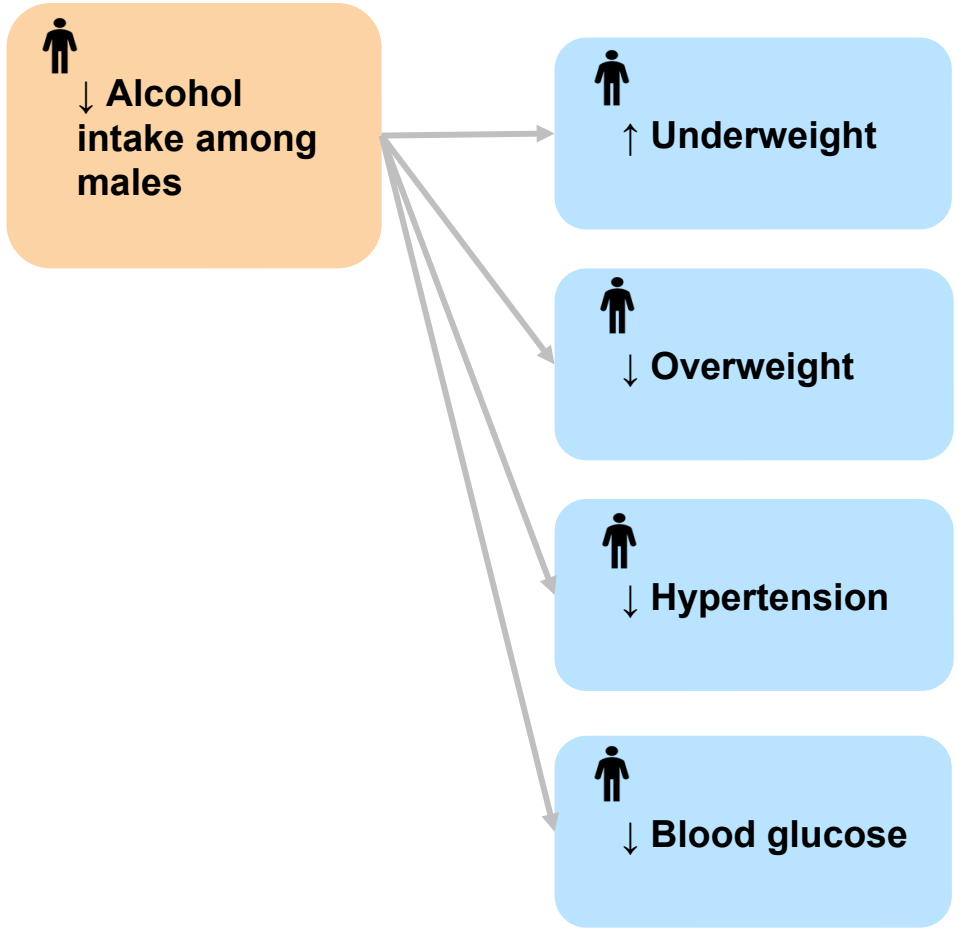
Impact on alcohol consumption

- Did the ban lead to a reduction in alcohol intake?
  - **At least weekly alcohol intake:** consuming alcohol either “almost every day” or “about once a week”.

Impact on health outcomes among males in Bihar

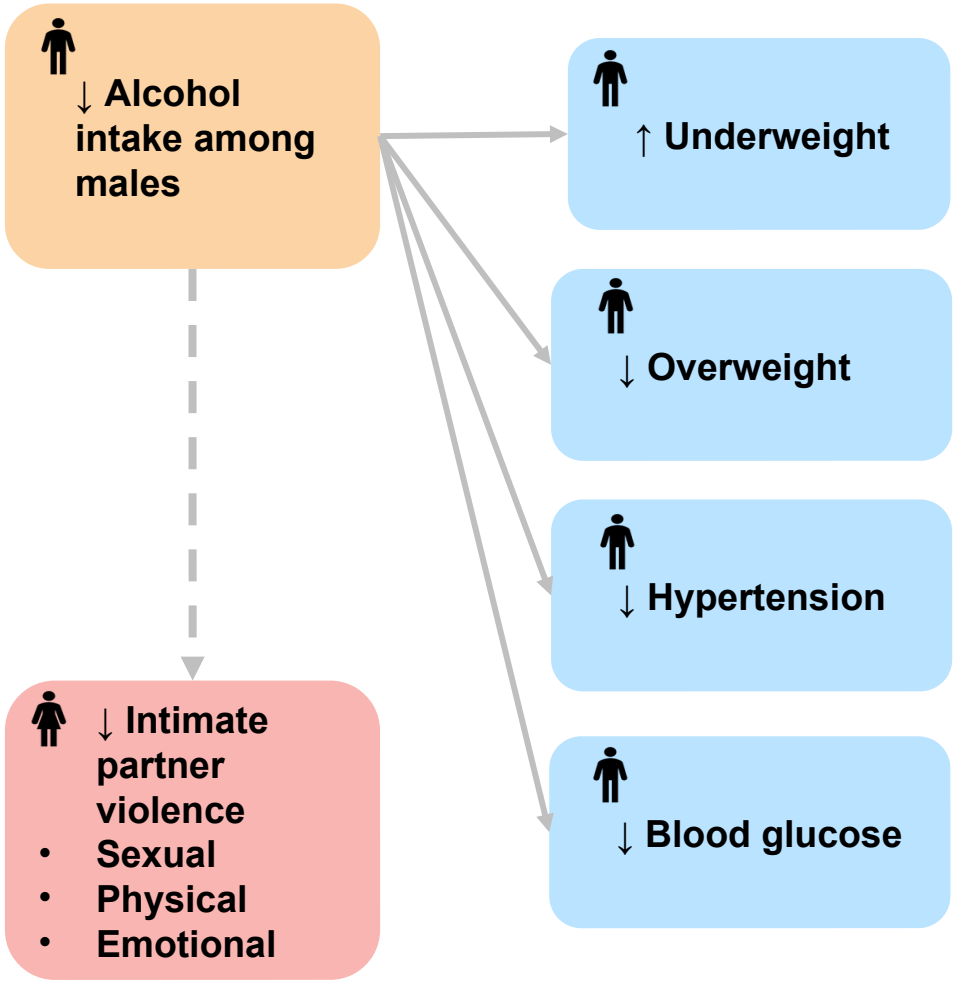
- Did the ban lead to a reduction in alcohol intake?
- Did this reduction influence health outcomes among males?

  - **Underweight:** body mass index ≤18.5 kg/m2
  - **Overweight/obesity:** body mass index ≥23 kg/m2 per the guidelines for Asian populations
  - **Hypertension:** average systolic blood pressure ≥140 or diastolic blood pressure≥90 mmHg.
  - **High blood glucose:** random blood glucose >140 mg/dl.



Impact on IPV among females in Bihar

- Did the ban lead to a reduction in alcohol intake?
- Did this reduction influence health outcomes among males?
- Did this reduction contribute to reduced violence among females?
    - **emotional violence:** humiliation, threats, or insults
    - **physical violence:** pushing, arm twisting, slapping, punching, kicking, choking, attacks with objects or weapons
    - **sexual violence:** forced sexual acts or intercourse



Individual and household level covariates

- Individual: age, education, cigarettes or bidis smoked daily
- Household: residence, access to health insurance, family size, religion, caste, BPL and wealth index

Difference – in – difference model (DID)

- Timing and location of the ban is treated as a natural (quasi) experiment
- Treatment group Bihar v/s comparison group neighboring Indian states (Uttar Pradesh, Jharkhand, West Bengal)
- DID models provide average treatment effect estimates in our analyses.

Triple difference model (DDD)

- <1% of females in Bihar, and its neighboring states combined, consumed alcohol before and after the ban.
- Third axis of comparison to implement a triple difference (DDD) model.
- Useful when no direct impact of the ban on females - health outcomes

Significant reduction in alcohol intake among males in Bihar

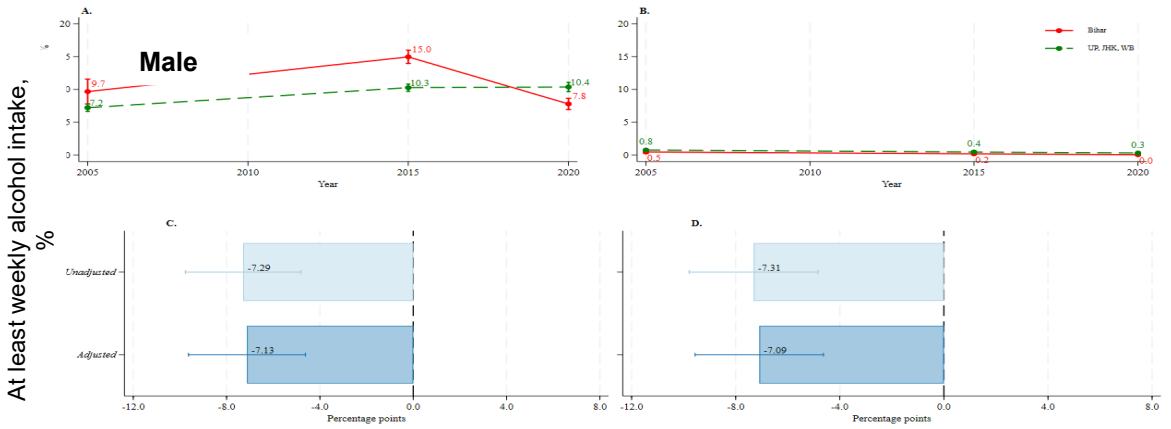
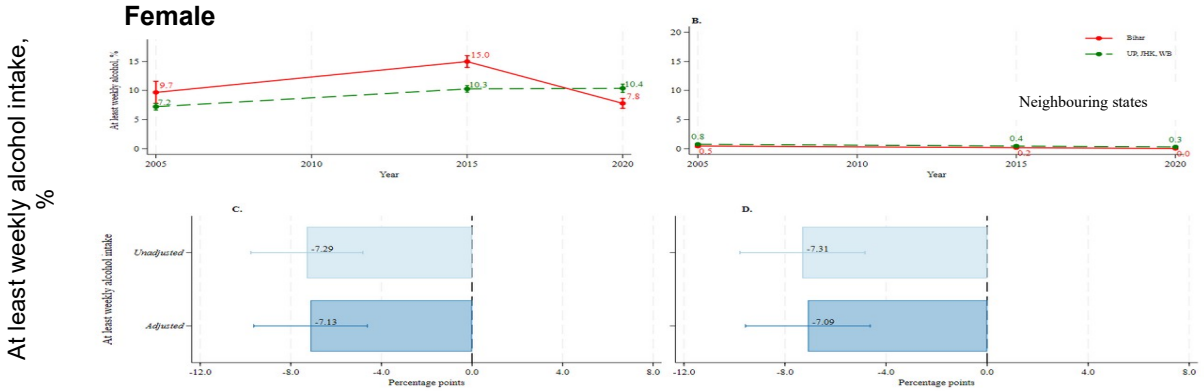


Figure 2. Parallel trends (2005-21) and change (2015-2021) in at least weekly alcohol consumption
Parallel trend among males (A) and females (B) in estimated at least weekly alcohol consumption between 2005-21. Coefficient plots (C and D) are the estimated intent to treat (ITT) effect between 2015-21, with robust standard errors, clustered at district level. Adjusted model controls for age, urban residence, education, number of cigarettes/bidis smoked, health insurance, family size, religion, caste, below poverty line card, and household wealth characteristics. All estimates are from the National Family Health Surveys and weighted using individual weights for males and females, respectively.



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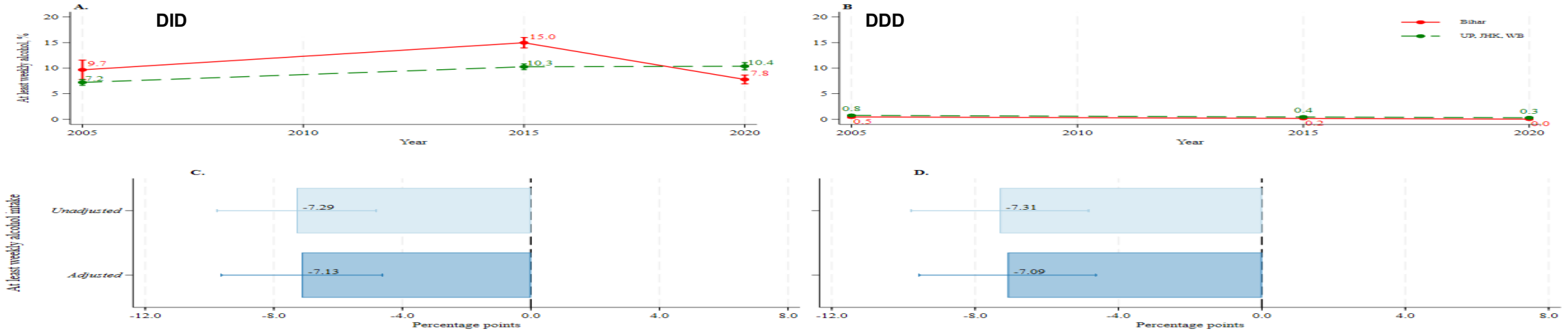
- The validity of DID estimation rests on parallel trends.
- After the ban, trends in alcohol consumption ***reversed in Bihar.***
- Alcohol consumption was ***virtually absent among females*** - a natural control group.

At least weekly intake of alcohol decreased by 7pp



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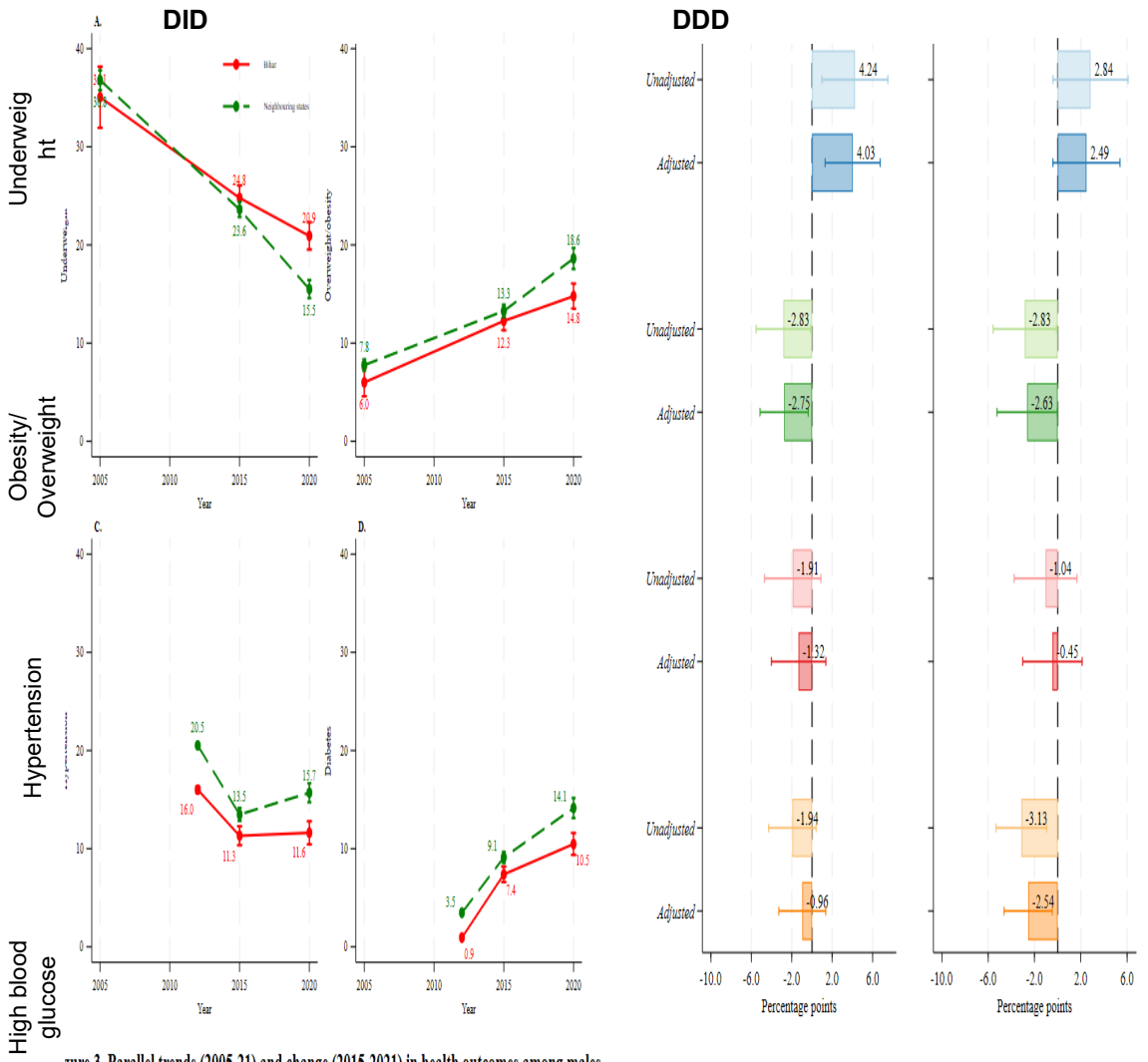
- Unadjusted model saw a ***decline*** for males in Bihar after the ban.
- Fully adjusted model also saw a ***decline.***
- Similar findings in the DDD.

Note: DID and DDD models with robust standard errors, clustered at district level. Adjusted model controls for age, urban residence, education, number of cigarettes/bidis smoked, health insurance, family size, religion, caste, below poverty line card, and household wealth characteristics. All estimates are from the National Family Health Surveys and weighted using individual weights for males and females, respectively.

Relative reduction in overweight and high blood glucose among males

- The DDD model - ***significant relative decline in obesity***, but not in underweight.
- DID and DDD models - reduction in ***hypertension***, but not statistically significant.
- DDD model – ***high blood glucose*** saw a significant relative reduction.



gure 3. Parallel trends (2005-21) and change (2015-2021) in health outcomes among males

rallel trends in underweight (A), overweight/obesity (B), hypertension (C), and diabetes (D) between 2005-21 among males. Coefficient plots (E and F) are the estimated intent to treat effects for the difference-in-difference model and triple difference model, respectively, between 2015-21, with robust standard errors, clustered at district level. Adjusted model controls for age, urban residence, education, number of cigarettes/bidis smoked, health insurance, family size, religion, caste, below poverty line card, and household wealth characteristics. All estimates are from the National Family Health Surveys and weighted using individual weights for males.

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Relative decrease in emotional and sexual violence among females in Bihar

- DID model - relative decrease in ***emotional violence*** and ***sexual violence.***
- No significant impact on physical violence.

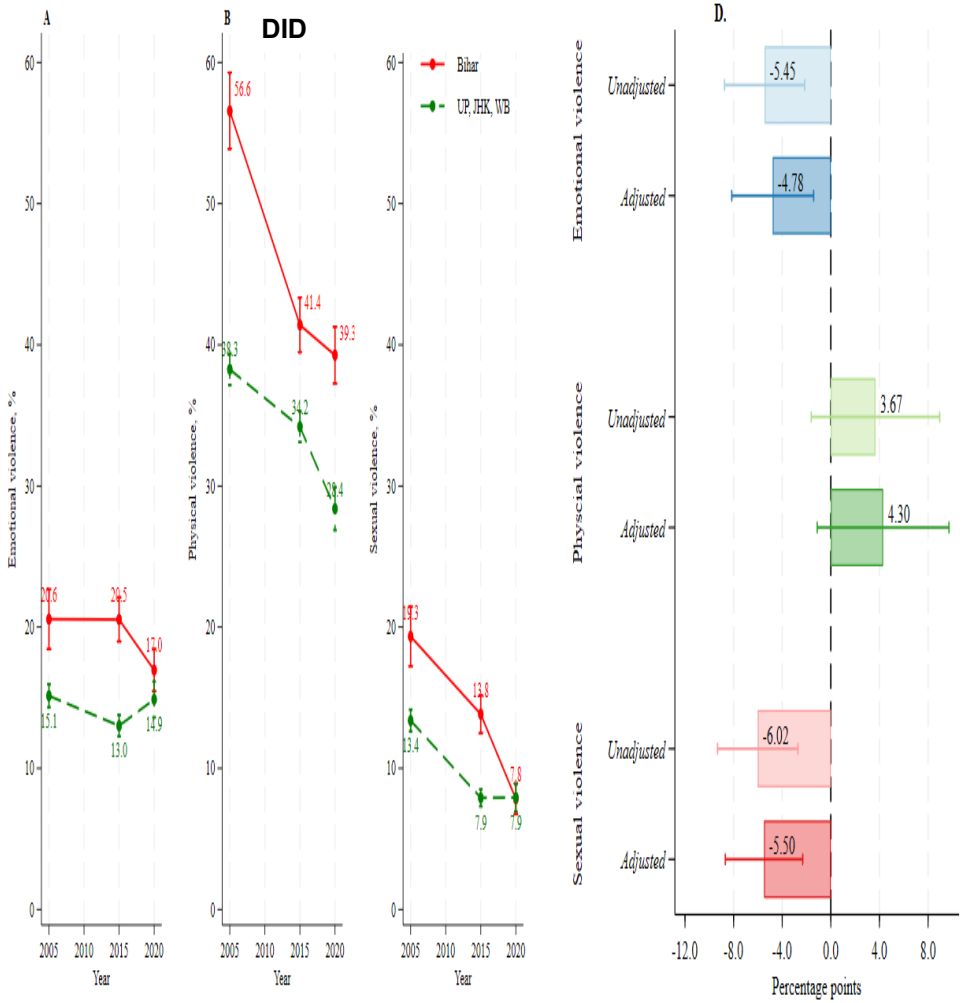
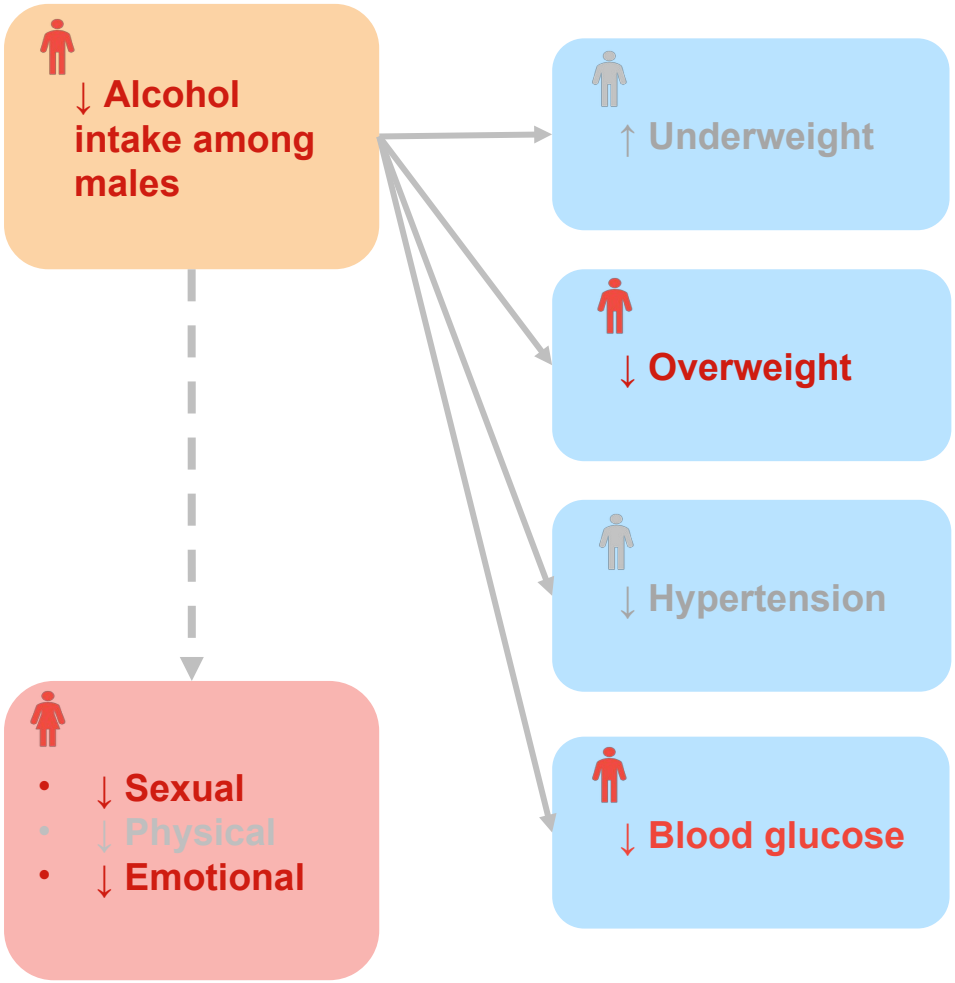


Figure 4. Parallel trends (2005-21) and change (2015-2021) in intimate partner violence outcomes among females

Parallel trends (A, B, and C) in estimated intimate partner violence outcomes between 2005-21 among females. Coefficient plot (D) are the estimated intent to treat (ITT) effect between 2015-21, with robust standard errors, clustered at district level. Adjusted model controls for age, urban residence, education, number of cigarettes/bidis smoked, health insurance, family size, religion, caste, below poverty line card, and household wealth, characteristics. All estimates are from the National Family Health Surveys and weighted using domestic violence weights.

Note: DID model with robust standard errors, clustered at district level. Adjusted model controls for age, urban residence, education, number of cigarettes/bidis smoked, health insurance, family size, religion, caste, below poverty line card, and household wealth characteristics. All estimates are from the National Family Health Surveys and weighted using domestic violence weights.

Final Takeaways



- Taken together, our results suggest that alcohol prohibition may have improved population-level health outcomes in Bihar.
- However, the sudden onset of the prohibition may have several complex ethical and health dilemmas not captured in the available data.