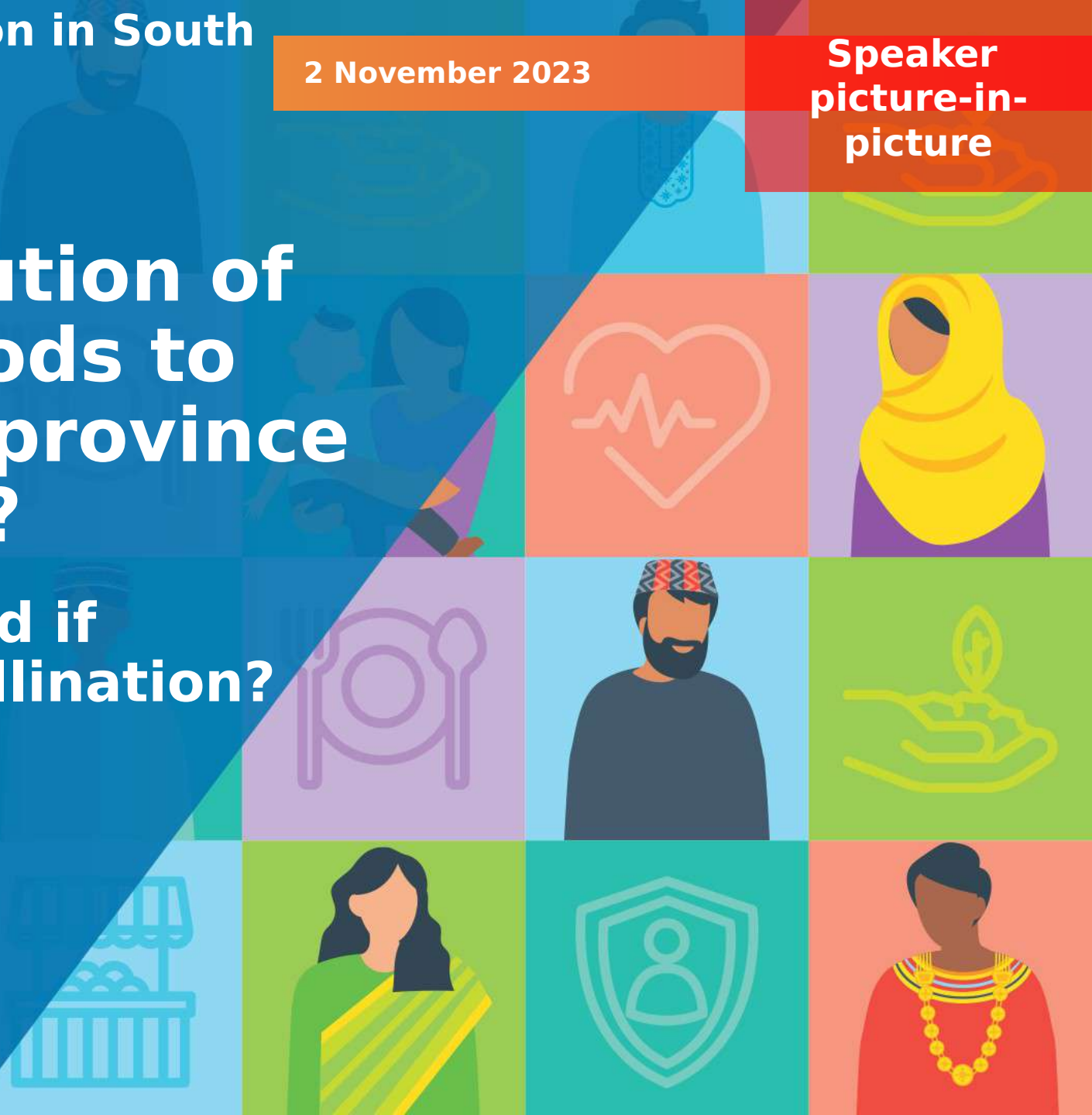


What is the contribution of insect-pollinated foods to diets in the Karnali province mountains of Nepal?

How might diets be affected if climate change reduces pollination?

Presenter: Naomi Saville

Co-authors: Tom Timberlake², Sujan Sapkota³, Santosh Giri³, Deepak Joshi³, Helen Harris-Fry⁴, Sushil Baral³, Jane Memmott²



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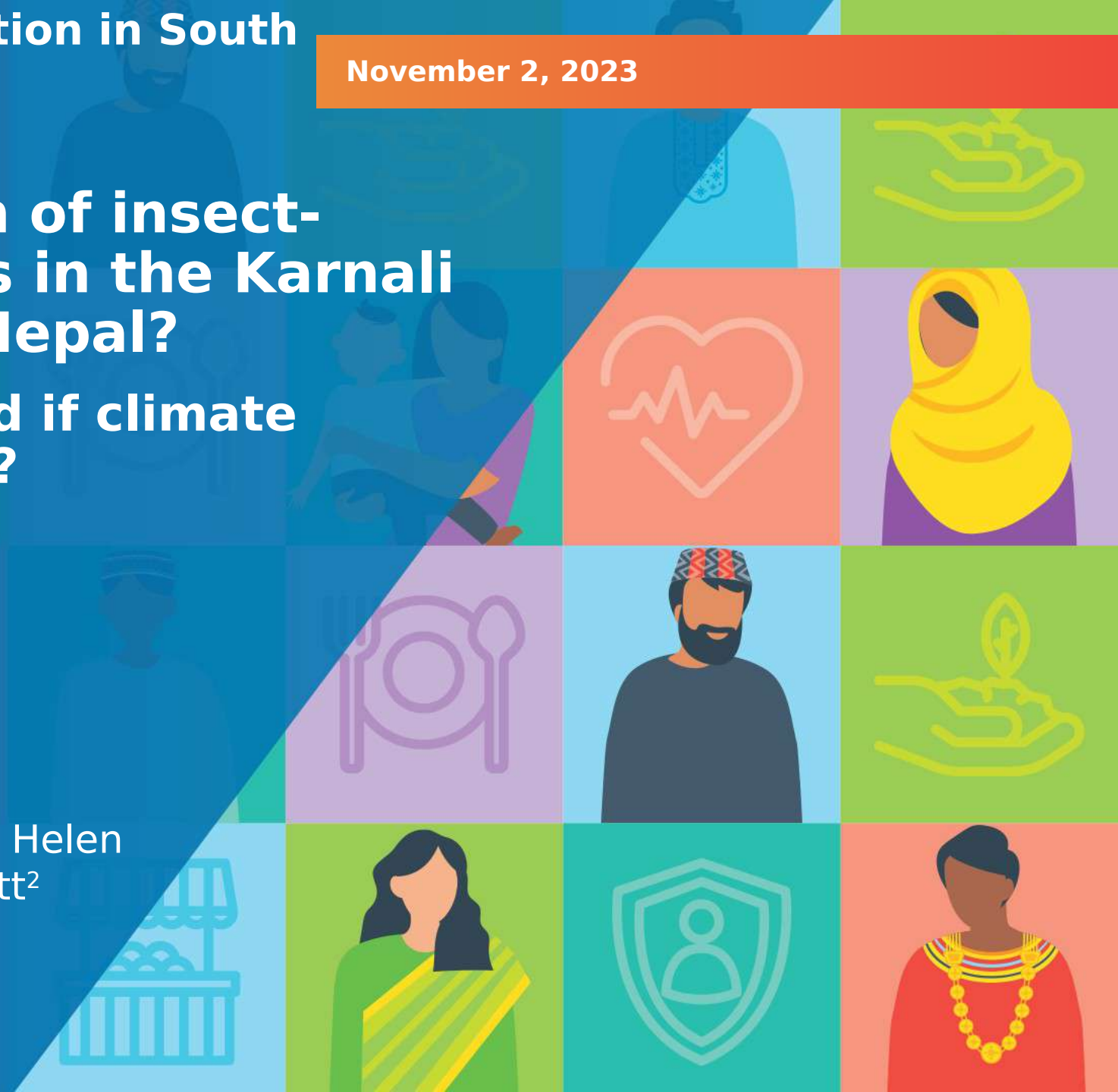
Presenter: **Naomi Saville**¹
Principal Research Associate
¹ Institute for Global Health
University College London

Co-authors: Tom Timberlake², Sujan Sapkota³, Santosh Giri³, Deepak Joshi³, Helen Harris-Fry⁴, Sushil Baral³, Jane Memmott²

² *University of Bristol*

³ *HERD international*

⁴ *London School of Hygiene and Tropical Medicine*



Rationale / Objectives of the Micropoll study

- Nutritious foods (fruit, veg, seed, nuts, etc.) are highly pollinator-dependent (Eilers *et al.* 2011)
- If pollinators decline, these crops yields will fall and people will consume less fruit & veg
- Pollinator loss is predicted to increase micronutrient deficiencies and global burdens of disease (Smith *et al.* 2015. *Lancet*)

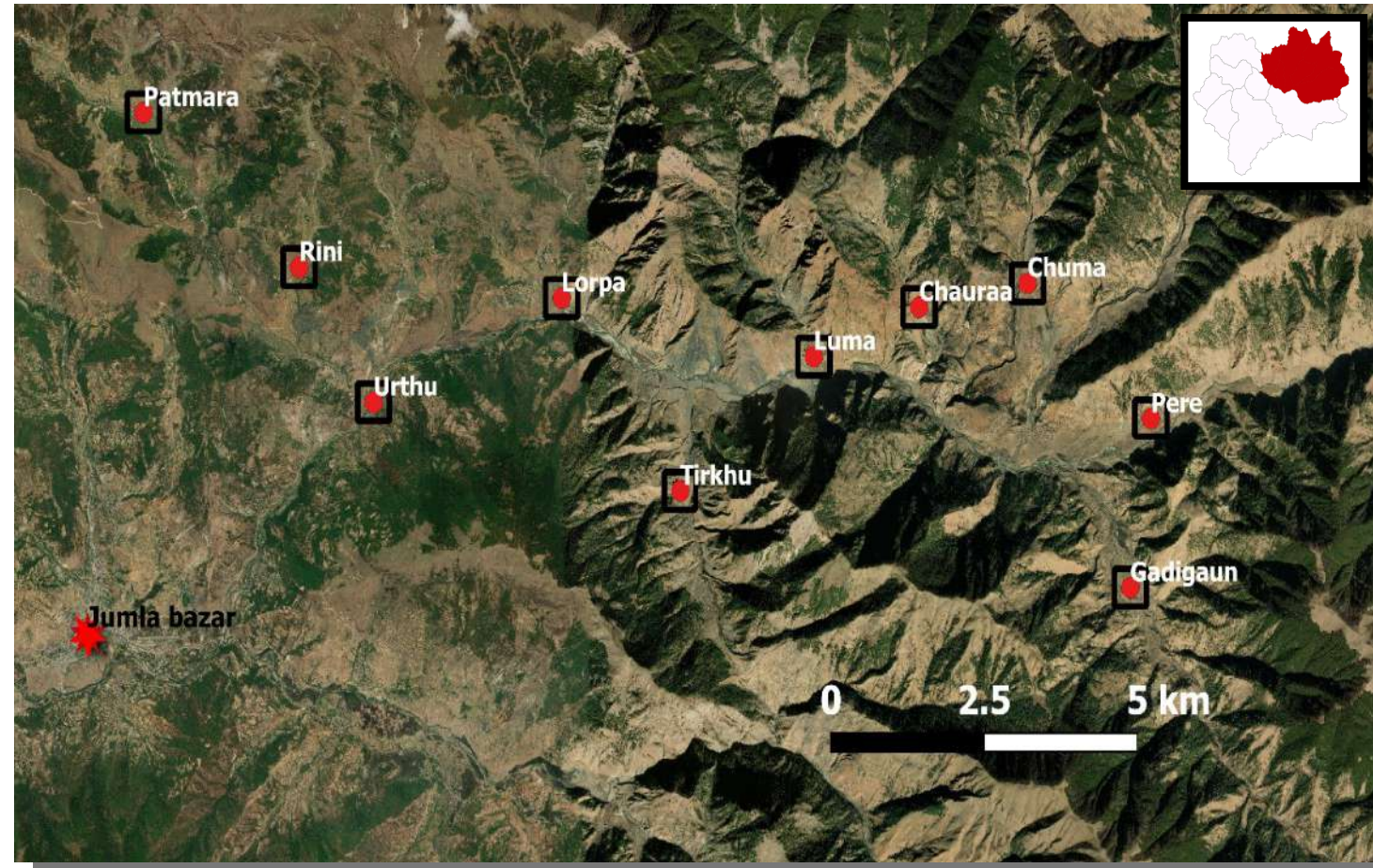
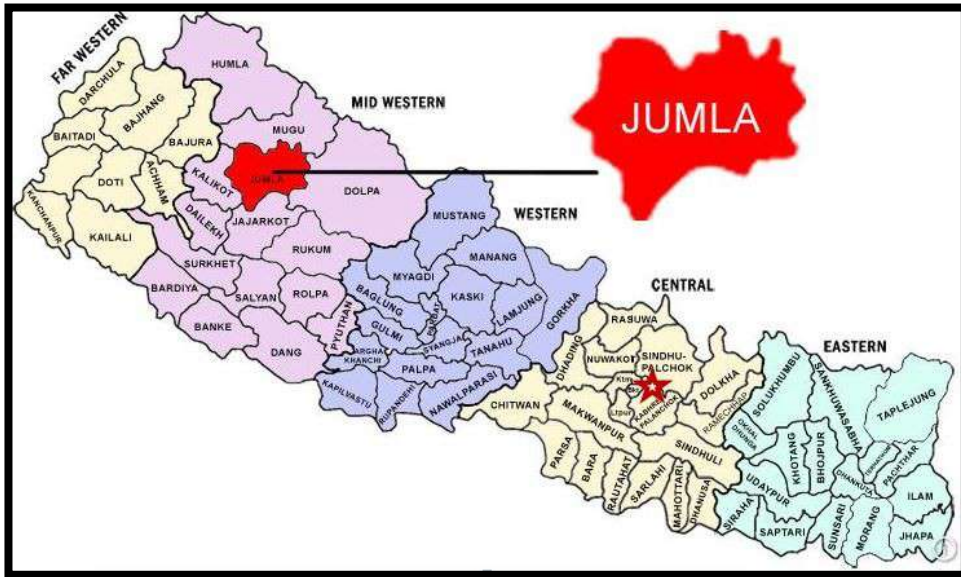
Aim: to measure the contribution of insect-pollinated foods to diets in the Nepal mountains



Micropoll study Methods:

Study site 10 villages in Jumla district,
Karnali Province, Nepal

- Remote
- Food insecure
- Altitude 2300 to 3200m



Research questions

Q1. What is the probability of adequacy of different micronutrients in the diet by population group?

Q2. What proportion of the foods consumed are insect-pollinated foods?

Q3. How pollinator dependent are nutrient intakes?

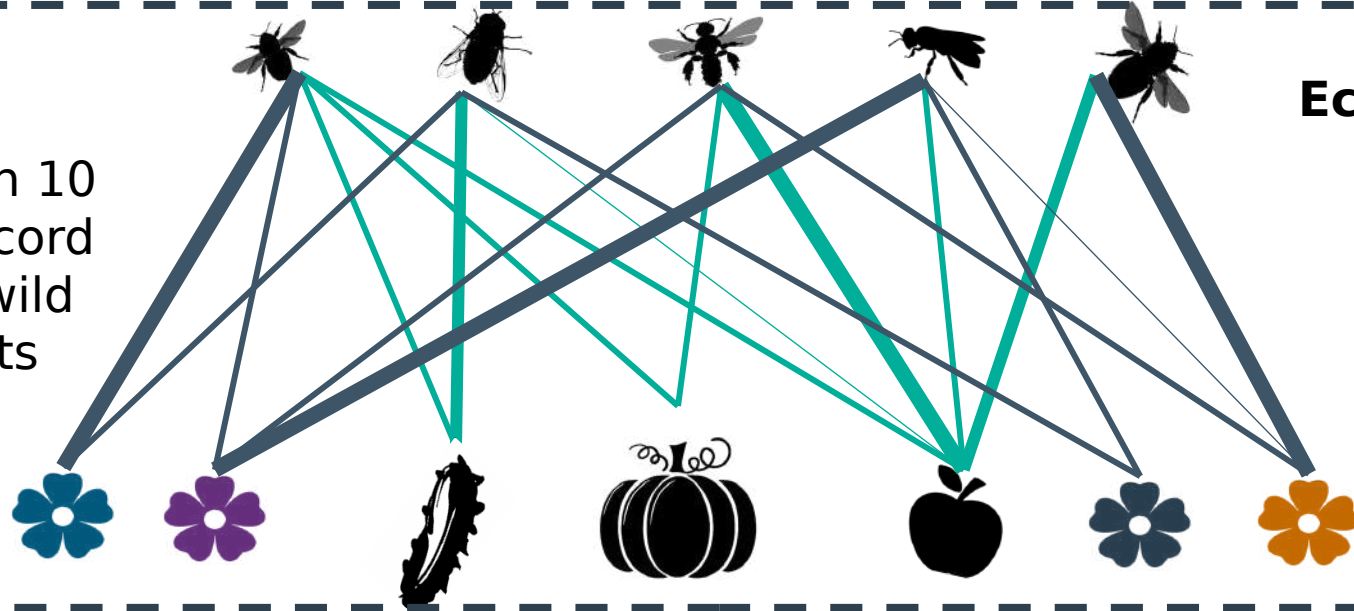
Q4. How do pollinator-dependent nutrient intakes vary by season?

Q5. Which foods provide most of the nutrients consumed in the diet and are these foods insect-pollinated?



Methods

April-Nov 2021:
Fortnightly plant-pollinator surveys in 10 study villages to record pollinator visits to wild plants



Ecology component



Plant-pollinator surveys

Nov 2021- Nov 2022
Fortnightly quantitative 24-hr dietary recalls with 776 participants in 211 households

215 - adult women

186 - adult men

190 - adolescent girls

185 - children <5 y

15,686 Total dietary recalls over 12 months (2/month)



Nutrition component

Dietary recall surveys

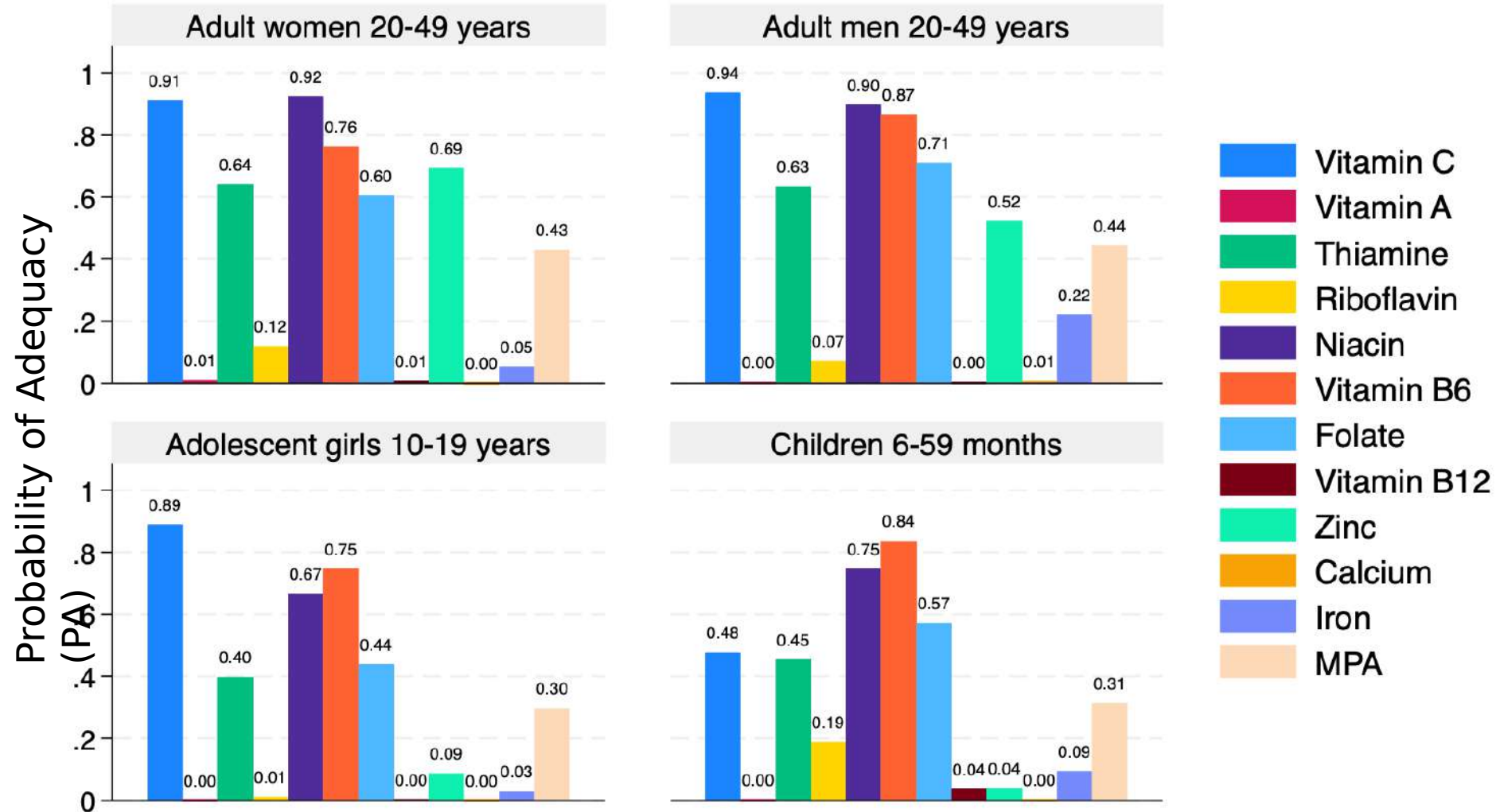


Methods / Analyses

- Used food models and conversion factors to estimate grams of intake
- Recorded standard recipes for dishes consumed
- Compiled location-specific Food Composition Table
- Estimated usual intakes by using linear prediction models on box-cox transformed accounting for intra-person variance by adjusting for respondent as a random effects
- Calculated Probability of Adequacy of 11 micronutrients using usual intakes



RESULTS: Q1: What is the probability of adequacy of different micronutrients by population group ?



Diets are very inadequate, especially for children and adolescent girls. (average 37% PA)

Problem nutrients:

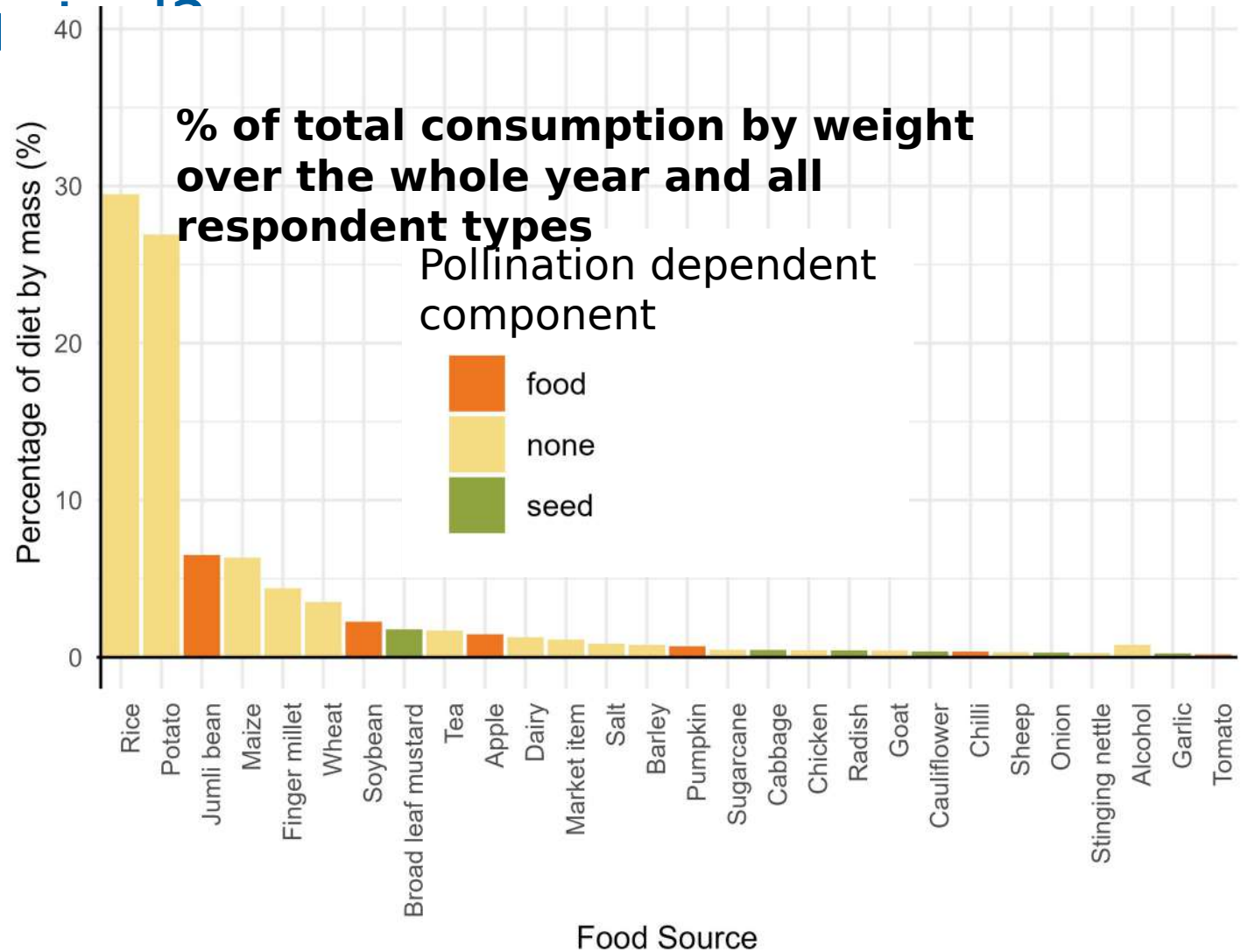
- Vitamin A
- Riboflavin
- Vitamin B12
- Calcium

Results: Q2. What proportion of foods consumed are insect-pollinated

- >55% of food intake by weight is from rice and potatoes
- Insect-pollinated Jumli beans account for ~6% intake by weight and 18% of items consumed

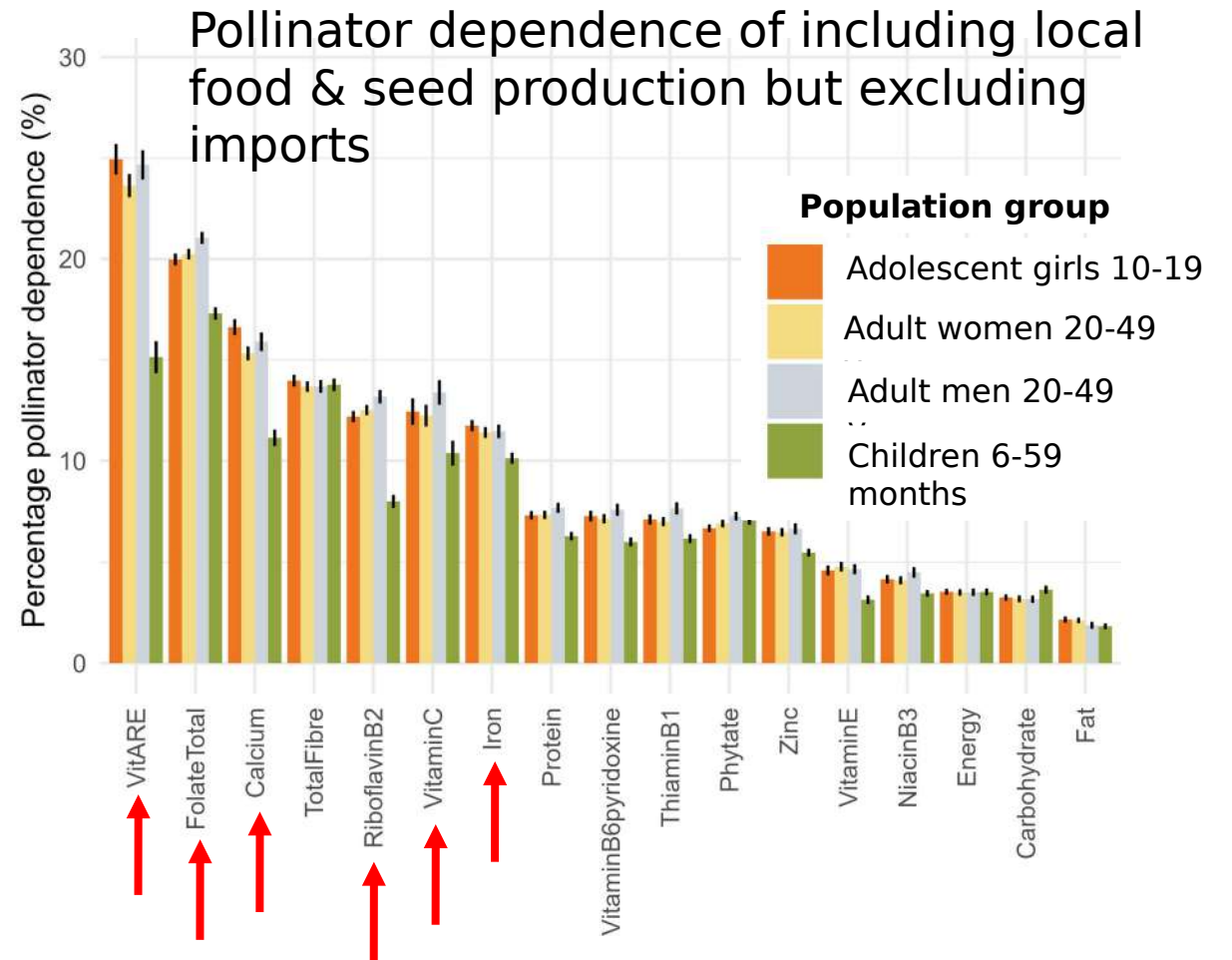
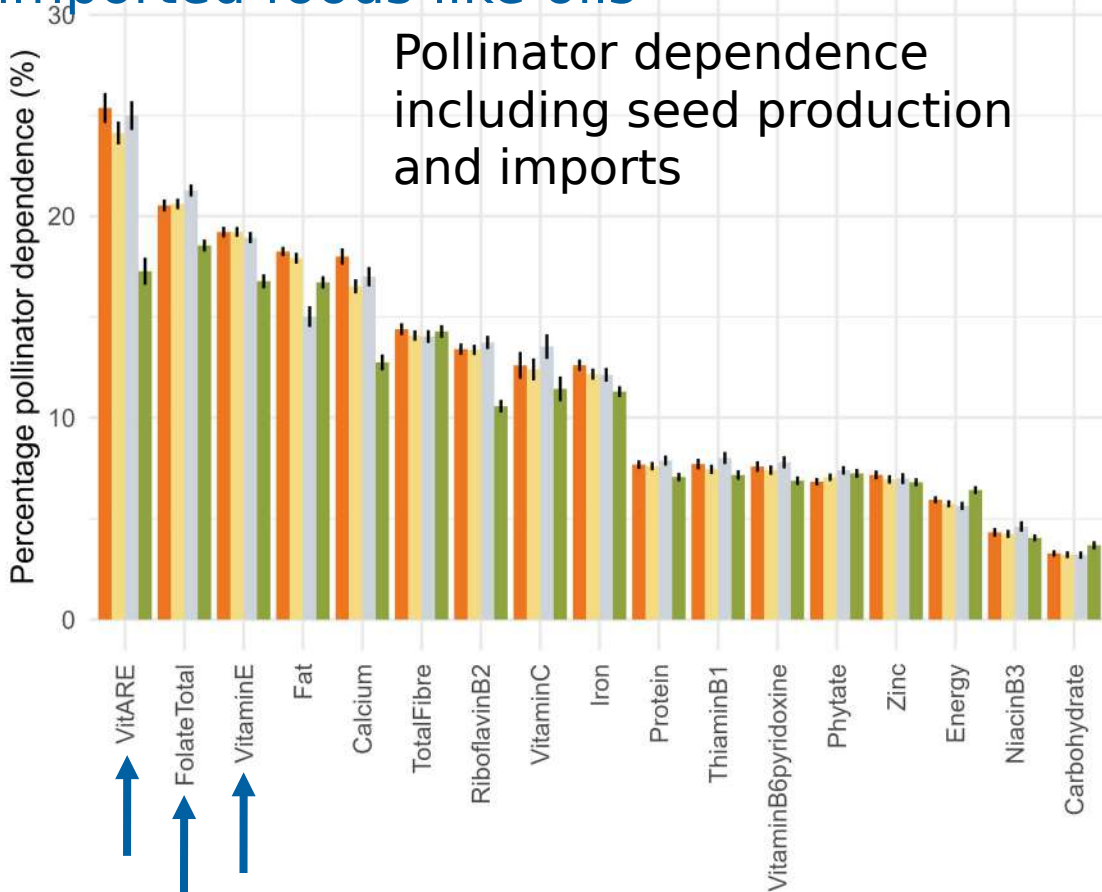
Other main pollinator dependent foods:

- Soyabeans, apple, pumpkin and chilli
- Green leafy veg and brassicas that depend on pollination for seed



Q3. How pollinator dependent are nutrient intakes?

The most pollination dependent nutrients in local foods are **Vitamin A**, Folate, **Calcium**, **Riboflavin**, Vitamin C and **Iron**
 Vitamin E & fats are more pollinator dependent when including imported foods like oils



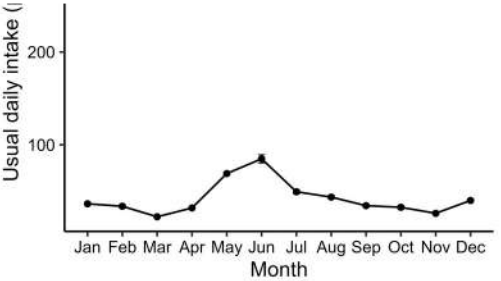
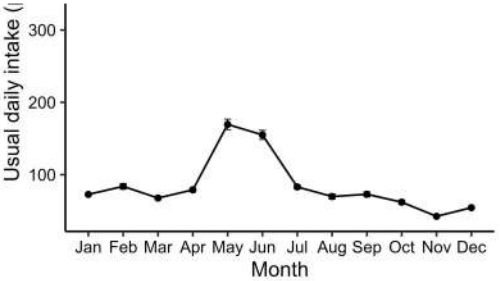
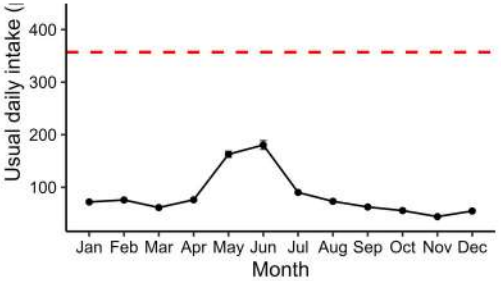
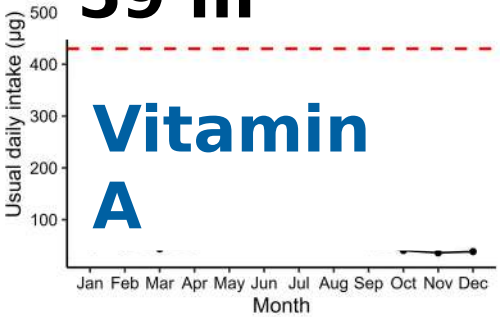
**Adolescent girl
59 m**

Adult Woman

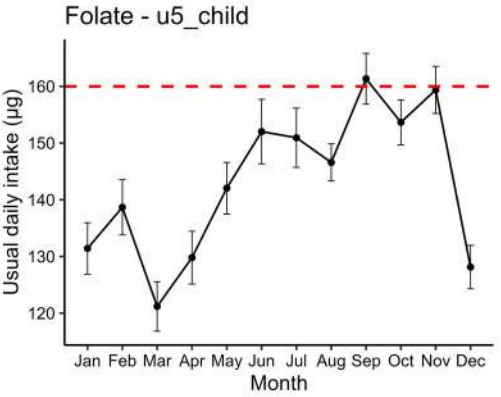
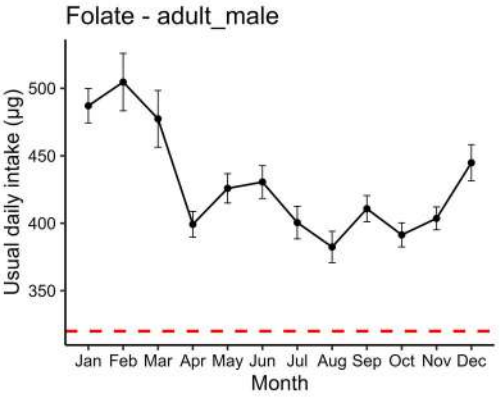
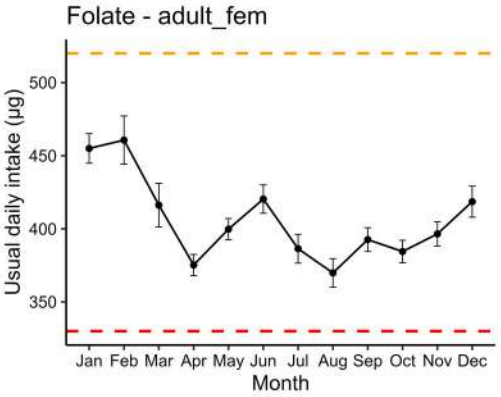
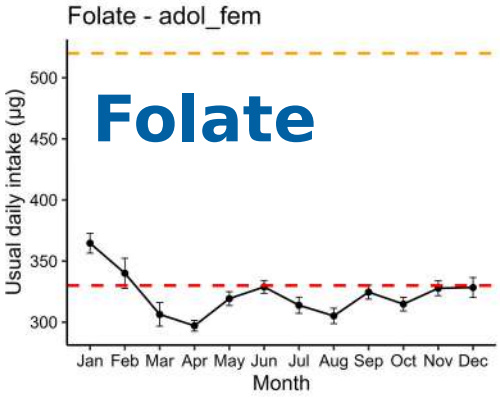
Adult Man

Child 6-

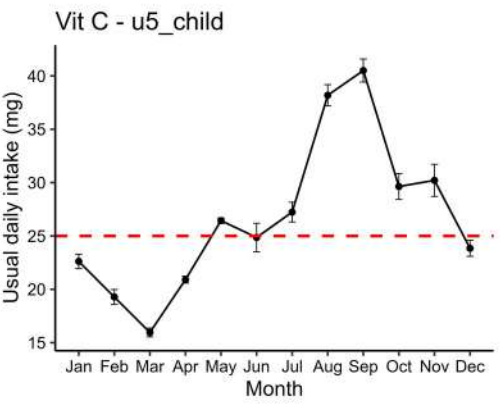
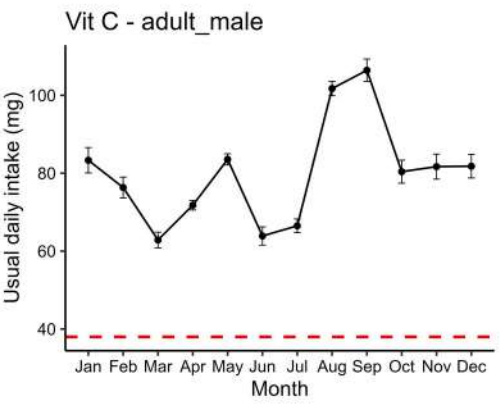
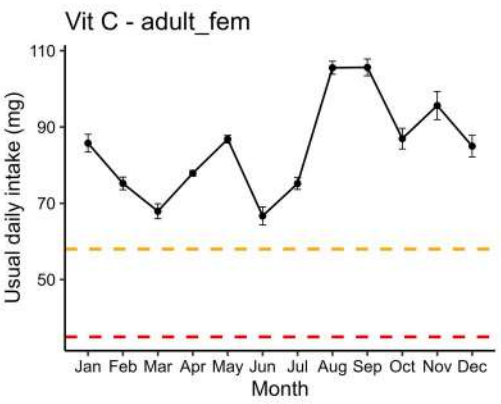
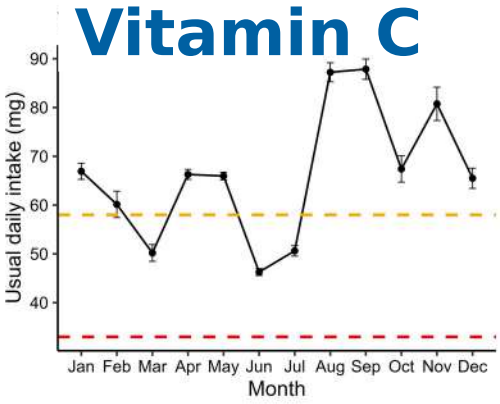
Vitamin A



Folate



Vitamin C



Q4. How do pollinator-dependent nutrient intakes vary by season?

Usual intakes of nutrients vary hugely by season or month and by respondent group

Legend
 - - - - - EAR
 - - - - - EAR for pregnant women

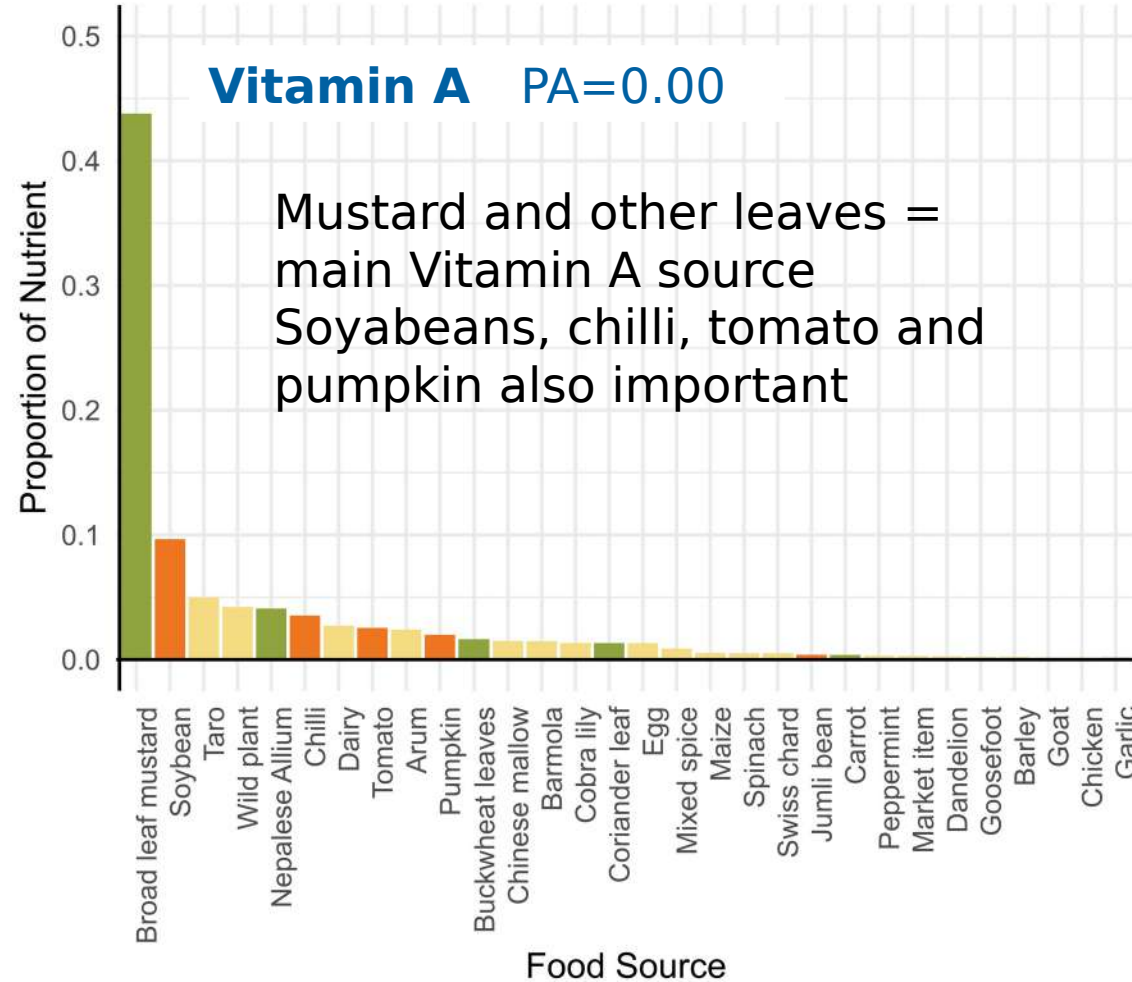
Results Q5: Which foods provide most of the nutrients consumed in the diet?

Pollination dependent component

- food
- none
- seed

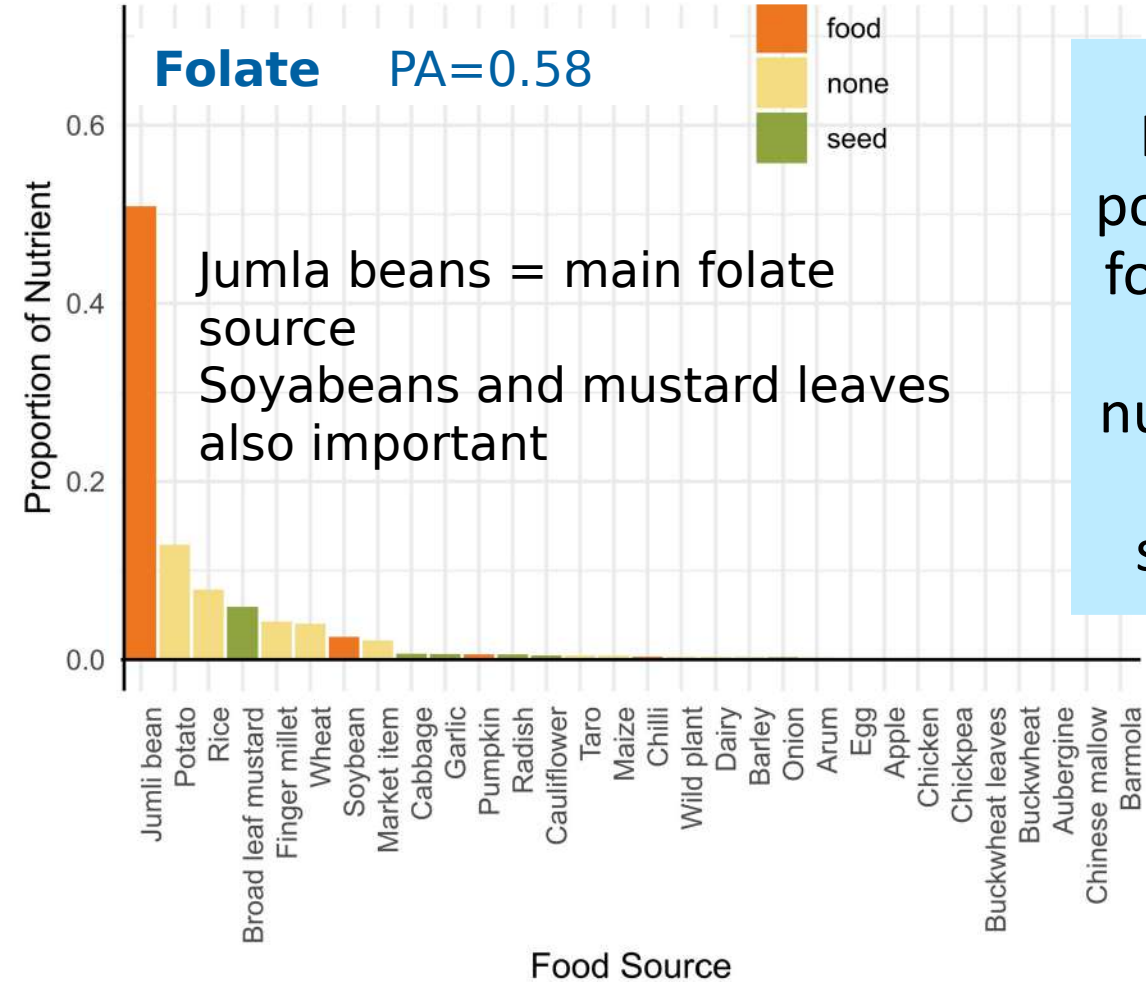
Vitamin A PA=0.00

Mustard and other leaves = main Vitamin A source
Soyabeans, chilli, tomato and pumpkin also important



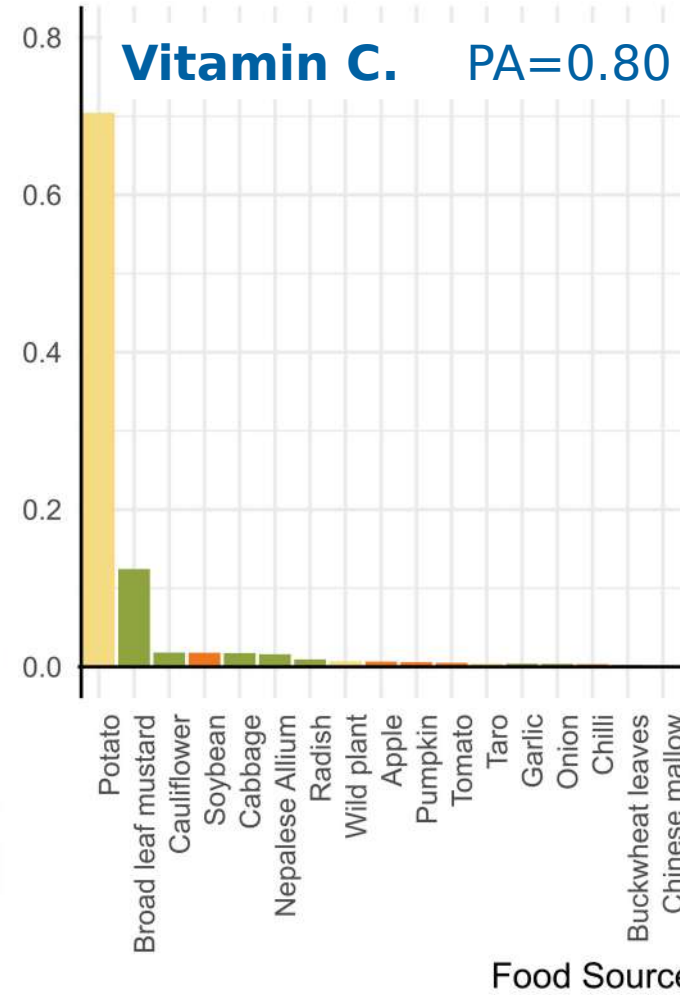
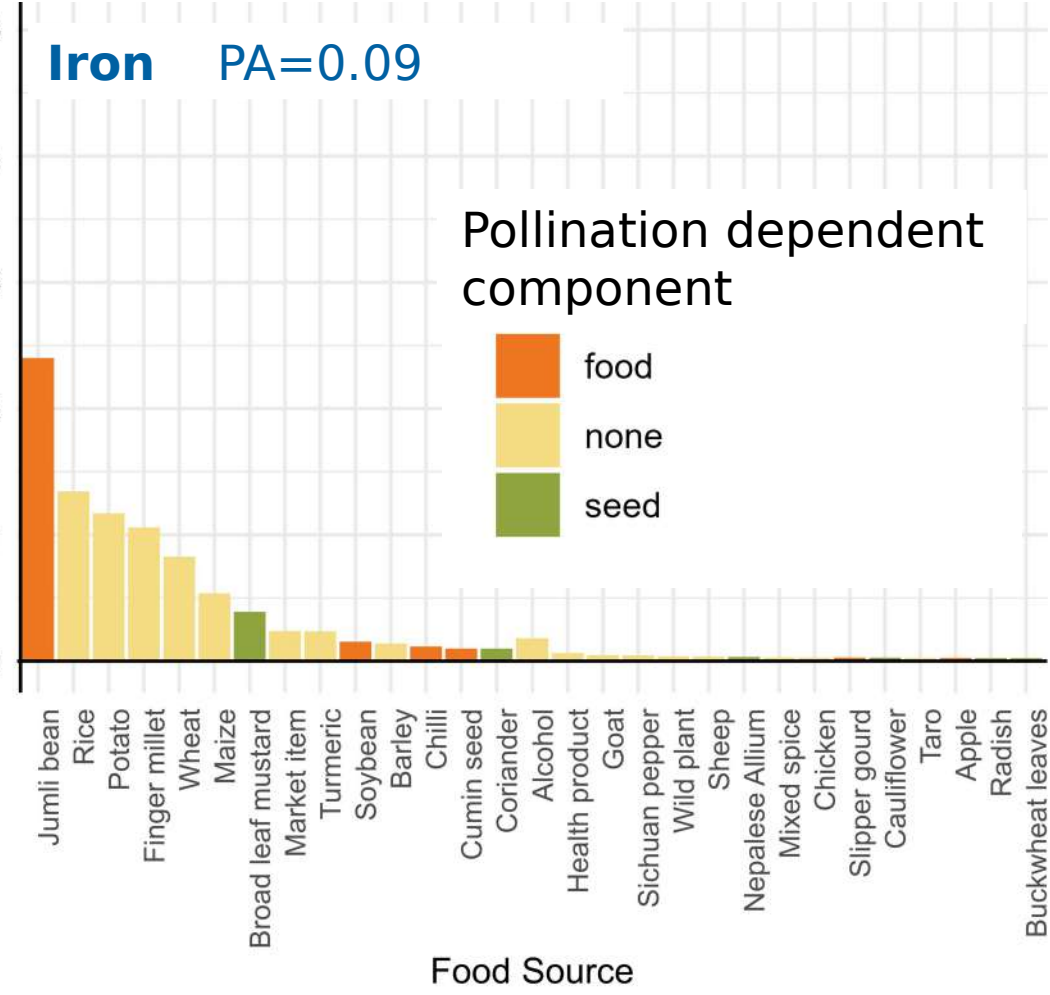
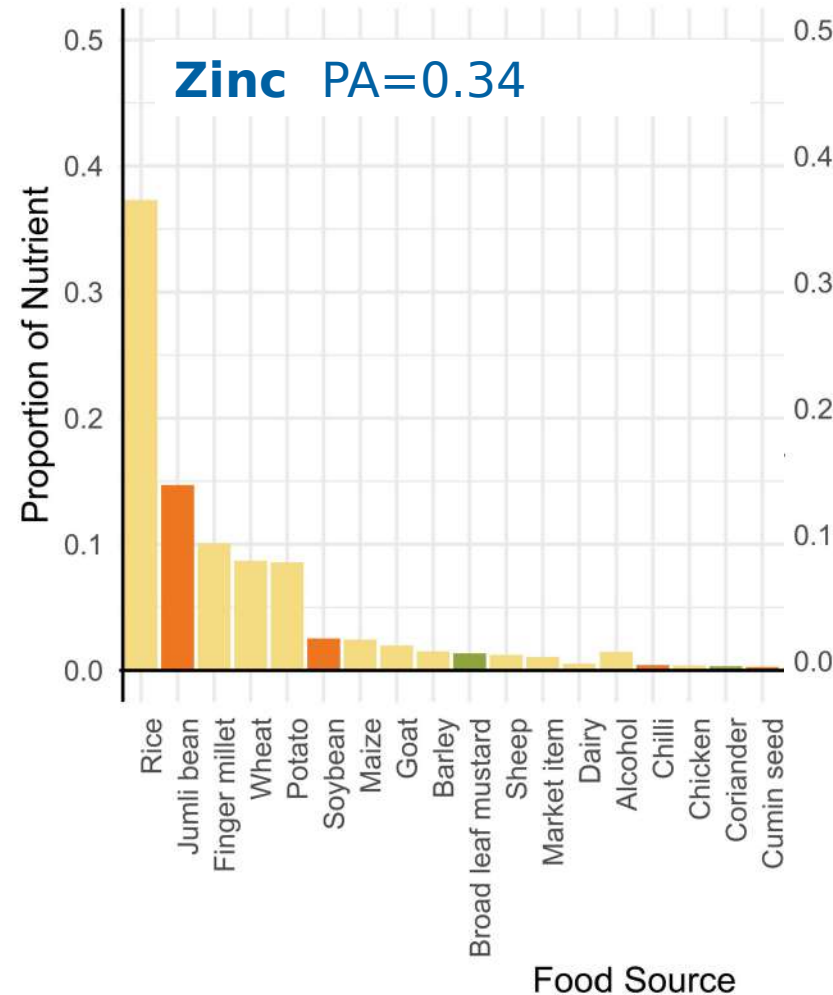
Folate PA=0.58

Jumla beans = main folate source
Soyabeans and mustard leaves also important



Insect-pollinated foods are more nutritious than staples

Locally grown staple Jumla beans accounted for most of the iron, zinc, calcium and protein consumed. Mustard leaves provided Vitamin C, iron & zinc.



Micropoll Study Implications

Climate change leads to

- ↓ pollinators
- ↓ consumption of insect-pollinated food
- ↓ dietary adequacy

Future studies should

increase production/consumption of insect pollinated foods and improve dietary adequacy:

- climate-change adapted agroecology +
- managed pollination +
- nutrition behaviour change

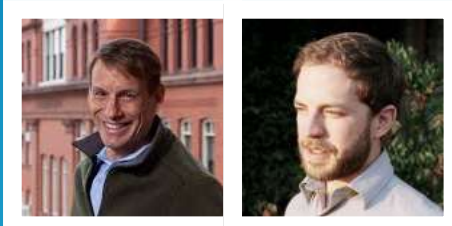
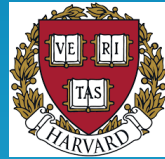




Acknowledging the Micropoll team



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University of Bristol



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Sam Myers & Matt Smith
Harvard University



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UCL & LSHTM



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University of Helsinki



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Tribhuvan University



Slide credit: Tom Timberlake