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China Rural Health Initiative – Sodium Reduction Study: the effects of a community-based sodium reduction program on 24hr urinary sodium and blood pressure in rural China

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Background

- Cardiovascular diseases are the leading cause of death in China, responsible for more than 3 million deaths each year.
- Stroke, high blood pressure and excess salt consumption (12-15g/day) highly prevalent in rural China
- Little debate about the adverse effects of salt consumption at this level, or the potential benefits of salt restriction

Objective

- To define the effects of a novel, low-cost, scalable and sustainable, community-based salt reduction strategy on salt consumption, as estimated from 24-hour urinary sodium excretion

Design

120 villages

Randomized

60 villages in intervention group

60 villages in control group

Randomized

30 villages without price subsidy

30 villages with price subsidy

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Intervention and control

- **Intervention**

  - **Health education**
    - Health belief model
      - Awareness
      - Beliefs
      - Behavior
    - Key messages
    - Implementation Strategy

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  - **Access to salt substitute**
    - Salt Substitute
      - 65-75% NaCl
      - 15-25% KCl
      - 0-10%MgSO4
    - Double cost of usual salt
    - Promotion of sales

- **Control: usual practice**

Outcomes

- Primary
  - 24h urinary sodium (90% power,11mmol/day difference)
- Secondary
  - 24-hour urinary potassium
  - Na/K ratio
  - Knowledge, attitude and practices
  - Systolic and diastolic blood pressure
  - Proportion with hypertension
- Questionnaire, examination and 24hr urine collection

Analysis

- Intention to treat, no imputation for missing value
- GEE model accounting for cluster effects
- Primary comparison of 60 intervention vs. 60 control villages
- Secondary comparison of 30 price subsidy vs. 30 no price subsidy villages
- Pre-defined subgroups – age, sex, education, BMI, smoking, alcohol

Survey data

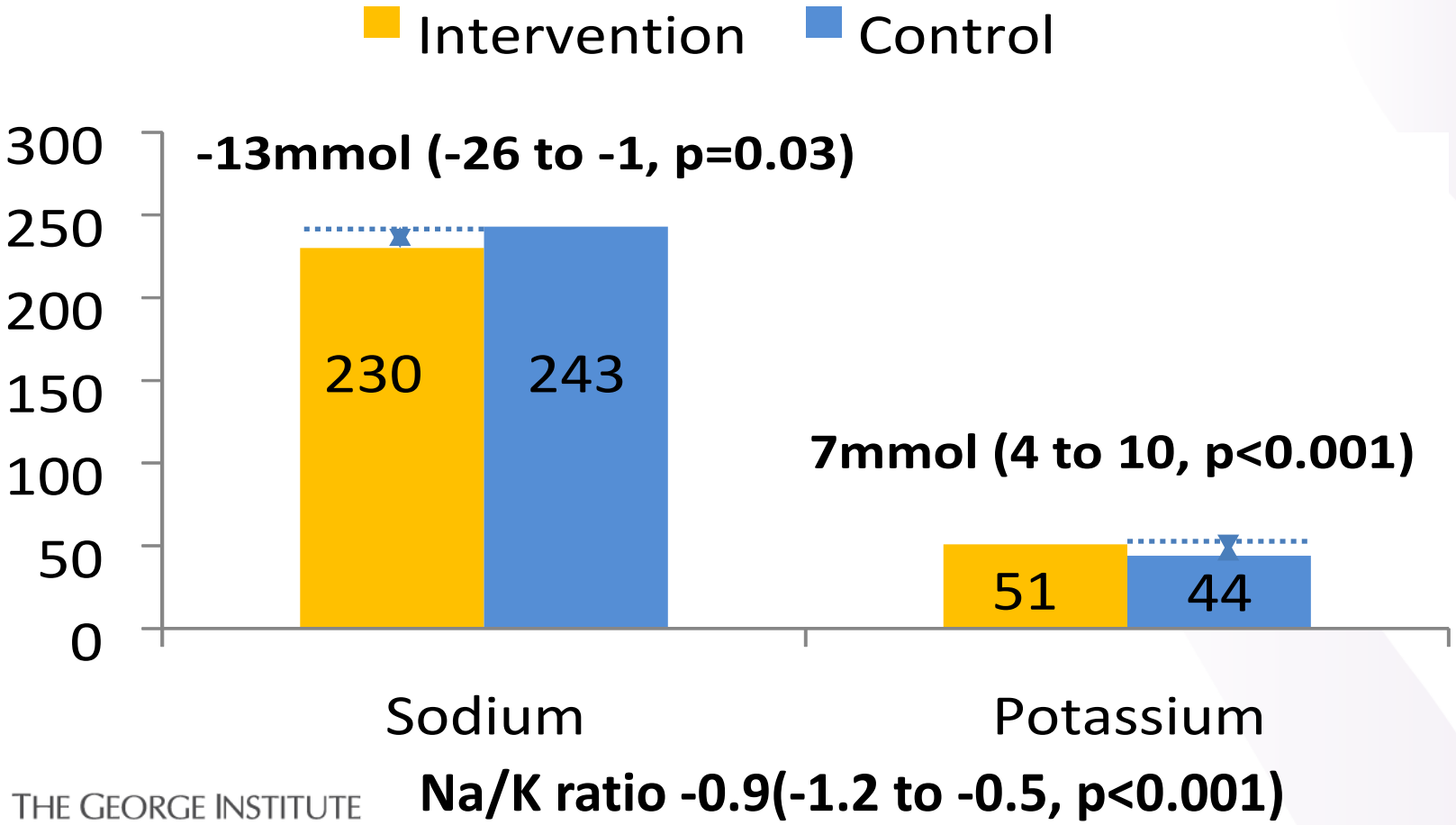
- 60 intervention villages
  - 1,295 questionnaire and examination
  - 1,063 urine sample (82%)

- 59 control villages
  - 1,272 questionnaire and examination
  - 1,001 urine sample (77%)

Characteristics of survey participants

	Intervention	Control
Female (%)	50	50
Age (years)	55	55
BMI (kg/m2)	24	24
Current smoker (%)	33	30
Drinks alcohol (%)	25	25
Education ≥9years (%)	32	31
Hypertension (%)	56	58

Effects on 24hr urinary sodium and potassium

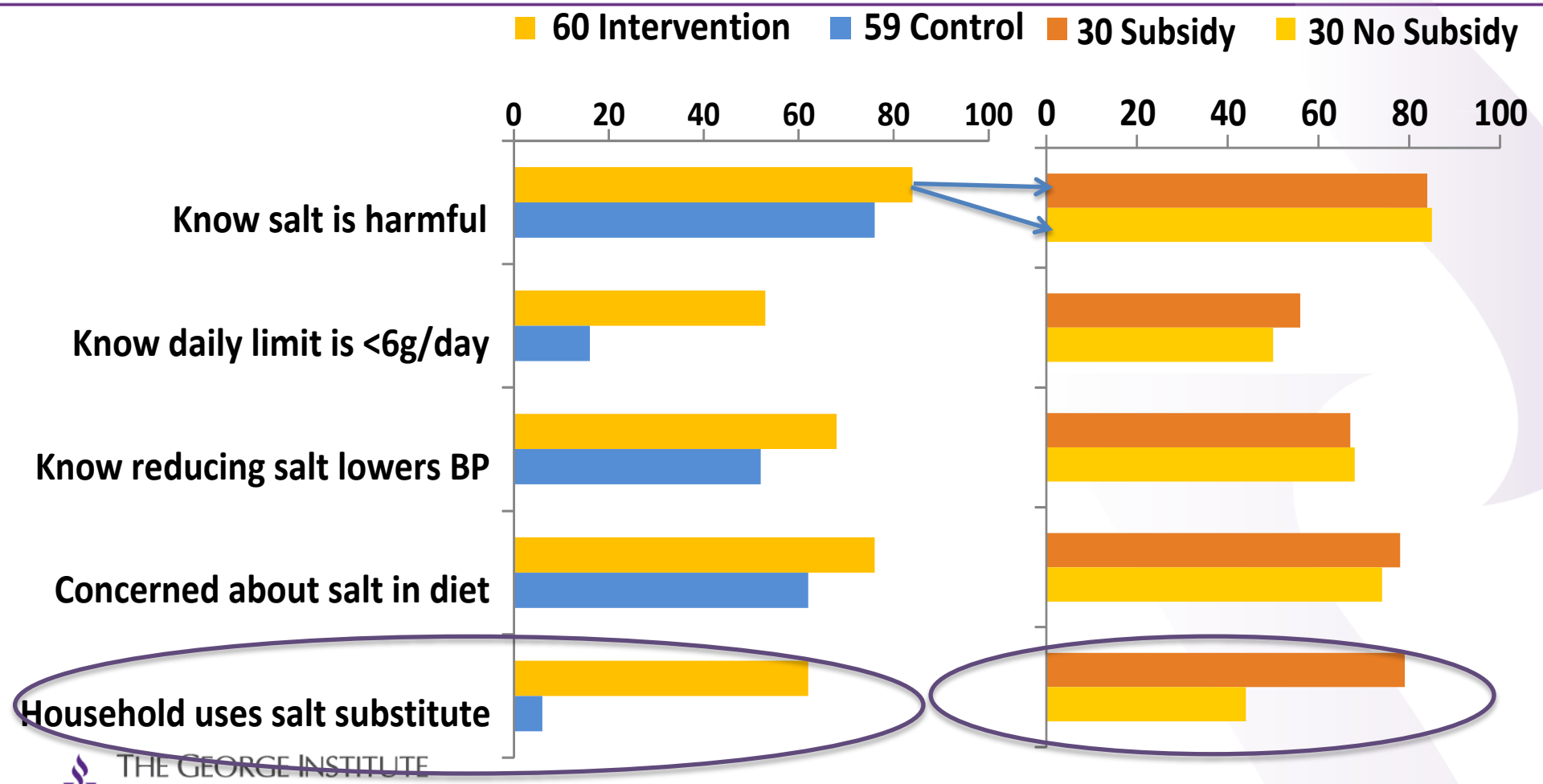


Na/K ratio -0.9(-1.2 to -0.5, p<0.001)

Effects on blood pressure outcomes

- Systolic blood pressure
  - -1.0mmHg (-3·2 to 1·2), p=0.39
- Diastolic blood pressure
  - -0·8mmHg (-2·3 to 0·8), p=0.34
- Percent with hypertension
  - -2·2% (-5·5 to 1·2), p=0.20

Effects on knowledge and behaviors



Interpretation

- 1.0g lower salt intake delivers:
  - 1.8%-2.8% reduced risk of stroke
- 13mmol sodium reduction (0.75g Salt reduction):
  - 1.4%-2.1% reduced risk of stroke
  - 1.4%-2.1% reduction of 2 million new stroke cases ≈ 28，000-42,000 strokes prevented each year in China
  - Additional effects of potassium supplementation not included.

K. Bibbins-Domingo et al.. N Engl J Med. 20 Jan, 2010

Discussion

- **Strengths**
  - Robust large scale randomized design
  - Excellent statistical power for primary outcome
  - Gold standard 24 hour urine collections
  - Simple, low-cost, scalable intervention
- **Weakness**
  - Limited power for secondary blood pressure and hypertension outcomes

Conclusions

- Anticipated effects on sodium excretion were achieved
- Effects appear to have been driven primarily by use of the salt substitute (through provision of education and access)
- Subsidization of the price of salt substitute was important for uptake
- Salt substitution has significant potential to reduce the large burden of blood-pressure related disease in rural China

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