NUS National University of Singapore | Saw Swee Hock School of Public Health

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# The SHAYP study

**S**upporting **H**ousehold he**A**lth through famil**Y**-led **P**romotion (SHAYP)

# Empowering young adults to lead household sodium reduction:

## *Family-wide changes in dietary knowledge, attitudes, and behaviors following a novel online intervention in Singapore*


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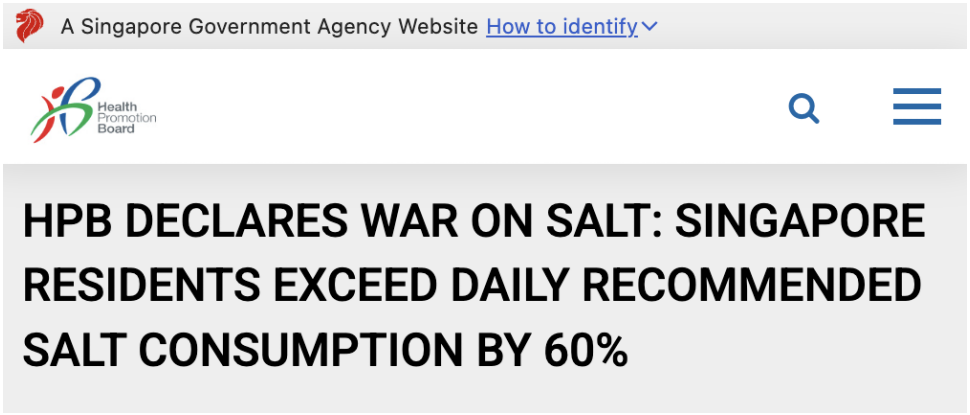
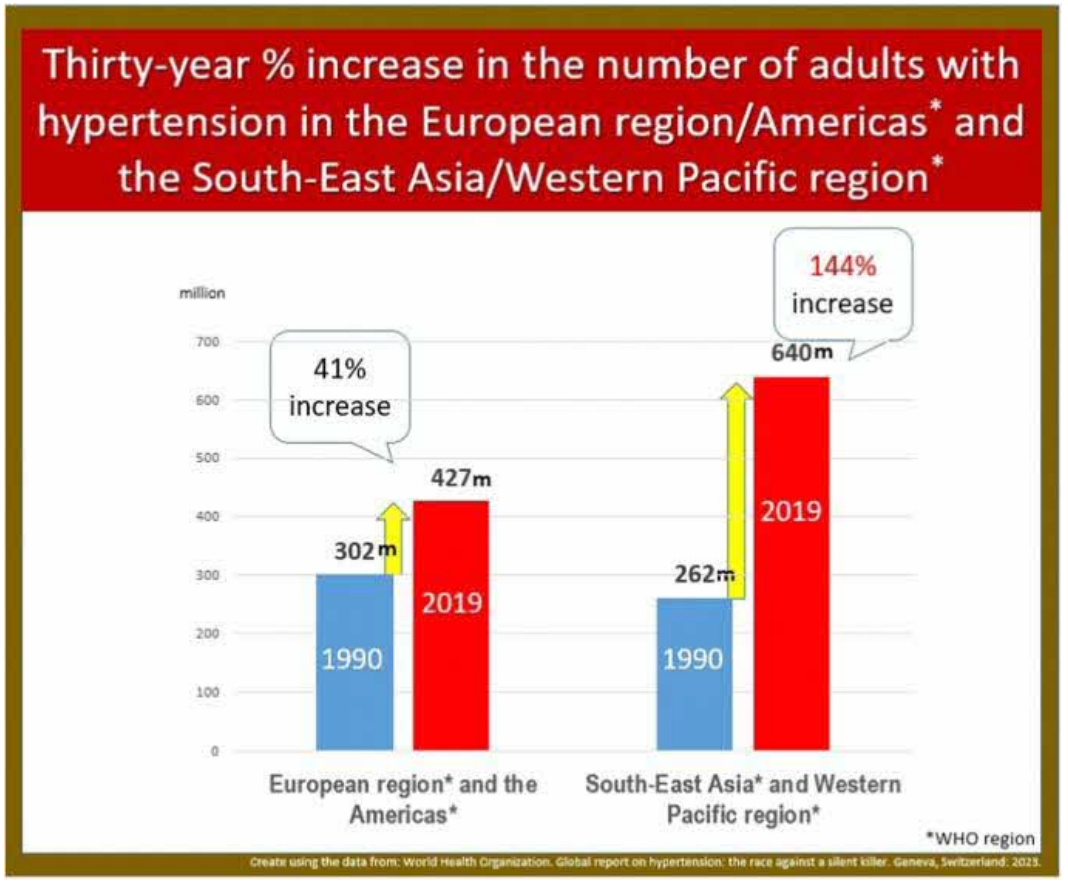
## Globally … and SG

**Growing burden of hypertension, diabetes, and heart disease**

In Singapore, 23 people die from cardiovascular disease every day.[1]



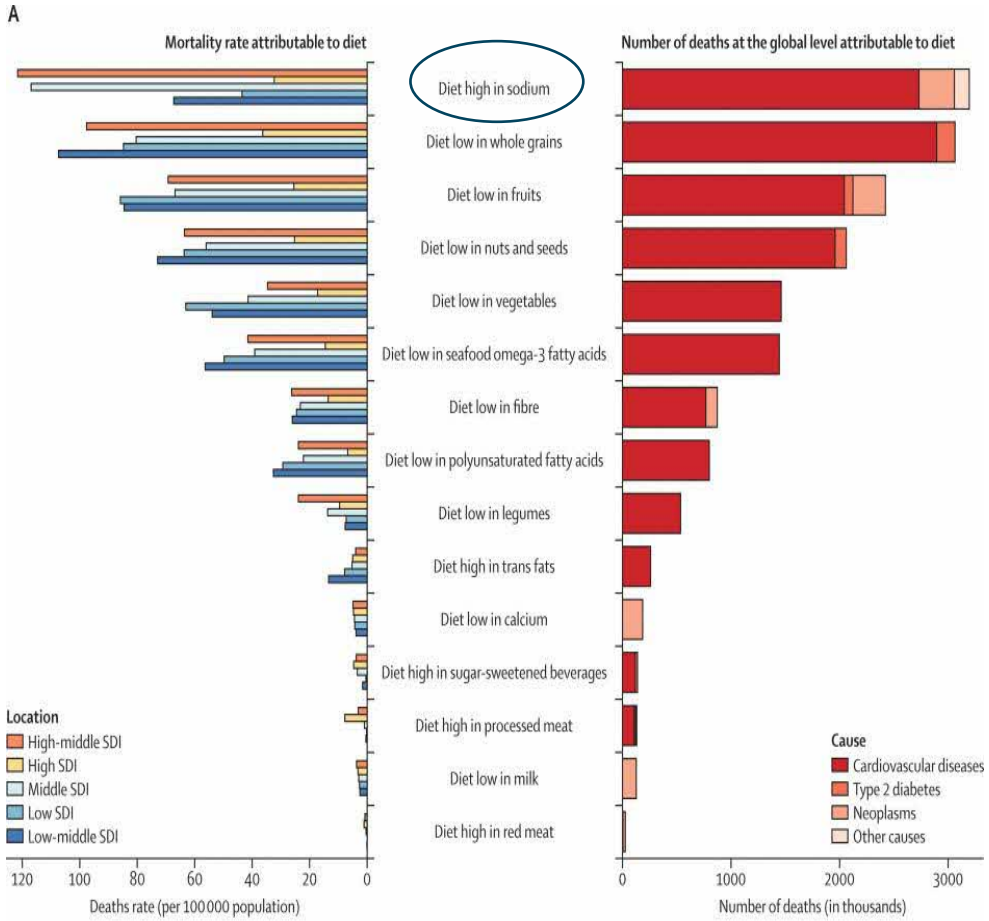

Kario K, Okura A, Hoshide S, Mogi M. The WHO Global report 2023 on hypertension warning the emerging hypertension burden in globe and its treatment strategy. Hypertens Res. 2024;47(5):1099-1102. doi:10.1038/s41440-024-01622-w

# Globally … and SG

Growing burden of **hypertension, diabetes, and heart disease**

High prevalence of **unhealthy lifestyle behaviors** (particularly related to diet)

**High sodium intake a major concern in Singapore, around the world**


Afshin, Ashkan, et al. "Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017." The lancet 393.10184 (2019): 1958-1972.

# Understanding the context

Growing burden of **hypertension, diabetes, and heart disease**

High prevalence of **unhealthy lifestyle behaviors** (particularly related to diet)

**Diet/lifestyle behaviors are dynamic, complex, VERY difficult to change**

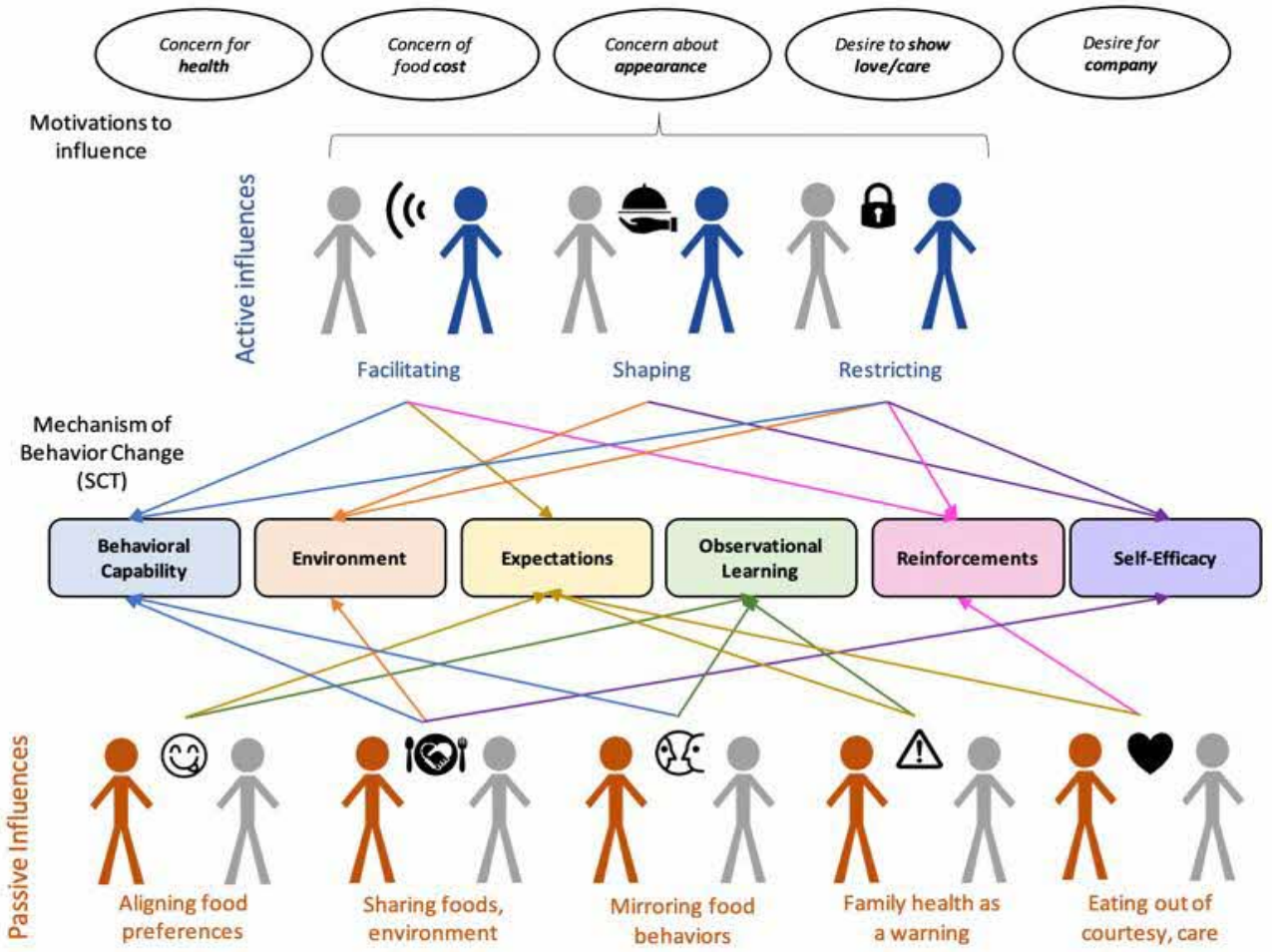
# Understanding the context

**Family members are powerful influencers of household diets**, making them key targets for sustainable dietary change, especially in salt reduction.

**Young adults in multigenerational households are well-positioned to lead change**, given their digital fluency, openness to new habits, and frequent contact with family decision-makers.

By applying strategies **grounded in behavior change theory**, young adults can shift family norms both directly and indirectly.

**Social cognitive theory (SCT) informed familial dietary influence conceptual framework developed by Ali et al. (2024)**



# The SHAYP study

**S**upporting **H**ousehold he**A**lth through famil**Y**-led **P**romotion (SHAYP)

Aim: Pilot-test a sodium-reduction education intervention for young adults aimed at 1) reducing their sodium intake, and 2) empowering them to reduce their family member's sodium intake.

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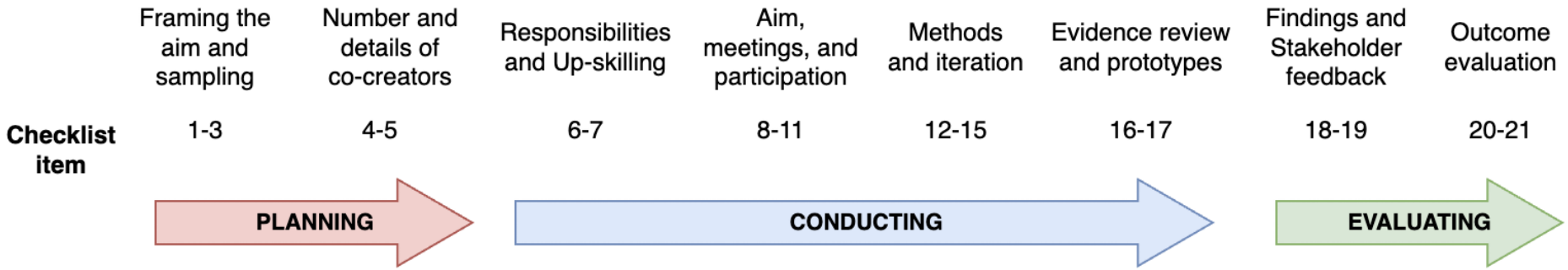
# Methods

# Development

## Applying Leask et al. (2019)'s 21-item co-creation checklist to develop SHAYP




- Integrated community and academic priorities by co-developing study goals with young adults and researchers.

- Recruited 8-10 diverse young adults (18-30) and 4 academic researchers.

- Ensured diversity in sampling young adults: avg. age 26.4, 50% female, culturally diverse backgrounds.

- Defined roles and responsibilities via consent forms; trained young adults in co-creation and academics in community engagement.

- Bi-weekly 2-hour workshops over 6 months used techniques like role-playing, case studies, surveys, and interviews.

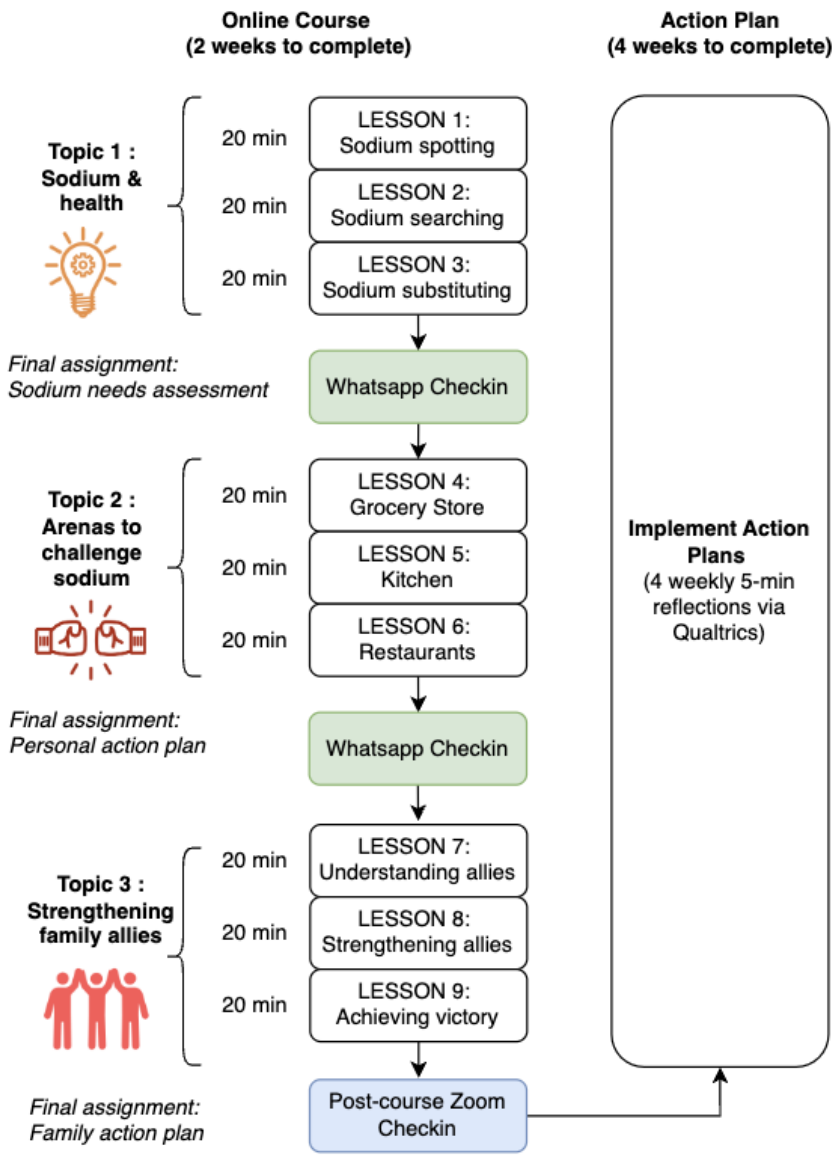
- Feedback loops refined interventions; iteratively developed an evidence-based educational curriculum.

- Summarized key findings and recommendations after each consultation, updates shared during subsequent meetings

- Effectiveness will be tested in a scaled-up study with 20-30 young adults and their family members.

- Pre-post quantitative evaluations will assess sodium-related knowledge, attitudes, and behaviors.

# Study Design




**6-week one-group pre-post study piloted a family-led sodium-reduction intervention in Singapore**, with young adults as the primary participants and family members as indirect beneficiaries

Young adults completed a **self-paced online course** with videos and assignments to build knowledge and **develop SMART-based personal and family action plans**

**Tailored feedback** was provided via WhatsApp and Zoom to support action plan refinement before a 4-week implementation phase

**Family members were not direct recipients** of the intervention but were engaged during goal-setting discussions and behavioral strategies implemented by young adults within the household

# Intervention

## Scan below to try out a SHAYP lesson!

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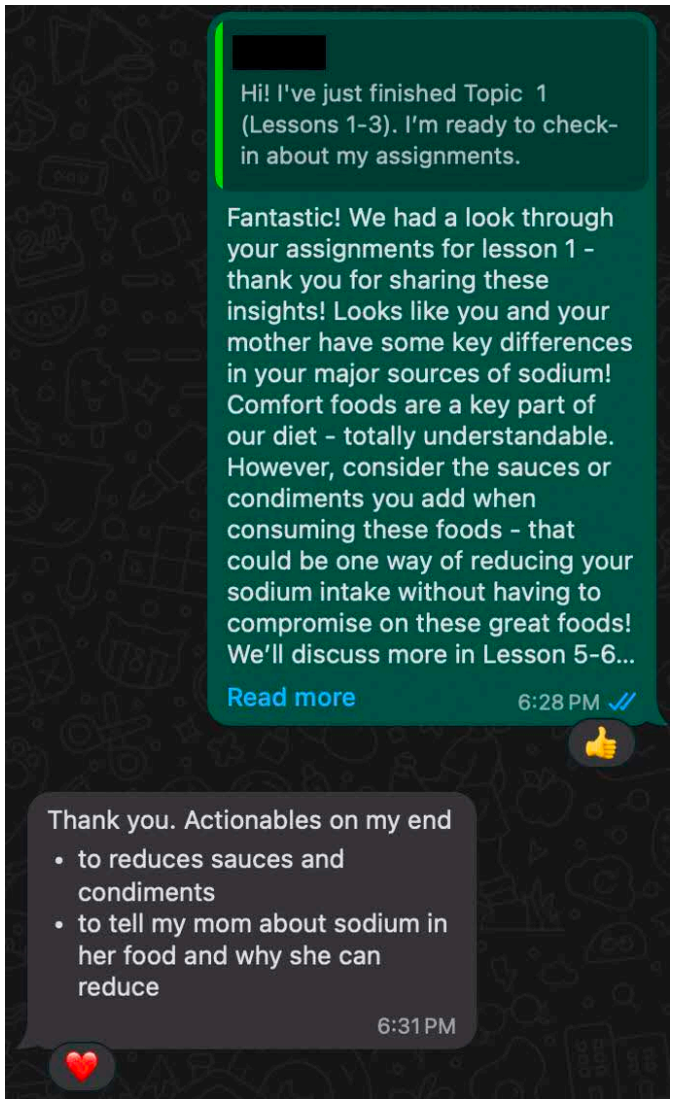
**LESSON 3 : Sodium Substituting (20 min)**


Let's apply what we've learned about behavioral mechanisms of family dietary influence to **better understand dietary influence within your family**. In order to figure out the how best you can approach healthy salt promotion in your family, let's break down how you currently influence the diet of each member.

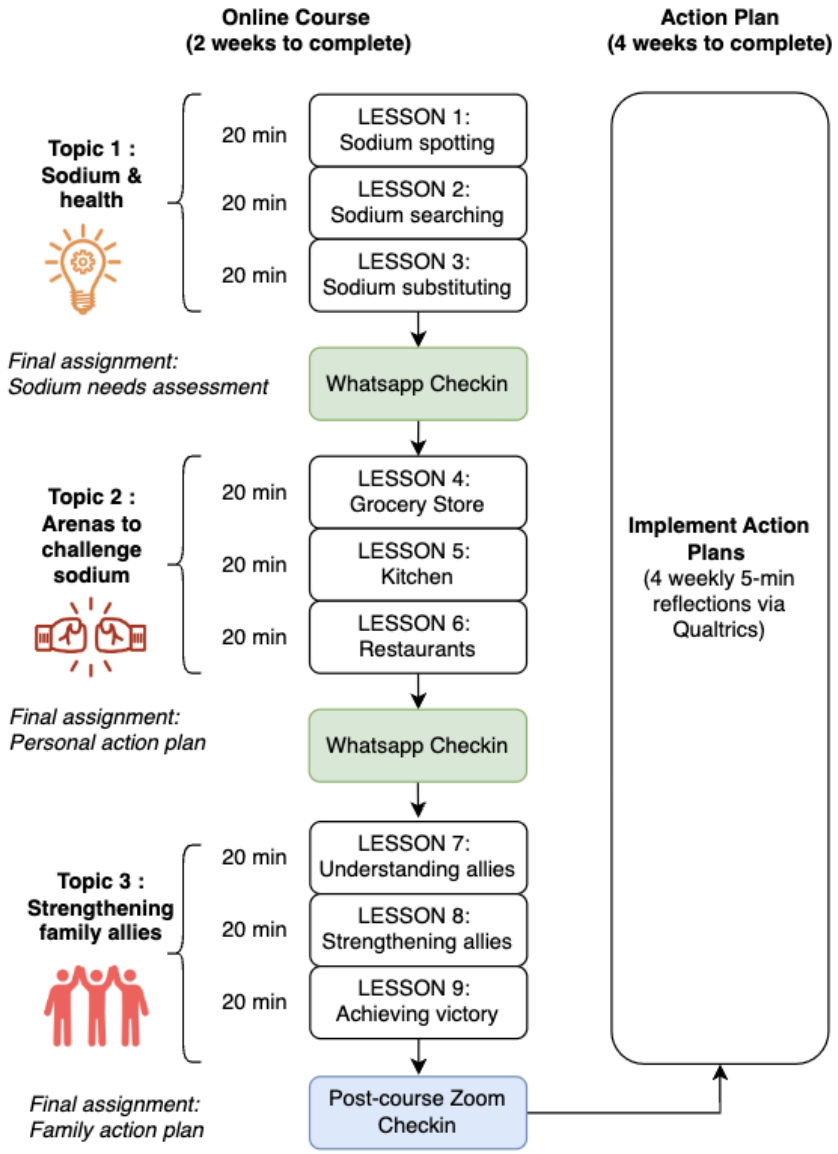
Please answer the next few questions in 1-3 sentences.

*__How often__ do you currently use any of the following **active influence mechanisms** to shape the diet of your family members? Please enter a number from 0 (Not at all) to 10 (all the time)

| | Your mother | Your brother |
|---|---|---|
| Facilitating (0 to 10) | | |
| Shaping (0 to 10) | | |
| Restricting (0 to 10) | | |



# Measurement




**Impact related outcomes:** *Collected through pre- and post-intervention surveys completed by both young adults and family members.*

- Sodium knowledge and behavior questionnaire (adapted from past study)
- Sodium attitudes, subjective norms, perceived behavioral control (TPB)
- Demographics, cardiovascular health conditions, BMI, and self-rated health, dietary healthfulness

**Engagement/Implementation outcomes:** *Collected through platform analytics, assignment responses, and weekly self-report reflections submitted via Qualtrics.*

- Course completion time, time spent per topic, and assignment engagement (e.g., text length)
- Types of goals developed and level of involvement from young adults and family members
- Weekly self-ratings of effort and success on personal and family goals (1–10 scale)

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# Results

# Participants

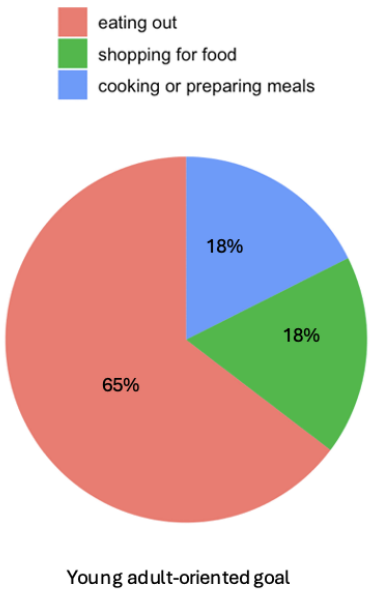
| Variable | Total | Young adult (n=35) | Family member (n=79) | p value |
|---|---|---|---|---|
| **Age, mean (SD)** | 37.17 (15.50) | 24.43 (3.11) | 42.81 (15.46) | <0.001 |
| **Sex, n (%)** | | | | |
| **Female** | 65 (57.0) | 20 (57.1) | 45 (57.0) | 1 |
| **Male** | 49 (43.0) | 15 (42.9) | 34 (43.0) | |
| **Race, n (%)** | | | | |
| **Chinese** | 87 (76.3) | 26 (74.3) | 61 (77.2) | 0.800 |
| **Indian** | 17 (14.9) | 5 (14.3) | 12 (15.2) | |
| **Malay/Other** | 10 (8.8) | 4 (11.4) | 6 (7.6) | |
| **Household income, n (%)** | | | | |
| **$2000-$5999** | 23 (20.9) | 8 (23.5) | 15 (19.7) | 0.762 |
| **$6000-$9999** | 46 (41.8) | 15 (44.1) | 31 (40.8) | |
| **≥$10,000** | 41 (37.3) | 11 (32.4) | 30 (39.5) | |
| **Relationship status, n (%)** | | | | |
| **Not Partnered or Married** | 54 (48.6) | 28 (80.0) | 26 (34.2) | <0.001 |
| **Partnered or Married** | 57 (51.4) | 7 (20.0) | 50 (65.8) | |
| **Subjective health, mean (SD)** | 7.12 (1.52) | 7.29 (1.34) | 7.05 (1.60) | 0.450 |
| **Effort put in health, mean (SD)** | 6.59 (1.82) | 6.51 (1.48) | 6.62 (1.96) | 0.776 |
| **Diet healthfulness (1-7), mean (SD)** | 4.61 (0.64) | 4.44 (0.50) | 4.68 (0.68) | 0.064 |
| **Cardiovascular NCD** | | | | |
| **No** | 95 (83.3) | 34 (97.1) | 61 (77.2) | 0.018 |
| **Yes** | 19 (16.7) | 1 (2.9) | 18 (22.8) | |
| **Weight status** | | | | |
| **Underweight** | 13 (11.5) | 5 (14.7) | 8 (10.1) | 0.741 |
| **Normal** | 49 (43.4) | 16 (47.1) | 33 (41.8) | |
| **Overweight** | 37 (32.7) | 10 (29.4) | 27 (34.2) | |
| **Obese** | 14 (12.4) | 3 (8.8) | 11 (13.9) | |

The study included 114 participants: **35 young adults and 79 family members**, comprising 38 parents, 18 siblings, 10 spouses or partners, 7 cousins, and 6 parent or sibling in-laws.

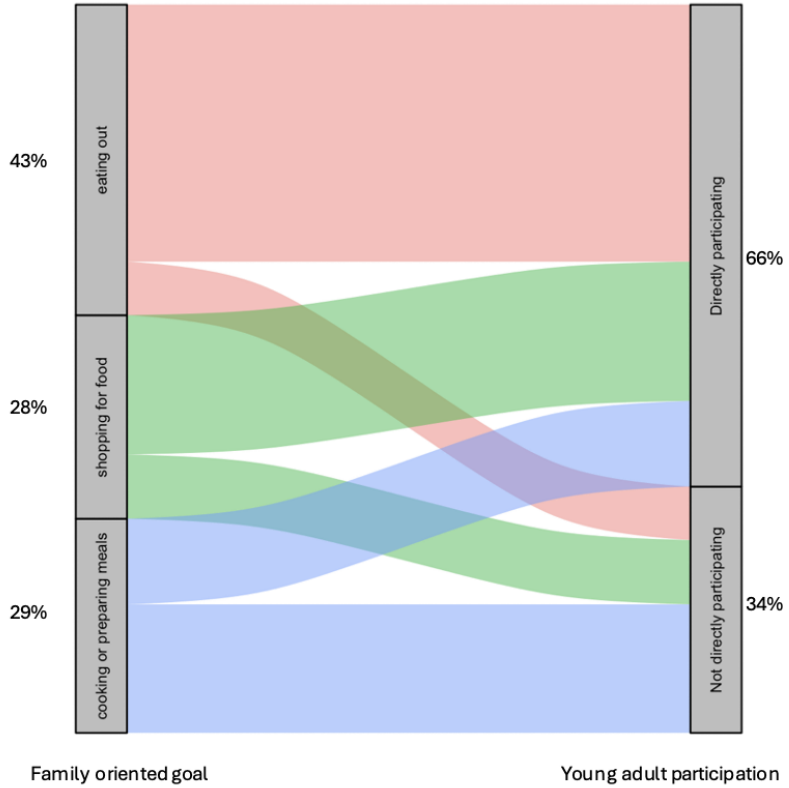
Most participants were Chinese (76%) and female (57%); over one-third reported household incomes of ≥$10,000, and the majority of young adults were single (80%) compared to 34% of family members.

**Young adults** had lower rates of cardiovascular conditions (3% vs 23%), **slightly lower self-reported diet healthfulness** (4.44 vs 4.68), and similar subjective health and effort toward health compared to family members.

# Course completion and goal development




Young adult-oriented goal




Family oriented goal

Young adult participation

Young adults were typically direct participants in eating-out goals, such as: *"**When I eat out with my parents, my goal is to order at least one lower-in-sodium option on their behalf such as foods with healthier cooking methods or with less gravy**."*

In contrast, cooking and shopping goals often involved indirect influence, such as: *"**When my sister cooks or prepare meals, my goal is to ask her to order takeout less and encourage more cooking at home using lower-sodium products**."*

Young adults took an average of **7.74 days (SD: 6.85)** to complete the course.

Most personal (65%) and family-oriented (43%) goals focused on **eating out**, with others related to cooking and grocery shopping

# Goal Implementation

| | Overall | Week 1 | Week 2 | Week 3 | Week 4 |
|---|---|---|---|---|---|
| **Effort put into meeting goal (Score out of 10)** | | | | | |
| Personal goal, mean (SD) | 6.55 (1.82) | 6.35 (2.23) | 6.24 (2.26) | 6.76 (2.31) | 6.82 (2.4) |
| Family goal, mean (SD) | 5.49 (2.11) | 5.21 (2.83) | 5.26 (2.51) | 5.79 (2.25) | 5.76 (2.55) |
| **Success in meeting goal (Score out of 10)** | | | | | |
| Personal goal, mean (SD) | 6.58 (1.77) | 6.03 (2.43) | 6.65 (2.36) | 6.88 (2.27) | 6.76 (2.54) |
| Family goal, mean (SD) | 5.24 (1.95) | 4.5 (2.57) | 5 (2.57) | 5.71 (2.28) | 5.85 (2.61) |
| **Family influence mechanisms used** | | | | | |
| Facilitating, Yes (%) | 34 (100) | 26 (76.47) | 23 (67.65) | 29 (85.29) | 28 (84.85) |
| Shaping, Yes (%) | 29 (85.29) | 13 (38.24) | 23 (67.65) | 21 (61.76) | 20 (60.61) |
| Restricting, Yes (%) | 15 (44.12) | 7 (20.59) | 7 (20.59) | 8 (23.53) | 5 (15.15) |
| **Obstacles in implementing goal (Score out of 10)** | | | | | |
| No/limited time, mean (SD) | 4.56 (2.28) | 5 (3.16) | 4.5 (3.16) | 4.85 (3.14) | 3.94 (2.71) |
| No/limited opportunities to eat out, mean (SD) | 3.37 (1.9) | 3.65 (2.78) | 3.15 (2.62) | 3.44 (2.84) | 3.18 (2.62) |
| No/limited opportunities to cook, mean (SD) | 4.76 (2.54) | 5.82 (3.26) | 4.76 (3.26) | 4.65 (3.6) | 3.88 (3.09) |
| No/limited family interactions, mean (SD) | 4.52 (2.25) | 4.85 (3.33) | 4.44 (3.14) | 5.12 (3.26) | 3.55 (2.78) |
| Family not interested / accepting, mean (SD) | 2.42 (1.77) | 2.79 (2.64) | 2.26 (2.06) | 2.53 (2.33) | 2.15 (1.79) |

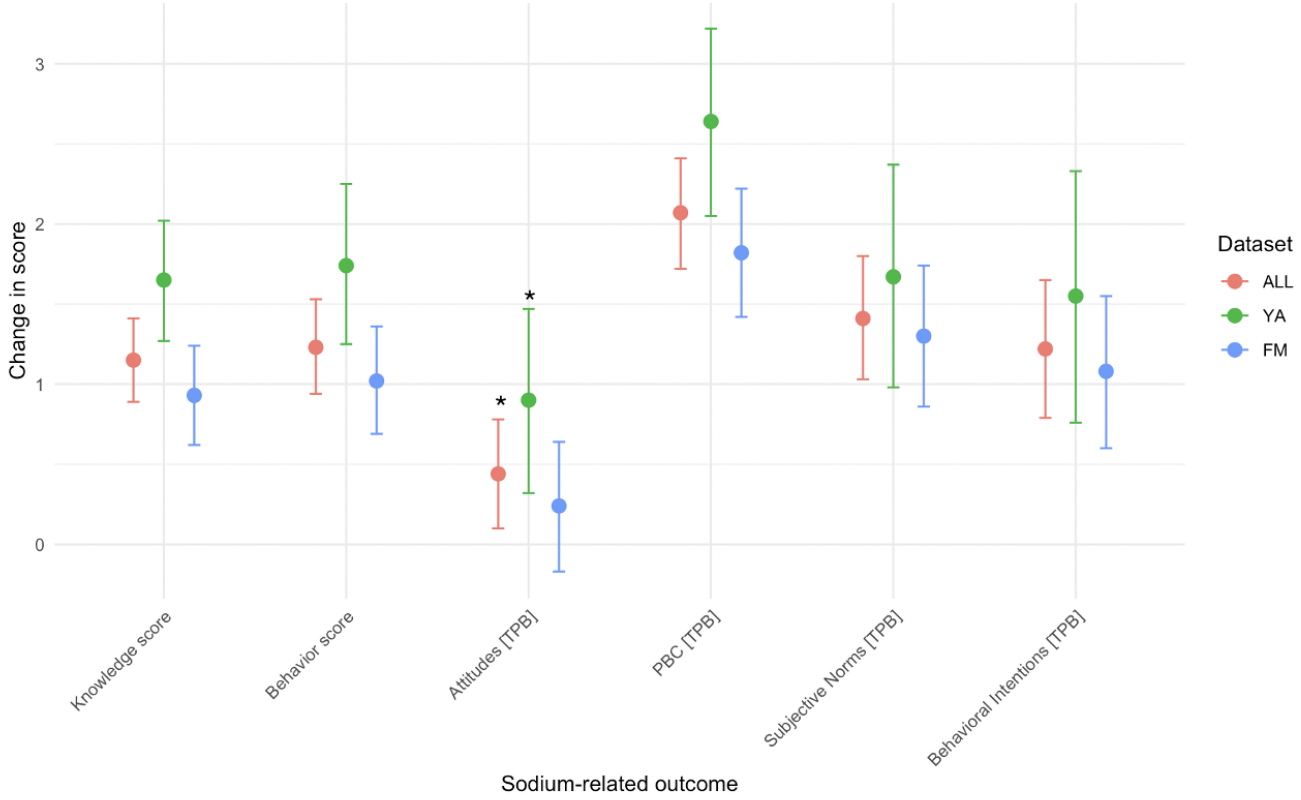
Young adults reported putting **more effort into personal goals** (mean: 6.47, SD: 1.84) than family-oriented goals (mean: 5.48, SD: 2.08).

Success and effort put in goals was **relatively stable** across the 4-week implementation

**Facilitating (more 'light touch')** was the most used influence strategy for family goals (100%), followed by shaping (85.7%) and restricting (42.9%).

**Limited time and fewer opportunities to cook** were the most frequently reported barriers to implementing goals.

# Post-intervention changes




[1] Adjusted for age, sex, race, income, baseline obesity status, self-rated health, self-rated effort put into health, and dietary healthfulness. * No longer significant after Bonferroni correction for family-wise error rate.

**Sodium-related knowledge** (+1.15) and **behaviors** (+1.23) improved significantly in both groups, with young adults showing the greatest gains.

**Sodium-related attitudes** was the only observed outcome to not significantly change post-intervention.

Interaction analyses showed **no significant impact of course engagement or goal effort** on sodium-related outcomes (except for attitudes)

**Perceived behavioral control (PBC)** showed the largest post-intervention improvement (+2.07), with significant changes among both young adults (+2.64) than family members (+1.82)

# Impact on young adults and family members – preliminary quotes

*"Actually after this study… **it made me become even more aware. And when I become very aware, I become very conscious**, like I have this aversion towards very salty food, or very preserved food. This study helped me to decide against eating all the very salty and unhealthy food. - Young Adult 5*

*"When I was eating fast food… **I [now] tried to use one sachet only for each meal, and also when I ate ramen, I didn't drink a lot of the broth.** There's a good chunk that's still left over in the bowl after I'm done eating all the noodles. It's these small little steps I took to reduce my sodium intake." - Young Adult 1*



***"I was telling her (mother) based on what I learned from the the videos that actually, there's this potassium (salt) alternative** that you can buy… **from then on, she bought it, and she's still been using it.** All these dishes were made using the potassium salt." - Young Adult 6*

# Impact on young adults and family members – preliminary quotes

*"**For me, the family-led approach is more personal. When it's more personal, we are likely to be more receptive…** [sometimes] people will just see [health promotion materials] and then that's all... don't really heed the advice"*
*– Family Member 3*

*"We see those commercials, campaigns, posters sometimes, but (there was) no conscious effort to do things… **but with young adult now actively acting as a health ambassador in the family, I think we will continue to practice all these healthier cooking, healthier dining, and so on**."*
*– Family member 5*

**Family Members**

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# Implications

# Conclusion

The study demonstrated the **feasibility of a family-led, young adult–driven intervention**

- Preliminary findings suggesting meaningful improvements in sodium-related outcomes (especially sodium-reduction self-efficacy).

**Most personal and family goals focused on eating out behaviors**

- Eating out may be a particularly well-suited for this model of family-led educational intervention

# Conclusion

Course engagement and goal-setting effort were not consistently linked to greater outcome changes

- Suggesting that **even low-effort strategies can yield meaningful impact.**

**Qualitative analysis** of young adults and family members **ongoing**

- Aim: identify content and implementation revisions to inform decision making for a scaled-up program

# Next Steps

**Scaled-up, integrated assessment of family-led models of sodium reduction and hypertension management in different settings and populations**

- Tailoring content towards hypertension management more broadly

- Expanding integration with healthcare, educational, social settings

- Exploring social media, AI, or chatbot integration

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# Thank you!


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