Color-Blind to the Obvious: Salience, Misperception, and Technology Adoption in Uganda

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Outline

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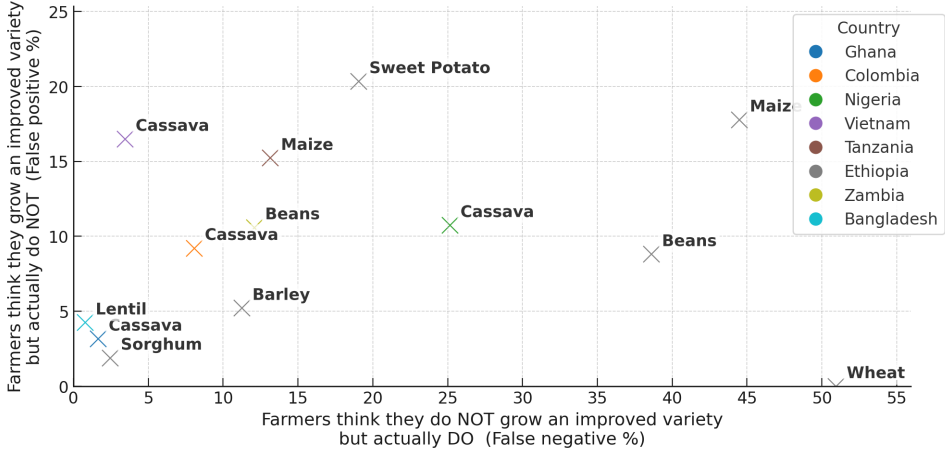
- As a result, farmers may struggle to form **correct beliefs** about varietal traits.

Do farmers know they are growing high-yielding varieties?

What type of seed was used for [CROP] on [FIELD]?

1. Traditional 2. Improved(New/Recycled)



Source: Stevenson et al. 2023

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- **Hard to update:** limited salience/knowledge and persistent beliefs from older technologies.

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  - T1 increases salience, but **does not change planting**.
  - T2 **changes behavior**: +38–59% higher adoption of nutritious and disease-resistant varieties.
  - Mechanism: better trait–variety matching and solves perceived trade-offs.

Literature and Contribution

1. **Technology adoption in agriculture:** Prior work highlights constraints from credit/risk, learning and networks, input quality/markets, and heterogeneous returns (Karlan et al. 2014; Foster and Rosenzweig 1995; Conley and Udry 2010; BenYishay and Mobarak 2018; Bold et al. 2017; Suri 2011).
   $\Rightarrow$ We add a novel mechanism: **misperceptions about varietal traits**.
2. **Welfare impacts:** We track effects from variety choice to household consumption and **child health**, contributing evidence on agriculture–nutrition linkages (Ruel, Quisumbing, and Balagamwala 2018).

Outline

Context: Sweet Potato in Uganda

- **Major staple:** Third most important crop, with high per-capita consumption.
- **Rich varietal diversity:** varieties differ in many traits (taste, yield, storability, resistance, nutritional content).
- **Focus on two Traits:**
  - **Flesh-color:** signals vitamin A content of the sweet potato.
  - **Disease resistance:** minimizes crop losses and ensures stable yields.
- **Experienced farmers:** long familiarity with cultivation and varietal choice.
- **Low-input crop:** very little fertilizer and pesticide use.
- Planting material mainly from **own harvest** or community; little commercial purchase.

Outline

Data and Measurement: Surveys

- **Survey rounds:** Baseline Feb–Mar 2022; Endline Feb–Mar 2023.
- **What we measure:**
  - Adoption and production outcomes (both rounds).
  - Endline: food consumption + child health (illness in past 2 weeks and 6 months).
- **Measurement innovations:**
  - GPS-measured plot area.
  - DNA fingerprinting to identify varieties and key traits.

Data and Measurement: DNA Fingerprinting

How leaf samples are collected (in practice)

1. Enumerator walks to each sweet potato plot with the farmer.
2. For each distinct variety in the plot: pick **3–5 young, healthy leaves** from **different vines**.
3. Put leaves in a **labeled sample bag** (farmer ID, plot ID, reported variety name).
4. Store in a cool box; transport to the lab for DNA extraction and matching to the **reference library**.

Outline

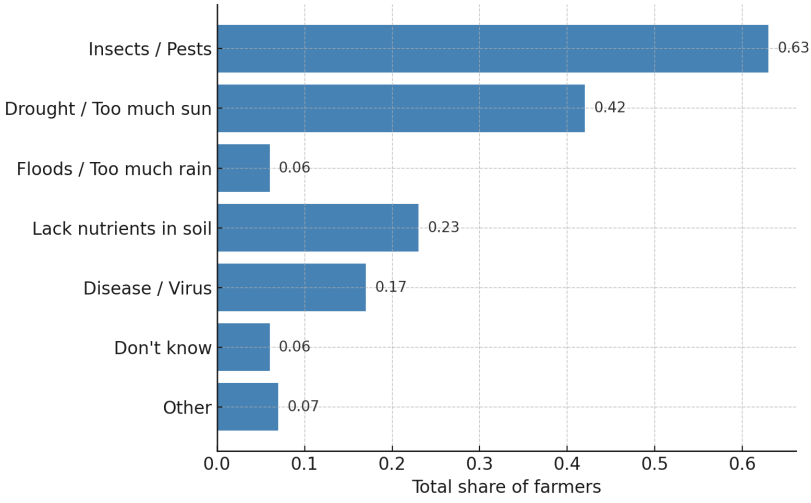
Adoption rates at baseline using objective measurement

Table: Sweet Potato Variety Adoption at Baseline

Panel A: Share of households with at least one variety		
Variety Type	Share	N
Orange-fleshed	0.062	1,000
Yellow-fleshed	0.301	1,000
White-fleshed	0.350	1,000
SPVD-resistant	0.617	1,000
AB-resistant	0.543	1,000
Yellow & Disease-resistant	0.222	1,000

Fact 1: Most farmers misdiagnose virus-related symptoms

"What are the causes of these signs on leaves?"

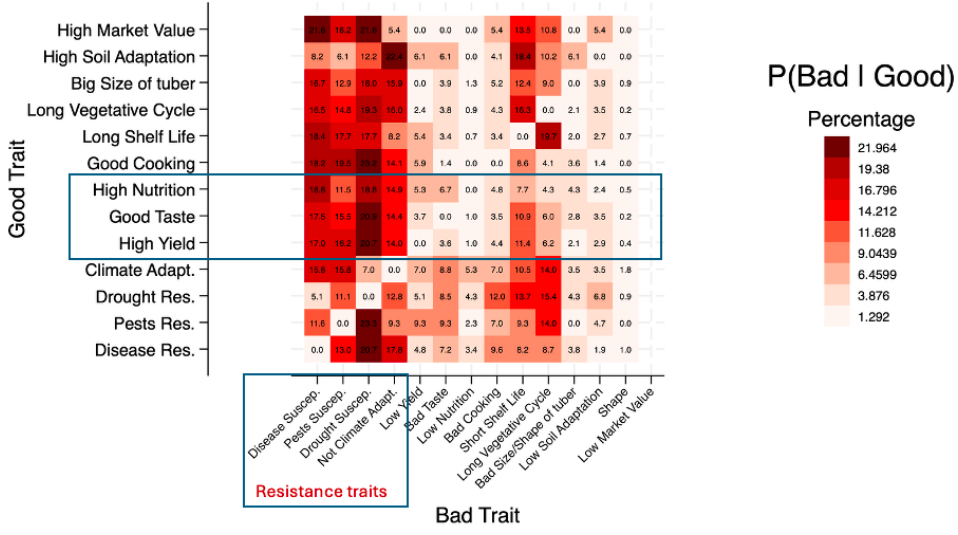


Fact 2: Trait misidentification is common

Trait	Correct: Has trait (TP)	Error: Over-claim (FP)	Error: Miss trait (FN)	Correct: No trait (TN)
Orange-fleshed	2.7%	4.5%	0.9%	91.8%
Yellow-fleshed	14.2%	28.4%	26.1%	31.1%
SPVD-resistant	62.2%	10.8%	24.1%	2.8%
AB-resistant	44.4%	27.7%	22.3%	5.6%

Notes: Shares based on household-level comparison of self-reports vs DNA fingerprinting in the control group at endline ($N = 671$). TP = true positive, FP = false positive, FN = false negative, TN = true negative.

Fact 3: Farmers believe nutrition and disease resistance trade off



- Farmers often believe desirable traits come at a cost (e.g., nutrition vs resistance).

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Experimental design

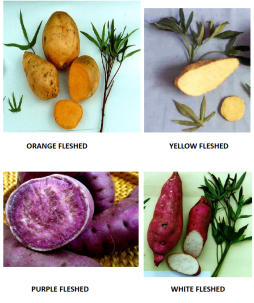
- **Sample:** 108 villages (4 regions), 2,150 households ($\sim$20 per village).
- **Village-level randomization:**
  - Info only: information on nutrition (flesh color) and disease/virus resistance.
  - Info+DNA: same info + DNA-based feedback on farmers' own varieties.
  - Control: no intervention.
- **Stratified by:** region and baseline share of orange-fleshed / disease-resistant varieties.
- **Spillovers:** a subsample of Info+DNA also receives community feedback.
- **Key outcomes:** adoption, beliefs, production, consumption, child health.

General information treatment - T1

Flesh color and vitamin A

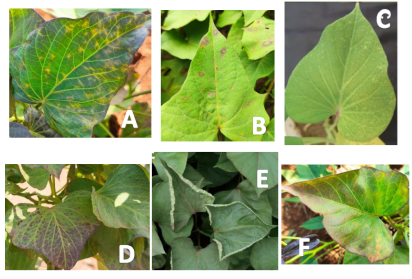
- Orange flesh = high vitamin A
- Yellow flesh = medium
- White or purple flesh = none

Vitamin A benefits: Supports immune function, prevents night-blindness, and is vital for growth—especially for children and pregnant women.



Sweet Potato Viruses and Diseases

- Recognize symptoms of SPVD and Alternaria blight on leaves.
- Apply correct management when symptoms appear.
- Understand roles of insect vectors and climate.
- Learn that resistant varieties exist.



DNA-fingerprinting treatment: Individual Card example - T2

District	Parish	Subcounty	Village	Name
A	B	C	D	E

Variety	Official name	Resistant to SPVD	Resistant to AB	Disease resistant	Flesh color
Funtula	Muwulu Aduduma	YES	NO	NO	White or purple
Icok agamente	KAKAMEGA	YES	YES	YES	Orange
Lira lira	KML934	YES	YES	YES	Yellow

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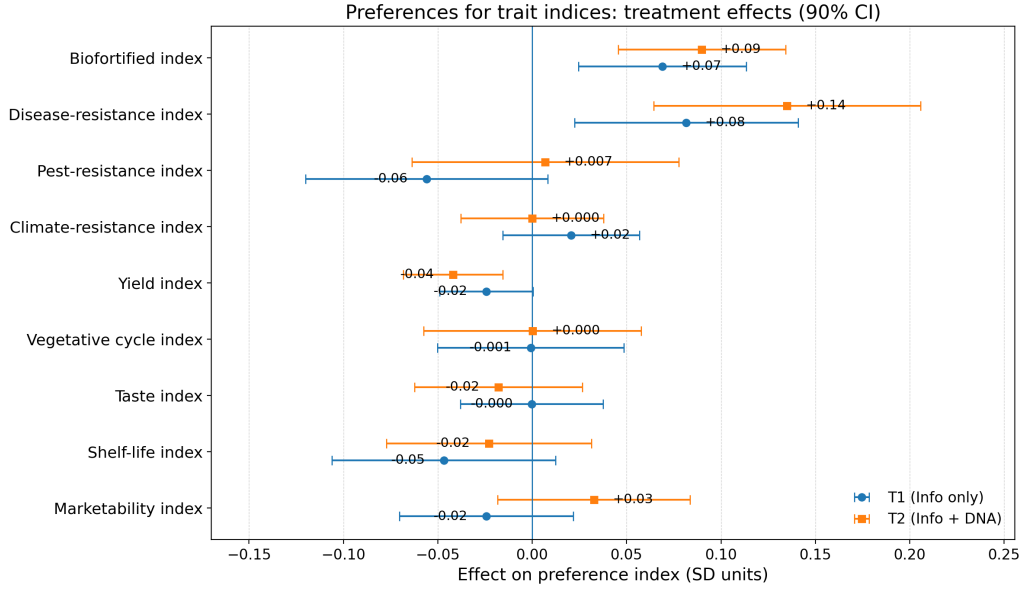
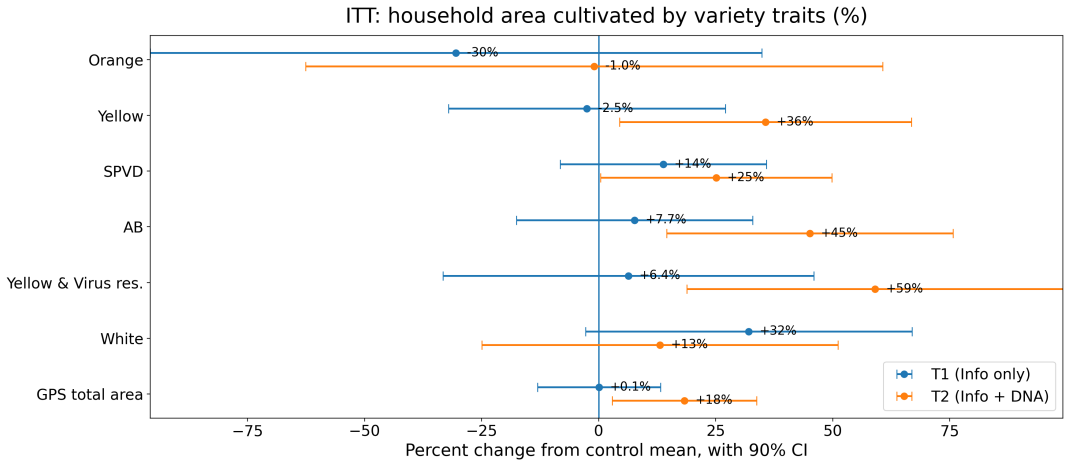
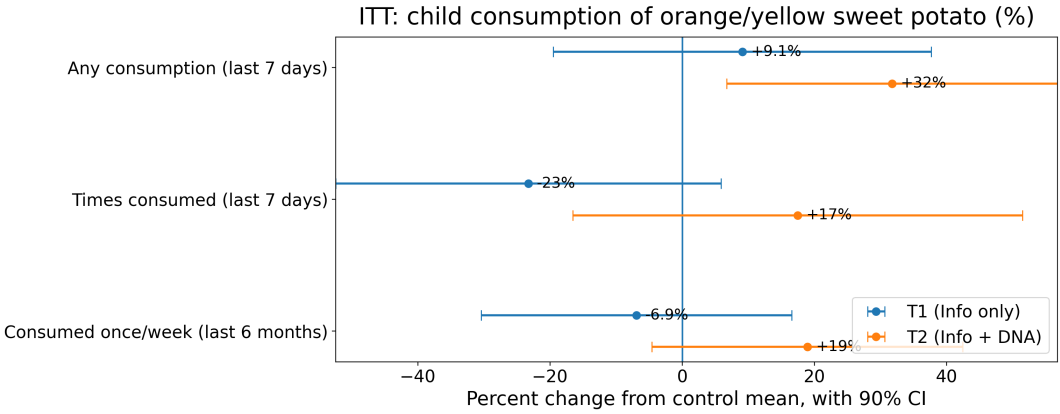
ITT results for Household preferences for varietal traits



Adoption - Intensive Margin



Consumption of Orange or Yellow Sweet Potato: Children Under 2 y.o.



Why Expect Health Effects?

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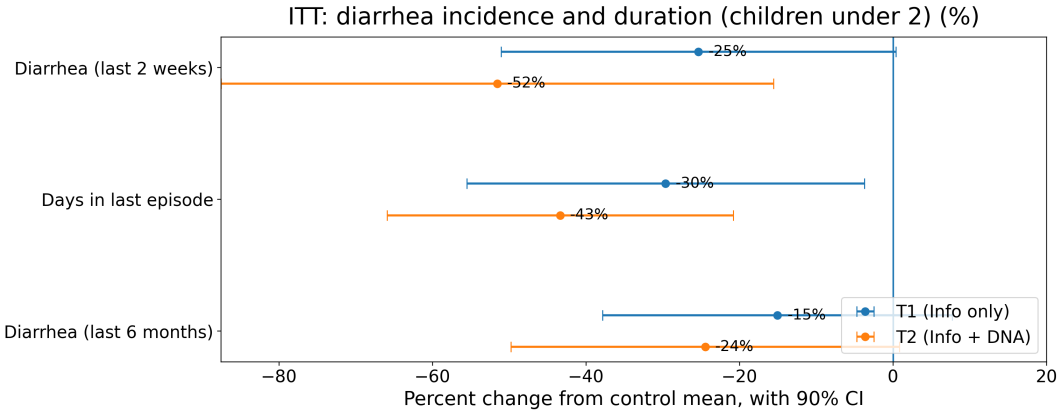
- Mechanism: maintains gut mucosal integrity and enhances immune function (Stephensen 2001).

Incidence of Diarrhea: Children Under 2 y.o.



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Mechanisms: Why T2 works and T1 doesn't

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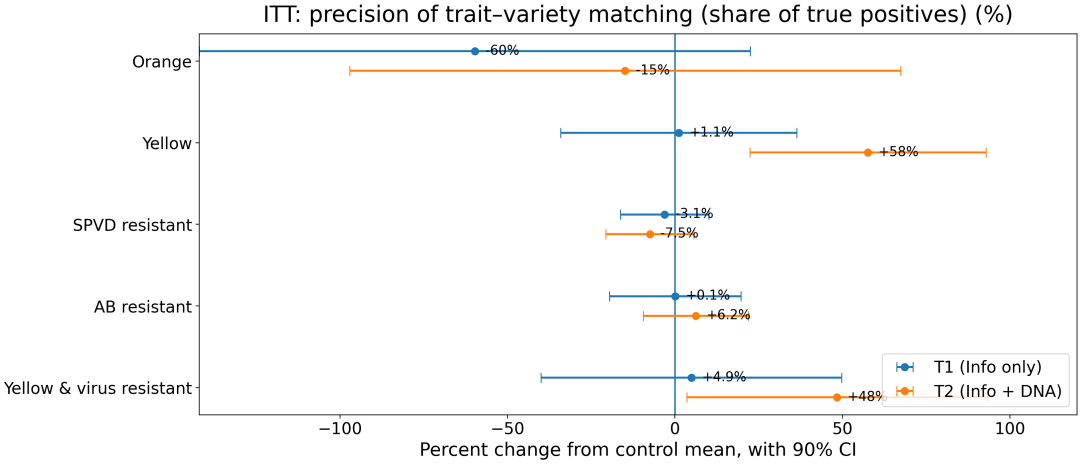
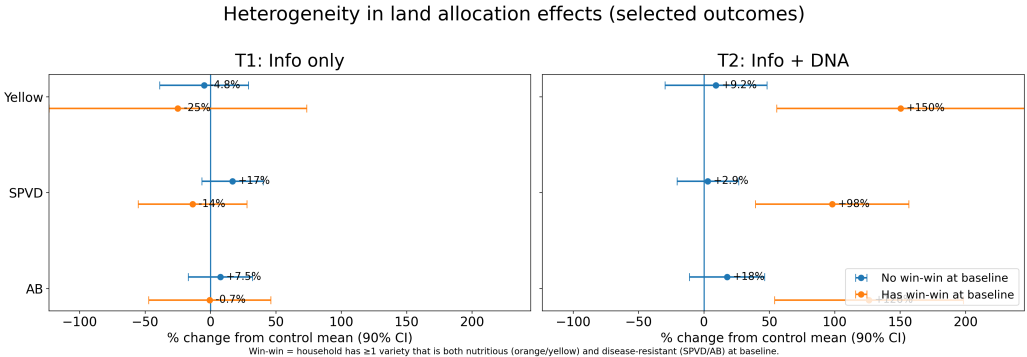
- **Missing: Identification** $\rightarrow$ no reliable trait–variety matching.
- **Missing: Trade-offs** $\rightarrow$ focusing on one trait can raise perceived costs on others.
- **T2 (Info+DNA):** objective, variety-specific feedback $\rightarrow$ improves identification and clarifies multi-trait packages $\rightarrow$ increases planting of yellow/virus-resistant varieties.

Accurate Trait Recognition: Share of correctly identified varieties



- Info Only: no changes.
- Info + DNA: improved recognition of yellow flesh and yellow+virus resistance.

Heterogeneity: Effects concentrated among "win-win" households



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Robustness Checks

- Consumption of Orange/Yellow varieties:
  - Experimenter demand bias: should be observed in both treatment arms (not just one).
  - Bounding exercise: improved recognition would need to be very large to fully explain consumption effects.
- Health effects:
  - Script did not mention diarrhea as an outcome of vitamin A.
  - No effects on other symptoms: cough, fever, malaria Placebo1
  - Sight improvement was mentioned but no effects Placebo2

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Big-picture takeaway

- Information alone is not enough when farmers cannot link traits to their own varieties.
- Objective, variety-specific feedback corrects beliefs and changes technology adoption.
- These belief corrections translate into measurable nutrition and child health gains.

Policy Implications

- **Technology returns:**
  Misperceptions lower the payoff to plant breeding, extension services, and seed systems.
- **R&D targeting:**
  Correcting misperceptions reveals the varietal traits farmers truly value, guiding future research and development.
- **Welfare implications:**
  Improving misperceptions about varietal traits can generate tangible nutrition and health gains.

Thank You!

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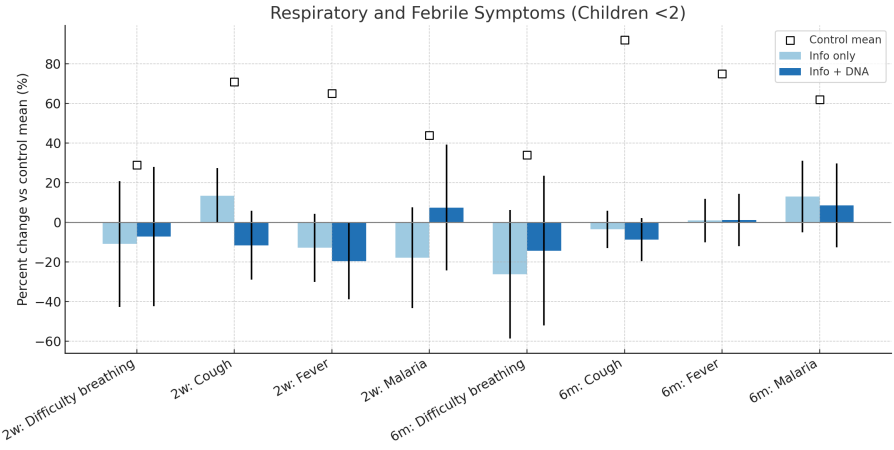
Placebo Health Outcomes: U2



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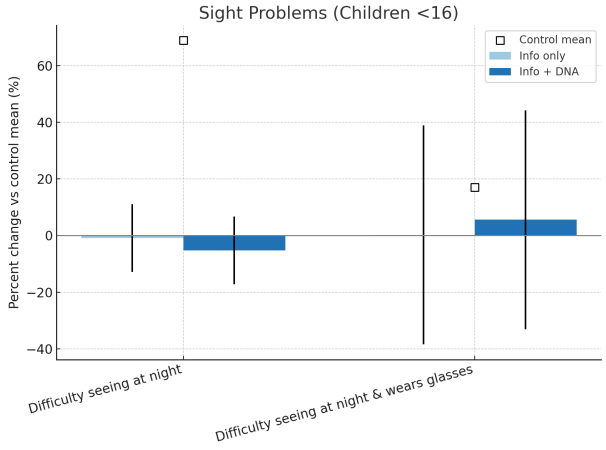

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