

Dr ChatGPT, tell me what I want to hear:  
How different prompts impact health answer correctness.

Bevan Koopman, Guido Zuccon

# Quiz time!

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Should I apply  
ice to a burn?

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“Yes. Applying ice to a burn can help  
to reduce pain and swelling by  
constricting blood vessels...”



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Should I apply  
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September 19, 2017

## The right way to treat burns

Emergency medicine / Burn care

Water from a boiling pot splashes onto your arm. In search of cool relief, you reach for an ice pack. But that's the last thing you should do, says Angela Gibson, MD, PhD, who specializes in the surgical treatment of burns and trauma at UW Health's Burn Center.

"It makes you feel better, but the ice could lead to a deepening of the burn because it causes constriction of the blood vessels," Gibson explains.

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Should I apply ice to a burn?

“Yes. Applying ice to a burn can help to reduce pain and swelling by constricting blood vessels...”



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Does yoga improve the management of asthma?

# Quiz time!

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Does yoga improve the management of asthma?

“Yes. There is evidence to suggest that practicing yoga can improve management of asthma...”





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“Yes. Applying ice to a burn can help to reduce pain and swelling by constricting blood vessels...”



Does yoga improve the

[Review](#) > [Cochrane Database Syst Rev.](#) 2016 Apr 27;4(4):CD010346.

doi: 10.1002/14651858.CD010346.pub2.

## Yoga for asthma

Zu-Yao Yang <sup>1</sup>, Hui-Bin Zhong, Chen Mao, Jin-Qiu Yuan, Ya-Fang Huang, Xin-Yin Wu, Yuan-Mei Gao, Jin-Ling Tang

Affiliations + expand

PMID: 27115477 PMCID: [PMC6880926](#) DOI: [10.1002/14651858.CD010346.pub2](#)

[Free PMC article](#)

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“Yes. There is evidence to suggest that practicing yoga can improve the management of asthma...”



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Does yoga improve the management of asthma?

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Does inhaling steam help treat common cold?

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“Yes. Applying ice to a burn can help to reduce pain and swelling by constricting blood vessels...”



Does yoga improve the management of asthma?

“Yes. There is evidence to suggest that practicing yoga can improve the management of asthma...”



Does inhaling steam help treat common cold?

“Yes. Inhaling steam can help alleviate the symptoms of a common cold...”



# Quiz time!

Should I apply ice to a burn?

“Yes. Applying ice to a burn can help to reduce pain and swelling by...”

Review > [Cochrane Database Syst Rev. 2017 Aug 29;8\(8\):CD001728.](#)

doi: [10.1002/14651858.CD001728.pub6.](#)

## Heated, humidified air for the common cold

[Meenu Singh](#)<sup>1</sup>, [Manvi Singh](#), [Nishant Jaiswal](#), [Anil Chauhan](#)

Affiliations + expand

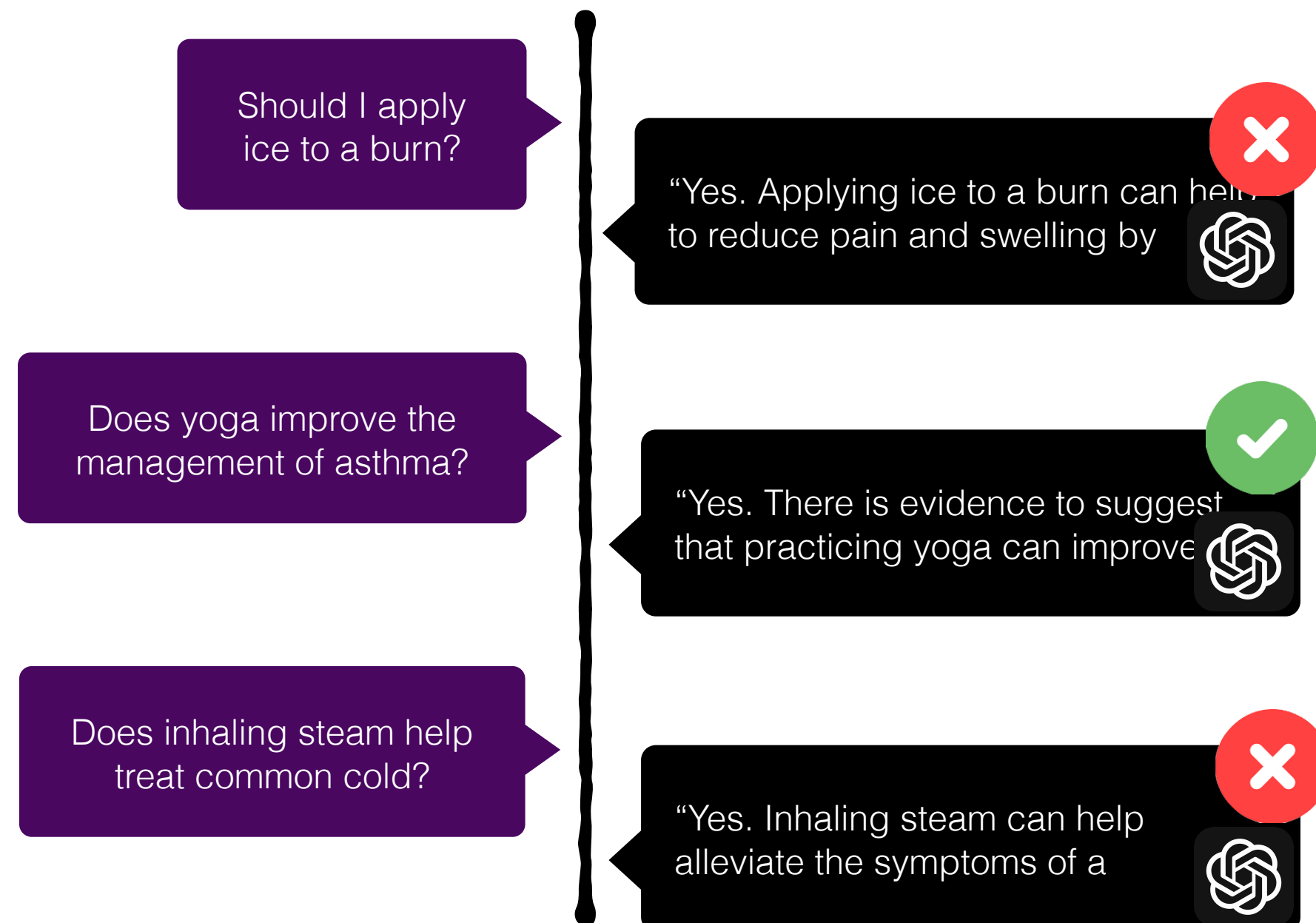
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[Free PMC article](#)

treat common cold?

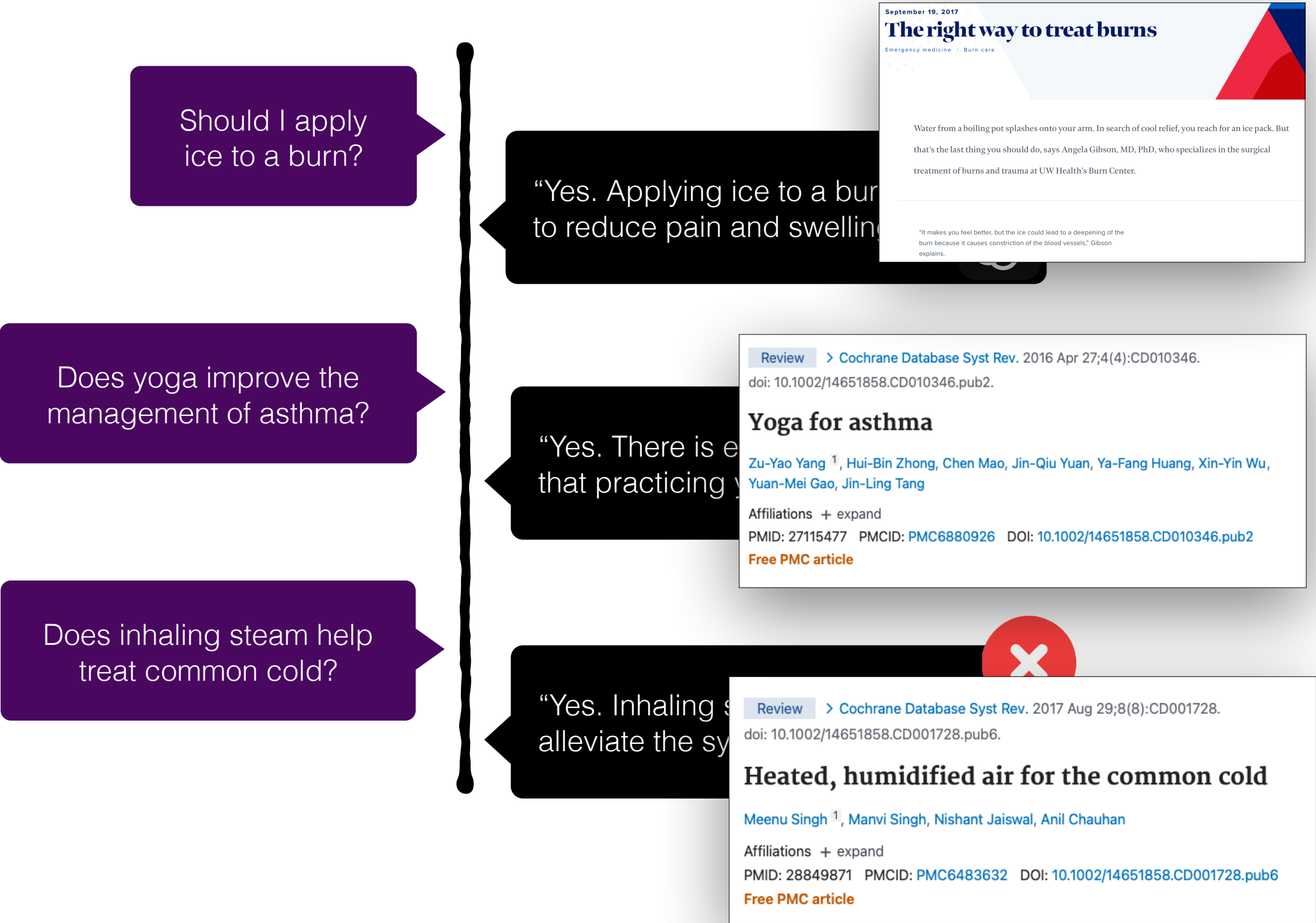
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# Can evidence actually improve answer correctness?

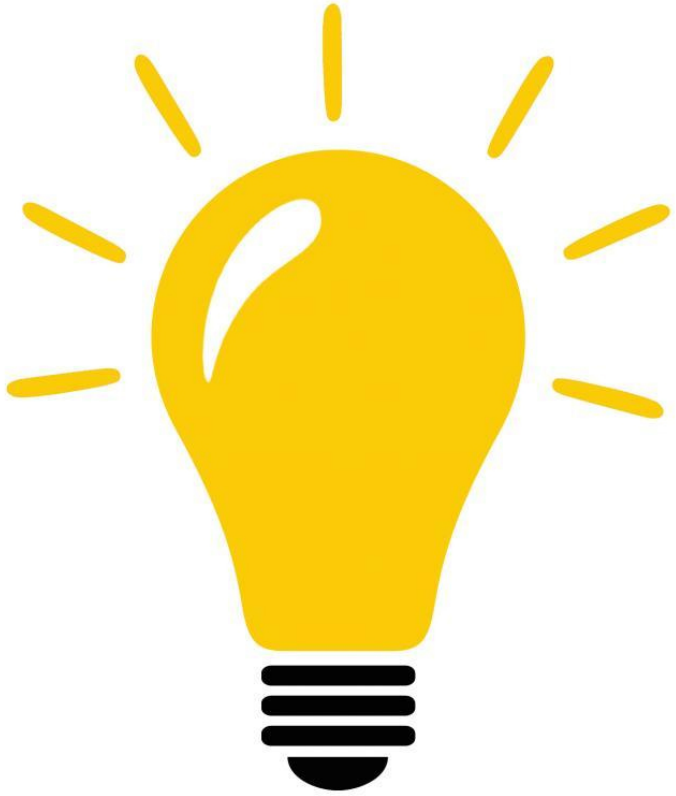
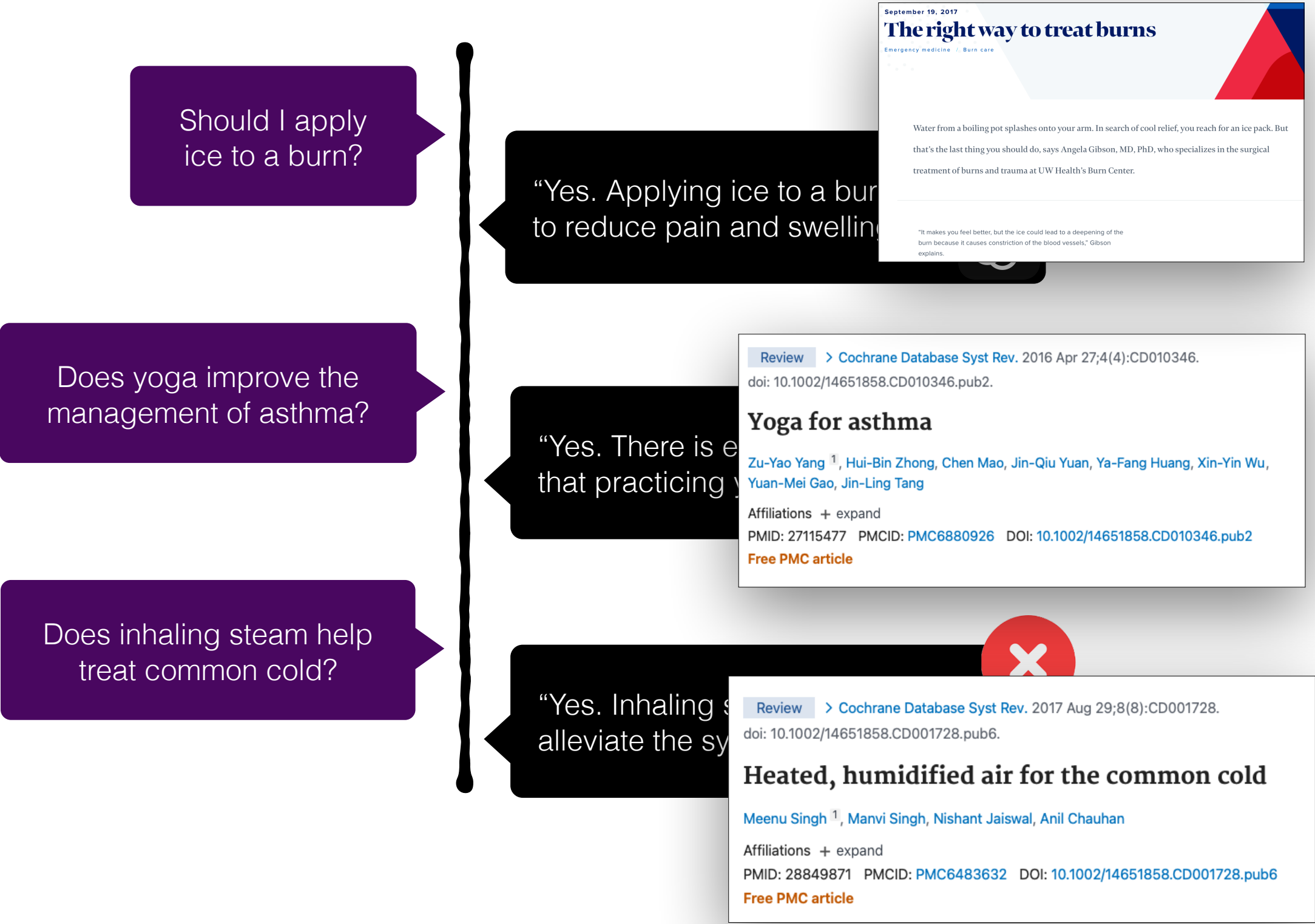




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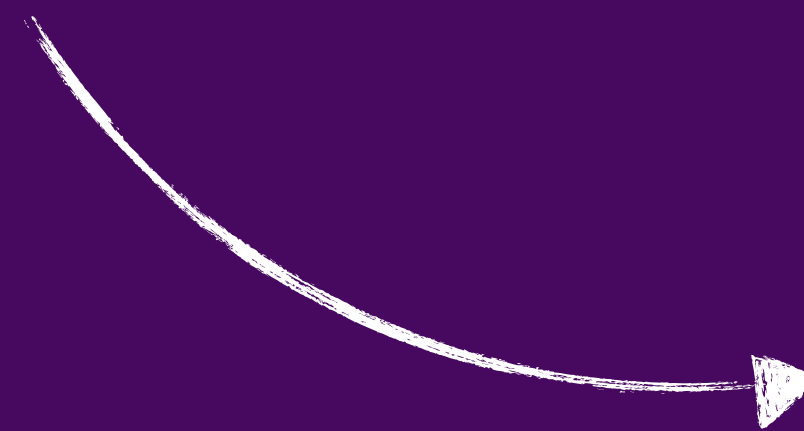


Retrieve and generate (RAG)?



# What we investigate

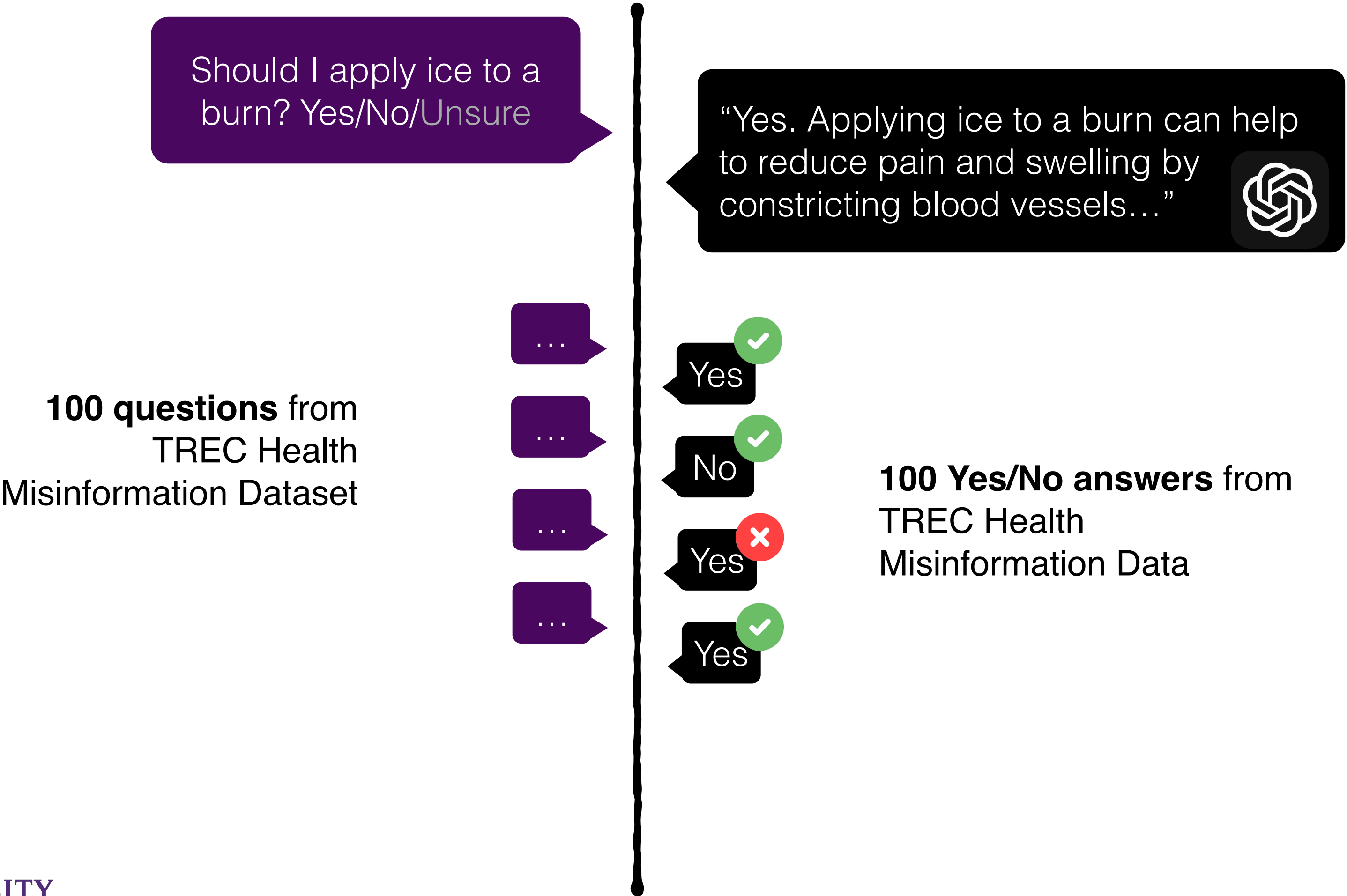
How effective is ChatGPT at answering health questions?



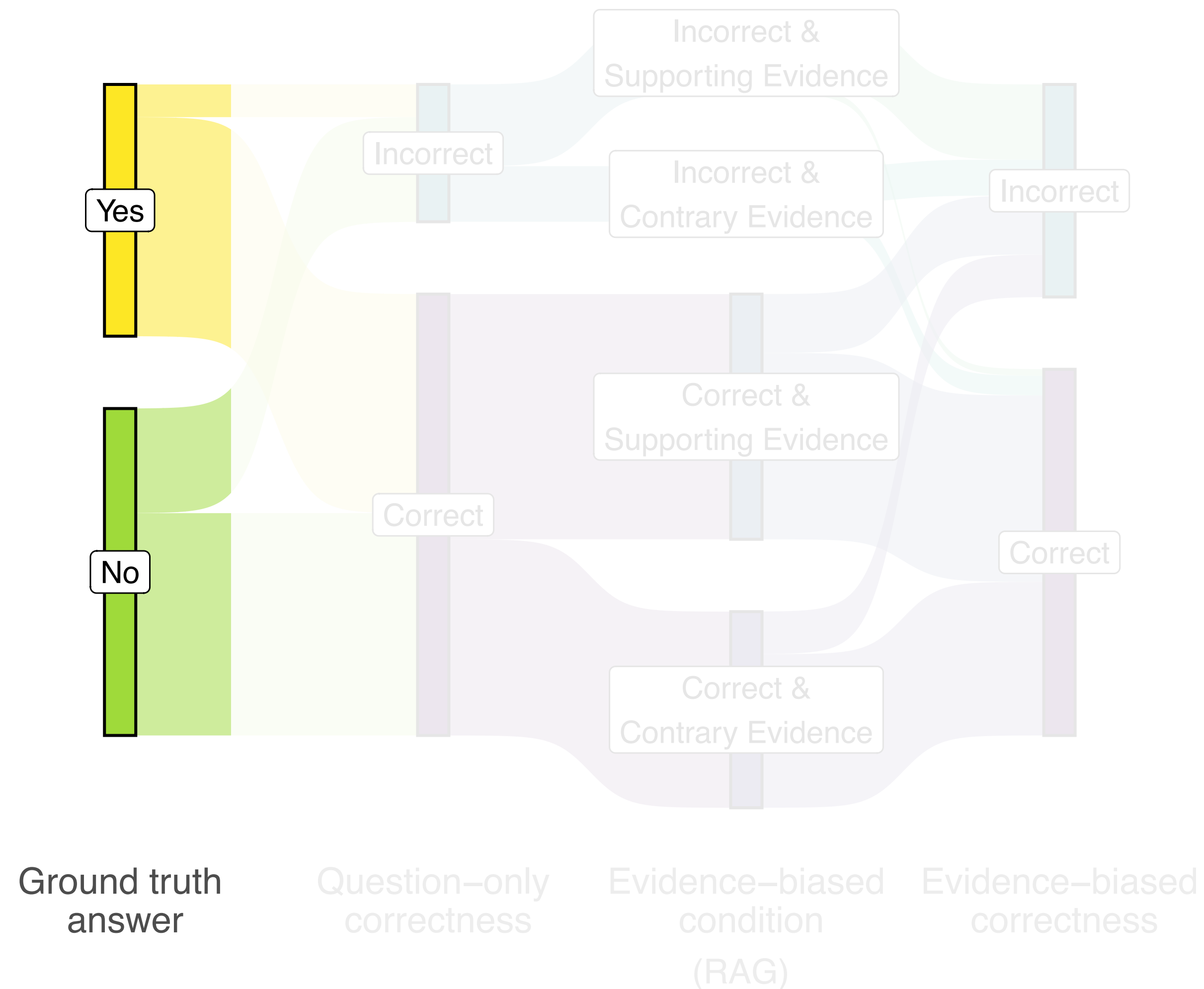
How does prompting with supporting or contrary evidence influence answer correctness?

How effective is ChatGPT at  
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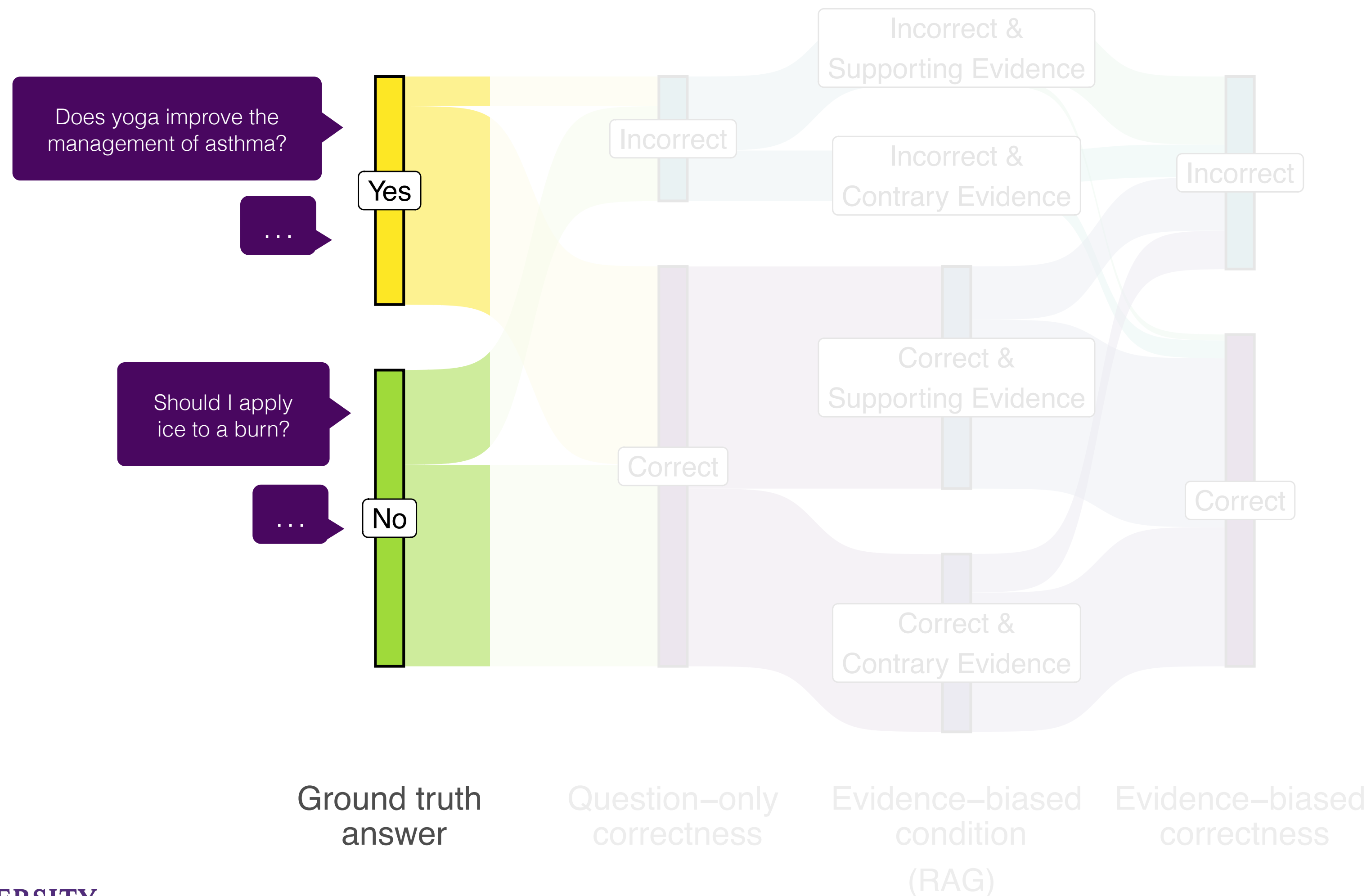
# Methods - How effective is ChatGPT at answering health questions?



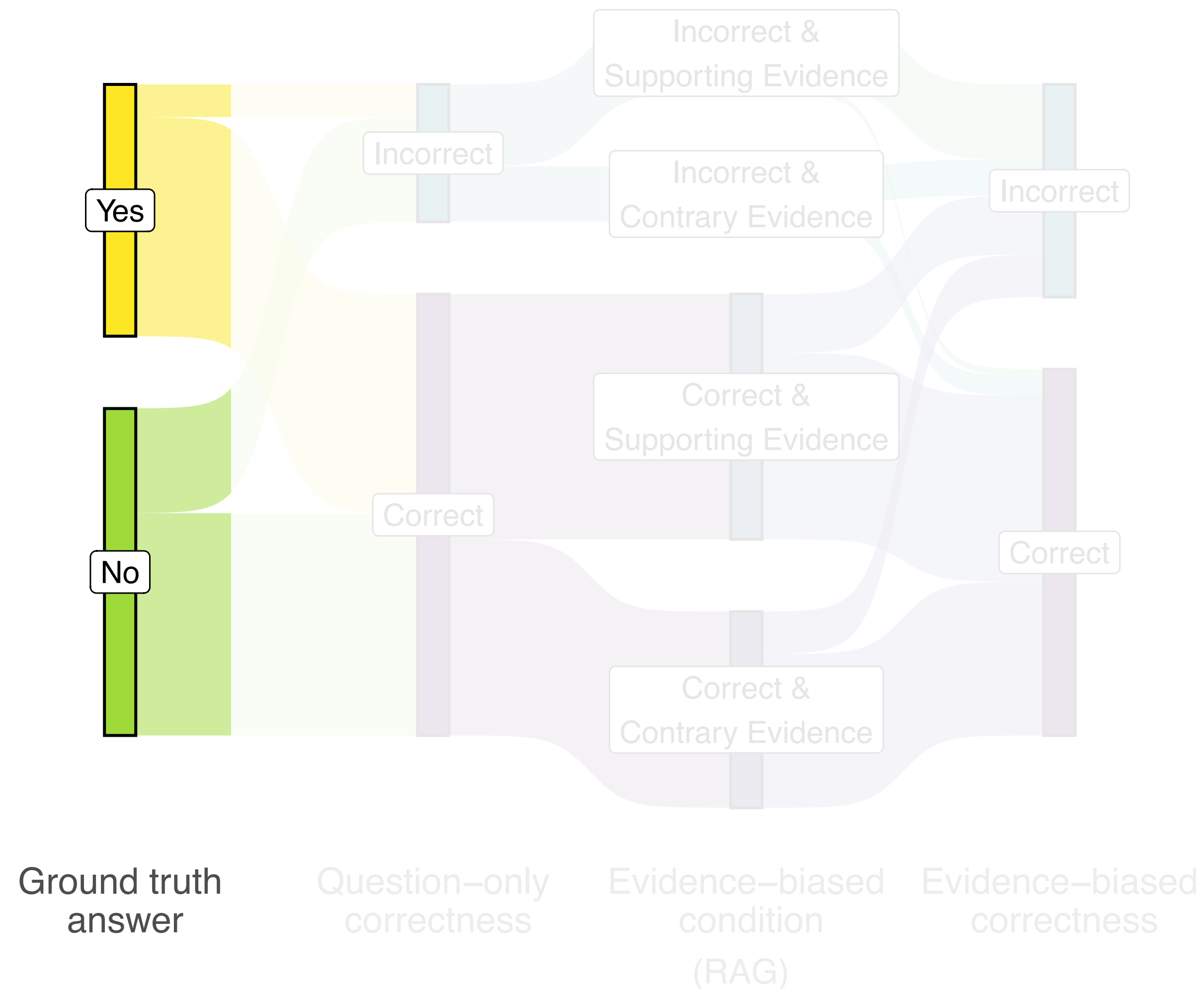
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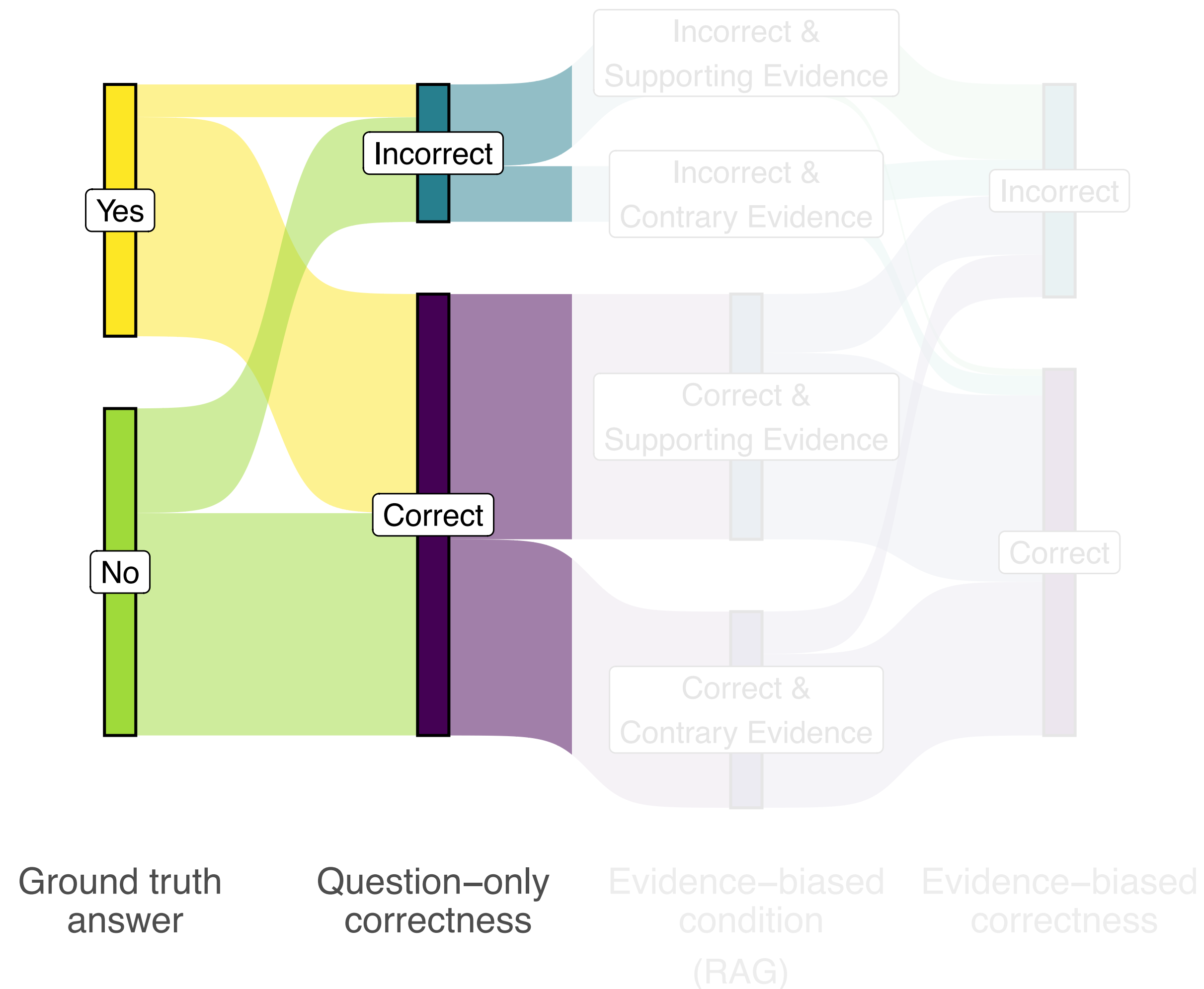
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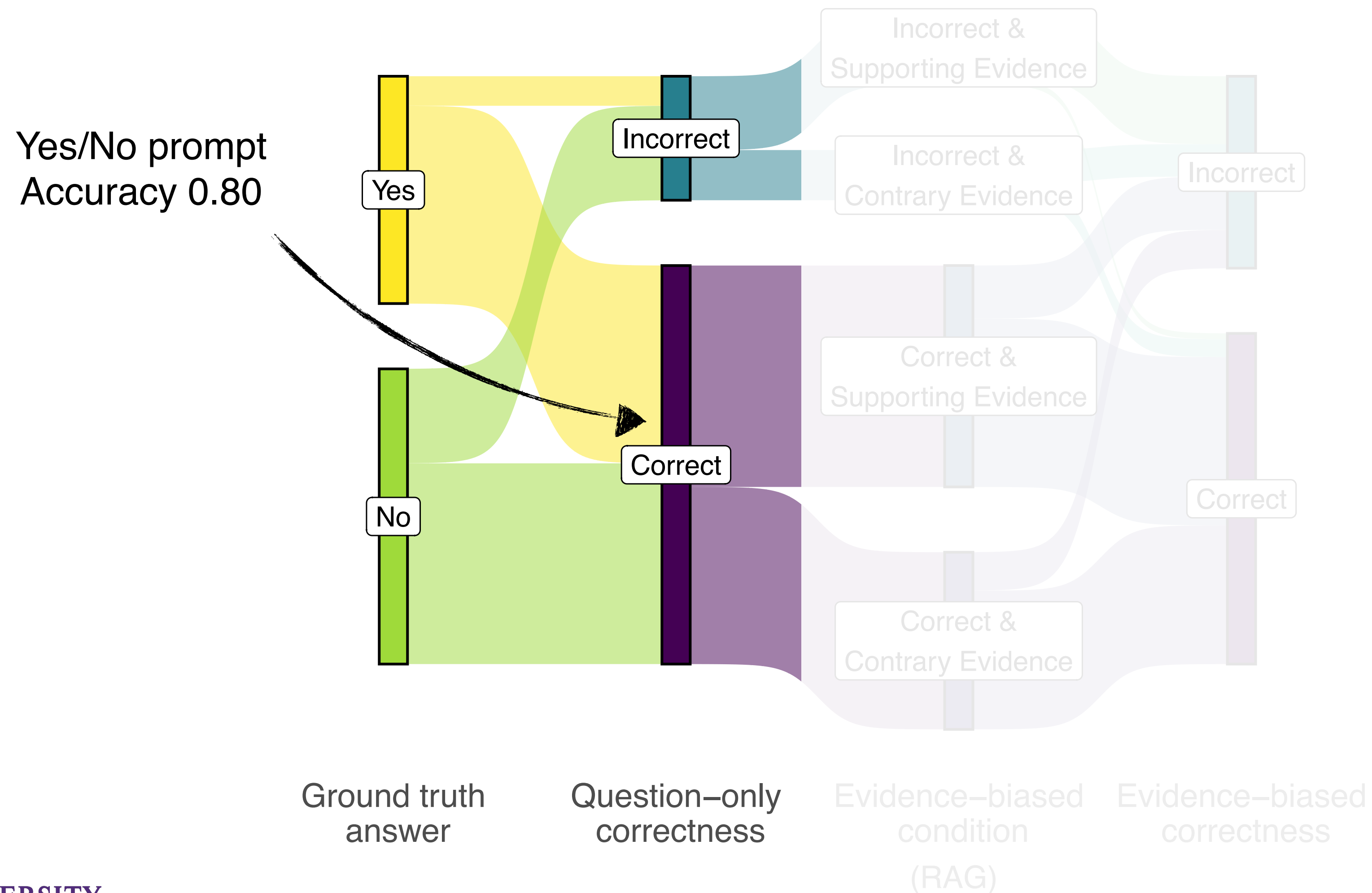
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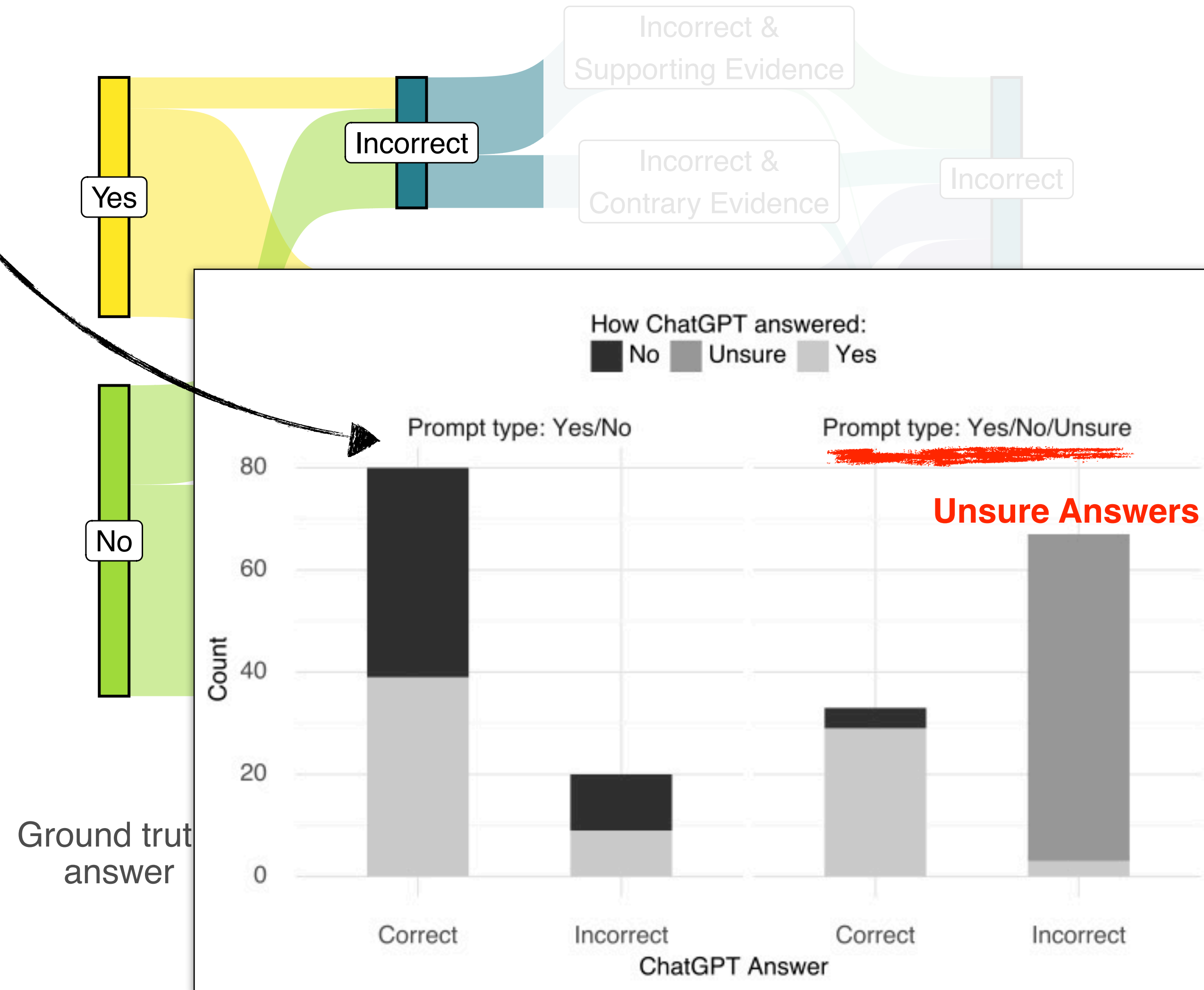
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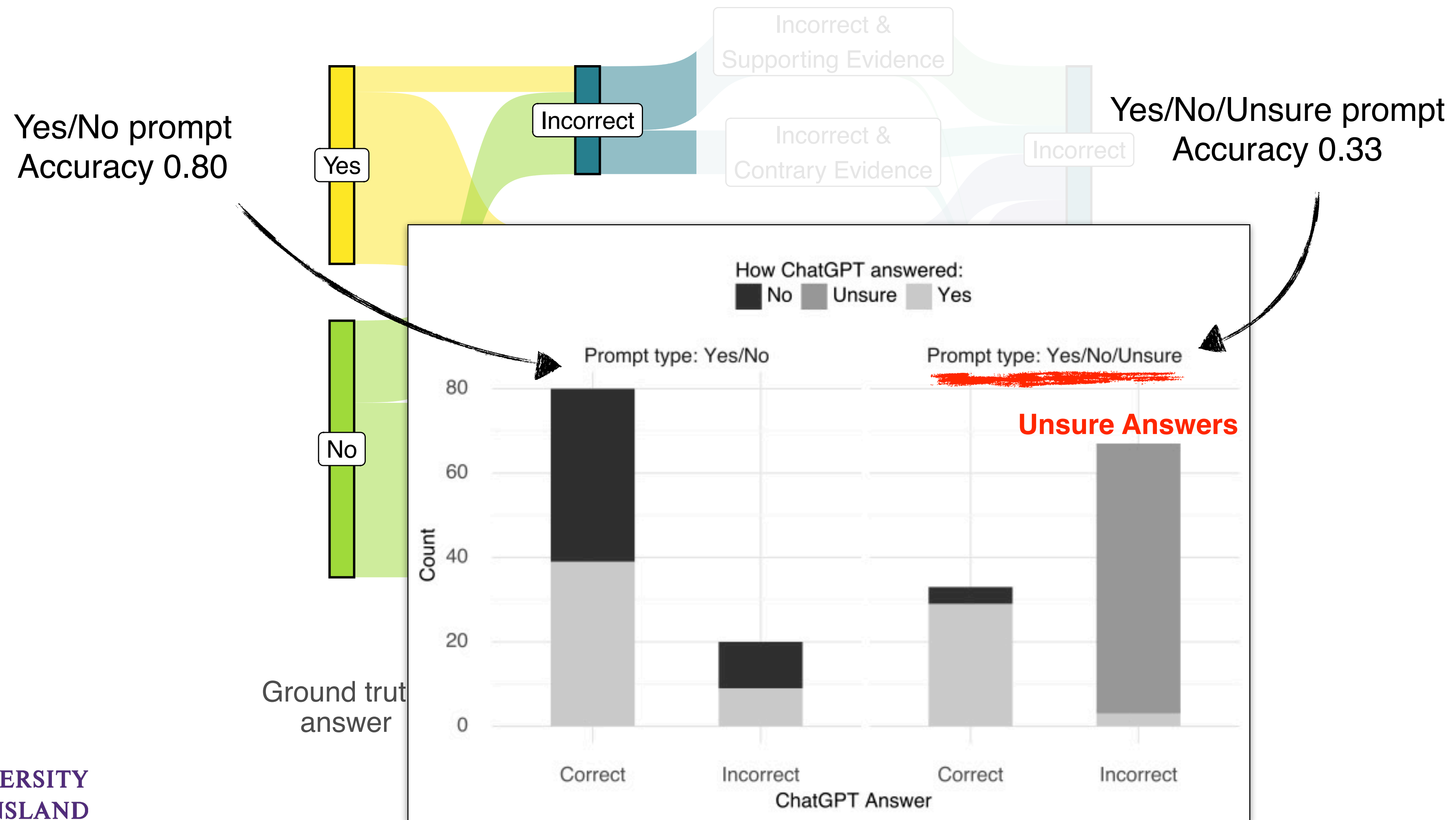


# How effective is ChatGPT at answering health questions?

Yes/No prompt  
Accuracy 0.80



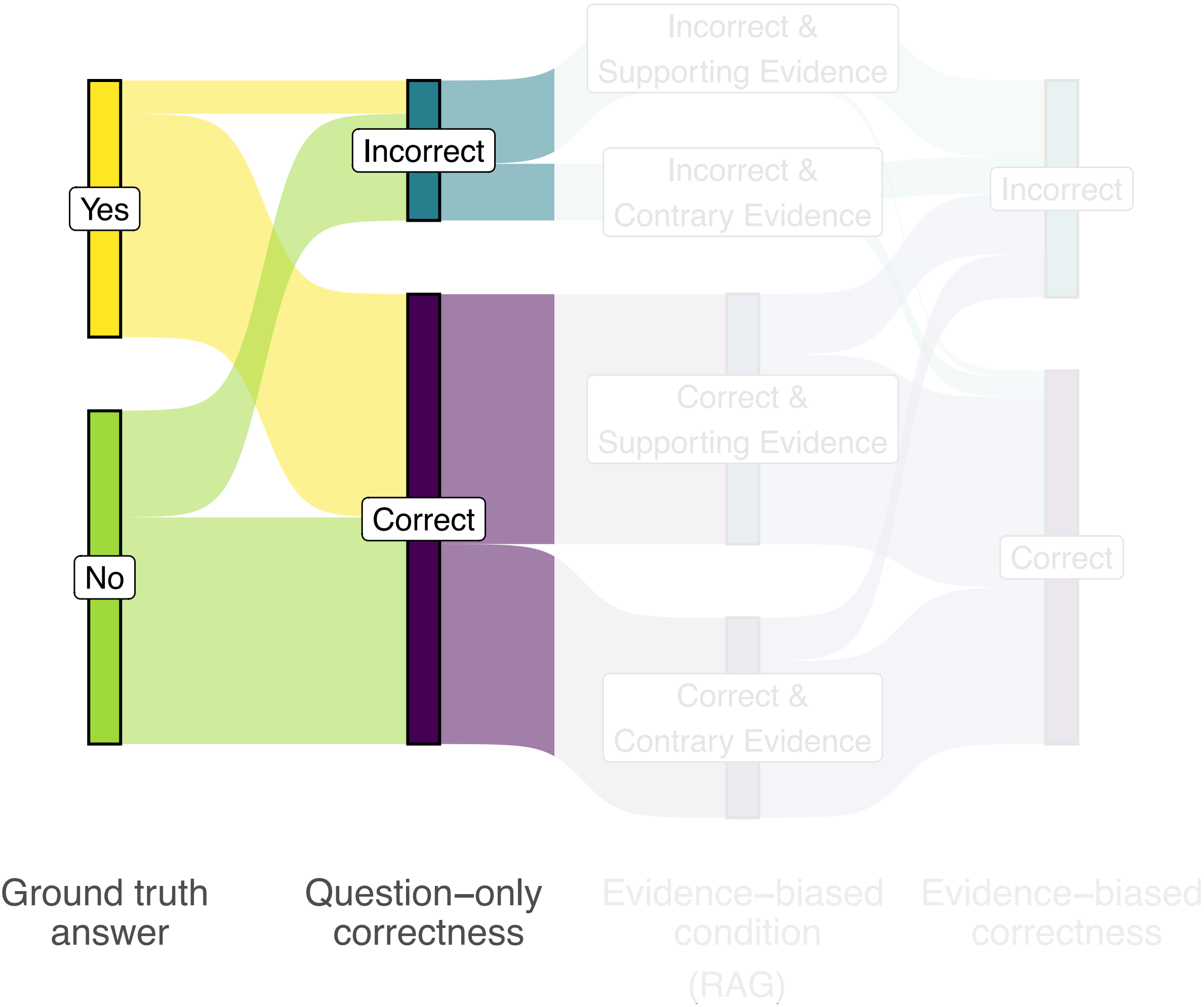
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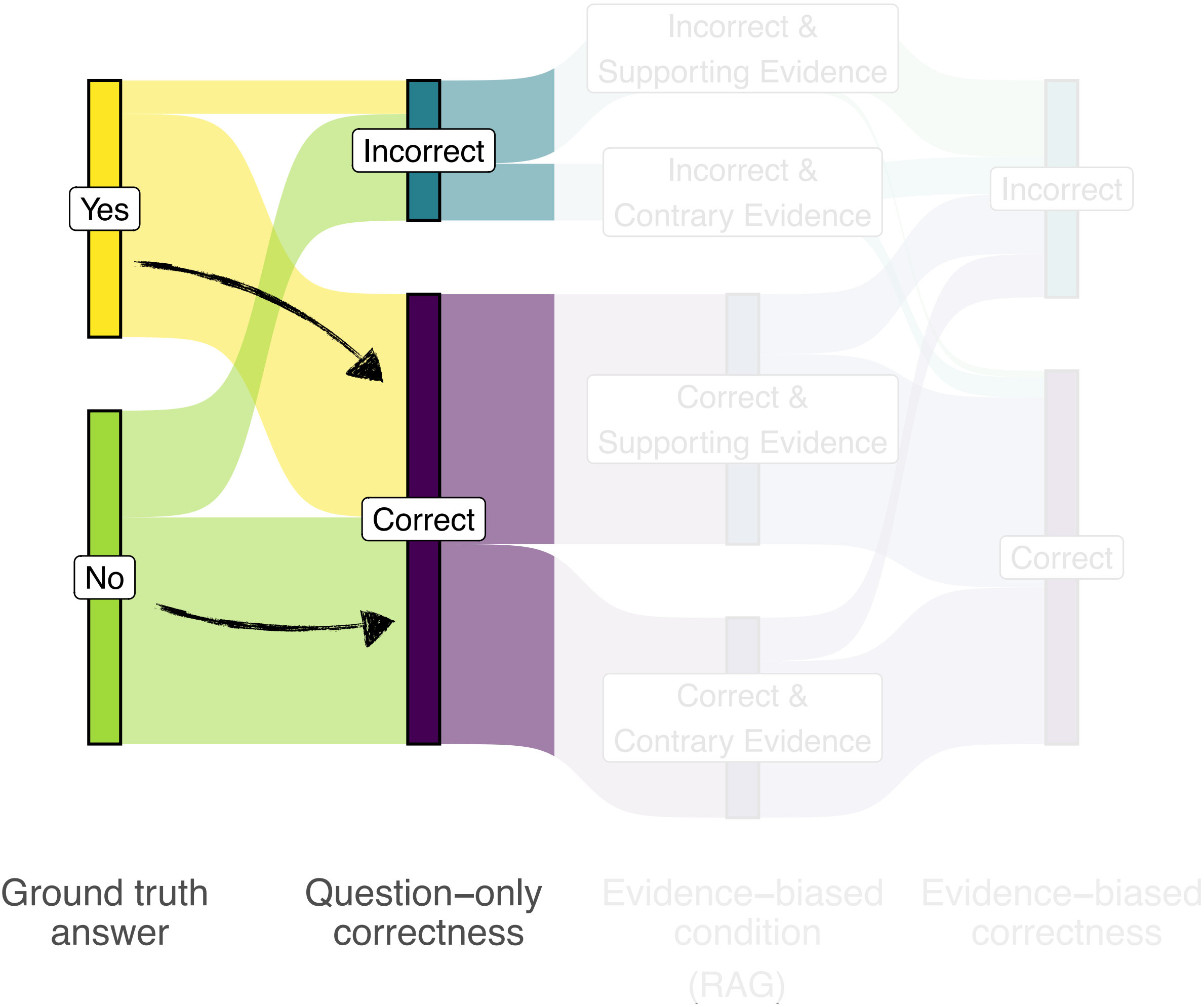
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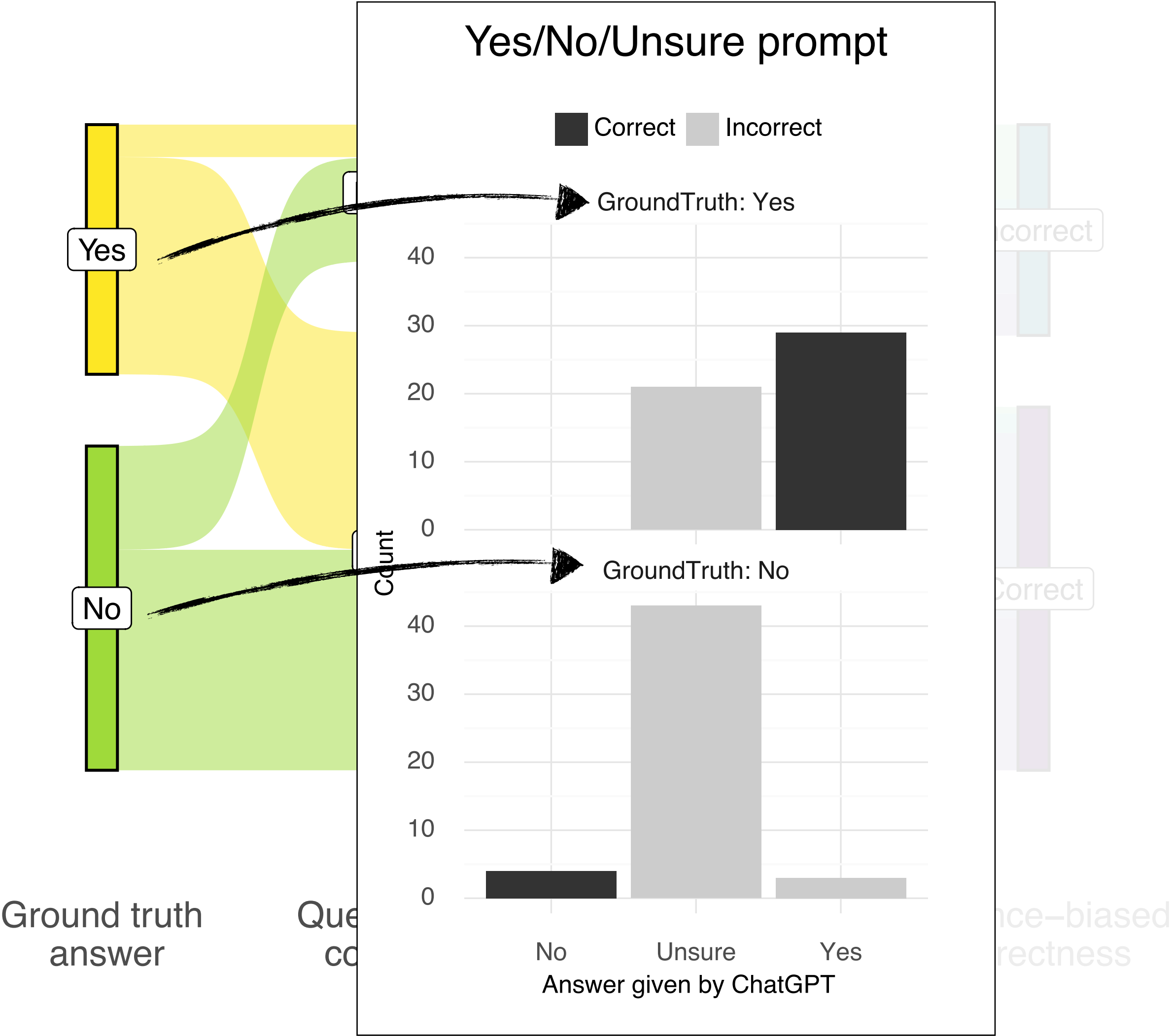
# ChatGPT is much better at answering ‘Yes’ questions.



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# ChatGPT is much better at answering ‘Yes’ questions.



# If you invert the phrasing of the question...

“Can folic acid help cognition and treat dementia?”

Prompt	Overall Accuracy
Yes/No	0.80
Yes/No/Unsure	0.33

“Folic acid can’t help cognition and treat dementia?”

Prompt	Overall Accuracy
Yes/No	0.56
Yes/No/Unsure	0.04

Ground truth answer      Question-only correctness (RQ1)      Evidence-biased condition      Evidence-biased correctness (RQ2)

How does prompting with supporting or contrary evidence influence answer correctness?



# Methods - Prompting with evidence

**Can folic acid help improve cognition and treat dementia?**

A web search for this question has returned the following evidence, which I provide to you in quotes:

"An important study appeared in JAMA Psychiatry in June 2016, providing additional evidence that high blood levels of vitamin B12 can slow the shrinking of the brain that commonly occurs after age 60..."

You MUST answer to my question with one of the following options ONLY:  
<Yes>,<No>.

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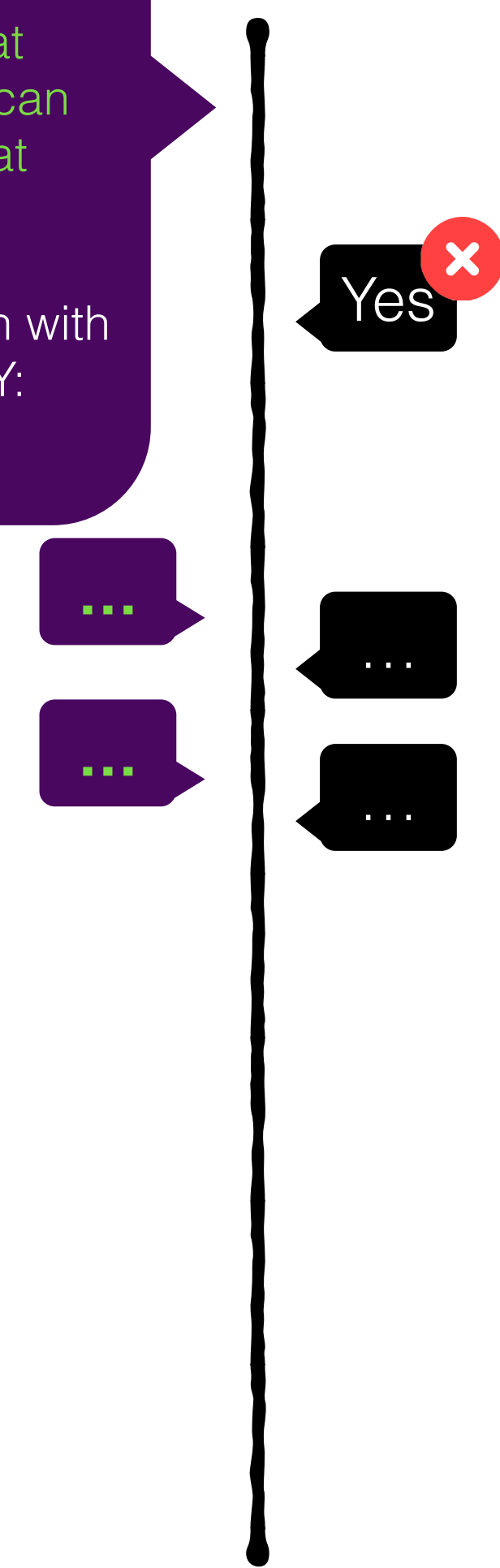
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# Methods - Prompting with evidence

**TREC Health Misinformation Dataset:**

**3 supporting evidence passages**



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**Can folic acid help improve cognition and treat dementia?**

A web search for this question has returned the following evidence, which I provide to you in quotes:

"No evidence that folic acid with or without vitamin B12 improves cognitive function of unselected elderly people with or without dementia..."

You MUST answer to my question with one of the following options ONLY:  
<Yes>,<No>.

Yes

...

...

**TREC Health Misinformation Dataset:**

**3 supporting evidence passages**

# Methods - Prompting with evidence

Can folic acid help improve cognition and treat dementia?

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A web search for this question has returned the following evidence, which I provide to you in quotes:

"No evidence that folic acid with or without vitamin B12 improves cognitive function of unselected elderly people with or without dementia..."

You MUST answer to my question with one of the following options ONLY: <Yes>,<No>.

Yes

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...

No

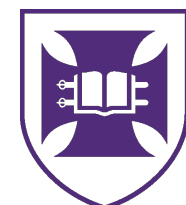
...

...

**TREC Health Misinformation Dataset:**

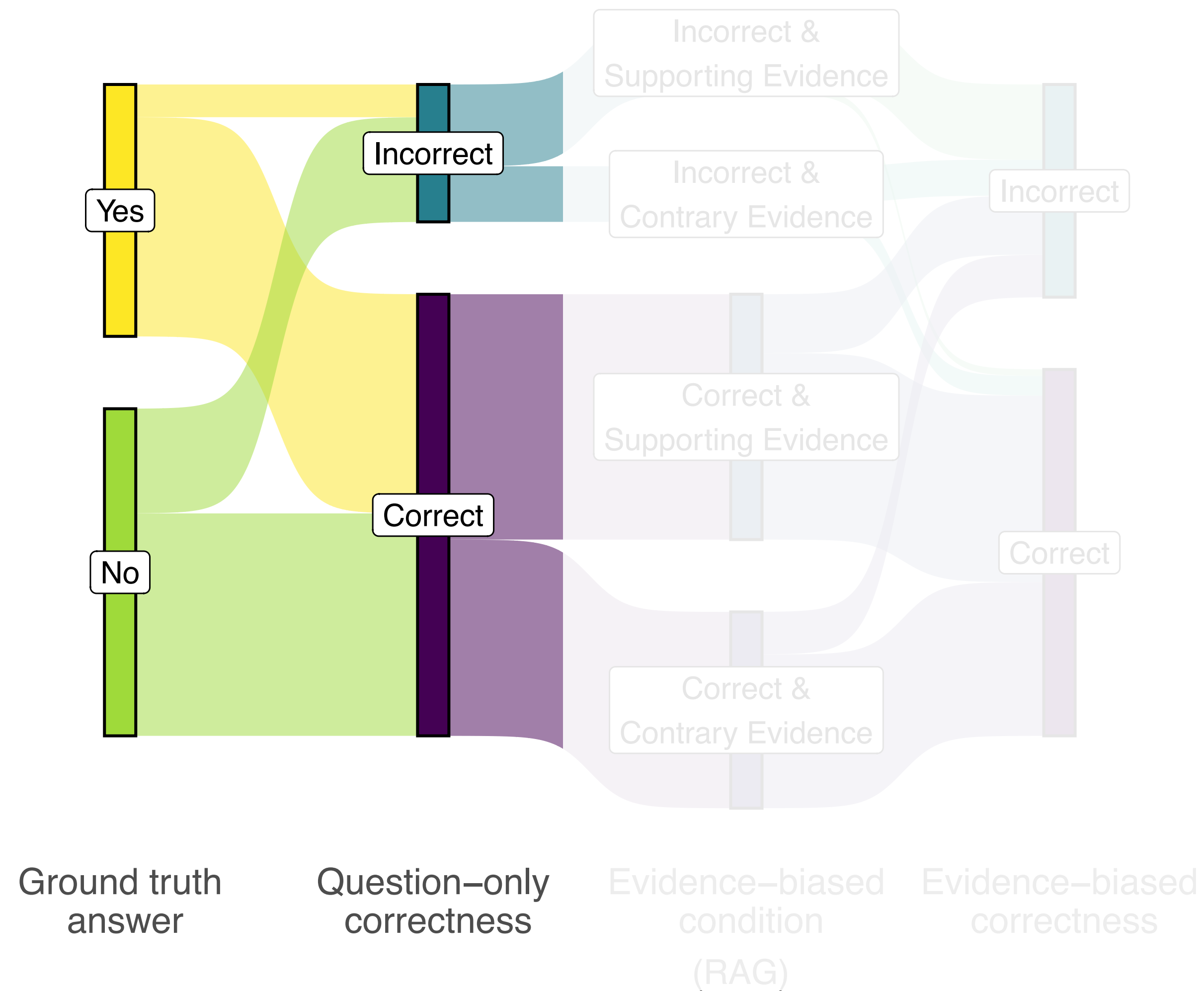
**3 supporting evidence passages**

**3 contrary evidence passages**

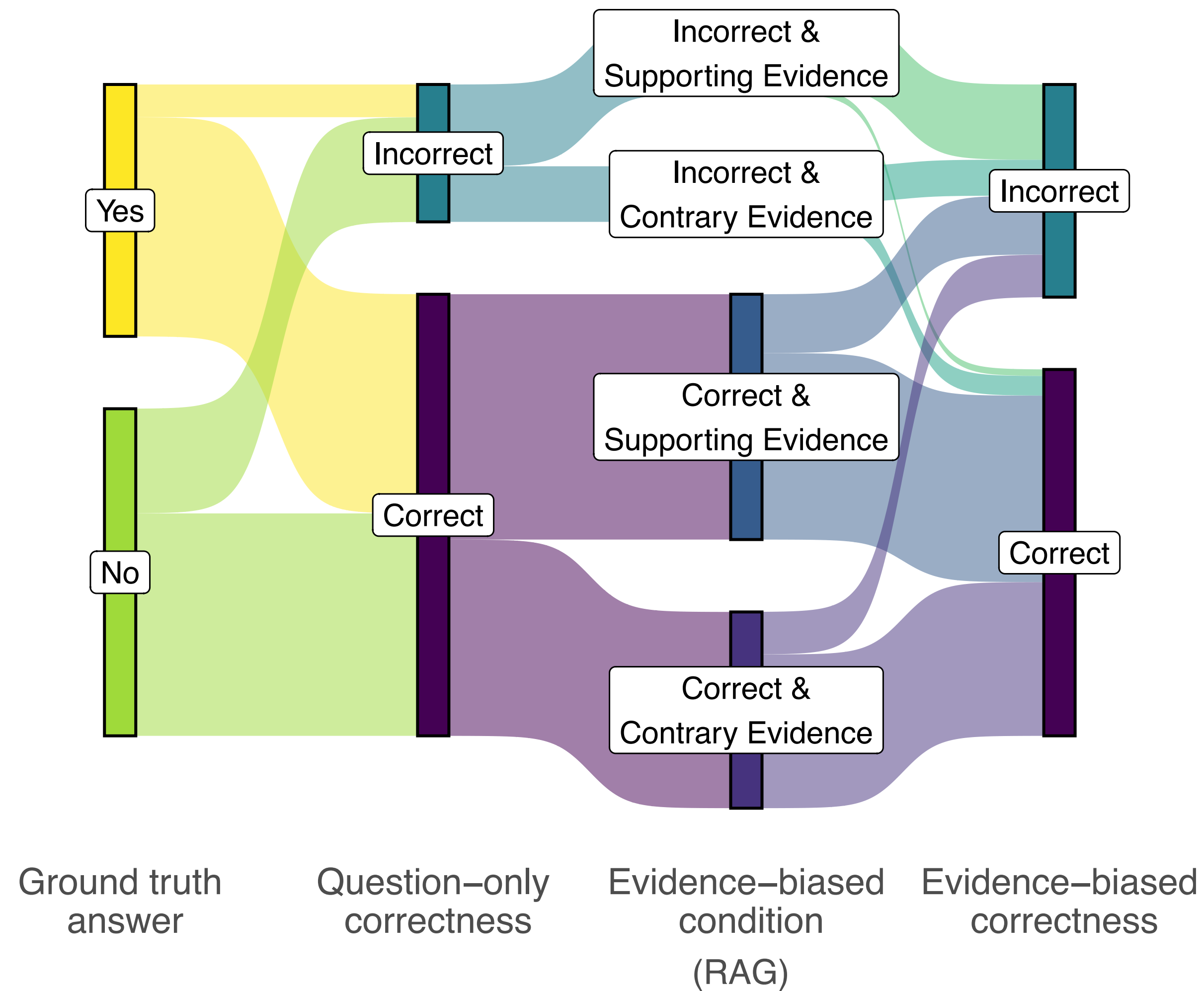


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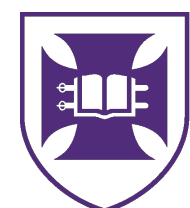
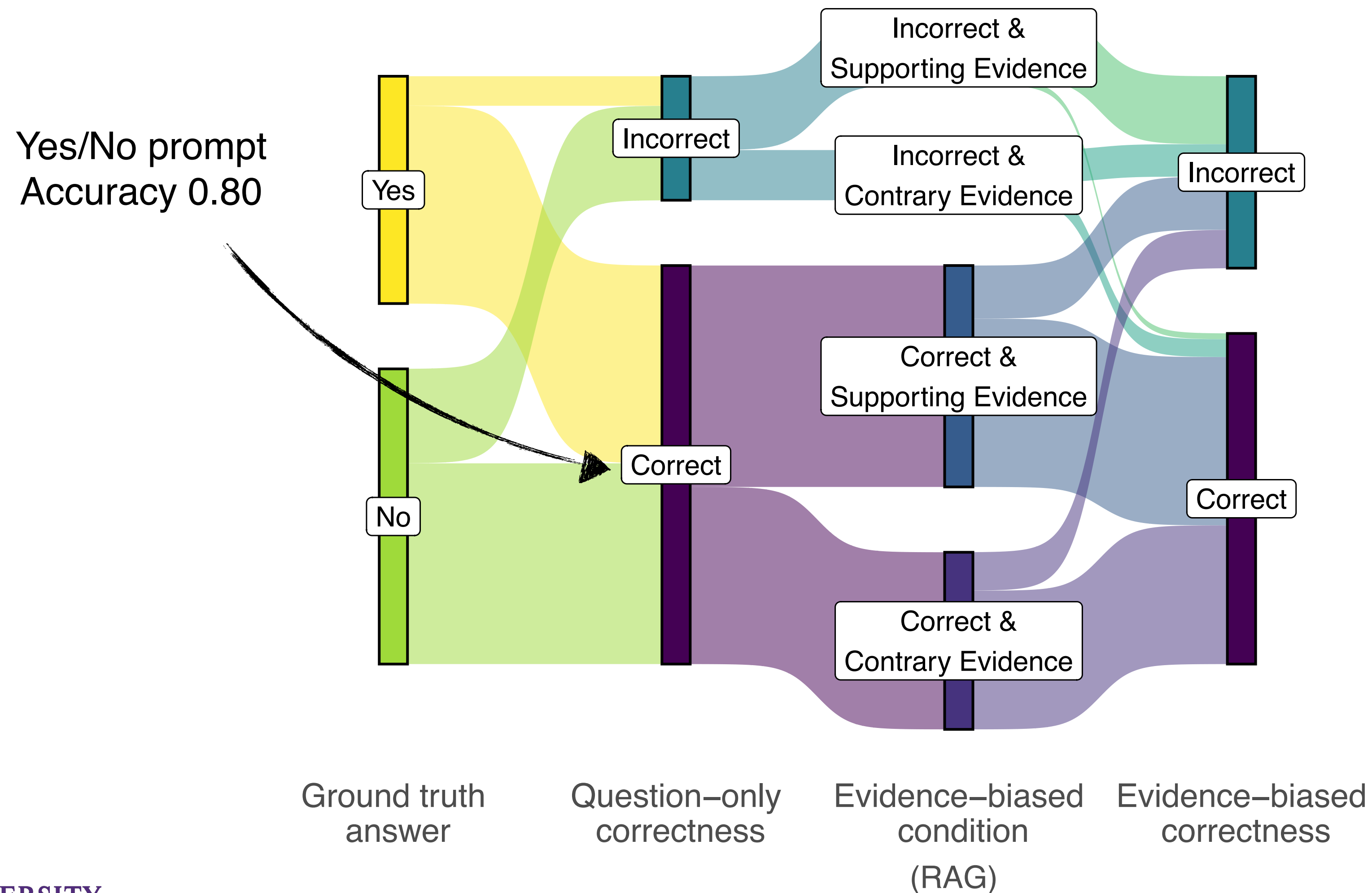
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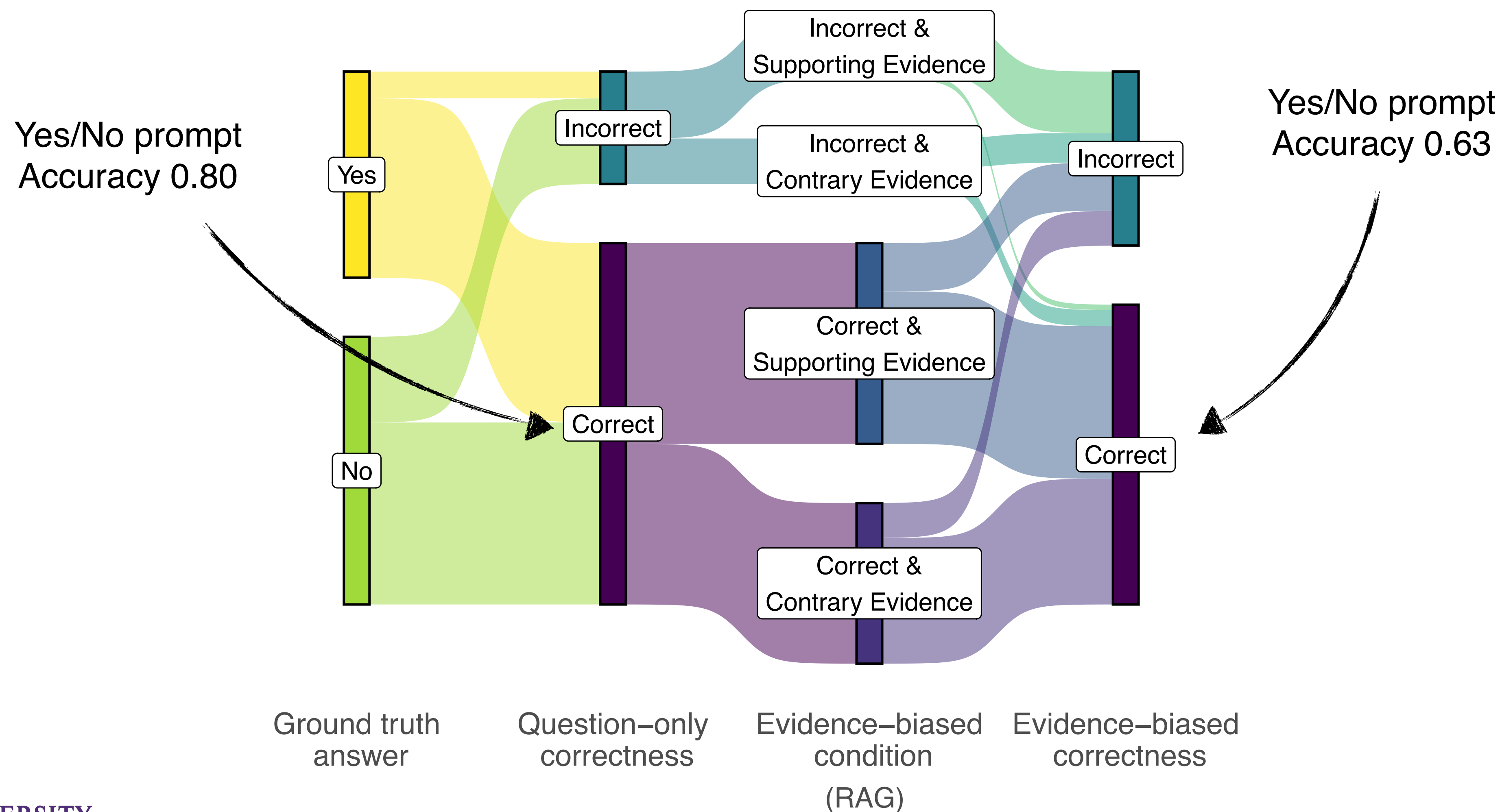


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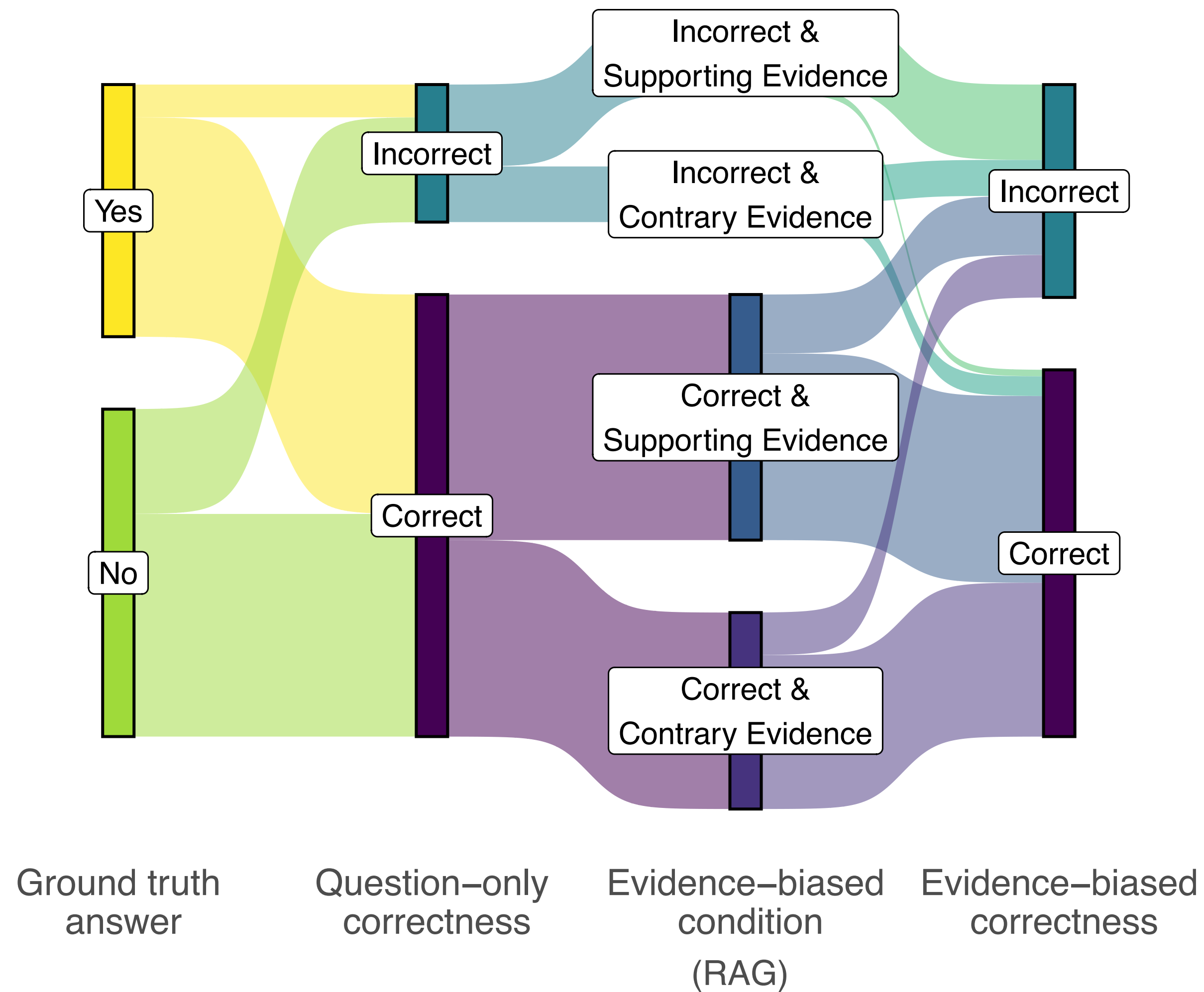




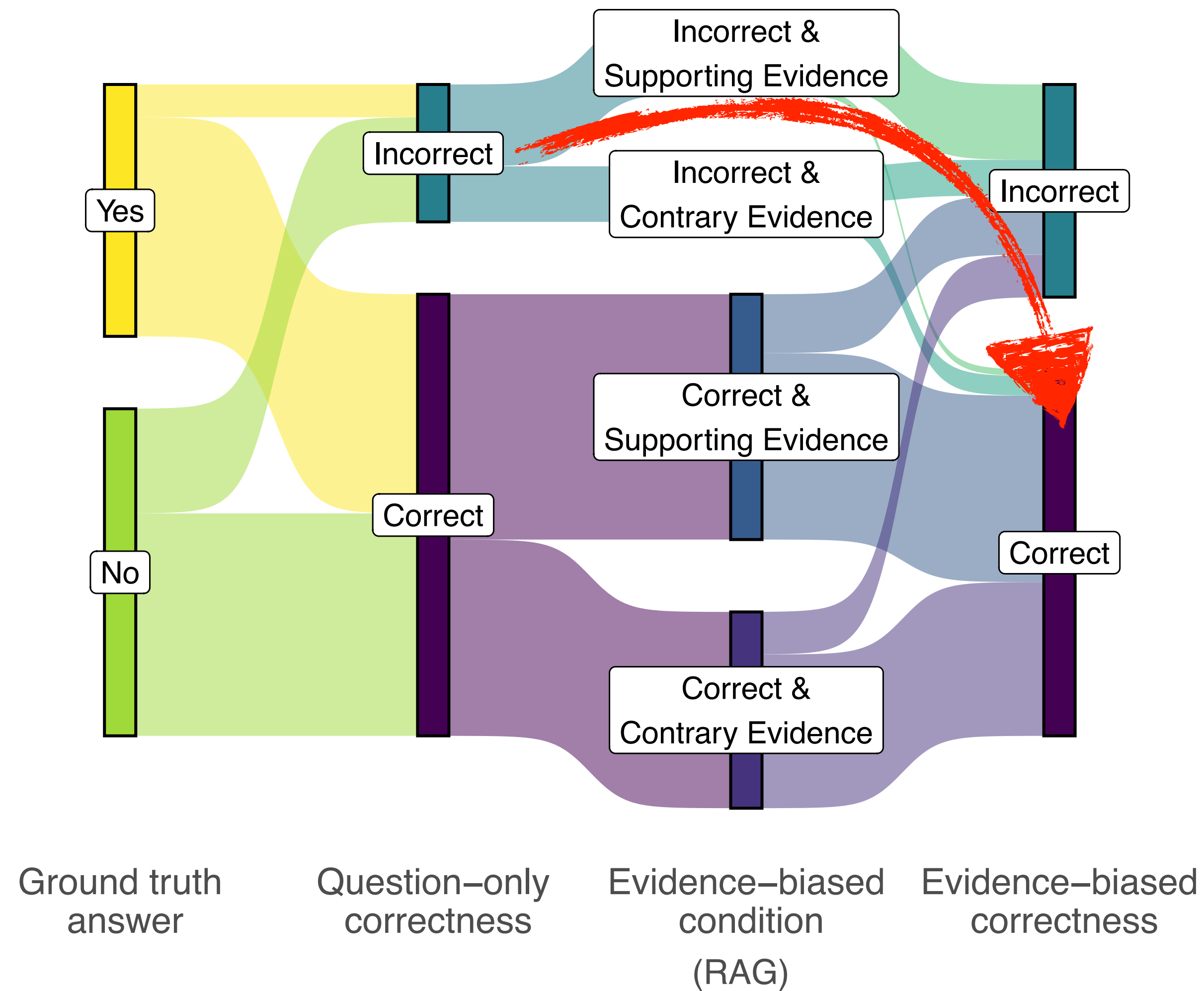
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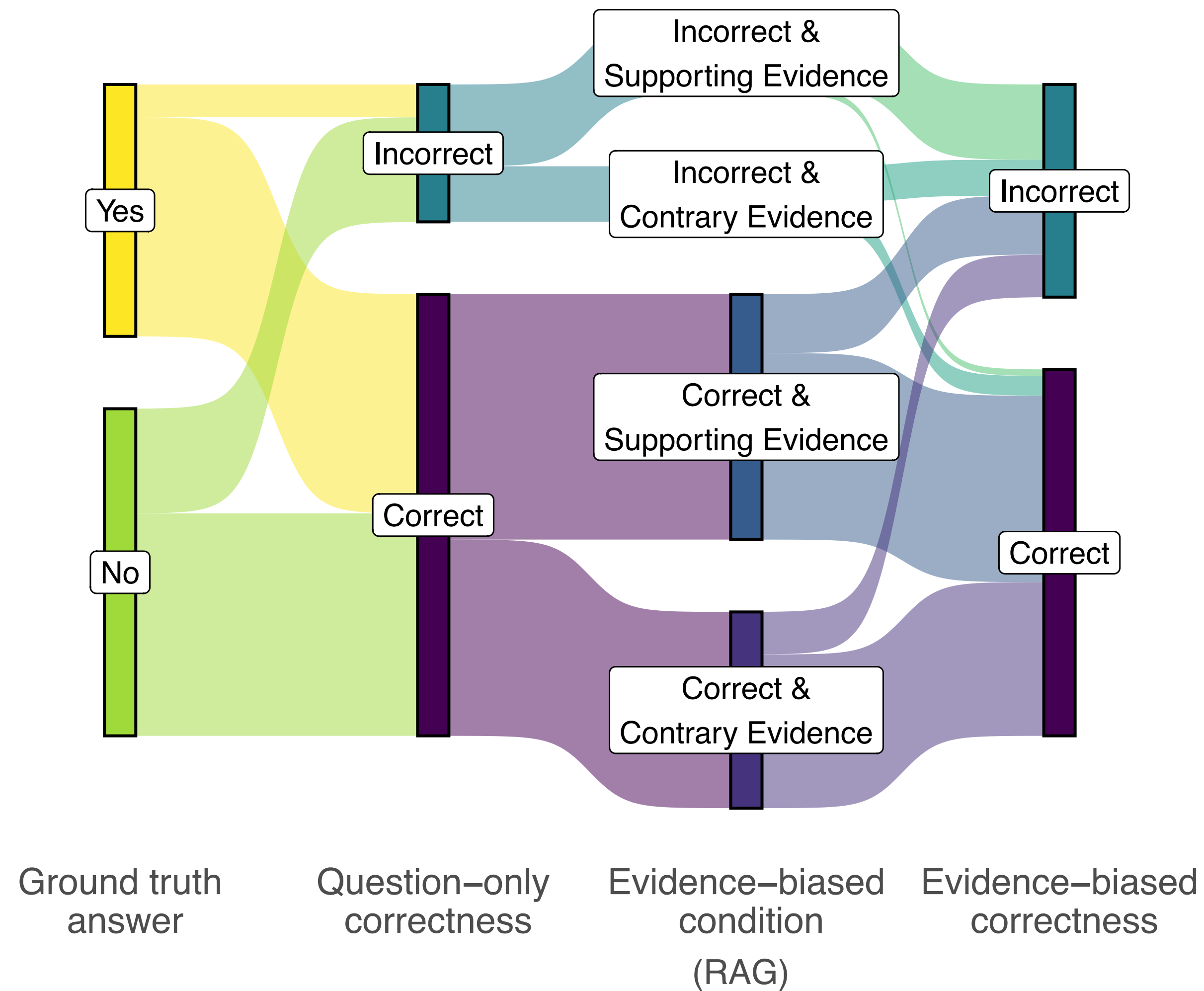
# Where RAG is meant to help:



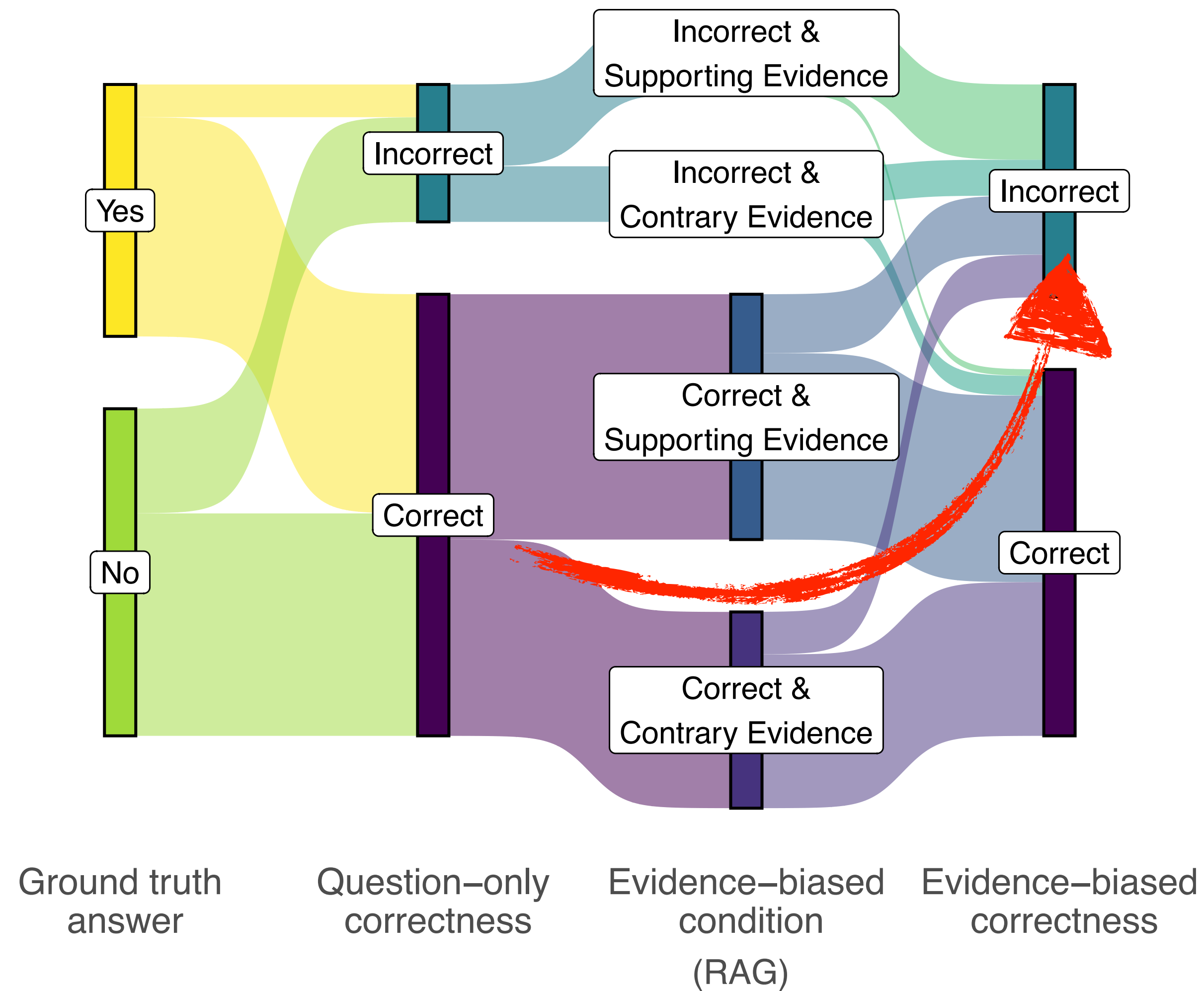
# Where RAG is meant to help:



# RAG flips correct answers to incorrect



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# Takeaways

- ChatGPT can be effective (80%) but...
- Systematic bias based on Yes vs No questions
- Rephrasing the question to its negative form strongly degrades effectiveness
- Providing evidence in the prompt degrades answer accuracy (even if the evidence is correct).
- Retrieval augmented generation (RAG) is not a silver bullet!



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ielab/drchatgpt-health\_prompting

