Pregnant Questions: The Importance of Pragmatic Awareness in Maternal Health QA

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SCAN ME

Motivation

Humans **naturally embed assumptions and implications in questions** all the time! Sometimes, these assumptions or implications are false.

Sensitive

- What year did Billy Joel's 15th studio album release?
- When should I give my baby fever reducing meds after shots?
- Why can tenants be evicted without any notice if the landlord decides to sell the property?

1. Fever reducing meds can be given to babies.
2. Receiving shots can cause fever in babies.
3. I should give my baby fever reducing meds after a vaccine.
4. An amount of time must pass before giving meds after a shot.

QA systems must naturally address false assumptions or implications in questions. This is especially **important in high-risk settings such as consumer health or the legal domain**.

Can we induce this behavior in a domain-specific QA system?

Linguistic Grounding: Pragmatic Inference

Presupposition

Implicit assumptions in utterances taken for granted by discourse participants. ***They are already part of an asker's world model.***

Are multiple ultrasounds dangerous from my baby?

presupposes

The effects of an ultrasound on my body are additive.

Implicature

A type of pragmatic inference suggested by an utterance instead of part of its literal meaning. These are **likely beliefs** that may be negated in a subsequent utterance.

Do most babies fit in newborn clothes?

implies

Not all babies fit in newborn clothes.

Collecting Assumptions in the Wild

Reddit

r/BabyBumps
r/breastfeeding
r/NewParents
r/Mommit
r/beyondthebump

Filtering Strategies

- Assumption-Correcting Behavior in Upvoted Comment
- Posts begin with a wh word
- Information seeking vs. community seeking
- Edit the titular question to include crucial details from post description

Rosie: A Custom Maternal Health QA System

CDC · MAYO CLINIC · KidsHealth · Vetted Corpus

Passage Retriever
Passage Reranker

Questions come from trial participants.

Natural Questions

NQ Train Set → mpnet-base-v2

Nearest neighbors to random ✖ {answerable, unanswerable}

Expert Annotation: OB/GYNs, Nurses, Lactation Specialists, Public Health Experts

Answer Writing
Write helpful and informative long-form answers from scratch + provide web documents.

Identifying Assumptions and Implications
Write a list of beliefs or assumptions the question asker may hold (or beliefs that any complete answer must address).

Veracity
Identify whether each assumption is medically T/F, provide supporting web document.

Question	Example Assumption or Implication		Answer + Textual Evidence
Is it okay for me to color my hair after giving birth?	Hair dye chemicals can pass through breast milk from mother to child.	False	Most experts agree that hair dye is generally…
Is it bad to use different bottles or nipples during feedings?	Using different bottles or nipples for feeding may compromise the baby's latch.	False	The type of nipple and bottle you choose will mainly depend…
When does the fetus begin to develop memory?	Fetuses have the ability to form memories.	True	Studies addressing the formation of memories in utero…

	Rosie	Reddit	Natural Questions
# questions	200	200	100
ans. length (# sent)	3.9	6.6	5.6
# inferences	1161	1114	452
% false/subjective	22.5	30.8	20.1
% true	77.5	69.2	79.9

How do humans ask and answer questions?

Finding 1
When users make false or subjective inferences, they are more likely to do so via implicature.

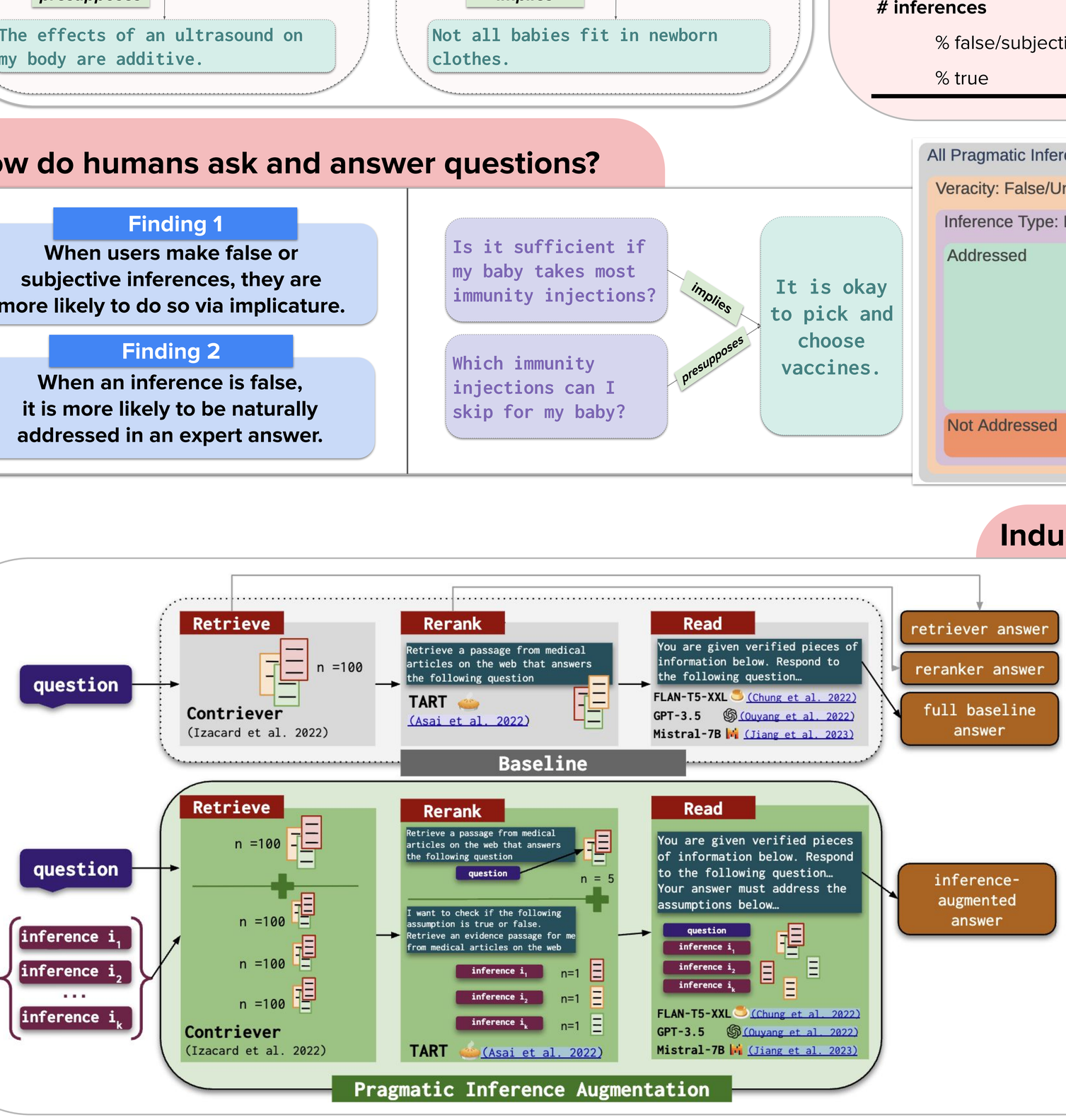
Finding 2
When an inference is false, it is more likely to be naturally addressed in an expert answer.

Is it sufficient if my baby takes most immunity injections? —*implies*→ It is okay to pick and choose vaccines.
Which immunity injections can I skip for my baby? —*presupposes*→ It is okay to pick and choose vaccines.

All Pragmatic Inferences in INFERENCE-SAMPLE

Veracity: False/Unsure		Veracity: True	
Inference Type: Implicature	Inference Type: Presupposition	Inference Type: Presupposition	Inference Type: Implicature
Addressed	Addressed	Addressed	Addressed
Not Addressed	Not Addressed	Not Addressed	Not Addressed

Inducing Pragmatic Behavior in QA Systems



Inference-augmented answers are always equally or more frequently preferred over the baseline response across all questions. Across questions with highly plausible false assumptions, the preference gap is much higher in favor the inference augmented system.

Our results illustrate the promise of inducing pragmatic behavior in QA models and **represent a lower bound of their performance.**