

# Understanding Statistics in the News

Kimball Martin

The University of Oklahoma  
Norman, Oklahoma

July 2021

# I. Truth and logic

**(Logical) statements:** declarative sentences which are objectively true or objectively false

Which of these are statements?

1. It's hot today.
2. It is freezing now.
3. There is a 20% chance of rain today.
4. The weather forecast said there is a 20% chance of rain today in Norman.
5. Is today Wednesday?
6. *Gone with the wind* is the most popular movie of all time.
7. My name is Mike.
8. My favorite food is pizza.
9.  $x = 7$ .

## More on Statements

- statements can be *relative* (e.g., contain “it”, “here” or “now”) or contain *variables*
- all terms in statements must be *well-defined*
- often terms are defined *implicitly*
- statements, both true and false, may be *verifiable* or *unverifiable* (e.g., “The butler did it.”)

— In practice, statements require interpretation and for accurate communication, we need to use a common (shared) interpretation.

— Many statements are implicitly approximations (e.g., “my dog weighs 50 lbs”) or opinions

— Precisely defining things is often hard

— It's often useful to work with concepts that are not well-defined (hot/cold, good/evil, ...)

— Statistics and statements in the news/media/etc are often misinterpreted or false

# Understanding truths

## 1. Concrete truth (facts)

Reality  $\rightarrow$  direct observer  $\rightarrow \dots \rightarrow$  reporter  $\rightarrow \dots \rightarrow$  you

- Many opportunities for errors in this “telephone game”
- *Daily Mirror* reports AC Omonia’s fans wear hats made from shoes based on Wiki page<sup>1</sup>

## 2. Abstract truth (ideas)

- $1 + 2 = 3$
- “that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness”

Both “formal” and “informal” abstract truths come from observation + logical thinking/arguments

---

<sup>1</sup>Source: *Virtual Unreality*, Charles Seife

# Thinking logically

A good argument is like a good recipe or directions

Tips from D.Q. McNerny's *Being Logical*, Chapter I:

- Be attentive
- Get the facts straight  
Basic types of facts: things (White House) and events (Lincoln's assassination)
- Ideas: objects and origins (cats, centaurs)
- Match ideas to facts (don't just live in ideas)
- Match words to ideas
- Effective communication
  - make definitions/assumptions clear (be on same page)
  - clearly connect facts and ideas
- Avoid ambiguous or evasive language
  - vague words: good, evil, love, democracy, fair, ...

## In practice...

- There's neither time nor resources to verify everything yourself, so we need to rely on others
  - The real world is complicated—there's much that we can't know for sure, and we have to take *probabilistic* and *heuristic* approaches to understanding the world
  - Even verified truths often don't fit into quick soundbites, so are not easy to communicate accurately
  - Two logical people with access to the same information may arrive at very different conclusions
  - Quality sources and expertise matters, but they aren't infallible
- Distinguish what you know to be true from what you think is true (biases)
  - Prioritize what's important to verify for yourself
  - Find reliable sources, but understand their limits, and learn how to corroborate evidence

## Logic quiz

Analyze the following:<sup>2</sup>

1. Every dog has 3 heads. Collies are dogs. Therefore, collies have 3 heads.
2. Pierre Poseur was an All-American football player. Pierre Poseur earned his first million before he was 30. Pierre Poseur is handsome and has a winning smile. Therefore, Pierre Poseur should be elected governor.
3. Every squirrel is a mammal. Every chipmunk is a mammal. Therefore, every chipmunk is a squirrel.
4. No men are daughters. No waitresses are men. Therefore, no waitresses are daughters.
5. No Oklahomans are Californians. Every Normanite is an Oklahoman. Therefore, no Normanites are Californians.

---

<sup>2</sup>Adapted from *Being Logical*, D.Q. McInerney