

# Syllabus Quiz!

Online or on paper:

<https://umtgis.github.io/apps/evaluations/syllabus-quiz.html>



paper quizzes below



# Announcements

- **Seeking note taker for rest of term**
  - \$50 in UMoney
  - See me after class if interested
- **Check in on map tutorials**
  - Aim for tutorials between 50 mins and 1.5 hours
- **Syllabus error in your favor!**
  - No lecture on Thursday.

# Scales of Measurement

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# Scales of Measurement

The scale indicates the data summarization and statistical analyses that are most appropriate. It determines the amount of information in the data.

**Scales of measurement include:**

## Qualitative

- Logical
- Nominal
- Ordinal

## Quantitative

- Interval
- Ratio

# Scales of Measurement

Today, we will explore scales of measurement by creating choropleths using data from the Montana Department of Revenue.<sup>1</sup>

# Qualitative versus Quantitative data

Data can be **qualitative** or **quantitative**.

The appropriate thematic map depends on whether the data for the variable are qualitative or quantitative.

# Qualitative Data

Qualitative data indicate what kind.

- Labels or names used to identify an attribute of each element. E.g., Black or white, male or female.
- Often referred to as categorical data
- May use either the nominal or ordinal scale of measurement
- Can be either numeric or non-numeric

# Quantitative Data

Quantitative data indicate how many or how much.

- Discrete, if measuring how many. E.g., number of 6-packs consumed at tail-gate party
- Continuous, if measuring how much. E.g., pounds of hamburger consumed at tail-gate party
- Quantitative data are always numeric.
- Ordinary arithmetic operations are meaningful for most quantitative data.



# Logical

**Logical** data are True/False; it is a binary form of nominal data (see next slide!).

- A non-numeric label (true/false) or numeric code (1/0) may be used to represent logical data.
- Many statistical tests, when performed on logical data, yield proportions. For example, taking the mean of a logical variable (with 1 representing true, and 0 representing false) will reveal the proportion of the sample that is “true”.

## Recreational Sales, December 2023

Recreational Sales, December 2023



# Nominal

**Nominal** data are categorically discrete data such as the name of a country visited, type of ground-cover, or the name of a biome.

- This one is easy to remember because nominal sounds like name (they have the same Latin root).
- A non-numeric label or numeric code may be used for nominal data.

## Local Option Tax Status, December 2023

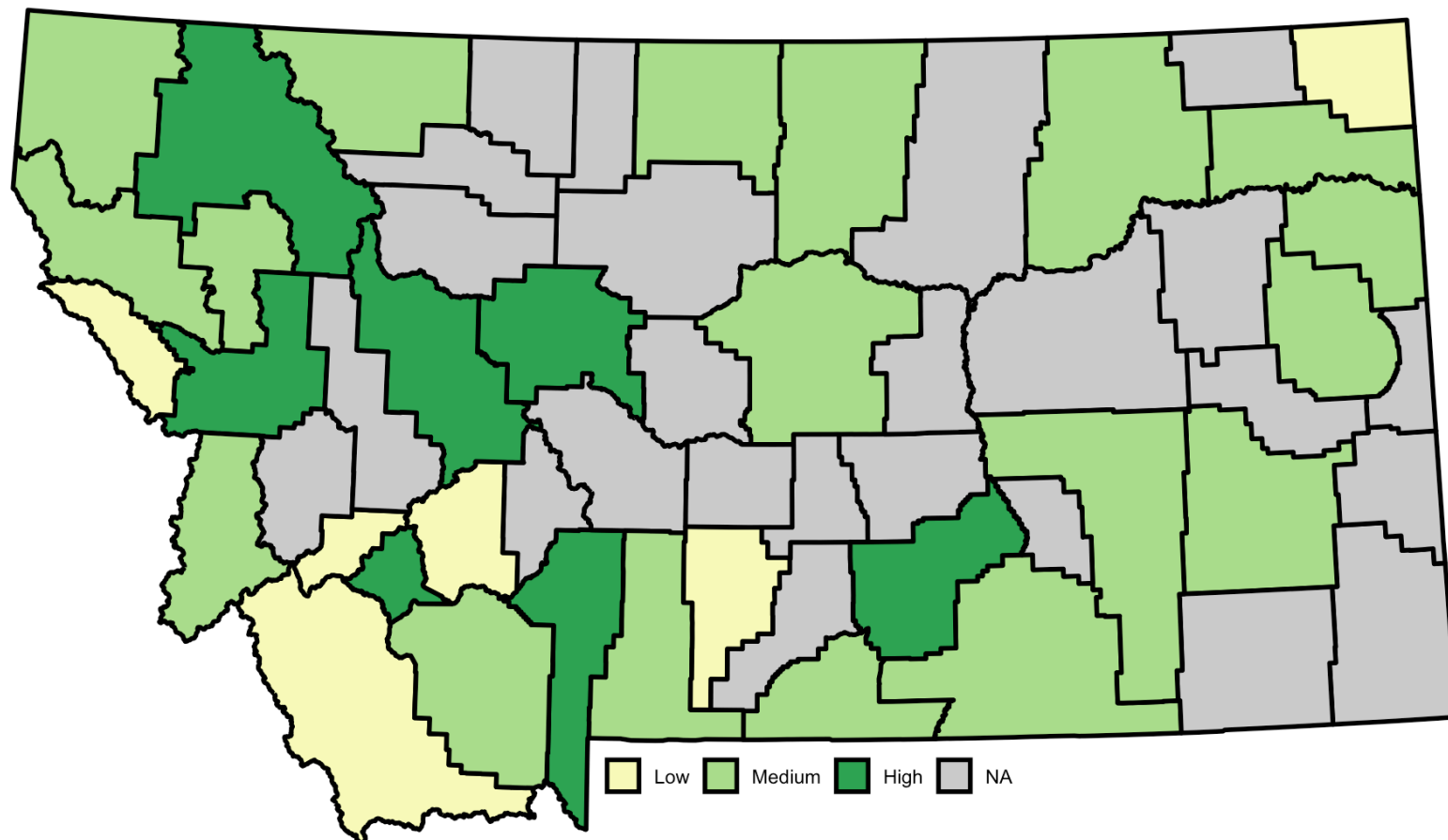


# Ordinal

**Ordinal** data are nominal data where the order or rank of the data is meaningful. However, the distance (interval) between categories is unknown or irregular.

- A non-numeric label or numeric code may be used.
- For example: freshmen → sophomore → junior → senior.

**Cannabis in Montana**  
Estimated Total Sales, December 2023 (Ordinal)



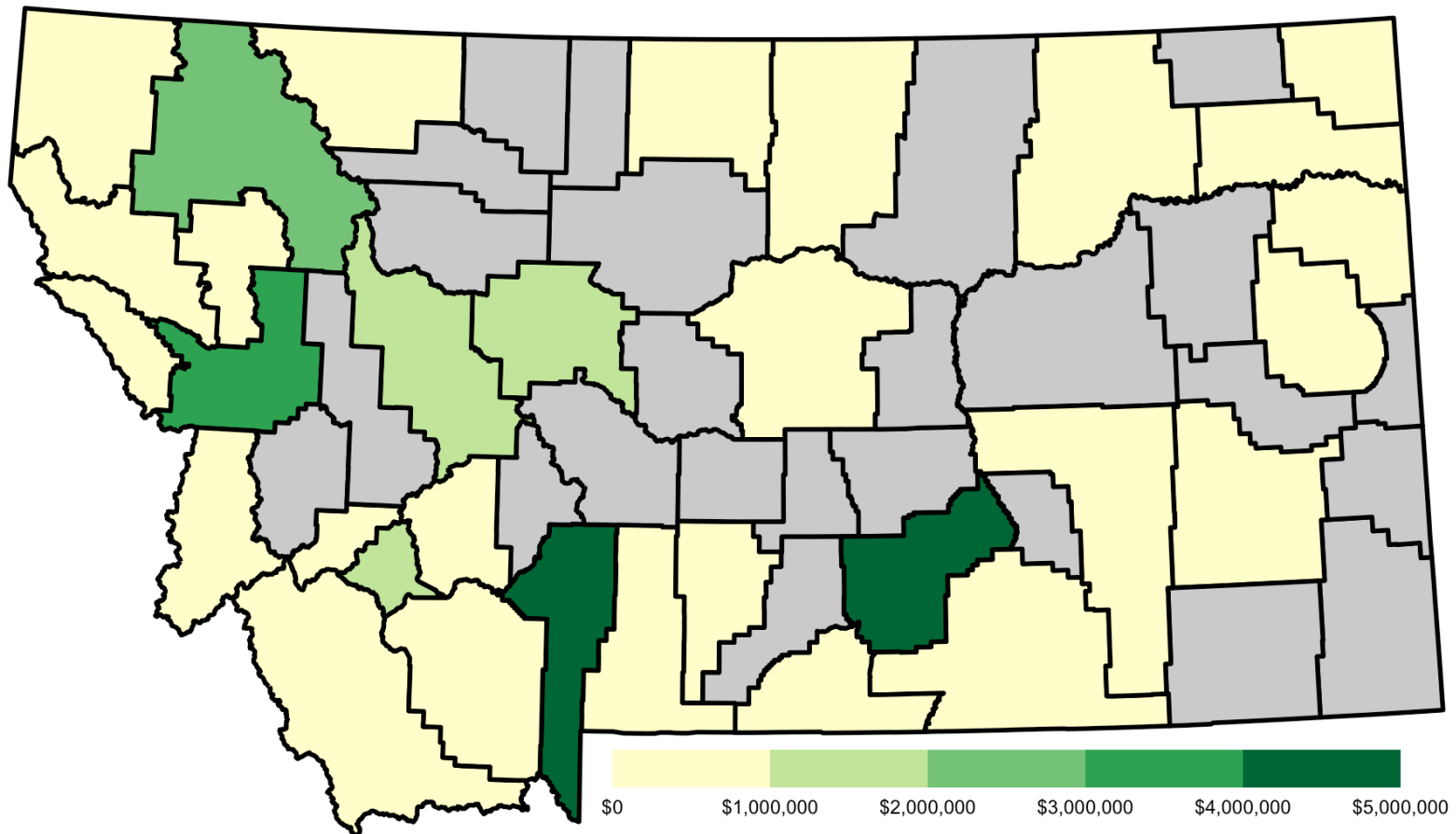
# Interval

**Interval** data have the properties of ordinal data, and the interval between observations is expressed in terms of a fixed unit of measure.

- Interval data are always numeric, and may be continuous or discrete.
- Interval data often do not have a zero that represents nothingness; temperature in the Celsius or Fahrenheit scales are examples of Interval data.
- You can add or subtract interval data, but you shouldn't multiply or divide them.

## Cannabis in Montana

Estimated Total Sales, December 2023 (Interval)





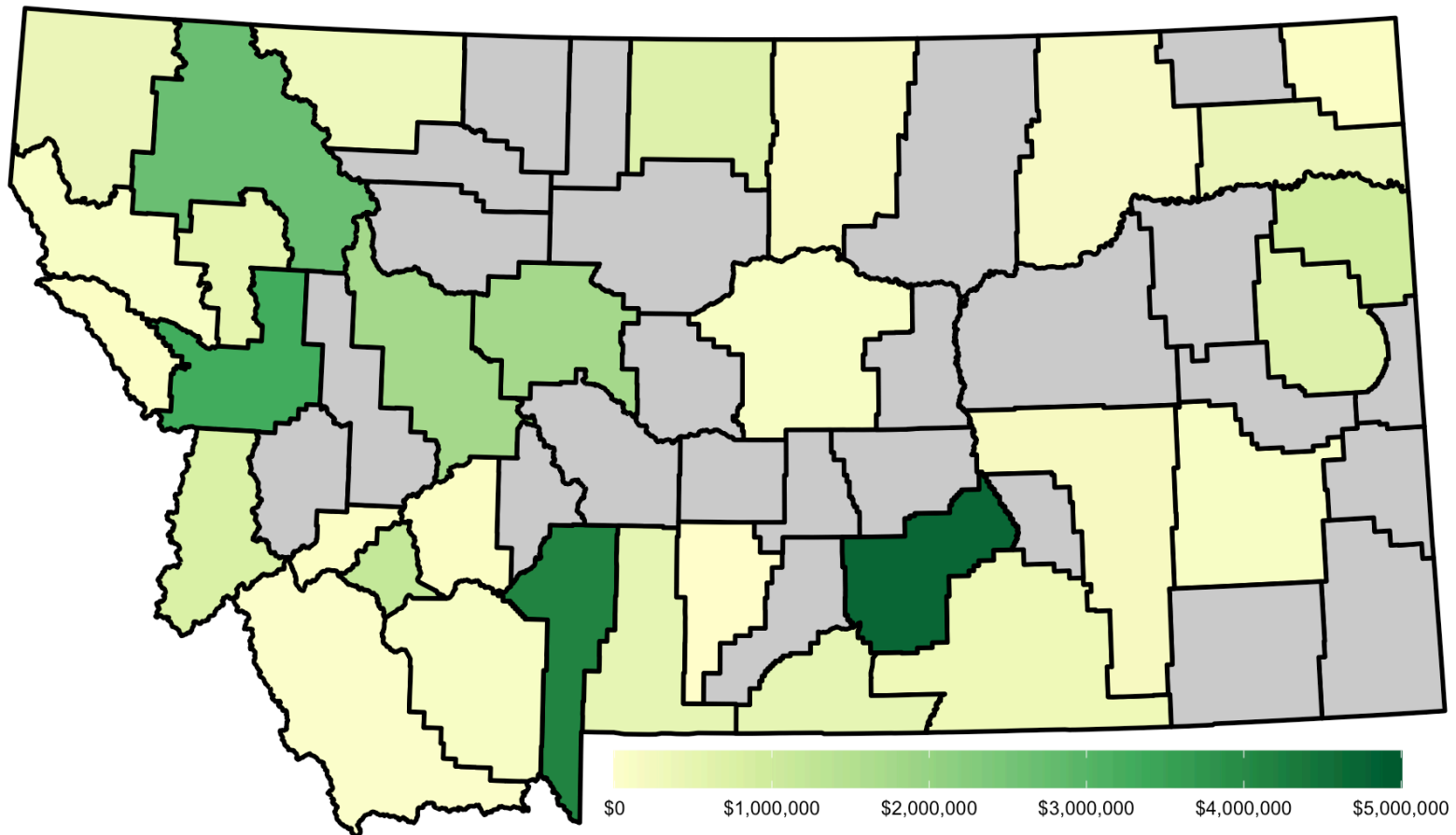
# Ratio

**Ratio** data have all the properties of interval data and the ratio of two values is meaningful.

- Ratio data are always numeric, and may be continuous or discrete.
- Ratio data must contain a true zero value that indicates that nothing exists for the variable at the zero point.
- Variables such as precipitation, temperature in degrees Kelvin, distance, height, weight, and time use the ratio scale.
- You can add, subtract, multiply and divide ratio scale data.

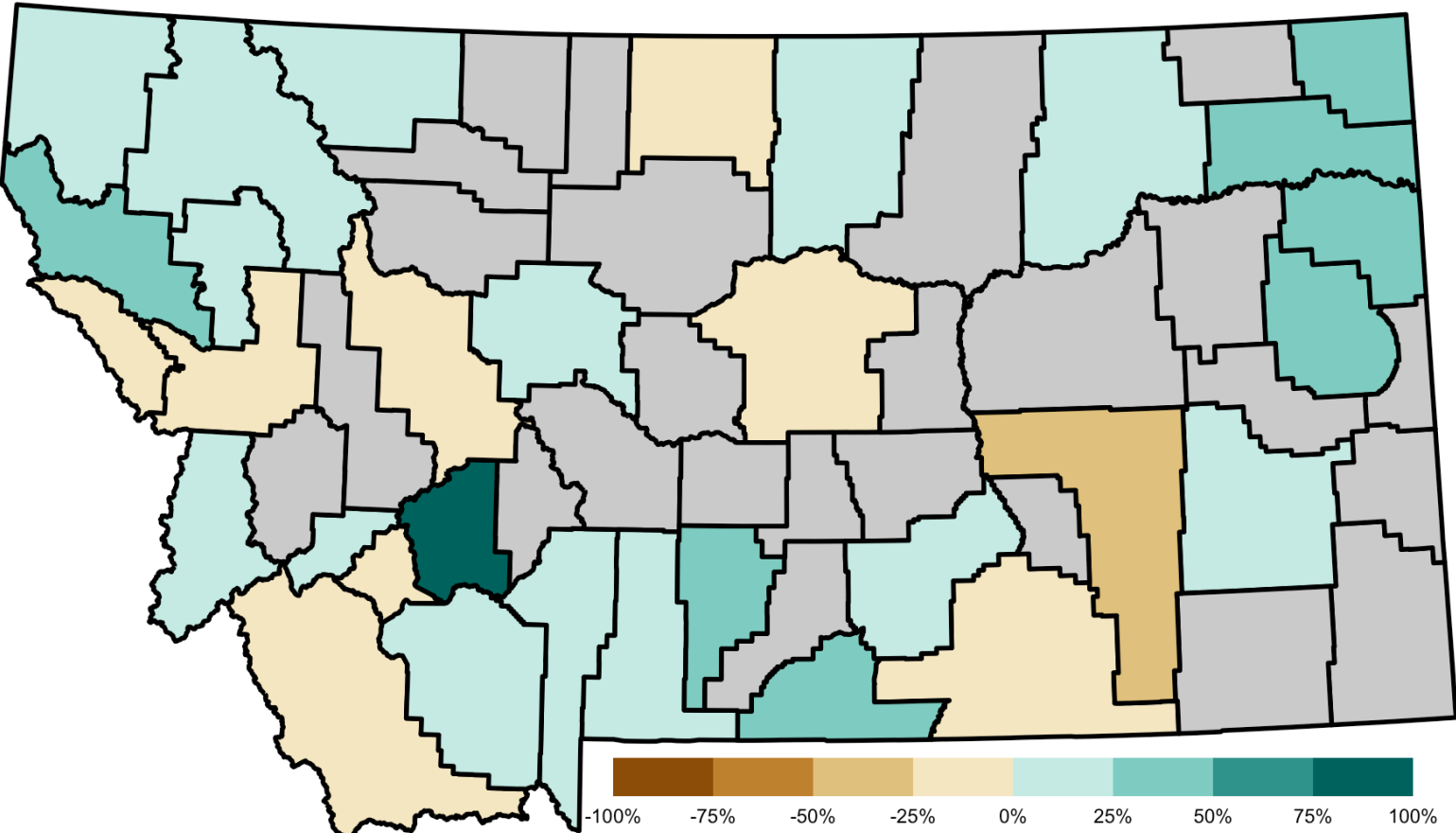
## Cannabis in Montana

Estimated Total Sales, December 2023 (Ratio)



# Cannabis in Montana

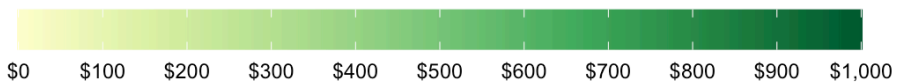
% Change, December 2022 to December 2023



# Cross-sectional Data

**Cross-sectional** data are observations across individuals at the same point in time, or aggregated over the same time period.

Estimated Sales per Capita, 2023



# Time Series Data

Time series data are collected over several time periods.

## Cannabis in Montana

Estimated Monthly Total Sales, 2022-01-01

