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ADTRANS
ADVANCED DATA ANALYSIS FOR TRANSPORTATION AND MOBILITY ACADEMIC TEACHERS

Modal split

Kristyna Rybova

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MODAL SPLIT

= shares of individual transport modes in the total volume of trips

Question: How to measure, evaluate and compare it correctly?

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Calculating modal split:

$$MS_i = \frac{Cesty_i}{\sum Cesty_j} \times 100$$

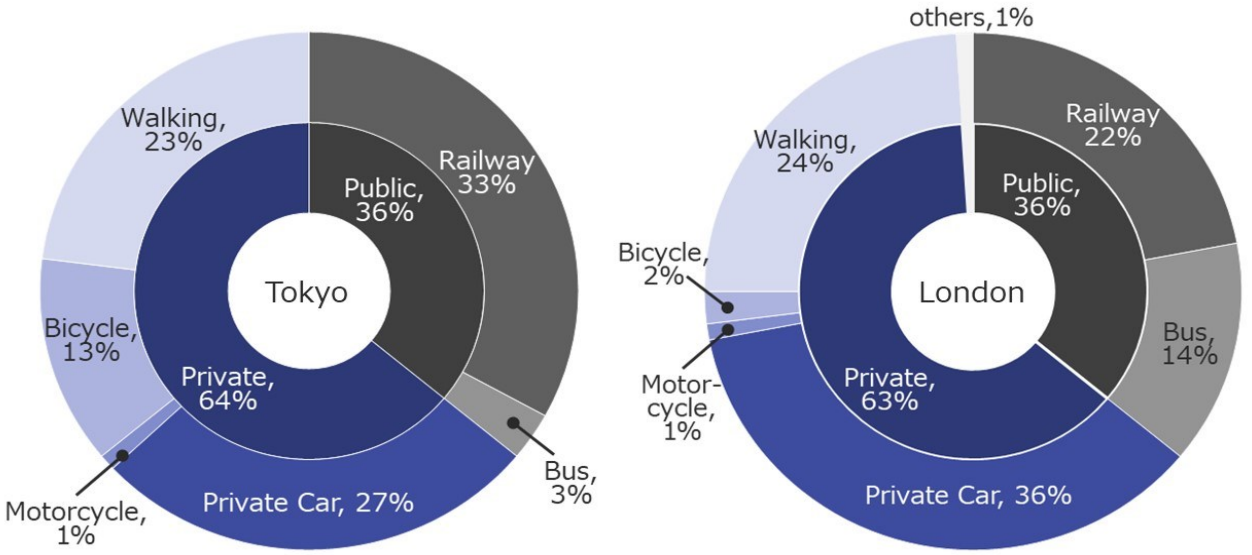
i = transport mode

Possibility of different tracking units – number of trips, distance, travel time

MODAL SPLIT

Various analysis options

- Average modal split – e.g. for city, region, state
- Differences between cities, regions, countries – e.g. deviations from the average, dispersion
- Visualization – using different types of graphs



https://www.sc-abeam.com/and_mobility/en/article/20201203-01/

MODAL SPLIT – GROUP COMPARISON

What characteristics can modal split vary by?

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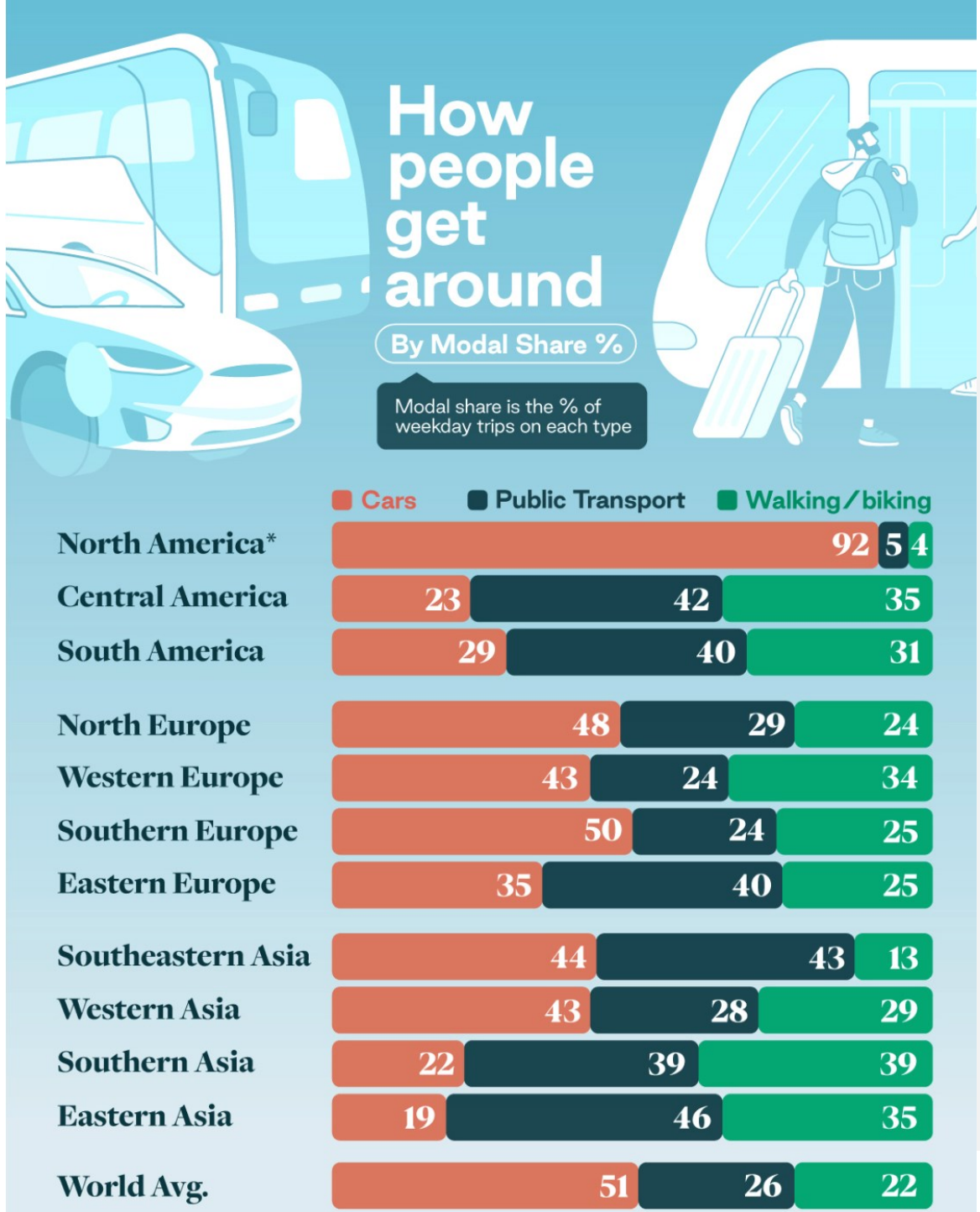
- E.g. by age, gender, household size, size of residence

How people get around

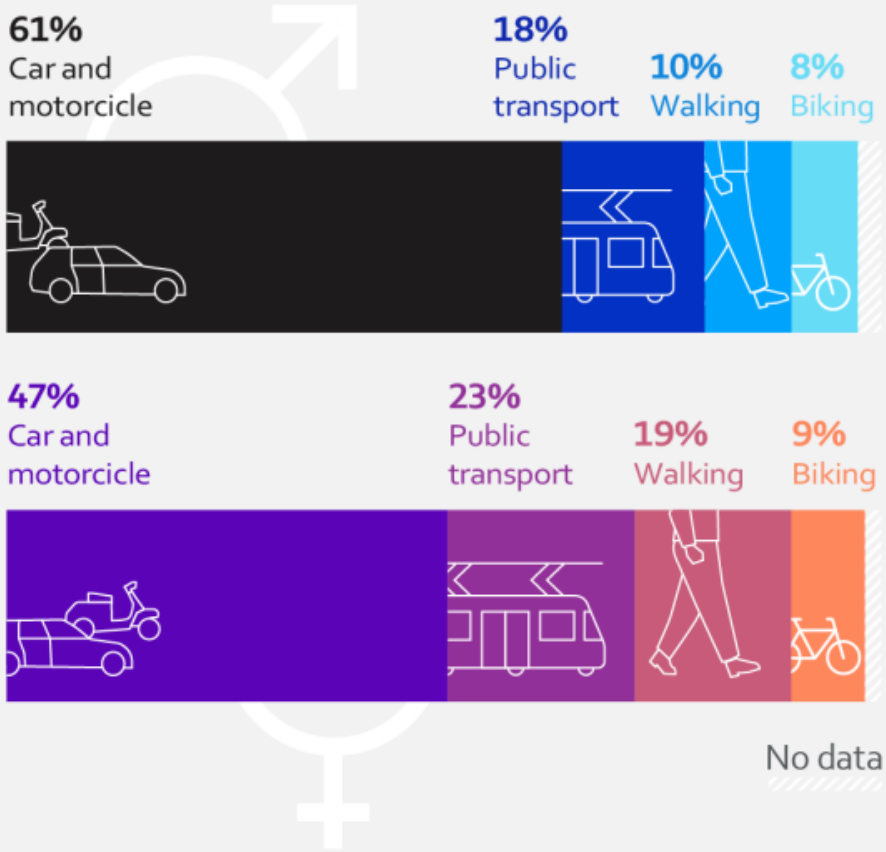
By Modal Share %

Modal share is the % of weekday trips on each type



* Excl. Mexico. Figures are rounded.
Source: The ABC of Mobility, Environment International, 2024

Modal split by gender in EU-28



Source: Illustration based on CEPAL (2017): *Género y transporte: experiencias y visiones de política pública en América Latina*, p.17. Accessed: repositorio.cepal.org/bitstream/handle/11362/43125/1/S1700969_es.pdf.

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MODAL SPLIT – GROUP COMPARISON

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In addition to visualization, statistical tests can also be used to evaluate differences.

- E.g. chi-square test – independence of modal split and various characteristics of user groups
- E.g. ANOVA/Kruskal-Wallis test – differences in structure between groups

https://www.ceskovpohybu.cz/#vysledky

CHI-SQUARE TEST FOR MODAL SPLIT

What are we testing?

- H_0 : The choice of means of transport is independent of category (e.g. gender)
- H_A : There is a dependence (e.g. men and women differ in modal split)

CHI-SQUARE TEST FOR MODAL SPLIT

Calculation procedure

- Building a PivotTable
  - Rows – groups (e.g. men, women)
  - Columns – mode of transport (e.g. car, public transport, bicycle, walking)
- Calculating expected frequencies

$$E_{ij} = \frac{(\text{součet řádku}_i \times \text{součet sloupce}_j)}{\text{celkový součet}}$$

- Test statistics

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O_{ij} – observed frequency, E_{ij} – expected frequency

- Comparison with critical value
  - Degrees of freedom: (r-1) x (c-1)
  - P-value < 0.05 ⟶ we reject H_0

TASK

Try using the chi-square test to compare the modal split by gender in your selected region.

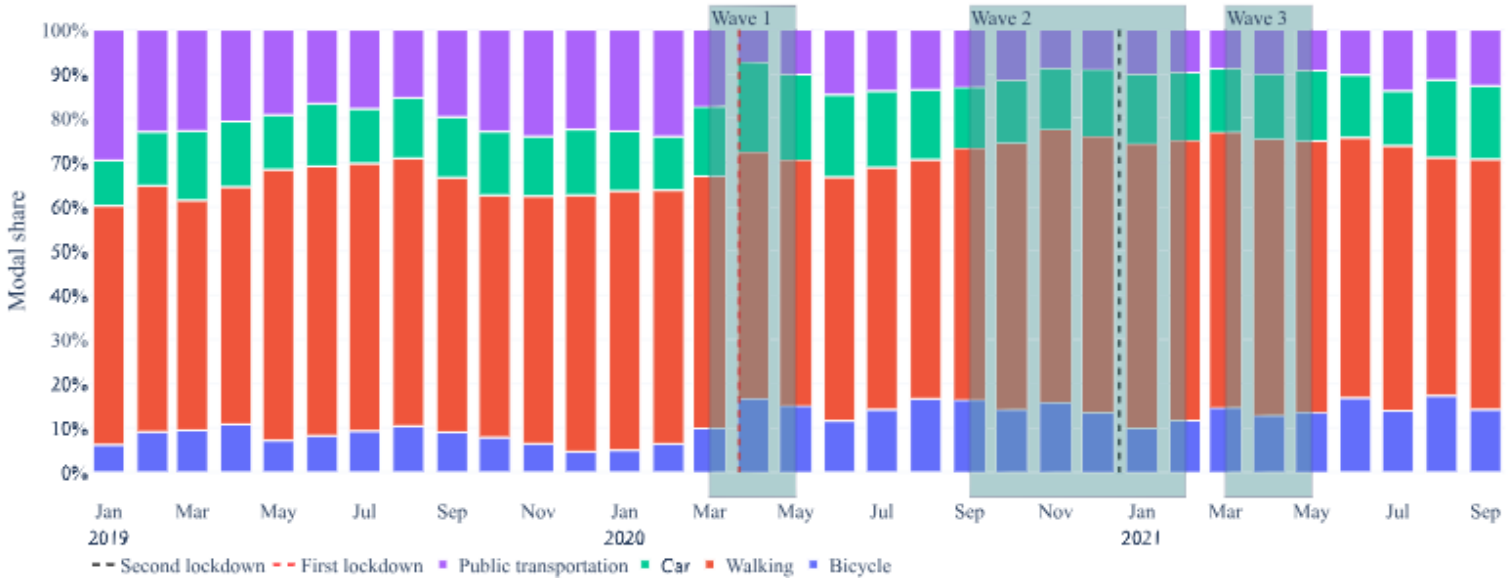
Use data from Czech Republic on the move

https://www.ceskovpohybu.cz/

MODAL SPLIT – TRENDS OVER TIME

Modal split time series analysis

- Possibility to use statistical methods
- Visualization
- Testing the impact of changes in a certain area on modal split – e.g. comparing modal split before and after a reduction/increase in public transport fares



linkinghub.elsevier.com/retrieve/pii/S2590198222001282

MODAL SPLIT MODELING

Regression models

- How various factors (e.g. age, gender, income, size of residence) influence the choice of means of transport
- Multinomial logistic regression – choice between car/public transport/walking

Discrete choice models

- Calibration based on survey data

SUMMARY

Modal split not only as a descriptive indicator, but also a basis for statistical analysis of population behavior

Possibility of comparison in space, time, between groups

Initial indicator for transport demand modeling