

1. Analysis 1

Question: Does spending time with friends influence one's life satisfaction?

Hypothesis: Individuals who spend more time socializing tend to have higher life satisfaction.

1. Variables to explore and the analysis process

a) Variables to explore

- Independent variables (Predictors): *CONNECTION_social_time_friends_p7d_grouped* -> Measure the amount of time each individual spends socializing with friends (continuous: in hours).
- Dependent variables (Outcomes): *WELLNESS_life_satisfaction* -> Self-reported score on life satisfaction (discrete, on a scale of 1–10).

b) Analysis may be performed: Using Linear Regression Model to show the correlation between time socializing and life satisfaction. (assume that their relationship is linear)

- Use a statistical software package to fit a linear regression model. The equation will look like this:
 - $\text{Life Satisfaction} = \beta_0 + \beta_1 \times (\text{Time of Social Interaction}) + \epsilon$
- Here, β_0 is the intercept, indicating the expected life satisfaction when the time of social interaction is zero.
- β_1 is the slope of the line, shows the change in life satisfaction for each additional unit of time spent socializing and ϵ is the error term.
- Conclusion
 - If β_1 is positive, it indicates that increased social interaction time is associated with higher life satisfaction.
 - If β_1 is negative, it suggests the opposite.

2. Possible Results and Their Relevance

- Expected Result:
 - Individuals who spend more time socializing with friends will report higher life satisfaction
- Relevance to Course Objectives:
 - If social interactions really have a correlation with well-being, this could have implications for promoting mental health interventions centered on social support. By conducting this analysis, we can have a better understanding of the importance of social interaction when it comes to the feeling of life fulfillment.

Analysis 2:

Question: How does vaccination status influence the likelihood of individuals wearing masks in public settings?

Hypothesis: Individuals who have received at least one dose of the COVID-19 vaccine do not wear masks in public.

1. Variables to be explored and the analysis process

a) Variables

COVID_prevention_masks: Categorical data represents how closely the individual follows the rule of wearing masks in public (Value: Not at all, Somewhat closely, Very closely)

COVID_vaccinated: Categorical data represents if the individual receives the COVID vaccine, and how many doses they had (if applicable)

b) Analysis process: Using the bootstrapping process and Confidence Interval to either agree or disagree with the hypothesis.

Process:

- Assign a discrete value for each categorical value of the variable *COVID_prevention_masks*: 0 for Not at all, 1 for Somewhat closely, 2 for Very closely
- Drop the observations with missing values
- From the variable *COVID_vaccinated*, this analysis will omit those who are not vaccinated, and only take into account people who at least have one dose of COVID-19 vaccine. Then from the observed variable *COVID_prevention_masks*, I will bootstrap 10000 samples. Then from the bootstrapped sample, I will find the 95% Confidence Interval. If 0 falls within the 95% Confidence Interval, I do not have enough evidence to reject the hypothesis that vaccinated people do not wear masks at all in public, otherwise, I successfully prove that vaccinated people still wear masks in public.

2. Possible result and how it is relevant to the course project objective

- a) Possible result: if 0 falls within the 95% CI, it is possible that vaccinated people will not wear masks at all and we cannot conclude anything. Otherwise, if 0 is outside the 95% CI, the confidence interval depicts that there is 95% confidence that people who are vaccinated still follow the adherence of wearing masks 'Somewhat closely' or 'Very closely'
- b) Relevance to the course project objective: This analysis can inform us about public health behavior during and after the pandemic. It depicts the mask-wearing practices of individuals, given that they are vaccinated. This analysis can emphasize the relative reality of continuous health-protecting practices, which is important for the community

Analysis 3:

Questions: Do newcomers (people who come to Canada in less than 10 years) feel connected to their neighborhood?

Hypothesis: As mentioned below

1. Variables to be explored and the analysis process

a) Variables

- *DEMO_identity_newcomers*: categorical data indicating if individuals are newcomers (e.g., Recent immigrants and refugees, i.e. being in Canada for less than 10 years)
- *GEO_robinson_neighbourhood_cohesion_scale_belong*: discrete data, showing how much they agree that they feel belong to their neighborhood (scale from 1 to 100)

b) Analysis process

Only focus on the study of people who are newcomers (whose value is 'Newcomers' in DEMO_identity_newcomers), omit those who are not newcomers

Null hypothesis (H0): newcomers feel like they belong to the neighborhood (mean score on the belonging scale is greater than or equal to a specified threshold, e.g., 50).

Alternative hypothesis (H1): newcomers do not feel like they belong to the neighborhood (the mean score on the belonging scale is less than the specified threshold).

Process:

- Simulate a test sample under the assumption of the null hypothesis
- Drop the observations that have missing values
- Calculating the test statistics to find the value of p-value using observed data
- Take the level of significance $\alpha=0.05$ (the result has 5% of being incorrect)
- Conclusion:
 - If the p-value is less than α , reject the null hypothesis, concluding that newcomers do not feel a sense of community in their neighborhood.
 - If the p-value is greater than or equal to α , fails to reject the null hypothesis, suggesting the conclusion that newcomers feel a sense of belonging.

2. Possible result and how it is relevant to the course project objective

- a) Possible result: p-value might be greater/ smaller than or equal to α . If $p \leq \alpha$, we can reject the null hypothesis and conclude that the newcomers do not feel belong to the community. Otherwise, we do not have enough evidence to be against the null hypothesis that newcomers have a sense of belonging to their community.
- b) Relevance to the course project objective: This analysis will provide a better understanding of how newcomers might feel about their new living environment/ community. Based on the result of this study, the locals can find solutions to better bond all community members, and foster better living space.