

**Duygu Abbasoğlu - 22102978**

**Burak Giray Kaplan - 22102738**

## **CTIS365 - Homework II**

In this step, we cleaned data by replacing missing-value codes (997–999) as NA, calculated age and restricted it to 16–100, and key variables such as age group, we mostly used UCLA loneliness score/level, health, depression, education, and relationship status.

We almost cited our work in phase 1, so we used the same references part. We prepared basic descriptive statistics (counts, percentages, means, quartiles, SD) with analysis in part 1, for both categorical and numerical variables following the structure of the reference paper.

Then, we created several frequency tables and ggplot based graphs to visualize relationships in the data, in part 2. These plots are preliminary and will be refined in the final stages. Finally, with that analysis, we created our LBS (Loneliness Burden Scale) in part 3, which combines three core components: loneliness, health risk and demographic vulnerability scores.

### **Part 1 - Descriptive Statistics**

Table A. Gender Distribution (n = 25,634)

Gender	n	Percent (%)
Female	13,245	51.7
Male	12,199	47.6
In another way	110	0.4
Missing	80	0.3

Table B. Educational Attainment

<b>Education Level</b>	<b>n</b>	<b>Percent (%)</b>
Completed primary	1,178	4.6
Completed secondary	8,226	32.1
Post-secondary/Bachelor	9,493	37.0
Master/Doctoral	6,454	25.2
Not completed primary	121	0.5
Missing	162	0.6

Table C. Relationship Status Distribution

<b>Relationship Status</b>	<b>n</b>	<b>Percent (%)</b>
Married/cohabiting	13,663	53.3
Single	5,529	21.6
In a relationship	3,709	14.5
Separated/divorced	1,872	7.3
Widowed	679	2.6
Missing	182	0.7

Table D. Response Distribution to “How often do you feel lonely?”

<b>Loneliness Category</b>	<b>n</b>	<b>Percent (%)</b>
None of the time	8,915	34.8
A little of the time	6,862	26.8
Some of the time	5,596	21.8
Most of the time	2,417	9.4
All of the time	811	3.2
Missing	1,033	4.0

Table E. Self-Reported Health Status

<b>Health Category</b>	<b>n</b>	<b>Percent (%)</b>
Fairly good	9,587	37.4
Average	8,701	33.9
Very good	3,468	13.5
Fairly poor	2,856	11.1
Very poor	686	2.7
Missing	336	1.3

Table F. Self-Reported Depressive Feelings

<b>Depression Category</b>	<b>n</b>	<b>Percent (%)</b>
Never	6,728	26.2
Very rarely	4,809	18.8
Rarely	4,575	17.8
Occasionally	5,484	21.4
Very frequently	2,753	10.7
Always	913	3.6
Missing	372	1.5

Table G. Descriptive Statistics for Continuous Variables

<b>Statistic</b>	<b>Age</b>	<b>Loneliness (Direct)</b>	<b>Health</b>	<b>Depression</b>
N	25634	24601	25298	25262
Minimum	16	1.00	1.00	1.00
25th Percentile (Q1)	32	3.00	2.00	3.00
Mean	44.39	3.84	2.51	4.18
Median	44	4.00	2.00	4.00
75th Percentile (Q3)	55	5.00	3.00	6.00
Maximum	91	5.00	5.00	6.00
Standard Deviation	15.20	1.12	0.96	1.48
Skewness	0.21	-0.66	0.34	-0.29
Kurtosis	-0.77	-0.43	-0.18	-1.02

Table 1. Mean Loneliness, Health, and Depression Scores by Gender

<b>Gender</b>	<b>n</b>	<b>Loneliness (Mean)</b>	<b>General Health (Mean)</b>	<b>Depression (Mean)</b>
Female	13,245	3.77	2.57	4.06
Male	12,199	3.92	2.44	4.32
In another way	110	3.32	2.93	3.50
Missing	80	3.62	2.80	3.92

Table 2. Mean Loneliness Score by Educational Attainment

<b>Education Level</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Not completed primary	121	3.19
Missing	162	3.47
Completed primary	1,178	3.66
Completed secondary	8,226	3.81
Master/Doctoral	6,454	3.85
Post-secondary/Bachelor	9,493	3.89

Table 3. Mean Loneliness Score by Relationship Status

<b>Relationship Status</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Single	5,529	3.50
Missing	182	3.54
Separated/divorced	1,872	3.67
In a relationship	3,709	3.73
Widowed	679	3.81
Married/cohabiting	13,663	4.03

Table 4. Mean Loneliness, Health, and Depression Scores by Age Group

<b>Age Group</b>	<b>n</b>	<b>Loneliness (Mean)</b>	<b>Health (Mean)</b>	<b>Depression (Mean)</b>
16–30	5,313	3.51	2.53	3.79
31–45	8,278	3.74	2.45	4.03
46–60	7,711	3.94	2.53	4.31
61–75	3,907	4.22	2.58	4.70
75+	425	4.33	2.53	4.76

Table 5. Mean Loneliness Score by Gender

<b>Gender</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Female	13,245	3.77
Male	12,199	3.92
In another way	110	3.32
Missing	80	3.62

Table 6. Mean Loneliness Score by General Health Status

<b>Health Status</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Very poor	686	2.76
Fairly poor	2,856	3.27
Average	8,701	3.69
Missing	336	3.85
Fairly good	9,587	4.08
Very good	3,468	4.21

Table 7. Mean Loneliness Score by Frequency of Depressive Feelings

<b>Depression Category</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Always	913	2.21
Very frequently	2,753	2.79
Occasionally	5,484	3.40
Missing	372	3.69
Rarely	4,575	3.83
Very rarely	4,809	4.20
Never	6,728	4.60

Table 8. Mean Loneliness Score by Migrant Status

Migrant Status	n	Loneliness (Mean)
Native	87	3.21
EU migrant	88	3.38
Non-EU migrant	932	3.94
Missing	24,527	3.84

Table 9A. Mean Loneliness Score by Childhood Health

Childhood Health	n	Loneliness (Mean)
Very poor	789	3.08
Poor	1,985	3.38
Average	5,800	3.62
Good	8,391	3.88
Very good	8,213	4.14
Missing	456	3.70

Table 9B. Mean Loneliness Score by Relationship with Mother

<b>Relationship with Mother</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Very good	514	3.28
Good	557	3.39
Average	775	3.47
Poor	952	3.56
Very poor	1,740	3.58
Missing	21,096	3.91

Table 9C. Mean Loneliness Score by Relationship with Father

<b>Relationship with Father</b>	<b>n</b>	<b>Loneliness (Mean)</b>
Very good	1,470	3.51
Good	1,092	3.52
Average	1,153	3.57
Poor	1,343	3.63
Very poor	2,283	3.69
Missing	18,293	3.94

## Part 2 - Graphs

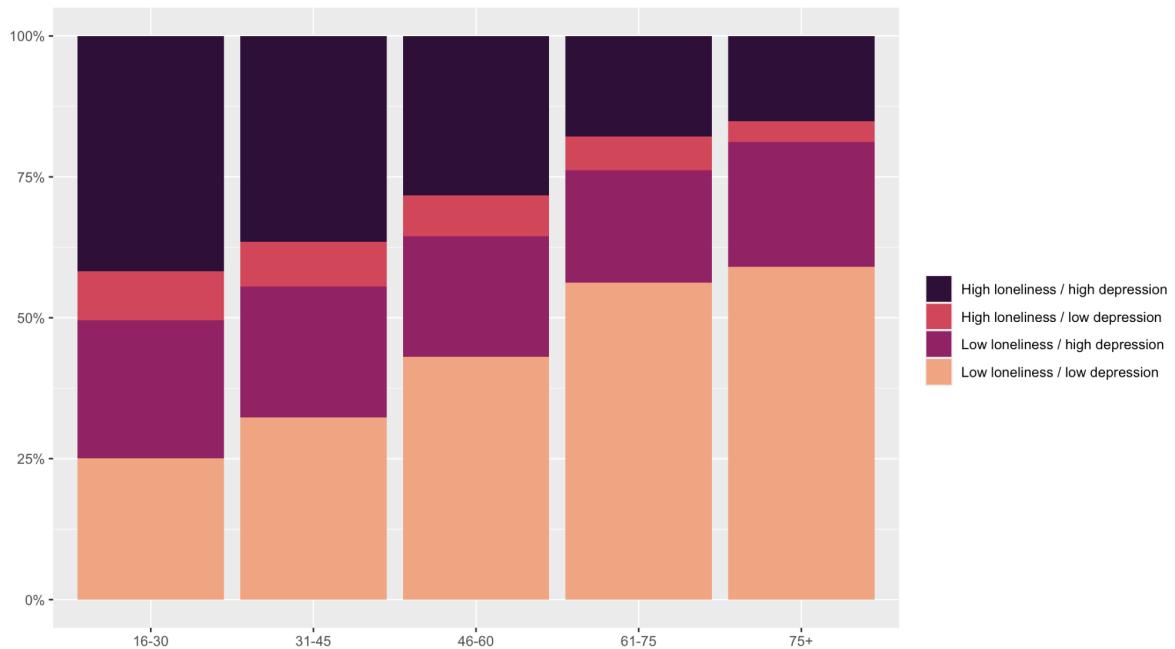


Figure 1. Loneliness and depression profiles by age group

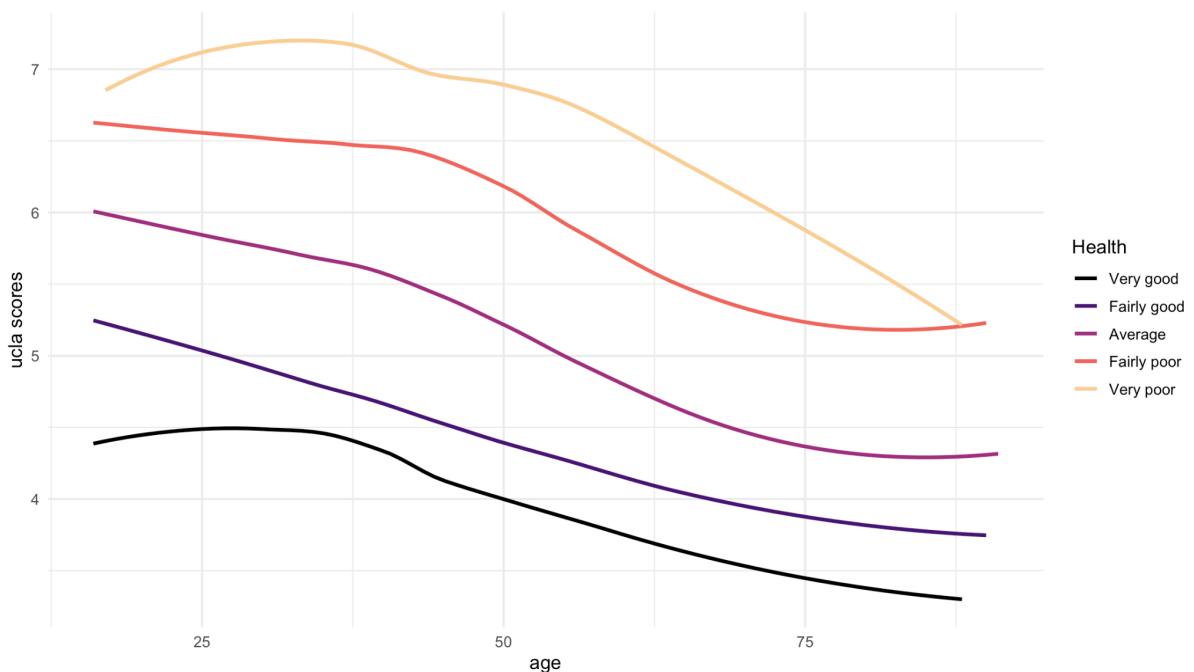


Figure 2. Loneliness score across age by self-rated health

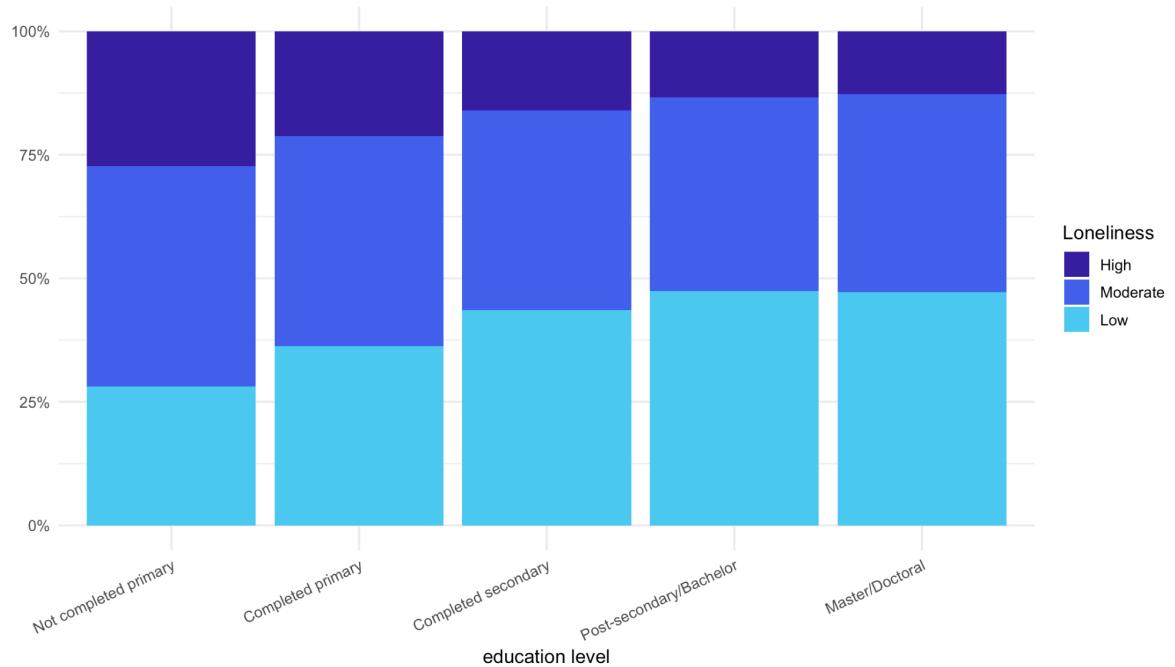


Figure 3. Loneliness levels by education

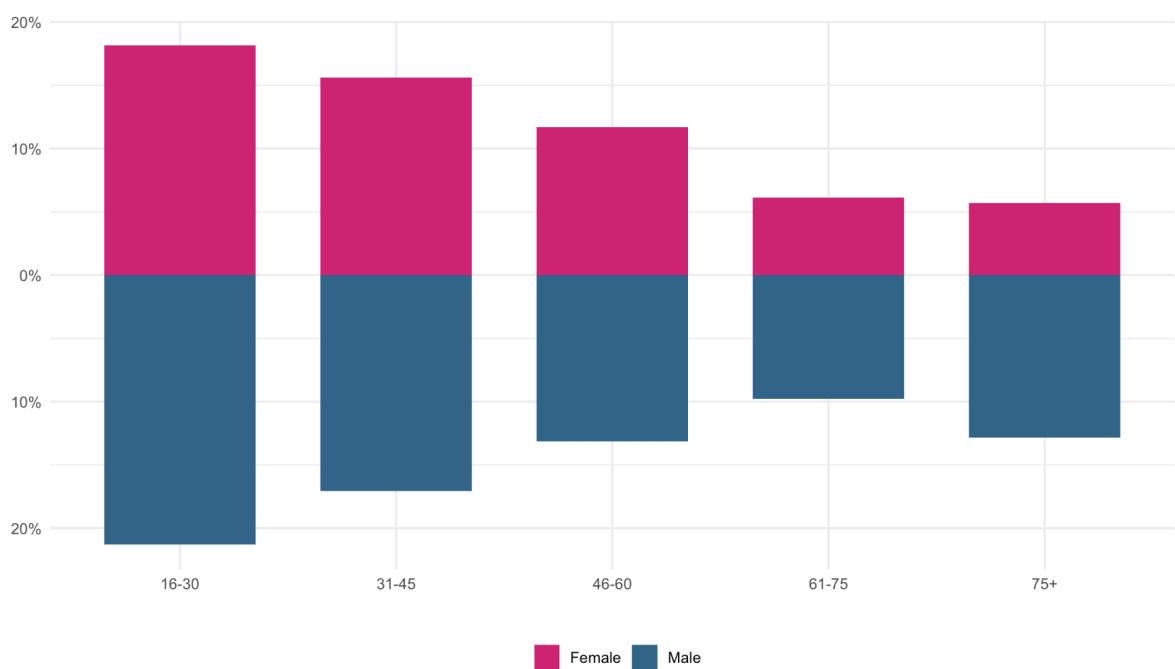


Figure 4. Loneliness by age and gender

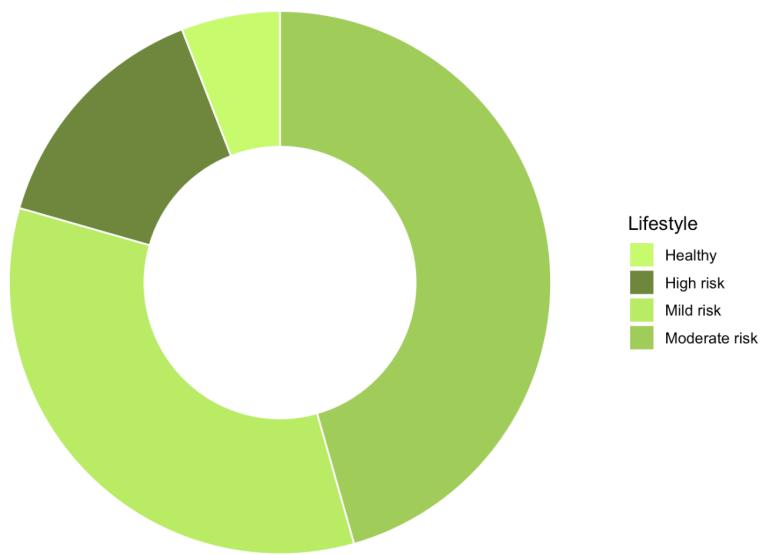


Figure 5. Lifestyle risk distribution among highly lonely respondents

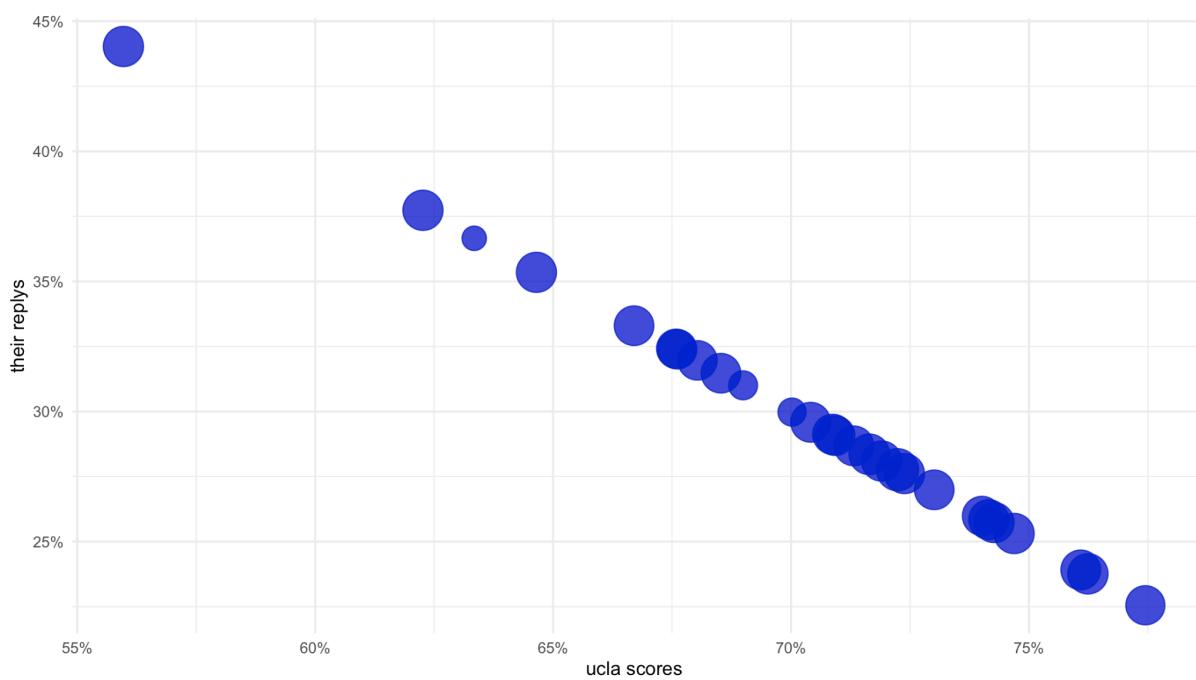
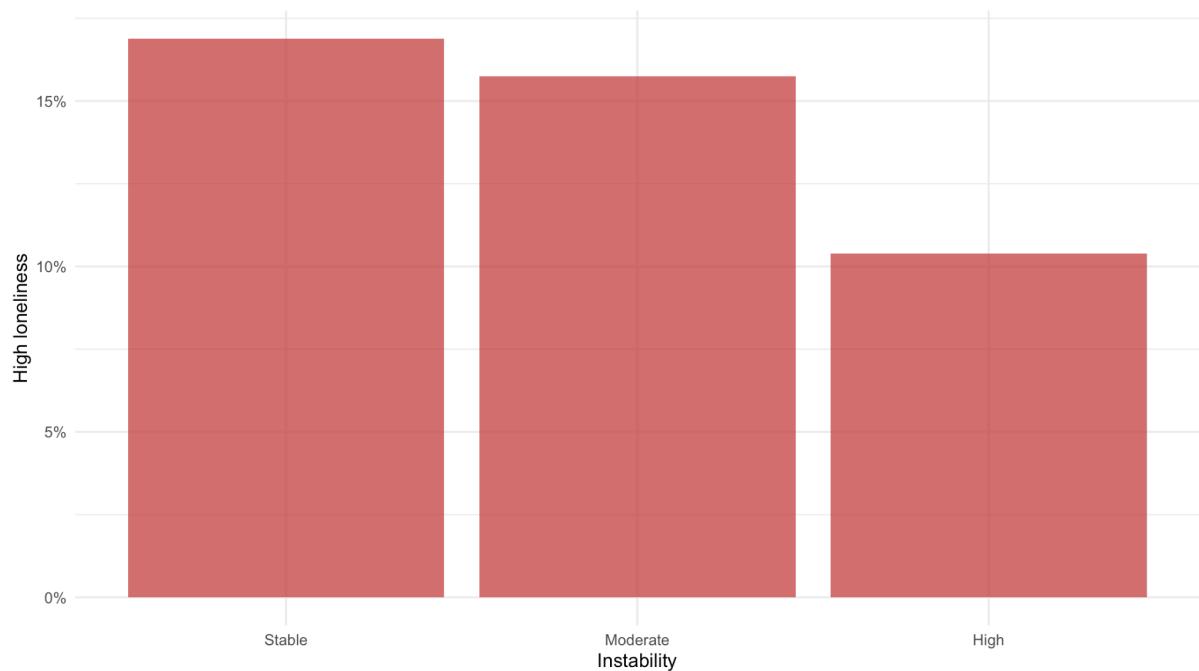
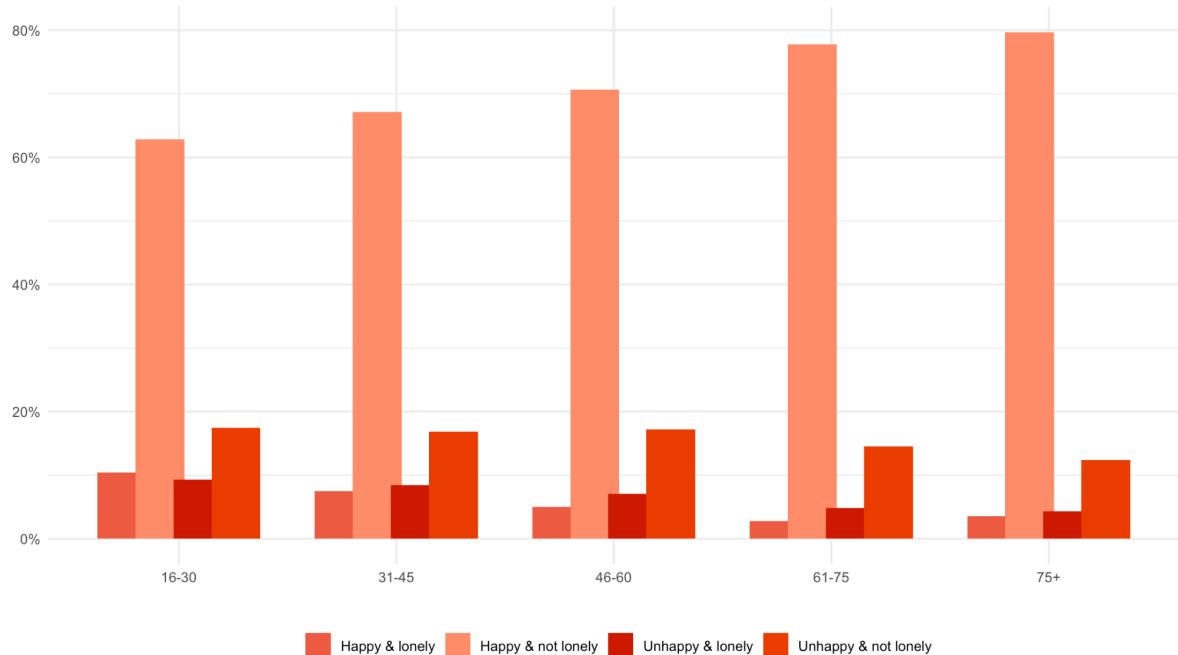


Figure 6. Agreement and mismatch between UCLA and direct loneliness measures  
**(participant respond)**



**Figure 7. High loneliness by affective instability (cok fazla renk olmasin)**



**Figure 8. Happiness–loneliness groups by age**

## **Part 3 - How LBS Was Constructed**

In this step, we constructed key variables such as age group, gender, education, loneliness indicators, health status and depressive feelings.

Using the insights from these analyses, we developed the Loneliness Burden Scale (LBS), an integrated measure intended to capture the combined burden of loneliness, health risk and demographic vulnerability. In our final model, LBS was constructed by normalizing and aggregating three survey-based components: the UCLA loneliness score, the direct loneliness measure and the loneliness intensity variable. These were combined into a unified index and scaled to a 0–100 range to improve interpretability.

### **Loneliness Score (LS):**

Loneliness was measured using three sources: UCLA items, the DJG scale, and a direct loneliness question. Each component was normalized and combined with the following weighted formula:

$$\text{LS} = 0.4 \times \text{UCLA\_norm} + 0.3 \times \text{DJG\_norm} + 0.3 \times \text{Direct\_norm}$$

### **Health Risk Score (HRS):**

Depression feelings and general health were normalized and aggregated as:

$$\text{HRS} = 0.6 \times \text{normalize(feelings\_depr)} + 0.4 \times \text{normalize(health\_general)}$$

### **Demographic Vulnerability Weight (DVW):**

DVW was constructed from age group, gender, and education level. Each category was assigned a risk weight, and the average was taken:

$$\text{DVW} = (\text{age\_w} + \text{gender\_w} + \text{education\_w}) / 3$$

### **Loneliness Burden Scale (LBS):**

LBS represents a combined indicator that integrates loneliness levels with vulnerability and health risk:

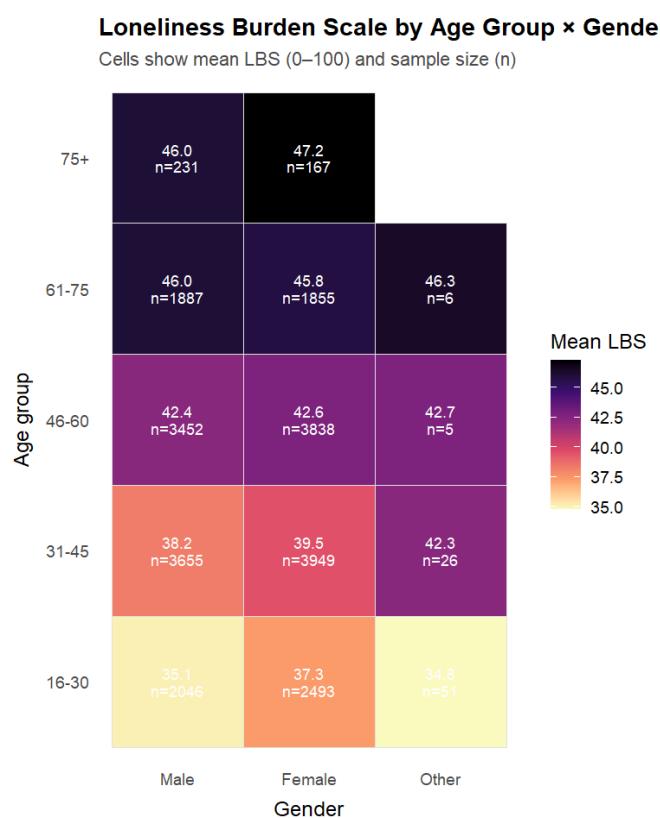
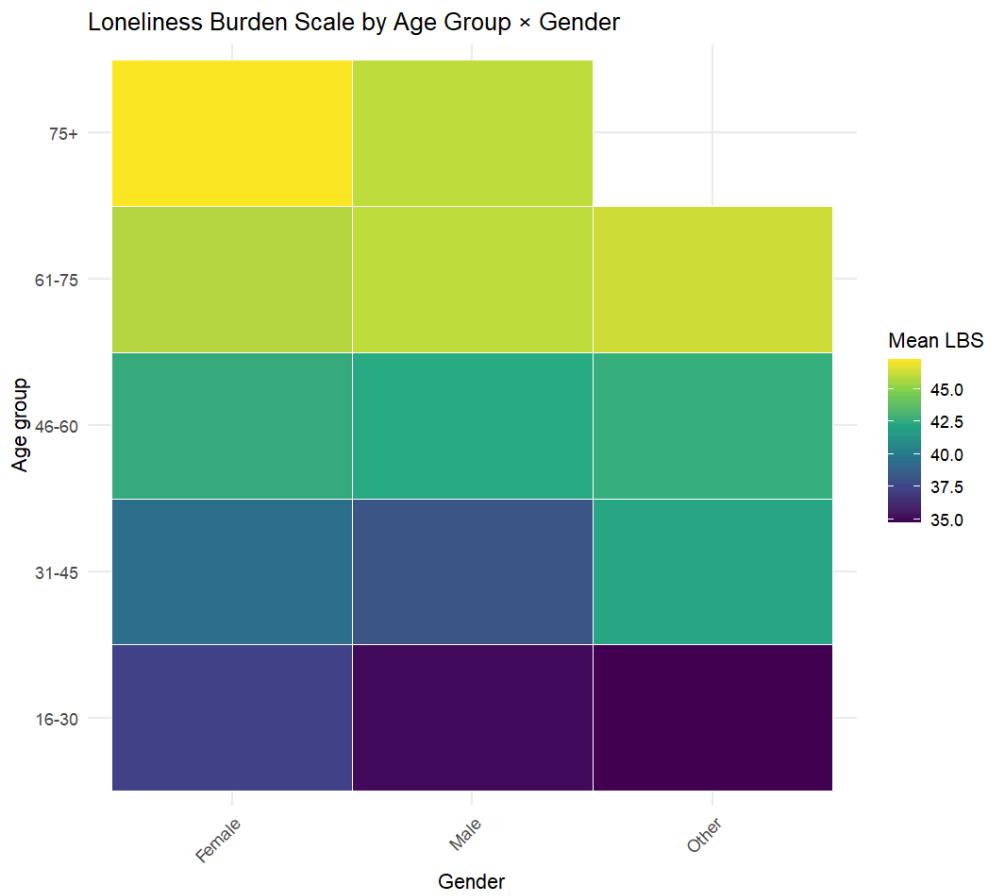
$$\text{LBS} = \text{LS} \times (0.6 \times \text{HRS} + 0.4 \times \text{DVW})$$

### **Scaling LBS:**

To improve interpretability, LBS was normalized to a 0–100 scale:

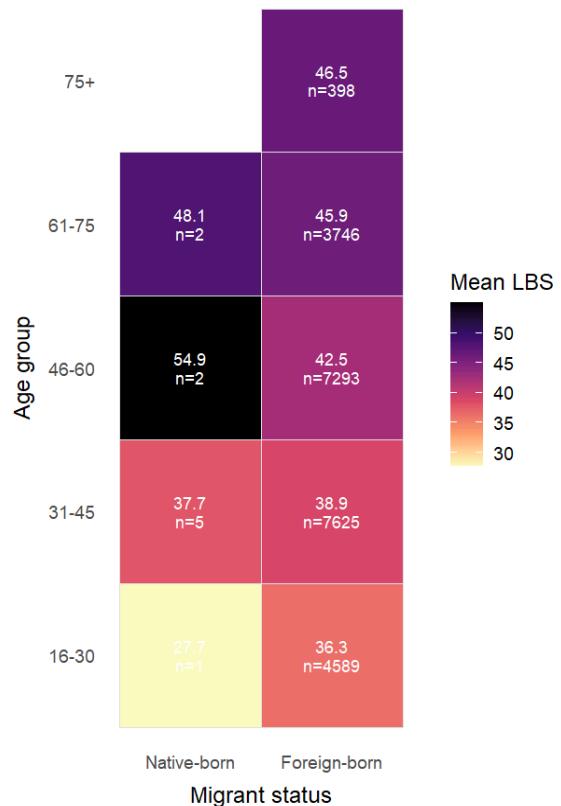
$$\text{LBS\_scaled} = \text{normalize(LBS)} \times 100$$

This method conceptualizes loneliness not merely as an emotional state but as a **multidimensional burden shaped by demographic vulnerabilities and health conditions**. It helps identify which population subgroups carry a disproportionate loneliness burden and provides a quantitative basis for targeted policy interventions.



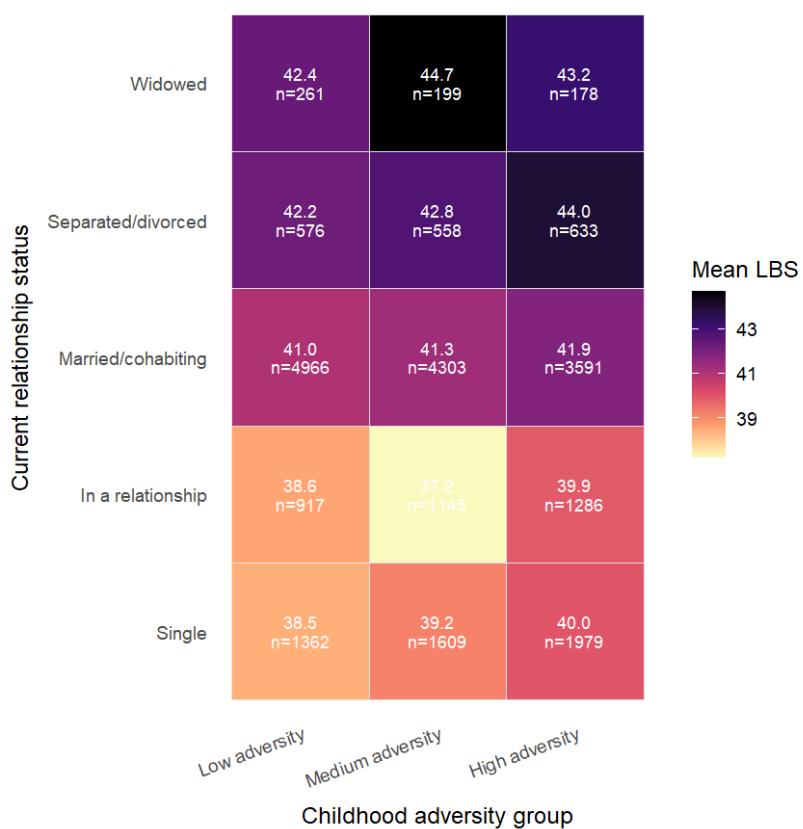
### Loneliness Burden Scale by Age Group × Migrant Status

Cells show mean LBS (0–100) and sample size (n)



### Loneliness Burden by Relationship Status × Childhood

Cells show mean LBS (0–100) and sample size (n)



## References

- [1]  
M. E. Hughes, L. J. Waite, L. C. Hawkley, and J. T. Cacioppo, “A Short Scale for Measuring Loneliness in Large Surveys,” *Res Aging*, vol. 26, no. 6, pp. 655–672, 2004, doi: [10.1177/0164027504268574](https://doi.org/10.1177/0164027504268574).
- [2]  
K. Nguyen, B. Vu, S. Chandna, J.-H. Schultz, and G. Mayer, “Between the lines: investigating health beliefs and emotional expressions in online mental health communities,” *Front. Psychol.*, vol. 16, Oct. 2025, doi: [10.3389/fpsyg.2025.1521623](https://doi.org/10.3389/fpsyg.2025.1521623).
- [3]  
“EU Loneliness Survey,” Nov. 2024, Accessed: Oct. 25, 2025. [Online]. Available: <http://data.europa.eu/89h/82e60986-9987-4610-ab4a-84f0f5a9193b>
- [4]  
“From loneliness to social connection: charting a path to healthier societies – Report of the WHO Commission on Social Connection.” Accessed: Oct. 25, 2025. [Online]. Available: <https://www.who.int/publications/i/item/978240112360>
- [5]  
T. A. Kato, N. Sartorius, and N. Shinfuku, “Shifting the paradigm of social withdrawal: a new era of coexisting pathological and non-pathological hikikomori,” *Curr Opin Psychiatry*, vol. 37, no. 3, pp. 177–184, May 2024, doi: [10.1097/YCO.0000000000000929](https://doi.org/10.1097/YCO.0000000000000929).
- [6]  
OECD, “Social Connections and Loneliness in OECD Countries,” OECD. Accessed: Oct. 25, 2025. [Online]. Available: [https://www.oecd.org/en/publications/social-connections-and-loneliness-in-oecd-countries\\_6df2d6a0-en.html](https://www.oecd.org/en/publications/social-connections-and-loneliness-in-oecd-countries_6df2d6a0-en.html)
- [7]  
“Social Isolation and Loneliness.” Accessed: Oct. 25, 2025. [Online]. Available: <https://www.who.int/teams/social-determinants-of-health/demographic-change-and-healthy-ageing/social-isolation-and-loneliness>
- [8]  
“Social isolation and loneliness among older people: advocacy brief.” Accessed: Oct. 25, 2025. [Online]. Available: <https://www.who.int/publications/i/item/9789240030749>
- [9]  
L. Ge, C. W. Yap, R. Ong, and B. H. Heng, “Social isolation, loneliness and their relationships with depressive symptoms: A population-based study,” *PLOS ONE*, vol. 12, no. 8, p. e0182145, Aug. 2017, doi: [10.1371/journal.pone.0182145](https://doi.org/10.1371/journal.pone.0182145).
- [10]

“Tackling loneliness evidence review: main report,” GOV.UK. Accessed: Oct. 25, 2025. [Online]. Available: <https://www.gov.uk/government/publications/tackling-loneliness-evidence-review/tackling-loneliness-evidence-review-full-report>

[11]

O. Akinyemi *et al.*, “The impact of loneliness on depression, mental health, and physical well-being,” *PLoS One*, vol. 20, no. 7, p. e0319311, Jul. 2025, doi: [10.1371/journal.pone.0319311](https://doi.org/10.1371/journal.pone.0319311).

[12]

J. Holt-Lunstad, “The Potential Public Health Relevance of Social Isolation and Loneliness: Prevalence, Epidemiology, and Risk Factors,” *Public Policy Aging Rep*, vol. 27, no. 4, pp. 127–130, Dec. 2017, doi: [10.1093/ppar/prx030](https://doi.org/10.1093/ppar/prx030).

[13]

“The risks of social isolation.” Accessed: Oct. 25, 2025. [Online]. Available: <https://www.apa.org/monitor/2019/05/ce-corner-isolation>