

Tombstone cost and longevity

Stata methods

Data preparation

Import Excel file, "Final, with lapida.xlsx"

Save as Stata file, "Lapidas.dta"

Clone and clean variables

Outcome variable

Clone variable Edaddemuerte, renaming age_death [. clonevar age_death = Edaddemuerte]

Use Data Editor (Edit) to manually replace days and months, changing values to years

Convert string variable to numeric variable [. destring age_death, replace]. Generates 2273 values, with 29 missing.

Exposure variable and covariates

The exposure variable is tombstone cost, "Lapida", where 1 is low cost, 2 is medium cost, and 3 is high cost

Clone variable Sexo0masc1fem, renaming sex [. clonevar sex = Sexo0masc1fem]. Generates 2273 variables, where 0 is male and 1 is female.

Create new variable, civil_status, where 0 is not married or with partner and 1 is married or with partner. Clone variable EstadoCivil0casado1soltero, renaming married [. clonevar married = EstadoCivil0casado1soltero]. Recode as missing 5 and 6 [. mvdecode married, mv(5, 6)] [. generate civil_status = 1 if married==0 | married==3] [. replace civil_status = 0 if married==1 | married==2 | married==4]. Generates 2273 values, with 514 missing.

Create new variable, violent_death, where 0 is not violent and 1 is violent or under investigation. Clone variable TipodeMuerte0natur, renaming violence [. clonevar violence = TipodeMuerte0natur] [. generate violent_death = 1 if violence==1 | violence==2] [. replace violent_death = 0 if violence==0]. Generates 2273 values, with 17 missing.

Year of death is variable, year_death

One-way ANOVA

Perform one-way ANOVA with Bonferroni correction [`. oneway age_death Lapida, bonferroni tabulate`] ($n=2244$)

The mean values for longevity are similar in the low-cost and medium-cost groups (61.6 ± 23.9 vs. 61.1 ± 25.0 years, respectively). The mean value for longevity is lower high-cost group (45.0 ± 22.9 years). Notice that the standard deviations are similar for each group, which is an assumption of ANOVA. Notice also that the sample size in the high-cost group is small ($n=46$), which may be problematic.

Look at the ANOVA table. There is variance between the group means. This is also variance within groups, which is relatively large and which suggests that (at least some of) the groups are not really different. The test statistic, F , is statistically significant ($p < 0.001$), meaning that there is a statistically significant difference between (at least some of) the means. Report as follows: $F(2, 2241) = 10.56, p < 0.001$.

Stata also computes Bartlett's test for equality of variance. The test is not significant ($p = 0.402$), which suggests that the data meet the assumption of equal variance in each group for the outcome variable.

The final table shows the comparison of all pairs of means, using the Bonferroni multiple comparison correction. The comparison of the low-cost and medium-cost groups is not statistically significant ($p = 1.0$). The comparisons of the low-cost and medium-cost groups with the high-cost groups are statistically significant (both $p < 0.001$).

We can use the `pwmean` command to generate confidence intervals [`. pwmean age_death, over(Lapida) effects cimeans mcompare(bonferroni)`]. Notice that the confidence interval for the low-cost group versus the high-cost group is wide and includes zero. Here, we could report between-group differences in age with confidence intervals.

ANCOVA

Perform ANCOVA, adjusting for sex, civil status, violent death, and year of death (year of death is continuous variable, all other variables are categorical [. anova age_death Lapida sex civil_status violent_death c.year_death] (n=1751)

Report estimated means and confidence intervals according to tombstone cost [. margins, within(Lapida)]

Low cost: 64.3 (63.2, 65.3)

Medium cost: 63.3 (61.3, 65.3)

High cost: 47.0 (40.1, 53.9)

Sensitivity analysis with non-violent deaths only

Drop violent deaths BUT DO NOT SAVE [. drop if violent_death==1]

Perform ANCOVA [. anova age_death Lapida sex civil_status c.year_death] [. Margins, within(Lapida)] (n=1299)

Low cost: 71.2 (70.0, 72.5)

Medium cost: 71.0 (68.7, 73.3)

High cost: 64.5 (53.3, 75.7)

Interestingly, longevity is similar across the groups when violent deaths are excluded

Subject characteristics

It may be more appropriate to use the term 'subjects' than 'participants' because the data are from deceased individuals who cannot participate in a study

Table 1 shows subjects' characteristics

Table 1. Subject characteristics

Characteristic	Value
Age at death, mean \pm SD (n)	61.1 \pm 24.2 (2,244)
Tombstone cost	
Low, n (%)	1,751 (77.03)
Medium, n (%)	474 (20.85)
High, n (%)	48 (2.11)
Missing, n (%)	0 (0)
Total, n (%)	2,273 (100)
Sex	
Male, n (%)	1,274 (56.05)
Female, n (%)	999 (43.95)
Missing, n (%)	0 (0)
Total, n (%)	2,273 (100)
Civil status	
Not married or with partner, n (%)	1,092 (48.04)
Married or with partner, n (%)	667 (29.34)
Missing, n (%)	514 (22.61)
Total, n (%)	2,273 (100)
Violent death	
Not violent, n (%)	1,531 (67.36)
Violent or under investigation, n (%)	725 (31.90)
Missing, n (%)	17 (0.75)
Total, n (%)	2,273 (100)
Year of death	
2022, n (%)	480 (21.12)
2021, n (%)	1,154 (50.77)
2020, n (%)	639 (28.11)
Missing, n (%)	0 (0)
Total, n (%)	2,273 (100)

Values are from 2,273 consecutive death certificates, starting with the most recently available. SD is standard deviation. N is number.