**Missing vrijednosti –** (datoteka **bank.sav**)

U ovom primjeru koristit će se datoteka **bank.sav**, u kojoj su prikazani podaci o zaposlenicima banke, njihovim socio-demografskim varijablama i zadovoljstvom radom u banci.

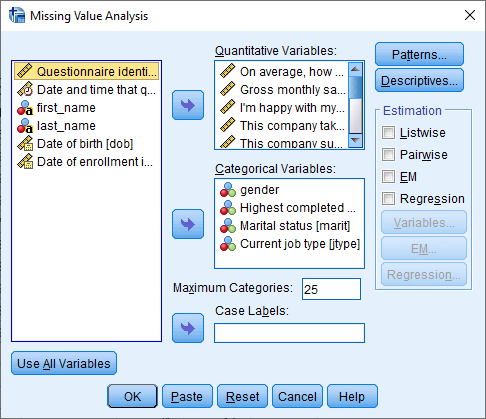
SPSS razlikuje dva tipa missing vrijednosti – *system-defined* i *user-defined*. Ako se pri unosu podataka ne unese ništa u polje u tablici, SPSS to polje proglašava *system-defined* missing vrijednošću i označava polje točkom (.). *User-defined* missing vrijednost se mora eksplicitno navesti u *Variable view*, pod stupcem *Missing*.

Zadatak: Pregledati varijable **gender, educ, marit, jtype, overall, q1-q9** i utvrditi što one znače. U stupcu *Values* pronaći vrijednosti za koje je navedeno „No answer“ i te vrijednosti definirati kao missing u stupcu *Missing* (Discrete missing values)*.*

U izborniku izabrati **Analyze > Descriptive statistics > Frequencies >** (izabrati varijable **gender, educ, marit, jtype, whours, salary, overall, q1-q9**) i kliknuti **OK**

\*Pregledati koliko ima missing vrijednosti za svaku varijablu\*

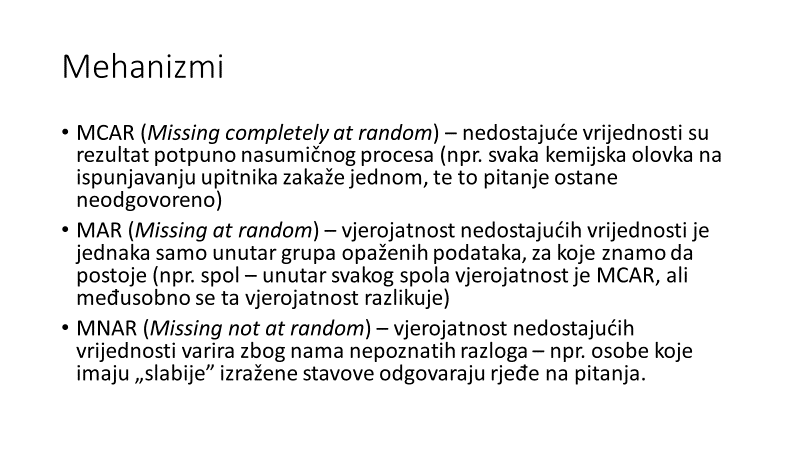
Isto tako, U izborniku izabrati **Analyze > Missing Value Analysis.** Iste varijable podijeliti na kategoričke i kvantitativne i kliknuti **OK.**



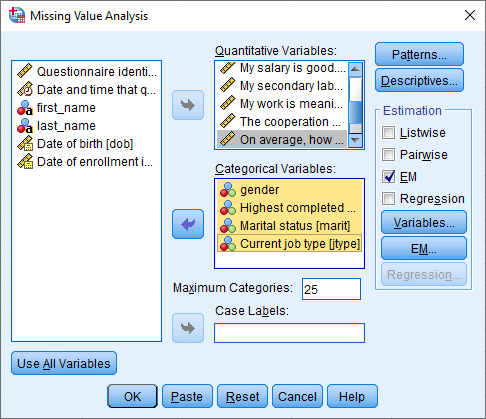
\*Pregledati koliko ima missing vrijednosti za svaku varijablu i koji je njihov postotak\*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Univariate Statistics** | | | | | | | |
|  | N | Mean | Std. Deviation | Missing | | No. of Extremesa | |
| Count | Percent | Low | High |
| whours | 457 | 31,2407 | 12,92438 | 7 | 1,5 | 1 | 6 |
| salary | 461 | $28,137.48 | $467,773.632 | 3 | ,6 | 0 | 45 |
| overall | 437 | 6,57 | ,887 | 27 | 5,8 | 0 | 4 |
| q1 | 444 | 5,99 | 2,106 | 20 | 4,3 | 0 | 0 |
| q2 | 438 | 4,92 | 2,102 | 26 | 5,6 | 0 | 0 |
| q3 | 434 | 4,90 | 1,680 | 30 | 6,5 | 6 | 4 |
| q4 | 447 | 7,74 | 1,632 | 17 | 3,7 | 0 | 0 |
| q5 | 430 | 5,86 | 1,944 | 34 | 7,3 | 0 | 0 |
| q6 | 441 | 5,88 | 2,014 | 23 | 5,0 | 0 | 0 |
| q7 | 443 | 5,92 | 1,945 | 21 | 4,5 | 11 | 22 |
| q8 | 443 | 4,88 | 1,759 | 21 | 4,5 | 8 | 8 |
| q9 | 440 | 6,97 | 1,799 | 24 | 5,2 | 6 | 0 |
| gender | 464 |  |  | 0 | ,0 |  |  |
| educ | 442 |  |  | 22 | 4,7 |  |  |
| marit | 447 |  |  | 17 | 3,7 |  |  |
| jtype | 443 |  |  | 21 | 4,5 |  |  |
| a. Number of cases outside the range (Q1 - 1.5\*IQR, Q3 + 1.5\*IQR). | | | | | | | |

Zadatak: Odrediti kojem tipu mehanizma pripadaju missing vrijednosti (MCAR, MAR, MNAR).



Jesu li podaci MCAR? Littleov test: U izborniku izabrati **Analyze > Missing Value Analysis.** Iste varijable podijeliti na kategoričke i kvantitativne, „zakačiti“ opciju **EM** i kliknuti **OK**



Rezultat:

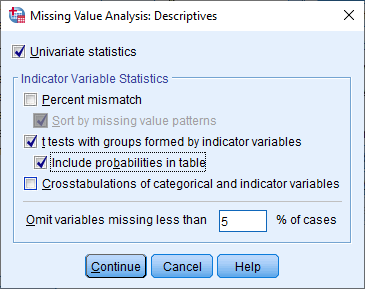
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **EM Meansa** | | | | | | | | | | | | |
| whours | salary | overall | q1 | q2 | q3 | q4 | q5 | q6 | q7 | q8 | q9 |
| 31,2418 | $30,654.80 | 6,55 | 6,05 | 4,87 | 4,89 | 7,78 | 5,83 | 5,83 | 5,88 | 4,85 | 6,97 |
| 1. Little's MCAR test: Chi-Square = 362,297, DF = 411, Sig. = ,960 | | | | | | | | | | | | |

Littleov test nije značajan što sugerira da podaci nedostaju potpuno nasumično.

**!!!! Što u slučaju da je Littleov test statistički značajan!!!**

U ovom slučaju podaci ne nedostaju nasumično. Postoji nači za utvrđivanje je li mehanizam MAR ili MNAR.

U izborniku izabrati **Analyze > Missing Value Analysis.** Iste varijable podijeliti na kategoričke i kvantitativne, „zakačiti“ opciju **EM,** pod linkom **Descriptives** „zakačiti“ **t test with groups formed by indicator variables** i **Include probabilities in table** i kliknuti **OK.**



Rezultat:

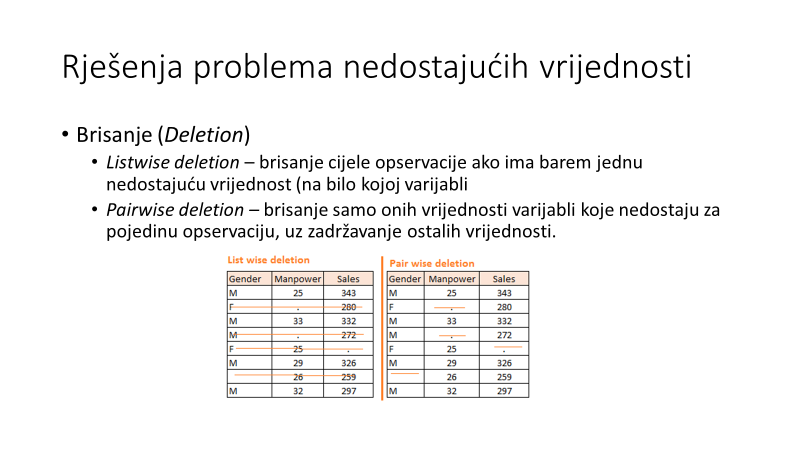
|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Separate Variance t Testsa** | | | | | | | | | | |
|  | | q1 | q2 | q3 | q4 | q5 | q6 | q7 | q8 | q9 |
| q2 | t | 1,6 | . | ,6 | -,4 | -,9 | -,6 | 1,1 | ,0 | ,5 |
| df | 21,9 | . | 23,2 | 23,4 | 21,6 | 22,7 | 24,0 | 23,8 | 22,0 |
| P(2-tail) | ,119 | . | ,543 | ,717 | ,365 | ,587 | ,272 | ,984 | ,608 |
| # Present | 423 | 438 | 412 | 425 | 409 | 419 | 420 | 420 | 419 |
| # Missing | 21 | 0 | 22 | 22 | 21 | 22 | 23 | 23 | 21 |
| Mean(Present) | 6,03 | 4,92 | 4,92 | 7,74 | 5,83 | 5,86 | 5,95 | 4,88 | 6,98 |
| Mean(Missing) | 5,24 | . | 4,68 | 7,86 | 6,29 | 6,14 | 5,43 | 4,87 | 6,76 |
| q3 | t | -1,0 | -,6 | . | ,2 | -1,2 | ,2 | -1,1 | ,4 | -,1 |
| df | 26,6 | 28,6 | . | 27,3 | 28,7 | 24,4 | 28,8 | 26,4 | 27,9 |
| P(2-tail) | ,312 | ,548 | . | ,837 | ,250 | ,815 | ,275 | ,675 | ,925 |
| # Present | 419 | 412 | 434 | 422 | 404 | 417 | 417 | 418 | 414 |
| # Missing | 25 | 26 | 0 | 25 | 26 | 24 | 26 | 25 | 26 |
| Mean(Present) | 5,97 | 4,91 | 4,90 | 7,75 | 5,83 | 5,88 | 5,90 | 4,89 | 6,96 |
| Mean(Missing) | 6,44 | 5,15 | . | 7,68 | 6,27 | 5,75 | 6,31 | 4,72 | 7,00 |
| q5 | t | -2,8 | ,7 | 1,2 | -1,7 | . | ,3 | ,4 | ,0 | -1,1 |
| df | 37,2 | 33,2 | 34,9 | 30,9 | . | 32,1 | 35,6 | 34,8 | 32,0 |
| P(2-tail) | ,008 | ,505 | ,257 | ,101 | . | ,749 | ,711 | ,967 | ,282 |
| # Present | 416 | 409 | 404 | 420 | 430 | 412 | 412 | 413 | 412 |
| # Missing | 28 | 29 | 30 | 27 | 0 | 29 | 31 | 30 | 28 |
| Mean(Present) | 5,94 | 4,94 | 4,93 | 7,71 | 5,86 | 5,88 | 5,93 | 4,88 | 6,94 |
| Mean(Missing) | 6,71 | 4,69 | 4,60 | 8,19 | . | 5,76 | 5,81 | 4,87 | 7,29 |
| q9 | t | ,0 | -,3 | ,9 | ,3 | 1,3 | -,3 | -,3 | -,2 | . |
| df | 20,1 | 19,7 | 21,5 | 19,2 | 18,6 | 19,4 | 23,3 | 19,2 | . |
| P(2-tail) | ,987 | ,778 | ,357 | ,792 | ,198 | ,801 | ,764 | ,882 | . |
| # Present | 425 | 419 | 414 | 428 | 412 | 422 | 421 | 424 | 440 |
| # Missing | 19 | 19 | 20 | 19 | 18 | 19 | 22 | 19 | 0 |
| Mean(Present) | 5,99 | 4,91 | 4,92 | 7,75 | 5,88 | 5,87 | 5,92 | 4,87 | 6,97 |
| Mean(Missing) | 6,00 | 5,05 | 4,60 | 7,63 | 5,28 | 6,00 | 6,05 | 4,95 | . |
| For each quantitative variable, pairs of groups are formed by indicator variables (present, missing). | | | | | | | | | | |
| a. Indicator variables with less than 5% missing are not displayed. | | | | | | | | | | |

Za svaku kvantitativnu varijablu koja ima više od 5 % missing vrijednosti, SPSS računa t testove između postojećih i missing vrijednosti te varijable (to su grupe) i zasebno vrijednosti svake od ostalih varijabli. Npr. za varijablu q2 (prvi redak, gore lijevo) odredi postojeće i missing vrijednosti (dvije grupe) i uspoređuje rezultate (aritmetičke sredine) podataka na svakoj od ostalih varijabli posebno. Ako svi t testovi nisu značajni (ako je p vrijednost iznad 0.05), onda su podaci MAR. Vidljivo je da kod varijable q5 test jest značajan za varijablu q1, ali već smo pokazali Littleovim testom da su podaci MCAR. Dakle, ako Littleov test pokaže značajnost (Podaci nisu MCAR) i u tablici t testova ima značajnih razlika, onda je mehanizam MNAR.

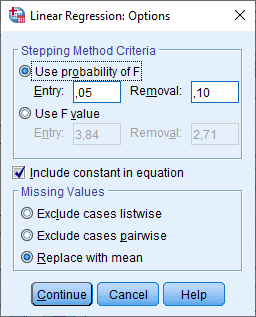
**Rješavanje problema missing vrijednosti**

Rješavanje problema missing vrijednosti ovisi o mehanizmu njihova generiranja. U slučaju MCAR, stvar je najjednostavnija. Mnoge analize već nude načine rješavanja problema missing vrijednosti, bez da se vrijednosti imputiraju. Slijedi primjer linearne regresije.

Regresijom se pokušava utvrditi povezanost prediktorskih varijabli **gender, educ, marit, jtype, whours, salary** i kriterijske varijable **overall** (općenito zadovoljstvo poslom). Regresija nudi *listwise deletion*, *pairwise deletion* i imputaciju aritmetičke sredine.



Izabrati **Analyze > Regression > Linear,** odabrati varijable, pod **Statistics**  zakačiti **Descriptives,**  a pod **Options** odabrati jednu od opcija



Prikazani rezultati po redu:

1. Listwise deletion

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| I'm happy with my job | 6,55 | ,877 | 374 |
| gender | ,43 | ,495 | 374 |
| Highest completed education level | 4,20 | 1,088 | 374 |
| Marital status | 2,17 | ,935 | 374 |
| Current job type | 2,04 | 1,055 | 374 |
| On average, how many hours do you work per week? | 31,3717 | 13,95361 | 374 |
| Gross monthly salary | $33,688.53 | $519,309.221 | 374 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | ,339a | ,115 | ,100 | ,831 |
| a. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 32,943 | 6 | 5,490 | 7,943 | ,000b |
| Residual | 253,691 | 367 | ,691 |  |  |
| Total | 286,634 | 373 |  |  |  |
| a. Dependent Variable: I'm happy with my job | | | | | | |
| b. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 5,897 | ,209 |  | 28,239 | ,000 |
| gender | -,191 | ,090 | -,108 | -2,121 | ,035 |
| Highest completed education level | ,071 | ,044 | ,088 | 1,626 | ,105 |
| Marital status | ,020 | ,047 | ,021 | ,415 | ,678 |
| Current job type | ,246 | ,045 | ,296 | 5,413 | ,000 |
| On average, how many hours do you work per week? | -,004 | ,003 | -,056 | -1,073 | ,284 |
| Gross monthly salary | 2,055E-8 | ,000 | ,012 | ,247 | ,805 |
| a. Dependent Variable: I'm happy with my job | | | | | | |

Model objašnjava oko 10 % varijance (Model Summary) i značajan je (ANOVA). Muškarci su nezadovoljniji poslom (gender je značajan i negativan), a zadovoljniji su oni na menadžerskim pozicijama (Current job type). Ukupno je analizirano 374 osobe (Descriptives).

1. Pairwise deletion

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| I'm happy with my job | 6,57 | ,887 | 437 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,20 | 1,083 | 442 |
| Marital status | 2,14 | ,936 | 447 |
| Current job type | 2,04 | 1,054 | 443 |
| On average, how many hours do you work per week? | 31,2407 | 12,92438 | 457 |
| Gross monthly salary | $28,137.48 | $467,773.632 | 461 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | ,306a | ,094 | ,081 | ,850 |
| a. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 30,609 | 6 | 5,102 | 7,056 | ,000b |
| Residual | 295,711 | 409 | ,723 |  |  |
| Total | 326,320 | 415 |  |  |  |
| a. Dependent Variable: I'm happy with my job | | | | | | |
| b. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 5,922 | ,207 |  | 28,673 | ,000 |
| gender | -,140 | ,087 | -,078 | -1,600 | ,110 |
| Highest completed education level | ,072 | ,042 | ,088 | 1,697 | ,090 |
| Marital status | ,034 | ,046 | ,036 | ,738 | ,461 |
| Current job type | ,221 | ,045 | ,262 | 4,938 | ,000 |
| On average, how many hours do you work per week? | -,004 | ,003 | -,052 | -1,036 | ,301 |
| Gross monthly salary | 2,448E-8 | ,000 | ,013 | ,274 | ,785 |
| a. Dependent Variable: I'm happy with my job | | | | | | |

Kod pairwise deletion broj analiziranih jedinica je veći (437-461). I ovdje je model značajan, objašnjava nešto manje varijance (8 %), a spol više nije značajan prediktor.

1. Imputacija aritmetičke sredine

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| I'm happy with my job | 6,57 | ,860 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,20 | 1,057 | 464 |
| Marital status | 2,14 | ,919 | 464 |
| Current job type | 2,04 | 1,030 | 464 |
| On average, how many hours do you work per week? | 31,2407 | 12,82630 | 464 |
| Gross monthly salary | $28,137.48 | $466,255.704 | 464 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | ,290a | ,084 | ,072 | ,829 |
| a. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | |

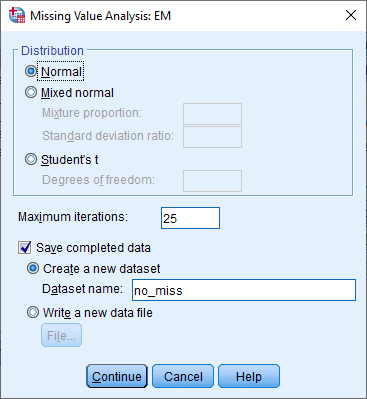
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 28,750 | 6 | 4,792 | 6,972 | ,000b |
| Residual | 314,083 | 457 | ,687 |  |  |
| Total | 342,833 | 463 |  |  |  |
| a. Dependent Variable: I'm happy with my job | | | | | | |
| b. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 5,936 | ,194 |  | 30,533 | ,000 |
| gender | -,132 | ,081 | -,076 | -1,639 | ,102 |
| Highest completed education level | ,072 | ,040 | ,089 | 1,816 | ,070 |
| Marital status | ,033 | ,043 | ,036 | ,776 | ,438 |
| Current job type | ,204 | ,042 | ,244 | 4,883 | ,000 |
| On average, how many hours do you work per week? | -,003 | ,003 | -,046 | -,967 | ,334 |
| Gross monthly salary | 2,554E-8 | ,000 | ,014 | ,308 | ,758 |
| a. Dependent Variable: I'm happy with my job | | | | | | |

Kod imputacije arit. sredine je analizirano najviše jedinica (svih 464), objašnjeno je oko 7 % varijance i spol i dalje nije značajan prediktor.

**!!!NAPOMENA: nominalne i ordinalne varijable u ovom primjeru su tretirane kao kontinuirane varijable. U suprotnom je potrebno dummy kodiranje!!!**

Kod MCAR i MAR preporuča se koristiti EM algoritam (Expectation maximization) za imputaciju vrijednosti, no ova metoda imputira vrijednosti samo za kontinuirane (*Scale varijable)*. Ono što se mora učiniti jest u izborniku **EM** (**Analyze > Missing Value Analysis > EM**) zakačiti „Save completed data“ i imenovati datoteku u kojoj će biti spremljeni novi podaci (u ovom slučaju datoteka se zove **no\_miss.sav**).



Regresija istovrsna gornjima, s novim podacima i imputacijom aritmetičke sredine (za ne scale varijable) daje ove rezultate.

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| I'm happy with my job | 6,57 | ,873 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,20 | 1,057 | 464 |
| Marital status | 2,14 | ,919 | 464 |
| Current job type | 2,04 | 1,030 | 464 |
| On average, how many hours do you work per week? | 31,2549 | 12,82712 | 464 |
| Gross monthly salary | $28,532.97 | $466,281.620 | 464 |

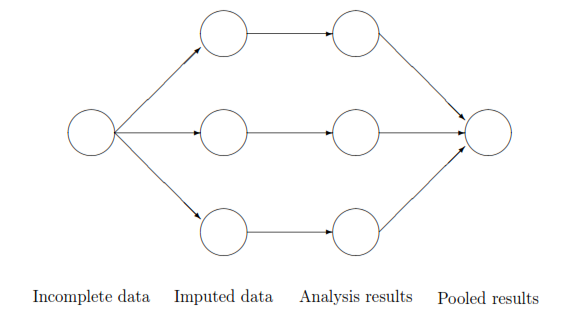
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | ,302a | ,091 | ,079 | ,838 |
| a. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 32,191 | 6 | 5,365 | 7,649 | ,000b |
| Residual | 320,551 | 457 | ,701 |  |  |
| Total | 352,742 | 463 |  |  |  |
| a. Dependent Variable: I'm happy with my job | | | | | | |
| b. Predictors: (Constant), Gross monthly salary, On average, how many hours do you work per week?, Highest completed education level, Marital status, gender, Current job type | | | | | | |

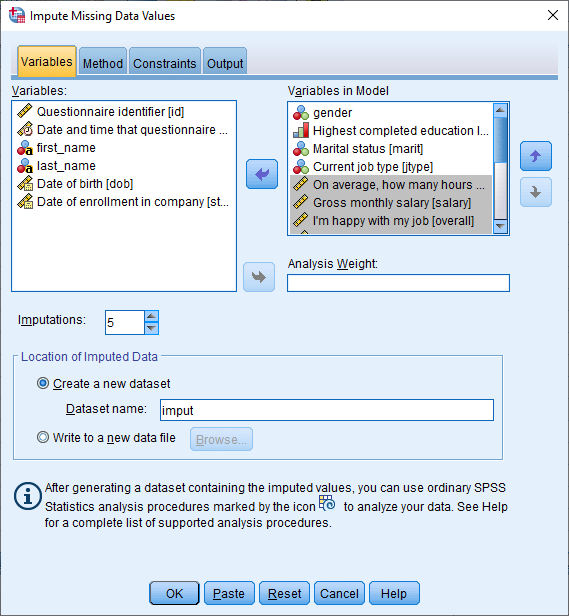
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 5,913 | ,197 |  | 30,087 | ,000 |
| gender | -,144 | ,081 | -,081 | -1,767 | ,078 |
| Highest completed education level | ,084 | ,040 | ,101 | 2,084 | ,038 |
| Marital status | ,016 | ,043 | ,017 | ,376 | ,707 |
| Current job type | ,215 | ,042 | ,254 | 5,102 | ,000 |
| On average, how many hours do you work per week? | -,003 | ,003 | -,050 | -1,043 | ,297 |
| Gross monthly salary | 2,530E-8 | ,000 | ,014 | ,302 | ,763 |
| a. Dependent Variable: I'm happy with my job | | | | | | |

Rezultati su vrlo slični slučaju kada su sve varijable imputirane aritmetičkom sredinom. To ne treba čuditi jer u slučaju MCAR-a (a naš je takav slučaj) EM algoritam nije mnogo učinkovitiji od imputacije aritmetičkom sredinom svih varijabli.

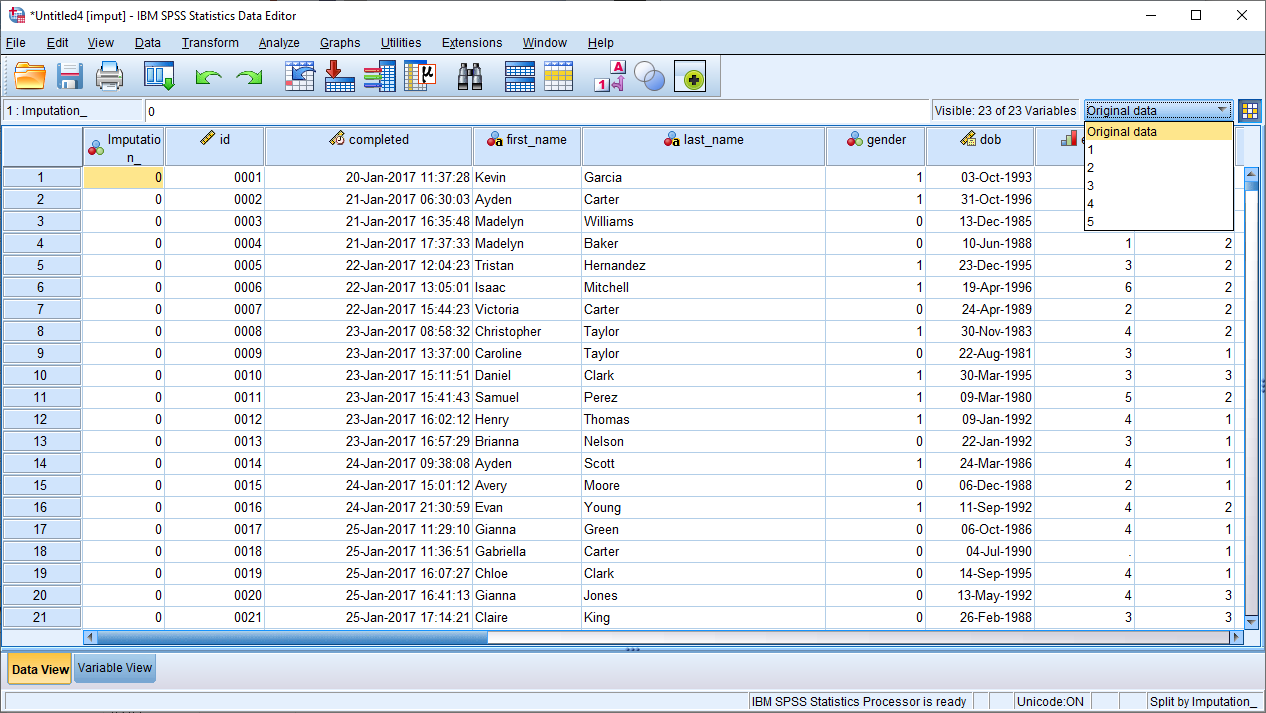
No u slučajevima MNAR, najbolja metoda je višestruka imputacija (*Multiple imputation*).



U ovom slučaju potrebno je iz izbornika odabrati **Analyze > Multiple imputation > Impute missing data values…** i odabrati varijable za imputaciju (one koje ćemo koristiti u analizama), kao i snimiti nove podatke u novu datoteku (ovdje **imput.sav**). Algoritam će imputirati pet setova podataka, a onda ih spojiti (pool) u jedan.



Novi podaci prikazuju originalne podatke i pet imputiranih setova.



Regresija slična prošlima daje ove rezultate:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | |
| Imputation Number | | Mean | Std. Deviation | N |
| Original data | I'm happy with my job | 6,55 | ,877 | 374 |
| gender | ,43 | ,495 | 374 |
| Highest completed education level | 4,20 | 1,088 | 374 |
| Marital status | 2,17 | ,935 | 374 |
| Current job type | 2,04 | 1,055 | 374 |
| Gross monthly salary | $33,688.53 | $519,309.221 | 374 |
| On average, how many hours do you work per week? | 31,3717 | 13,95361 | 374 |
| 1 | I'm happy with my job | 6,57 | ,881 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,20 | 1,101 | 464 |
| Marital status | 2,14 | ,929 | 464 |
| Current job type | 2,04 | 1,057 | 464 |
| Gross monthly salary | $33,616.96 | $472,261.709 | 464 |
| On average, how many hours do you work per week? | 31,2951 | 12,91289 | 464 |
| 2 | I'm happy with my job | 6,56 | ,888 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,19 | 1,099 | 464 |
| Marital status | 2,16 | ,950 | 464 |
| Current job type | 2,07 | 1,065 | 464 |
| Gross monthly salary | $30,271.00 | $467,073.665 | 464 |
| On average, how many hours do you work per week? | 31,1920 | 12,94138 | 464 |
| 3 | I'm happy with my job | 6,57 | ,887 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,14 | 1,145 | 464 |
| Marital status | 2,14 | ,941 | 464 |
| Current job type | 2,06 | 1,082 | 464 |
| Gross monthly salary | $27,958.20 | $466,996.006 | 464 |
| On average, how many hours do you work per week? | 31,1745 | 12,94338 | 464 |
| 4 | I'm happy with my job | 6,57 | ,887 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,21 | 1,085 | 464 |
| Marital status | 2,16 | ,941 | 464 |
| Current job type | 2,06 | 1,071 | 464 |
| Gross monthly salary | $27,833.22 | $466,359.408 | 464 |
| On average, how many hours do you work per week? | 31,3176 | 12,89786 | 464 |
| 5 | I'm happy with my job | 6,57 | ,888 | 464 |
| gender | ,42 | ,494 | 464 |
| Highest completed education level | 4,18 | 1,114 | 464 |
| Marital status | 2,13 | ,937 | 464 |
| Current job type | 2,05 | 1,068 | 464 |
| Gross monthly salary | $28,445.67 | $466,445.420 | 464 |
| On average, how many hours do you work per week? | 31,1483 | 12,96744 | 464 |
| Pooled | I'm happy with my job | 6,57 |  | 464 |
| gender | ,42 |  | 464 |
| Highest completed education level | 4,18 |  | 464 |
| Marital status | 2,15 |  | 464 |
| Current job type | 2,06 |  | 464 |
| Gross monthly salary | $29,625.01 |  | 464 |
| On average, how many hours do you work per week? | 31,2255 |  | 464 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Summary** | | | | | |
| Imputation Number | Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| Original data | 1 | ,339a | ,115 | ,100 | ,831 |
| 1 | 1 | ,331a | ,110 | ,098 | ,837 |
| 2 | 1 | ,320a | ,102 | ,090 | ,847 |
| 3 | 1 | ,328a | ,108 | ,096 | ,843 |
| 4 | 1 | ,330a | ,109 | ,097 | ,842 |
| 5 | 1 | ,312a | ,097 | ,085 | ,849 |
| a. Predictors: (Constant), On average, how many hours do you work per week?, Gross monthly salary, Highest completed education level, Marital status, gender, Current job type | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | | |
| Imputation Number | Model | | Sum of Squares | df | Mean Square | F | Sig. |
| Original data | 1 | Regression | 32,943 | 6 | 5,490 | 7,943 | ,000b |
| Residual | 253,691 | 367 | ,691 |  |  |
| Total | 286,634 | 373 |  |  |  |
| 1 | 1 | Regression | 39,393 | 6 | 6,566 | 9,378 | ,000b |
| Residual | 319,935 | 457 | ,700 |  |  |
| Total | 359,328 | 463 |  |  |  |
| 2 | 1 | Regression | 37,261 | 6 | 6,210 | 8,660 | ,000b |
| Residual | 327,742 | 457 | ,717 |  |  |
| Total | 365,003 | 463 |  |  |  |
| 3 | 1 | Regression | 39,221 | 6 | 6,537 | 9,194 | ,000b |
| Residual | 324,902 | 457 | ,711 |  |  |
| Total | 364,123 | 463 |  |  |  |
| 4 | 1 | Regression | 39,698 | 6 | 6,616 | 9,323 | ,000b |
| Residual | 324,328 | 457 | ,710 |  |  |
| Total | 364,026 | 463 |  |  |  |
| 5 | 1 | Regression | 35,462 | 6 | 5,910 | 8,199 | ,000b |
| Residual | 329,435 | 457 | ,721 |  |  |
| Total | 364,897 | 463 |  |  |  |
| a. Dependent Variable: I'm happy with my job | | | | | | | |
| b. Predictors: (Constant), On average, how many hours do you work per week?, Gross monthly salary, Highest completed education level, Marital status, gender, Current job type | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | | | | | |
| Imputation Number | Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Fraction Missing Info. | Relative Increase Variance | Relative Efficiency |
| B | Std. Error | Beta |
| Original data | 1 | (Constant) | 5,897 | ,209 |  | 28,239 | ,000 |  |  |  |
| gender | -,191 | ,090 | -,108 | -2,121 | ,035 |  |  |  |
| Highest completed education level | ,071 | ,044 | ,088 | 1,626 | ,105 |  |  |  |
| Marital status | ,020 | ,047 | ,021 | ,415 | ,678 |  |  |  |
| Current job type | ,246 | ,045 | ,296 | 5,413 | ,000 |  |  |  |
| Gross monthly salary | 2,055E-8 | ,000 | ,012 | ,247 | ,805 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,056 | -1,073 | ,284 |  |  |  |
| 1 | 1 | (Constant) | 5,947 | ,194 |  | 30,647 | ,000 |  |  |  |
| gender | -,172 | ,081 | -,097 | -2,117 | ,035 |  |  |  |
| Highest completed education level | ,074 | ,038 | ,093 | 1,945 | ,052 |  |  |  |
| Marital status | ,008 | ,043 | ,008 | ,182 | ,856 |  |  |  |
| Current job type | ,243 | ,041 | ,292 | 5,954 | ,000 |  |  |  |
| Gross monthly salary | 3,092E-8 | ,000 | ,017 | ,374 | ,708 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,062 | -1,317 | ,189 |  |  |  |
| 2 | 1 | (Constant) | 5,887 | ,196 |  | 30,057 | ,000 |  |  |  |
| gender | -,144 | ,082 | -,080 | -1,744 | ,082 |  |  |  |
| Highest completed education level | ,077 | ,038 | ,096 | 2,009 | ,045 |  |  |  |
| Marital status | ,025 | ,042 | ,027 | ,590 | ,556 |  |  |  |
| Current job type | ,232 | ,041 | ,278 | 5,668 | ,000 |  |  |  |
| Gross monthly salary | 2,990E-8 | ,000 | ,016 | ,354 | ,724 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,056 | -1,180 | ,238 |  |  |  |
| 3 | 1 | (Constant) | 5,940 | ,190 |  | 31,254 | ,000 |  |  |  |
| gender | -,134 | ,082 | -,075 | -1,637 | ,102 |  |  |  |
| Highest completed education level | ,055 | ,036 | ,071 | 1,537 | ,125 |  |  |  |
| Marital status | ,041 | ,042 | ,043 | ,957 | ,339 |  |  |  |
| Current job type | ,248 | ,039 | ,303 | 6,347 | ,000 |  |  |  |
| Gross monthly salary | 1,564E-8 | ,000 | ,008 | ,186 | ,853 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,065 | -1,384 | ,167 |  |  |  |
| 4 | 1 | (Constant) | 5,905 | ,194 |  | 30,362 | ,000 |  |  |  |
| gender | -,125 | ,082 | -,070 | -1,518 | ,130 |  |  |  |
| Highest completed education level | ,086 | ,039 | ,105 | 2,195 | ,029 |  |  |  |
| Marital status | ,000 | ,043 | ,001 | ,011 | ,991 |  |  |  |
| Current job type | ,241 | ,040 | ,291 | 5,963 | ,000 |  |  |  |
| Gross monthly salary | 2,065E-8 | ,000 | ,011 | ,245 | ,806 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,064 | -1,350 | ,178 |  |  |  |
| 5 | 1 | (Constant) | 5,932 | ,193 |  | 30,760 | ,000 |  |  |  |
| gender | -,162 | ,082 | -,090 | -1,965 | ,050 |  |  |  |
| Highest completed education level | ,064 | ,038 | ,080 | 1,670 | ,096 |  |  |  |
| Marital status | ,046 | ,043 | ,048 | 1,065 | ,288 |  |  |  |
| Current job type | ,225 | ,041 | ,271 | 5,499 | ,000 |  |  |  |
| Gross monthly salary | 2,424E-8 | ,000 | ,013 | ,286 | ,775 |  |  |  |
| On average, how many hours do you work per week? | -,004 | ,003 | -,056 | -1,176 | ,240 |  |  |  |
| Pooled | 1 | (Constant) | 5,922 | ,195 |  | 30,294 | ,000 | ,021 | ,021 | ,996 |
| gender | -,147 | ,085 |  | -1,737 | ,083 | ,066 | ,069 | ,987 |
| Highest completed education level | ,071 | ,040 |  | 1,773 | ,077 | ,112 | ,119 | ,978 |
| Marital status | ,024 | ,048 |  | ,500 | ,618 | ,222 | ,259 | ,957 |
| Current job type | ,238 | ,042 |  | 5,698 | ,000 | ,063 | ,065 | ,988 |
| Gross monthly salary | 2,427E-8 | ,000 |  | ,288 | ,773 | ,007 | ,007 | ,999 |
| On average, how many hours do you work per week? | -,004 | ,003 |  | -1,274 | ,203 | ,011 | ,011 | ,998 |
| a. Dependent Variable: I'm happy with my job | | | | | | | | | | |

U ovom slučaju, rezultati su slični kao i EM i imputacija arit. sredine.