MULTIVARIJANTNA I DUBINSKA ANALIZA PODATAKA

ZDRAVSTVENI POKAZATELJI DIJABETESA

CDC DIABETES HEALTH INDICATORS

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SADRŽAJ

PODACI O DATASETU

- Behavioral risk factor surveillance system (BRFSS) – godišnja anketa CDC-a preko telefona
- 70,692 pojedinaca odgovorilo
  - 21 varijabli (podaci su odgovori ili izračunati s obzirom na odgovore)
  - 50% nema dijabetes
- Diabetes_binary
  - 0 – nema dijabetes, 1 - ima preddijabetes ili dijabetes

Varijable koje ćemo analizirati

Prikupljeni podaci za različite rizične i druge faktore za dijabetes – kolesterol, fizičko i mentalno zdravlje, pokriće zdravstvenim osiguranjem, ekonomski i socijalni status…

Varijabla	Značenje	Vrsta varijable	Vrijednosti koje poprima
HighChol	Razina kolesterola	Kvalitativna, nominalna	0 (nizak), 1 (visok)
CholCheck	Pregledan kolesterol u zadnjih 5 godina?	Kvalitativna, nominalna	0 (jest), 1 (nije)
BMI_Group	Indeks tjelesne mase	Numerička, diskretna	12-98
HvyAlcoholConsump	Žene >= 7 pića tjedno Muškarci >= 14 pića tjedno	Kvalitativna, nominalna	0 (ne), 1 (da)
AnyHealthcare	Ima li zdravstveno osiguranje?	Kvalitativna, nominalna	0 (ne), 1 (da)
NoDocbcCost	U zadnjih godinu dana, nemogućnost odlaska doktoru zbog cijene?	Kvalitativna, nominalna	0 (ne), 1 (da)
Sex	Spol	Kvalitativna, nominalna	0 (žena), 1 (muškarac)

Tablica 1. Varijable koje ćemo analizirati

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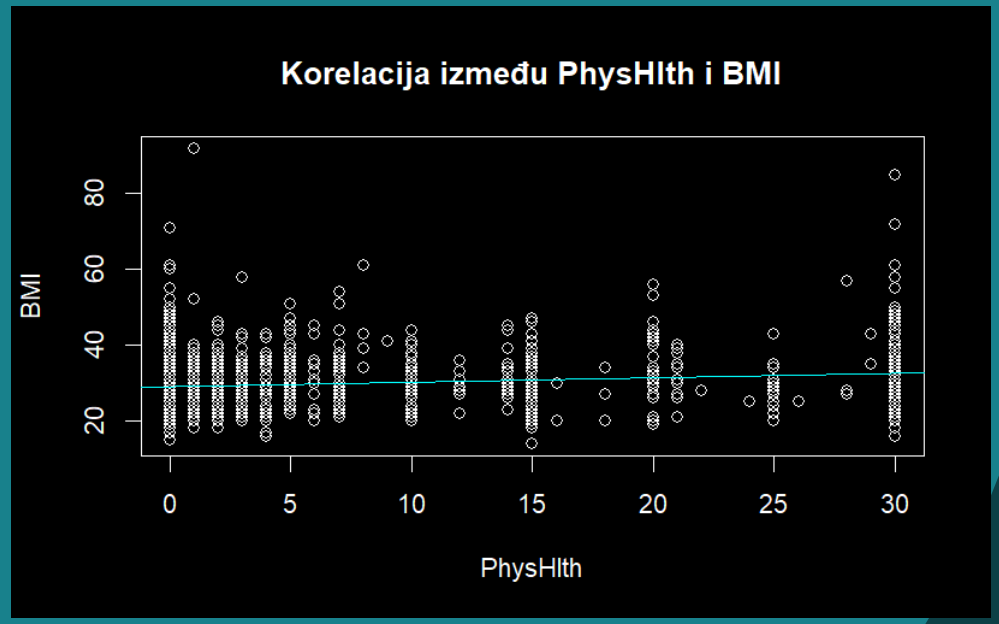
Tablica 1. Varijable koje ćemo analizirati

Varijable koje ćemo analizirati

Varijabla	Značenje	Vrsta varijable	Vrijednosti koje poprima
Age_Group	AGE5GYR skala dobi: 1 = 18-24, 2 = 25-29, 3 = 30-34, 4 = 35-39, 5 = 40-44, 6 = 45-49, 7 = 50-54, 8 = 55-59, 9 = 60-64, 10 = 65-69, 11 = 70-74, 12 = 75-79, 13 = 80+ godina	Kvalitativna, redoslijedna	1-13
Education_Group	EDUCA skala obrazovanja: 1 = samo vrtić, 2 = osnovna, 3 = nešto srednje škole, 4 = srednja škola, 5 = fakultet 1-3 godine, 6 = fakultet 4 godine ili više	Kvalitativna, redoslijedna	1-6
Income	INCOME2 skala zarade: 1 = manje od 10.000 dolara, 2 = 10.000-15.000 dolara, 3 = 15.000-20.000 dolara, 4 = 20.000-25.000, 5 = 25.000-35.000, 6 = 35.000-50.000, 7 = 50.000-75.000, 8 = 75.000 ili više dolara	Kvalitativna, redoslijedna	1-8

Tablica 1. Varijable koje ćemo analizirati

DESKRIPTIVNA STATISTIKA



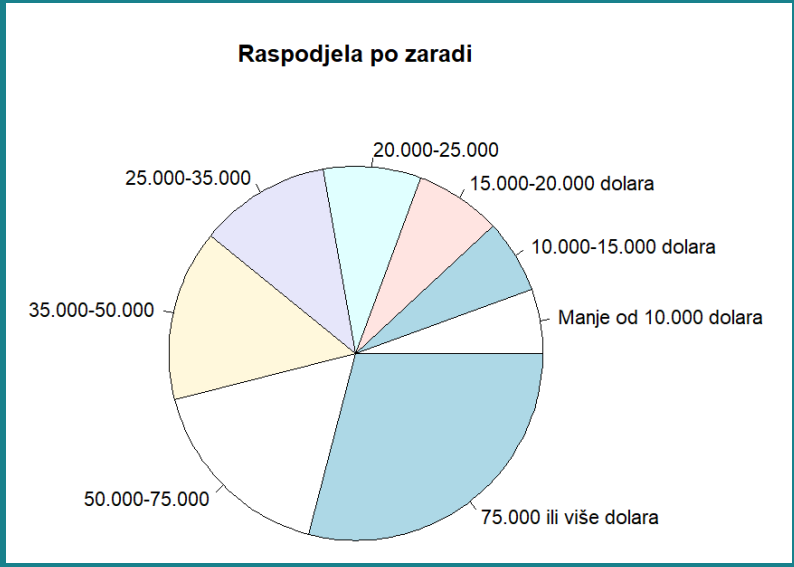
Slika 1. Korelacija PhysHlth i BMI

```
> # Deskriptivna statistika - numericka varijabla (BMI)
> median_bmi <- median(data$BMI)
> print(median_bmi)
[1] 29

> mean_bmi <- mean(data$BMI)
> print(mean_bmi)
[1] 29.77

> standard_deviation <- sd(data$BMI)
> print(standard_deviation)
[1] 6.806707

> variance <- var(data$BMI)
> print(variance)
[1] 46.33127

> quantiles <- quantile(data$BMI, probs = c(0.25, 0.5, 0.75))
> print(quantiles)
25% 50% 75%
 25  29  33

> correlation <- cor(data$PhysHlth, data$BMI)
> print(correlation)
[1] 0.1499764
```

summary(data) # za sve varijable

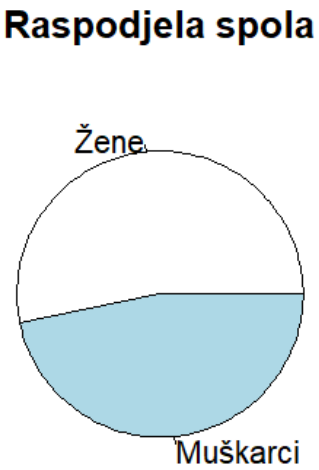
```
> summary(data)
 Diabetes_binary     HighBP          HighChol        CholCheck           BMI             Smoker          Stroke       HeartDiseaseorAttack
 1:1000          Min.   :0.0000   Min.   :0.000   Min.   :0.000   Min.   :14.00   Min.   :0.000   Min.   :0.000   Min.   :0.000
 2:1000          1st Qu.:0.0000   1st Qu.:0.000   1st Qu.:1.000   1st Qu.:25.00   1st Qu.:0.000   1st Qu.:0.000   1st Qu.:0.000
                 Median :1.0000   Median :1.000   Median :1.000   Median :28.00   Median :0.000   Median :0.000   Median :0.000
                 Mean   :0.5775   Mean   :0.528   Mean   :0.972   Mean   :29.69   Mean   :0.475   Mean   :0.072   Mean   :0.156
                 3rd Qu.:1.0000   3rd Qu.:1.000   3rd Qu.:1.000   3rd Qu.:33.00   3rd Qu.:1.000   3rd Qu.:0.000   3rd Qu.:0.000
                 Max.   :1.0000   Max.   :1.000   Max.   :1.000   Max.   :92.00   Max.   :1.000   Max.   :1.000   Max.   :1.000
  PhysActivity        Fruits          Veggies        HvyAlcoholConsump AnyHealthcare    NoDocbcCost        GenHlth          MentHlth
 Min.   :0.000   Min.   :0.000   Min.   :0.0000   Min.   :0.000     Min.   :0.0000   Min.   :0.0000   Min.   :1.000   Min.   : 0.000
 1st Qu.:0.000   1st Qu.:0.000   1st Qu.:1.0000   1st Qu.:0.000     1st Qu.:1.0000   1st Qu.:0.0000   1st Qu.:2.000   1st Qu.: 0.000
 Median :1.000   Median :1.000   Median :1.0000   Median :0.000     Median :1.0000   Median :0.0000   Median :3.000   Median : 0.000
 Mean   :0.704   Mean   :0.605   Mean   :0.7875   Mean   :0.046     Mean   :0.9585   Mean   :0.0975   Mean   :2.824   Mean   : 3.865
 3rd Qu.:1.000   3rd Qu.:1.000   3rd Qu.:1.0000   3rd Qu.:0.000     3rd Qu.:1.0000   3rd Qu.:0.0000   3rd Qu.:4.000   3rd Qu.: 3.000
 Max.   :1.000   Max.   :1.000   Max.   :1.0000   Max.   :1.000     Max.   :1.0000   Max.   :1.0000   Max.   :5.000   Max.   :30.000
    PhysHlth        DiffWalk           Sex             Age           Education        Income                BMI_Group     Age_Group
 Min.   : 0.000   Min.   :0.0000   Min.   :0.0000   Min.   : 1.000   Min.   :1.000   Min.   :1.000   Underweight   : 17   18-34 :125
 1st Qu.: 0.000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.: 7.000   1st Qu.:4.000   1st Qu.:4.000   Healthy weight:439   35-54 :280
 Median : 0.000   Median :0.0000   Median :0.0000   Median : 9.000   Median :5.000   Median :6.000   Overweight    :672   55-69 :750
 Mean   : 5.923   Mean   :0.2495   Mean   :0.4685   Mean   : 8.635   Mean   :4.932   Mean   :5.713   Obesity       :706   70-80+:701
 3rd Qu.: 5.250   3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:11.000   3rd Qu.:6.000   3rd Qu.:8.000   Severe obesity:166   NA's  :144
 Max.   :30.000   Max.   :1.0000   Max.   :1.0000   Max.   :13.000   Max.   :6.000   Max.   :8.000
 Education_Group
 Min.   :1.000
 1st Qu.:2.000
 Median :3.000
 Mean   :2.634
 3rd Qu.:3.000
 Max.   :3.000
```

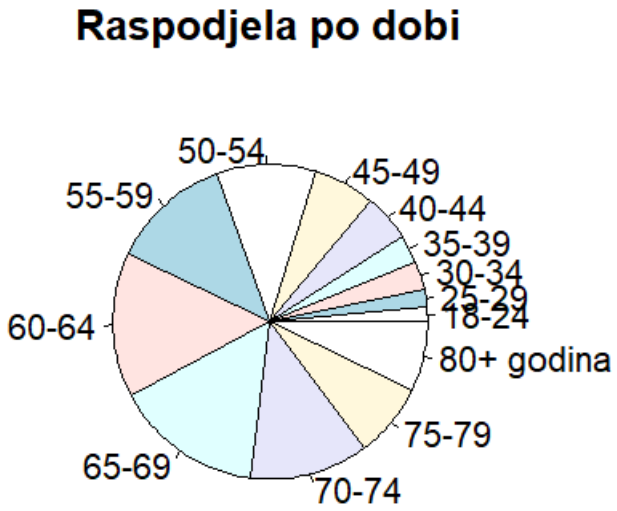
DESKRIPTIVNA STATISTIKA

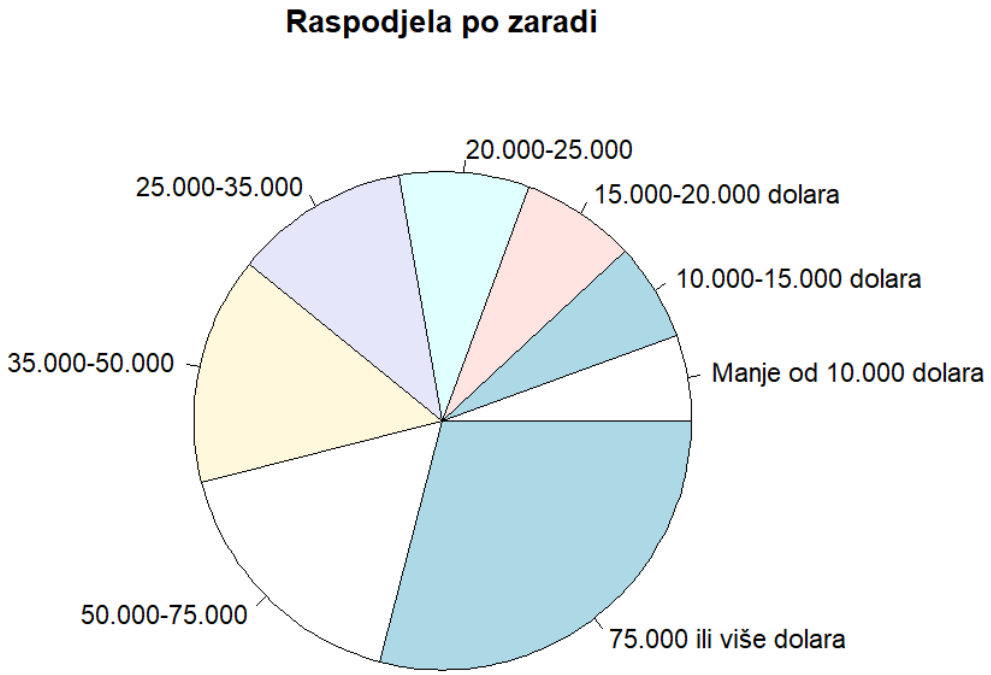


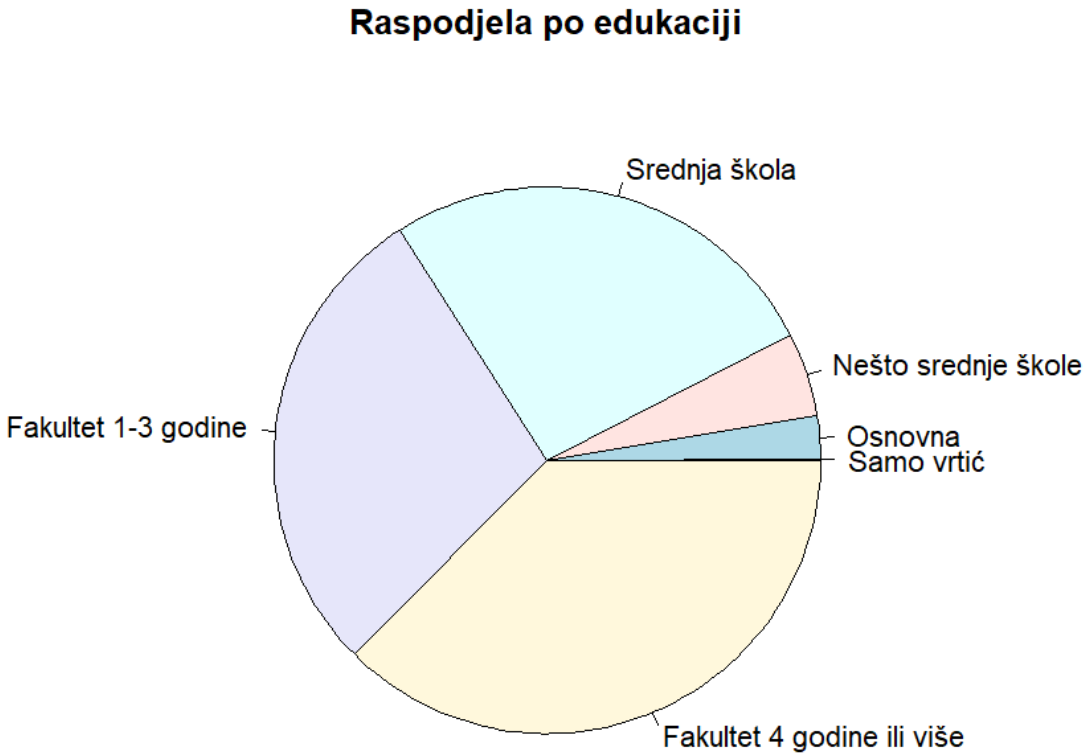
Slika 2. Raspodjela kvalitativnih varijabli

```r
# Deskriptivna statistika - kvalitativne varijable
promatranja <- table(data$Diabetes_binary)
pie(promatranja, labels = c("Nema dijabetes", "Ima dijabetes"), main =
"Raspodjela po dijabetesu")

promatranja <- table(data$Sex)
pie(promatranja, labels = c("Žene", "Muškarci"), main = "Raspodjela spola")

promatranja <- table(data$HighChol)
pie(promatranja, labels = c("Visok kolesterol", "Nizak kolesterol"),
                            main =  "Raspodjela po kolesterolu")

promatranja <- table(data$Age)
pie(promatranja, labels = c("18-24", "25-29", "30-34", "35-39", "40-44",
                            "45-49", "50-54", "55-59", "60-64", "65-69",
                            "70-74", "75-79", "80+ godina"),
    main = "Raspodjela po dobi")

promatranja <- table(data$Education)
pie(promatranja, labels = c("Samo vrtić", "Osnovna", "Nešto srednje škole",
                            "Srednja škola", "Fakultet 1-3 godine",
                            "Fakultet 4 godine ili više"),
    main = "Raspodjela po edukaciji")

promatranja <- table(data$Income)
pie(promatranja, labels = c("Manje od 10.000 dolara", "10.000-15.000 dolara",
                            "15.000-20.000 dolara", "20.000-25.000",
                            "25.000-35.000", "35.000-50.000", "50.000-75.000",
                            "75.000 ili više dolara"),
    main = "Raspodjela po zaradi")
```









Slika 2. Raspodjela kvalitativnih varijabli

PRIPREMA PODATAKA

- diabetes_binary_5050split_health_indicators_BRFSS2015.csv
- Python skripta
  - Odabir 2.000 opservacija na nasumičan način
  - 50% ispitanika nema dijabetes (0) i 50% ima preddijabetes ili dijabetes (1)

```
data = pd.read_csv("diabetes_binary_
    5050split_health_indicators_BRFSS2015.csv")

diabetes_0 = data[data['Diabetes_binary'] == 0]
diabetes_1 = data[data['Diabetes_binary'] == 1]

num_per_class = 2000 // 2

selected_0 = diabetes_0.sample(num_per_class)
selected_1 = diabetes_1.sample(num_per_class)

selected_data = pd.concat(
    [selected_0, selected_1])

selected_data = selected_data.sample(
    frac = 1).reset_index(drop = True)

selected_data.to_csv(
    "selected_data.csv", index = False)
```

PROVEDENE OBRADE

- 2 nezavisna uzorka
  - dijabetičari vs ne-dijabetičari
- Odabrane varijable (kontinuirane vrijednosti)
  - BMI: x ε [12, 98], Age: x ε [18, 80+]
- Provjera uvjeta za parametarski test:
  - Normalna distribucija (Shapiro-Wilks)
  - Jednakost varijanci skupova
    - S normalnom distribucijom skupova: F-test
    - Inače: Leveneov & Bartlettov test

Hi-kvadrat testovi

Shapiro-Wilksov, F-test, Leveneov i Bartlettov

Parametarski: T-test
Neparametarski: MWW (Wilcoxon rank-sum)

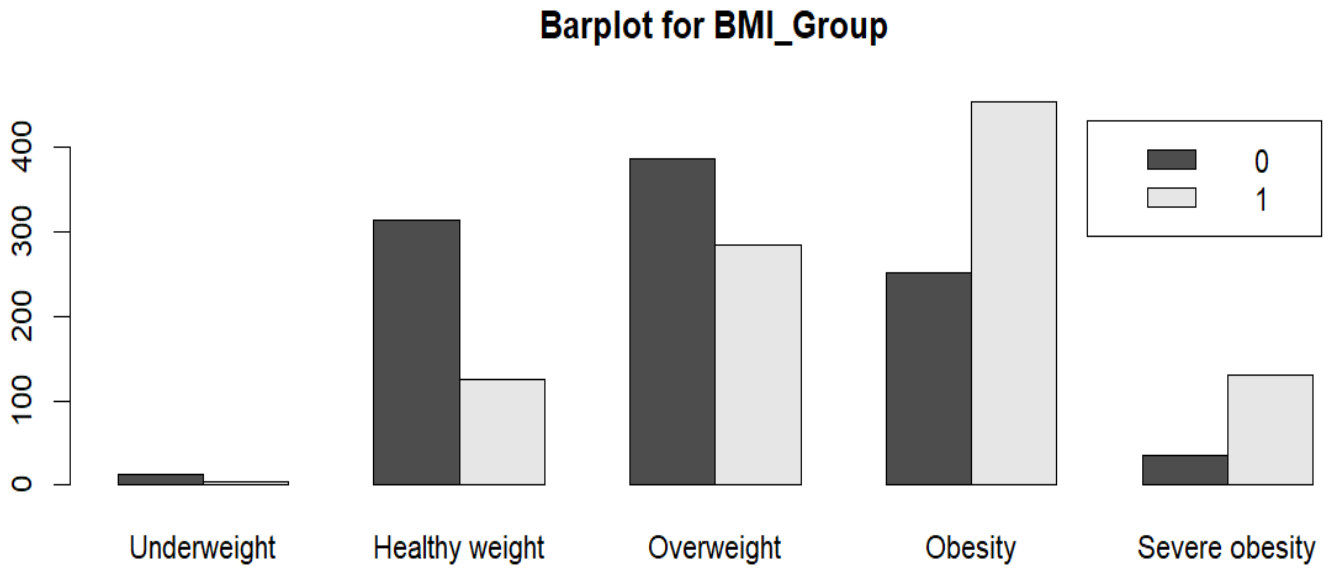
HI-KVADRAT TESTOVI NA RAZINI SIGNIFIKANTNOSTI 1%

- HighChol – H1
- CholCheck – H1
- BMI_Group – H1
- HvyAlcoholConsump – H1
- AnyHealthcare – H0
- NoDocbcCost – H0
- Sex – H0
- Age_Group – H1
- Education_Group – H1
- Income – H1

HI-KVADRAT TESTOVI BMI GRUPE

- Nul-hipoteza H0: Dijabetes je neovisan o BMI-ju.
- Alternativna hipoteza H1: Dijabetes je ovisan o BMI-ju.
- Grupiranje podataka za primjenu hi-kvadrat testa:

```
data$BMI_Group <- cut(
    data$BMI,
    breaks = c(
        0, 18.5, 24.9,
        29.9, 39.9, Inf),
    labels = c("Underweight“,
        "Healthy weight",
        "Overweight",
        "Obesity",
        "Severe obesity"))
```



Slika 3. Barplot za BMI grupe

```
        Pearson's Chi-squared test

data:  Tab
X-squared = 216.08, df = 4, p-value < 2.2e-16


Reject H0: There is a significant association between BMI_Group and Diabetes_binary
```

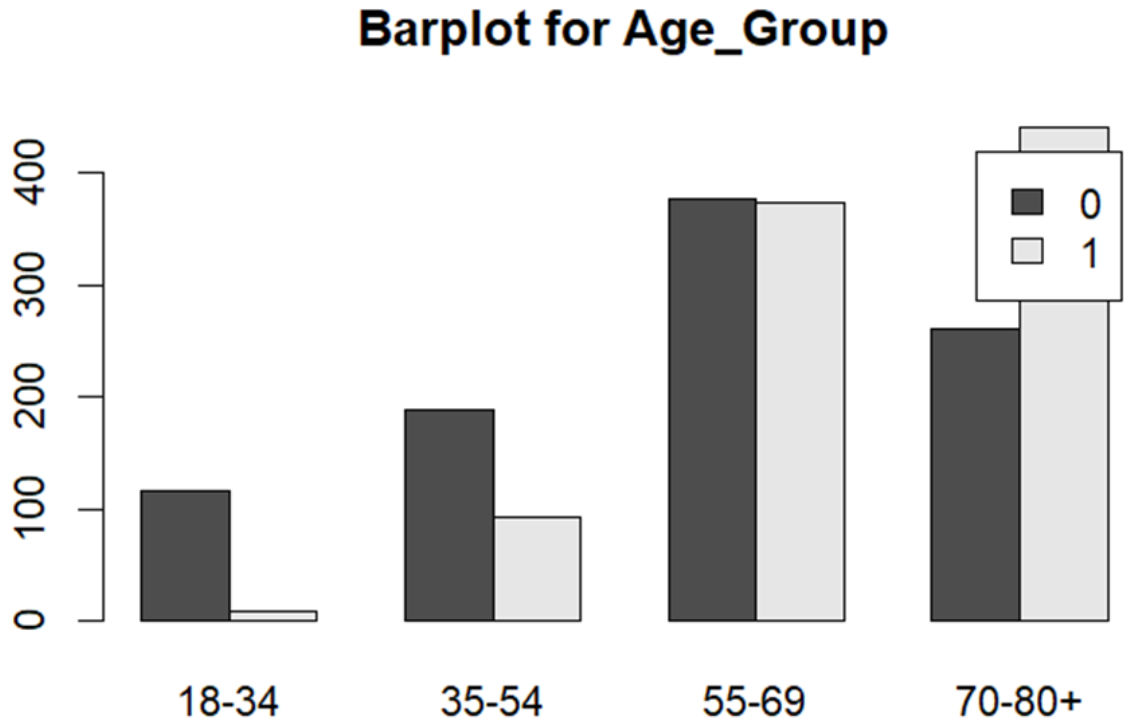
HI-KVADRAT TESTOVI GRUPE GODINA

- Nul-hipoteza H0: Dijabetes je neovisan o dobi.
- Alternativna hipoteza H1: Dijabetes je ovisan o dobi.
- Dataset koristi AGEG5YR (1 = 18-24, 9 = 60-64, 13 = 80+)
- Za primjenu hi-kvadrat, grupiranje podataka za min. 5 podataka u svakoj kategoriji:

```
data$Age_Group <- cut(
    data$Age,
    breaks = c(
        seq(0, 13, by = 3)),
        labels = c(
            "18-34", "35-54",
            "55-69", "70-80+"))
```

```
        Pearson's Chi-squared test

data:  Tab
X-squared = 170.93, df = 3, p-value < 2.2e-16
```

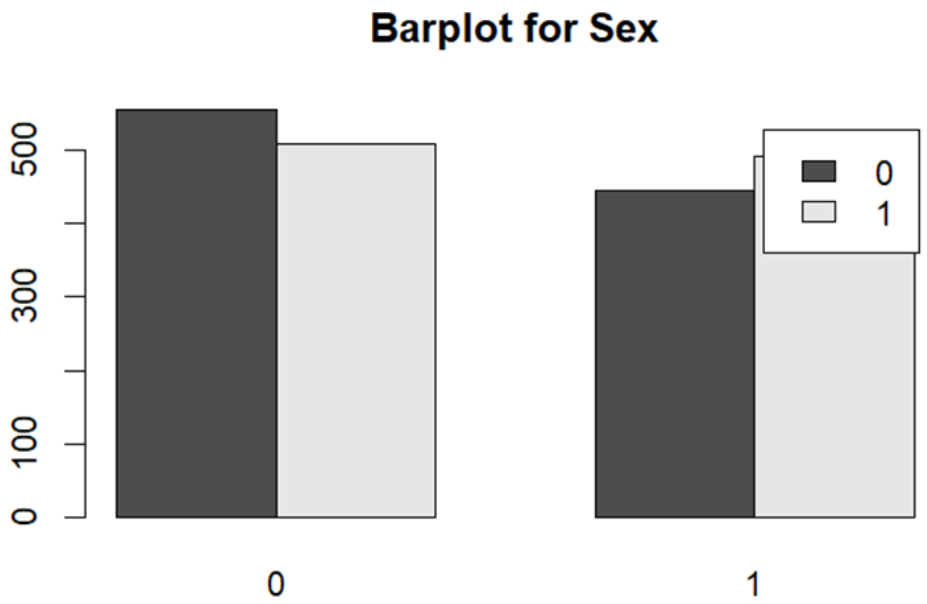
```
Reject H0: There is a significant association between Age_Group and Diabetes_binary
```



Slika 4. Barplot za grupe godina

HI-KVADRAT TESTOVI SPOL

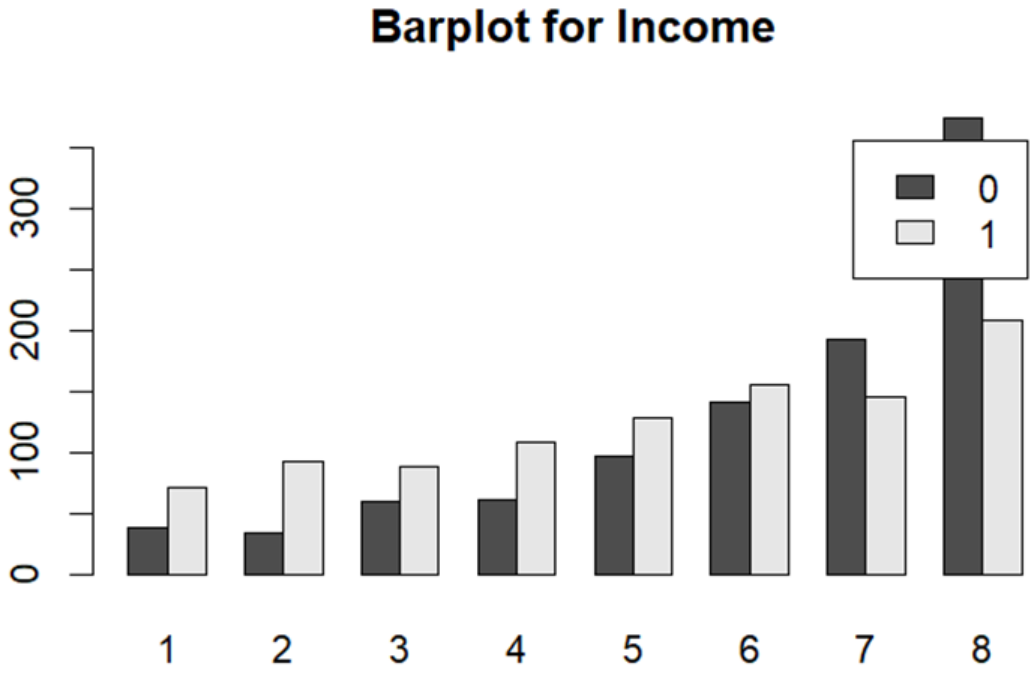
- Nul-hipoteza H0: Dijabetes je neovisan o spolu.
- Alternativna hipoteza H1: Dijabetes je ovisan o spolu.
- Na razini signifikantnosti 1% - ostajemo pri nul-hipotezi
- Na razini signifikantnosti 5% - muškarci imaju veću tendenciju biti dijabetičari



Slika 5. Barplot za spol

```
Table for Sex :

      0   1
  0 555 445
  1 508 492

H0: The Sex is independent of Diabetes_binary
H1: The Sex is not independent of Diabetes_binary


        Pearson's Chi-squared test with Yates' continuity correction

data:  Tab
X-squared = 4.2489, df = 1, p-value = 0.03928


Fail to reject H0: There is no significant association between Sex and Diabetes_binary
```

HI-KVADRAT TESTOVI ZARADA



Slika 6. Barplot za zaradu

- Nul-hipoteza H0: Dijabetes je neovisan o zaradi.
- Alternativna hipoteza H1: Dijabetes je ovisan o zaradi.

- Dovoljno podataka u svakoj kategoriji, nije potrebno pridruživanje grupa.

```
        Pearson's Chi-squared test

data:  Tab
X-squared = 113.86, df = 7, p-value < 2.2e-16


Reject H0: There is a significant association between
           Income and Diabetes_binary
```

PROVJERA UVJETA ZA T-TESTOVE SHAPIRO-WILKSOVI TESTOVI

```
Shapiro-Wilk test for normality for BMI :
Diabetic Group:

        Shapiro-Wilk normality test

data:  data[[var]][data$Diabetes_binary == 1]
W = 0.90346, p-value < 2.2e-16


Non-Diabetic Group:

        Shapiro-Wilk normality test

data:  data[[var]][data$Diabetes_binary == 0]
W = 0.90176, p-value < 2.2e-16
```

```
Shapiro-Wilk test for normality for Age :
Diabetic Group:

        Shapiro-Wilk normality test

data:  data[[var]][data$Diabetes_binary == 1]
W = 0.96189, p-value = 1.72e-15


Non-Diabetic Group:

        Shapiro-Wilk normality test

data:  data[[var]][data$Diabetes_binary == 0]
W = 0.96524, p-value = 1.039e-14
```

PROVJERA UVJETA F-TEST, LEVENEOV & BARTLETTOV TEST

```
F-test for equality of variances for BMI :

        F test to compare two variances

data:  data[[var]] by data$Diabetes_binary
F = 0.61225, num df = 999, denom df = 999, p-value = 1.229e-14
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.5408032 0.6931449
sample estimates:
ratio of variances
          0.612254


Levene's test for BMI :
Levene's Test for Homogeneity of Variance (center = median)
        Df F value    Pr(>F)
group    1  34.387 5.274e-09 ***
      1998
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Bartlett's test for BMI :

        Bartlett test of homogeneity of variances

data:  data[[var]] by data$Diabetes_binary
Bartlett's K-squared = 59.491, df = 1, p-value = 1.229e-14
```

```
F-test for equality of variances for Age :

        F test to compare two variances

data:  data[[var]] by data$Diabetes_binary
F = 1.9681, num df = 999, denom df = 999, p-value < 2.2e-16
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.738397 2.228095
sample estimates:
ratio of variances
          1.968073


Levene's test for Age :
Levene's Test for Homogeneity of Variance (center = median)
        Df F value    Pr(>F)
group    1  98.985 < 2.2e-16 ***
      1998
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Bartlett's test for Age :

        Bartlett test of homogeneity of variances

data:  data[[var]] by data$Diabetes_binary
Bartlett's K-squared = 112.31, df = 1, p-value < 2.2e-16
```

PROVJERA UVJETA ZA T-TESTOVE ZAKLJUČAK

- Shapiro-Wilks – nema normalne distribucije za BMI ili Age ni u grupi dijabetičara ni u grupi ne-dijabetičara
    - *koristimo Leveneove i Bartlettove testove za potvrdu F-testa*
- F-test, Levene i Bartlett – varijance između skupova nisu jednake ni za BMI ni za Age
- Nisu ispunjeni uvjeti za parametarski test
- Umjesto T-testova, koristimo MWW

MWW TEST NAD BMI

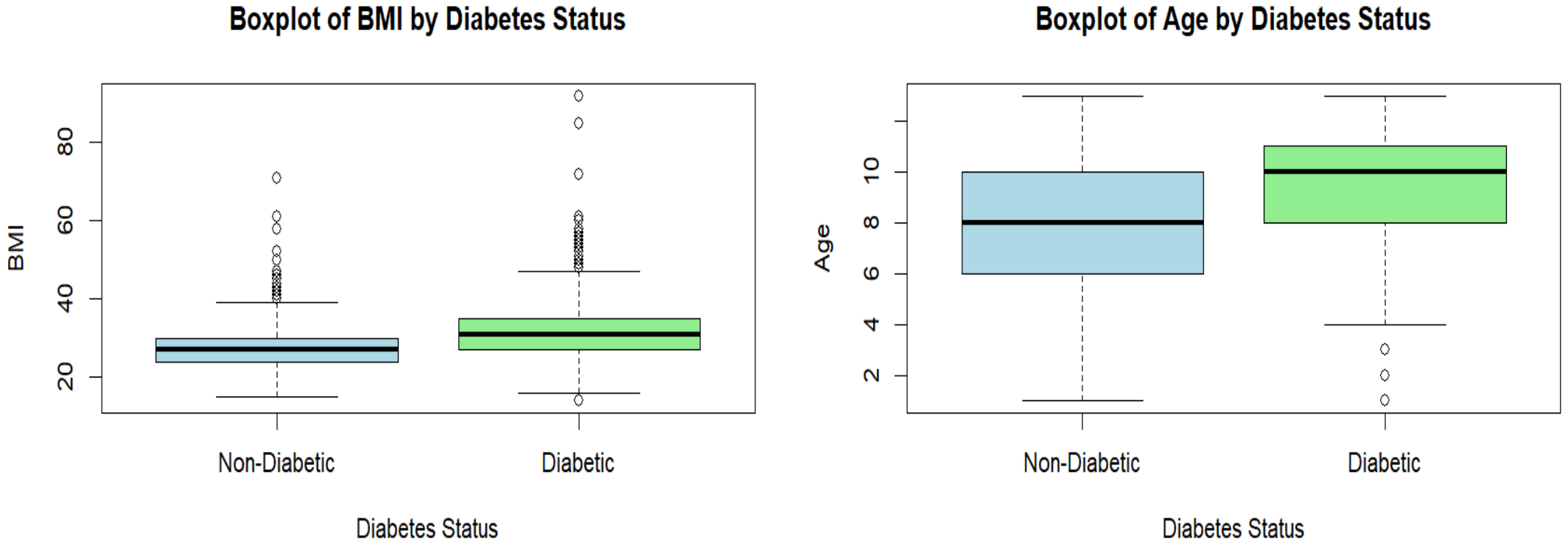
- Odbacujemo nul-hipotezu – postoji razlika u medijanima BMI između dijabetičara i ne-dijabetičara

```
At least one group does not follow a normal distribution.
Performing nonparametric Mann-Whitney U test (Wilcoxon rank sum test)...
Wilcoxon rank sum test for BMI :

        Wilcoxon rank sum test with continuity correction

data:  BMI by Diabetes_binary
W = 297212, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0


Reject H0: There is a significant difference in  BMI  between diabetic and non-diabetic groups.
```

MWW TEST NAD AGE

- Odbacujemo nul-hipotezu – postoji razlika u medijanima dobi između dijabetičara i ne-dijabetičara

```
At least one group does not follow a normal distribution.
Performing nonparametric Mann-Whitney U test (Wilcoxon rank sum test)...
Wilcoxon rank sum test for Age :

        Wilcoxon rank sum test with continuity correction

data:  Age by Diabetes_binary
W = 345808, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0


Reject H0: There is a significant difference in  Age  between diabetic and non-diabetic groups.
```



Slika 7. Boxplotovi analize

```
Median for BMI in Diabetic group: 31
Median for BMI in Non-Diabetic group: 27

Median for Age in Diabetic group: 10
Median for Age in Non-Diabetic group: 8
```

ZAKLJUČAK

- Više dijabetičara kod većih BMI-jeva
- Više dijabetičara u starijim dobnim skupinama (70+ godina)
- Manje dijabetičara s višim stopama edukacije i zarade -> moguća poveznica s lakšim pristupom zdravoj hrani koja je skuplja od fast fooda
- Na 1% razini signifikantnosti nema korelacije između dijabetesa i spola, odnosno imanja zdravstvenog osiguranja
  - Na 3% i većima razinama, više dijabetičara među muškarcima
- Nedostatak u datasetu: ne razlikuje preddijabetes, dijabetes tipa 1 i dijabetes tipa 2, nego ih sve stavlja pod istu klasu
  - zbog toga, kako se ovdje pronađene ovisnosti mogu odnositi samo na dijabetes tipa 2, ne možemo ih generalizirati za sve tipove dijabetesa koji imaju različite uzroke

testovi.R

GitHub poveznica na ovu datoteku u trenutku izrade dokumentacije.

```r
install.packages("car")
require("car")

data <- read.csv(file.choose())

data$Diabetes_binary <- as.factor(data$Diabetes_binary)

data$BMI_Group <- cut(data$BMI, breaks = c(0, 18.5, 24.9, 29.9, 39.9, Inf),
                      labels = c("Underweight", "Healthy weight", "Overweight", "Obesity", "Severe obesity"))
data$Age_Group <- cut(data$Age, breaks = c(seq(0, 13, by = 3)), labels = c("18-34", "35-54", "55-69", "70-80+"))
data$Education_Group <- cut(data$Education, breaks = c(seq(0, 6, by = 2)), labels = FALSE)

vars <- c("HighChol", "CholCheck", "BMI_Group", "HvyAlcoholConsump", "AnyHealthcare", "NoDocbcCost",
          "Sex", "Age_Group", "Education_Group", "Income")

for (var in vars) {
  tab <- table(data$Diabetes_binary, data[[var]])
  cat("Table for", var, ":\n")
  print(tab)
  barplot(tab, beside = TRUE, legend = TRUE, main = paste("Barplot for", var))

  c_test <- chisq.test(tab, correct = TRUE)
  cat("\nH0: The", var, "is independent of Diabetes_binary\n")
  cat("H1: The", var, "is not independent of Diabetes_binary\n\n")
  print(c_test)

  p_value <- c_test$p.value

  if (p_value <= 0.01) {
    cat("\nReject H0: There is a significant association between", var, "and Diabetes_binary\n\n")
  } else {
    cat("\nFail to reject H0: There is no significant association between", var, "and Diabetes_binary\n\n")
  }
}

vars_to_test <- c("BMI", "Age")

for (var in vars_to_test) { # nolint
  sw_test_diabetic <- shapiro.test(data[[var]][data$Diabetes_binary == 1])
  sw_test_nondiabetic <- shapiro.test(data[[var]][data$Diabetes_binary == 0])

  cat("\n\nShapiro-Wilk test for normality for", var, ":\n")
  cat("Diabetic Group:\n")
  print(sw_test_diabetic)
  cat("\nNon-Diabetic Group:\n")
  print(sw_test_nondiabetic)

  f_test <- var.test(data[[var]] ~ data$Diabetes_binary)

  cat("\nF-test for equality of variances for", var, ":\n")
  print(f_test)

  levene_test <- leveneTest(data[[var]], data$Diabetes_binary)

  cat("\nLevene's test for", var, ":\n")
  print(levene_test)

  bartlett_test <- bartlett.test(data[[var]] ~ data$Diabetes_binary)

  cat("\nBartlett's test for", var, ":\n")
  print(bartlett_test)


  if (sw_test_diabetic$p.value > 0.01 && sw_test_nondiabetic$p.value > 0.01) {
    cat("Both groups follow a normal distribution.\n")

   if (f_test$p.value > 0.01 && levene_test$p.value && bartlett_test$p.value) {
      cat("Variances of both groups are equal.\n")
      cat("Performing parametric two-sample t-test...\n")

      t_test <- t.test(data[[var]] ~ data$Diabetes_binary, conf.level = 0.99)
      print(t_test)

      if (t_test$p.value <= 0.01) {
        cat("\nReject H0: There is a significant difference in ", var, " between diabetic and non-diabetic groups.\n")
      } else {
        cat("\nFail to reject H0: There is no significant difference in ", var, " between diabetic and non-diabetic
groups.\n")
      }

    } else {
      cat("Variances of both groups are not equal.\n")
      cat("Performing nonparametric Mann-Whitney U test (Wilcoxon rank sum test)...\n")

      wilcox_test <- wilcox.test(as.formula(paste(var, "~ Diabetes_binary")), data = data)

      cat("Wilcoxon rank sum test for", var, ":\n")
      print(wilcox_test)

      if (wilcox_test$p.value <= 0.01) {
        cat("\nReject H0: There is a significant difference in ", var, " between diabetic and non-diabetic groups.\n")
      } else {
        cat("\nFail to reject H0: There is no significant difference in ", var, " between diabetic and non-diabetic
groups.\n")
      }

    }
  } else {
    cat("At least one group does not follow a normal distribution.\n")
    cat("Performing nonparametric Mann-Whitney U test (Wilcoxon rank sum test)...\n")

    wilcox_test <- wilcox.test(as.formula(paste(var, "~ Diabetes_binary")), data = data)

    cat("Wilcoxon rank sum test for", var, ":\n")
    print(wilcox_test)

    if (wilcox_test$p.value <= 0.01) {
      cat("\nReject H0: There is a significant difference in ", var, " between diabetic and non-diabetic groups.\n")
    } else {
      cat("\nFail to reject H0: There is no significant difference in ", var, " between diabetic and non-diabetic
groups.\n")
    }
  }
}
```

```r
for (var in vars_to_test) {
  median_diabetic <- median(data[[var]][data$Diabetes_binary == 1])
  median_nondiabetic <- median(data[[var]][data$Diabetes_binary == 0])

  cat("Median for", var, "in Diabetic group:", median_diabetic, "\n")
  cat("Median for", var, "in Non-Diabetic group:", median_nondiabetic, "\n\n")
}

vars_to_plot <- c("BMI", "Age")

par(mfrow = c(1, length(vars_to_plot)))

for (var in vars_to_plot) {
  boxplot(data[[var]] ~ data$Diabetes_binary,
          xlab = "Diabetes Status",
          ylab = var,
          main = paste("Boxplot of", var, "by Diabetes Status"),
          col = c("lightblue", "lightgreen"),
          names = c("Non-Diabetic", "Diabetic"))
}

par(mfrow = c(1, 1))


# Deskriptivna statistika - numericka varijabla (BMI)
median_bmi <- median(data$BMI)
print(median_bmi)

mean_bmi <- mean(data$BMI)
print(mean_bmi)

standard_deviation <- sd(data$BMI)
print(standard_deviation)

variance <- var(data$BMI)
print(variance)

quantiles <- quantile(data$BMI, probs = c(0.25, 0.5, 0.75))
print(quantiles)

correlation <- cor(data$PhysHlth, data$BMI)
print(correlation)

plot(data$PhysHlth, data$BMI,
     xlab = "PhysHlth",
     ylab = "BMI",
     main = "Korelacija između PhysHlth i BMI")

fit <- lm(data$BMI ~ data$PhysHlth)

abline(fit, col = "red")
```

GitHub poveznica na ovu datoteku u trenutku izrade dokumentacije.

```r
# Deskriptivna statistika - kvalitativne varijable
promatranja <- table(data$Diabetes_binary)
pie(promatranja, labels = c("Nema dijabetes", "Ima dijabetes"), main = "Raspodjela po dijabetesu")

promatranja <- table(data$Sex)
pie(promatranja, labels = c("Žene", "Muškarci"), main = "Raspodjela spola")

promatranja <- table(data$HighChol)
pie(promatranja, labels = c("Visok kolesterol", "Nizak kolesterol"), main = "Raspodjela po kolesterolu")

promatranja <- table(data$Age)
pie(promatranja, labels = c("18-24", "25-29", "30-34", "35-39", "40-44",
                            "45-49", "50-54", "55-59", "60-64", "65-69",
                            "70-74", "75-79", "80+ godina"),
    main = "Raspodjela po dobi")

promatranja <- table(data$Education)
pie(promatranja, labels = c("Samo vrtić", "Osnovna", "Nešto srednje škole",
                            "Srednja škola", "Fakultet 1-3 godine",
                            "Fakultet 4 godine ili više"),
    main = "Raspodjela po edukaciji")

promatranja <- table(data$Income)
pie(promatranja, labels = c("Manje od 10.000 dolara", "10.000-15.000 dolara",
                            "15.000-20.000 dolara", "20.000-25.000", "25.000-35.000",
                            "35.000-50.000", "50.000-75.000", "75.000 ili više dolara"),
    main = "Raspodjela po zaradi")
```

descriptive-statistics.R

GitHub poveznica na ovu datoteku u trenutku izrade dokumentacije.

```r
data <- read.csv(file.choose())

# Deskriptivna statistika
- numericka varijabla (BMI)
median_bmi <- median(data$BMI)
print(median_bmi)

mean_bmi <- mean(data$BMI)
print(mean_bmi)

standard_deviation <- sd(data$BMI)
print(standard_deviation)

variance <- var(data$BMI)
print(variance)

quantiles <- quantile(data$BMI, probs = c(0.25,
0.5, 0.75))
print(quantiles)

correlation <- cor(data$PhysHlth, data$BMI)
print(correlation)

plot(data$PhysHlth, data$BMI, xlab = "PhysHlth",
ylab = "BMI", main = "Korelacija između PhysHlth
i BMI")

fit <- lm(data$BMI ~ data$PhysHlth)

abline(fit, col = "red")
```

descriptive-statistics-pie-charts.R

GitHub poveznica na ovu datoteku u trenutku izrade dokumentacije.

```r
data <- read.csv(file.choose())

# Deskriptivna statistika - kvalitativne varijable
promatranja <- table(data$Diabetes_binary)
pie(promatranja, labels = c("Nema dijabetes", "Ima dijabetes"), main =
"Raspodjela po dijabetesu")

promatranja <- table(data$Sex)
pie(promatranja, labels = c("Žene", "Muškarci"), main = "Raspodjela
spola")

promatranja <- table(data$HighChol)
pie(promatranja, labels = c("Visok kolesterol", "Nizak kolesterol"), main
= "Raspodjela po kolesterolu")


promatranja <- table(data$Age)
pie(promatranja, labels = c("18-24", "25-29", "30-34", "35-39", "40-44",
                            "45-49", "50-54", "55-59", "60-64", "65-69",
                            "70-74", "75-79", "80+ godina"),
    main = "Raspodjela po dobi")

promatranja <- table(data$Education)
pie(promatranja, labels = c("Samo vrtić", "Osnovna", "Nešto srednje škole",
                            "Srednja škola", "Fakultet 1-3 godine",
                            "Fakultet 4 godine ili više"),
    main = "Raspodjela po edukaciji")

promatranja <- table(data$Income)
pie(promatranja, labels = c("Manje od 10.000 dolara",
"10.000-15.000 dolara",
                            "15.000-20.000 dolara",
"20.000-25.000", "25.000-35.000",
                            "35.000-50.000", "50.000-
75.000", "75.000 ili više dolara"),
    main = "Raspodjela po zaradi")
```

LITERATURA

Sav programski kod se može pronaći na javnom GitHub repozitoriju ovog rada: https://github.com/jfletcher20/diabetes-health-indicators-analysis

- *AGE5GYR - Variable Home Page* (bez dat.). Preuzeto na: https://www.icpsr.umich.edu/web/NAHDAP/studies/34085/datasets/0001/variables/AGEG5YR?archive=NAHDAP (pristupano: 5.5.2024.).
- *Body mass index (BMI) | NHS inform* (bez dat.). Preuzeto na: https://www.nhsinform.scot/healthy-living/food-and-nutrition/healthy-eating-and-weight-loss/body-mass-index-bmi/ (pristupano: 5.5.2024.).
- *Diabetes Health Indicators Dataset* (bez dat.). Preuzeto na: https://www.kaggle.com/datasets/alexteboul/diabetes-health-indicators-dataset/data?select=diabetes_binary_5050split_health_indicators_BRFSS2015.csv (pristupano: 5.5.2024.).
- *EDUCA - Variable Home Page* (bez dat.). Preuzeto na: https://www.icpsr.umich.edu/web/NAHDAP/studies/34085/datasets/0001/variables/EDUCA?archive=nahdap (pristupano: 5.6.2024.).
- *INCOME2 - Variable Home Page* (bez dat.). Preuzeto na: https://www.icpsr.umich.edu/web/NAHDAP/studies/34085/datasets/0001/variables/INCOME2?archive=NAHDAP (pristupano: 5.6.2024.).

HVALA VAM NA PAŽNJI

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