Final Project

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Data Import

```
cancer_raw =
  read_csv("./data/Cancer_Registry.csv") %>%
  janitor::clean_names() %>%
  dplyr::select(target_death_rate, geography, everything()) %>%
  separate(geography, into = c("county", "state"), sep = ",")
```

Data varibale dictionary:

- **target_death_rate:** mean per capita (100,000) cancer mortalities (a)
- **avg_ann_count:** mean number of reported cases of cancer diagnosed annually (a)
- **avg_deaths_per_year:** mean number of reported mortalities due to cancer (a)
- **incidence_rate:** mean per capita (100,000) cancer diagnoses (a)
- **med_income:** median income per county (b)
- **pop_est2015:** population of county (b)
- **poverty_percent:** percent of population in poverty (b)
- **study_per_cap** per capita number of cancer-related clinical trials per county (a)
- **binned_inc:** median income per capita binned by decile (b)
- **median_age:** median age of county residents (b)
- **median_age_male:** median age of male county residents (b)
- **median_age_female:** median age of female county residents (b)
- **geography:** county name (b)
- **avg_household_size:** mean household size of county (b)
- **percent_married:** percent of county residents who are married (b)
- **pct_no_hs18_24:** percent of county residents ages 18-24 highest education attained: less than high school (b)
- **pct_hs18_24:** percent of county residents ages 18-24 highest education attained: high school diploma (b)
- **pct_some_col18_24:** percent of county residents ages 18-24 highest education attained: some college (b)
- **pct_bach_deg18_24:** percent of county residents ages 18-24 highest education attained: bachelor's degree (b)
- **pct_hs25_over:** percent of county residents ages 25 and over highest education attained: high school diploma (b)

- **pct_bach_deg25_over:** percent of county residents ages 25 and over highest education attained: bachelor's degree (b)
- **pct_employed16_over:** percent of county residents ages 16 and over employed (b)

- **pct_unemployed16_over:** percent of county residents ages 16 and over unemployed (b)

- **pct_private_coverage:** percent of county residents with private health coverage (b)
- **pct_private_coverage_alone:** percent of county residents with private health coverage alone (no public assistance) (b)

- **pct__emp__priv__coverage:** percent of county residents with employee-provided private health coverage (b)

- **pct__public__coverage:** percent of county residents with government-provided health coverage (b)
- **pct__public__coverage__alone:** percent of county residents with government-provided health coverage alone (b)

- **pct__white:** percent of county residents who identify as White (b)

- **pct__black:** percent of county residents who identify as Black (b)
- **pct__asian:** percent of county residents who identify as Asian (b)

- **pct__other__race:** percent of county residents who identify in a category which is not White, Black, or Asian (b)

- **pct__married__households:** percent of married households (b)
- **birth__rate:** number of live births relative to number of women in county (b)

Look at the distribution of all varibales:

```r
cancer_raw %>%
  keep(is.numeric) %>%
  gather() %>%
  ggplot(aes(value)) +
    facet_wrap(~ key, scales = "free") +
    geom_histogram(bins = 30)
```

```
## Warning: Removed 3046 rows containing non-finite values (stat_bin).
```
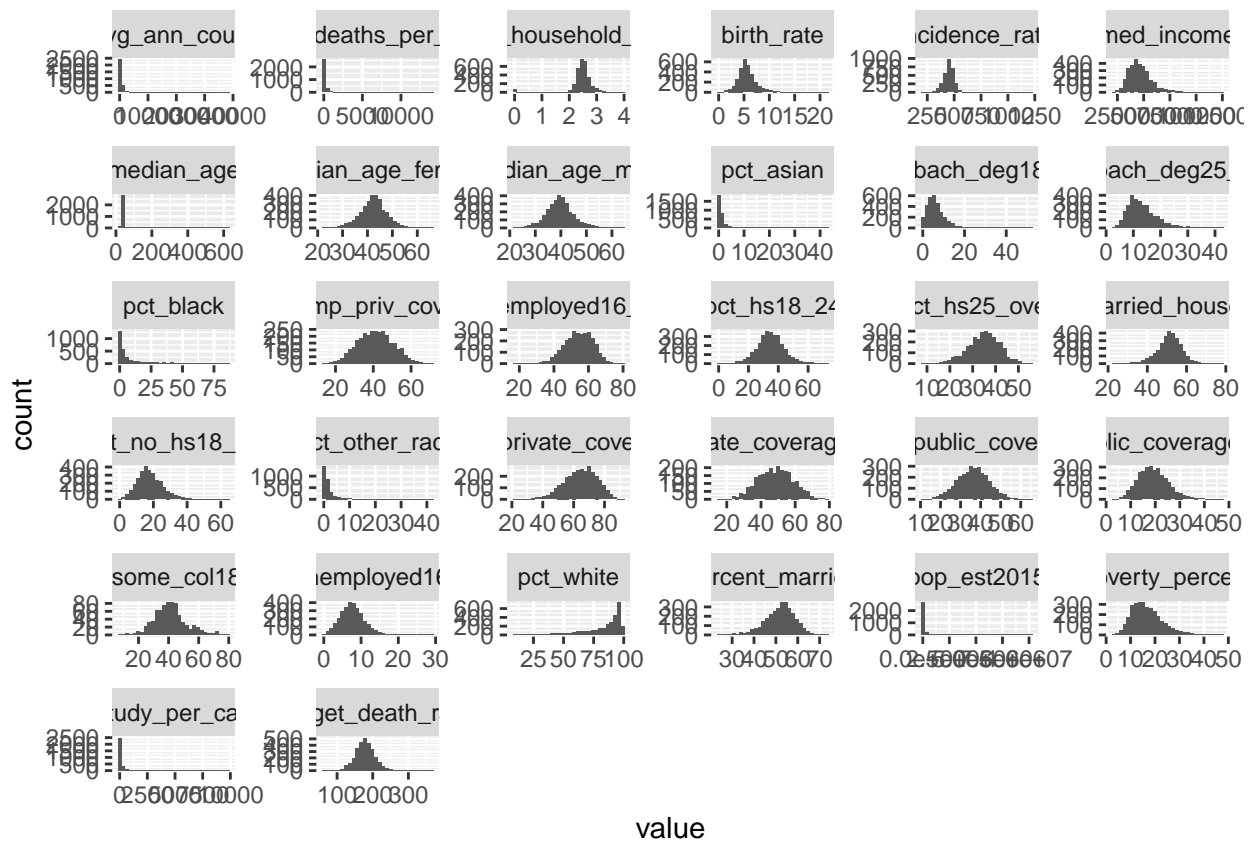
Choose variables:

```
cancer_county =
  cancer_raw %>%
  janitor::clean_names() %>%
  dplyr::select(target_death_rate, incidence_rate, med_income, poverty_percent, median_age:median_age_fe
  dplyr::select(-pct_hs25_over, -pct_bach_deg25_over, -pct_employed16_over, -percent_married) %>%
  mutate(pct_upto_hs18_24 = pct_no_hs18_24 + pct_hs18_24,
         pct_above_hs18_24 = 100 - pct_upto_hs18_24,
         pct_with_coverage = pct_private_coverage + pct_public_coverage_alone,
         income_cat = ifelse(med_income < 35000, 0, 1)) %>%
  dplyr::select(-(pct_no_hs18_24:pct_bach_deg18_24), -pct_above_hs18_24, -(pct_private_coverage:pct_publ
```

Check correlation and distribution:

```
cor(cancer_county) %>%
  knitr::kable()
```

	target_death_rate	incidence_rate	poverty_percent	median_age	median_age_male	m
target_death_rate	1.0000000	0.4494317	0.4293890	0.0043751	-0.0219294	
incidence_rate	0.4494317	1.0000000	0.0090463	0.0180892	-0.0147332	
poverty_percent	0.4293890	0.0090463	1.0000000	-0.0292800	-0.2140010	
median_age	0.0043751	0.0180892	-0.0292800	1.0000000	0.1291195	

	target_death_rate	incidence_rate	poverty_percent	median_age	median_age_male	n
median_age_male	-0.0219294	-0.0147332	-0.2140010	0.1291195	1.0000000	
median_age_female	0.0120484	-0.0091056	-0.1481635	0.1246784	0.9336961	
avg_household_size	-0.0369053	-0.1184000	0.0743076	-0.0319441	-0.3431887	
pct_unemployed16_over	0.3784124	0.0999795	0.6551481	0.0185904	-0.1427375	
pct_white	-0.1774000	-0.0145098	-0.5094328	0.0350094	0.3980444	
pct_black	0.2570236	0.1134890	0.5115297	-0.0171732	-0.2427481	
pct_asian	-0.1863311	-0.0081234	-0.1572887	-0.0384239	-0.2383224	
pct_other_race	-0.1898936	-0.2087483	0.0470959	-0.0302765	-0.2666554	
pct_married_households	-0.2933253	-0.1521763	-0.6049528	0.0145036	0.2222777	
pct_upto_hs18_24	0.2443042	-0.0929669	0.2517431	0.0401926	0.2371826	
pct_with_coverage	-0.2292798	0.2302489	-0.6516658	0.0049621	0.1497702	
income_cat	-0.3030288	0.0110839	-0.6344122	0.0103377	0.0266055	

```
cancer_county %>%
  gather() %>%
  ggplot(aes(value)) +
  facet_wrap(~ key, scales = "free") +
  geom_histogram(bins = 30)
```
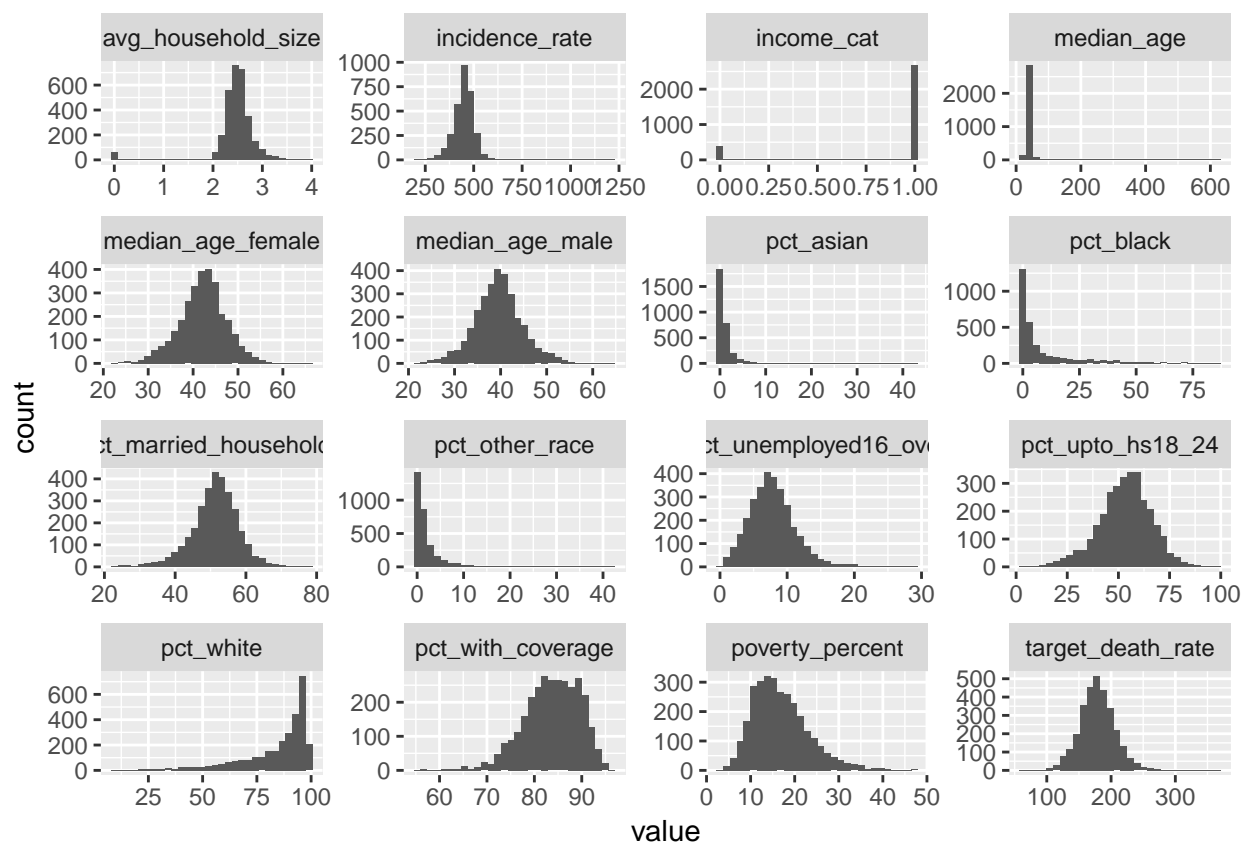

The discriptive statistics:

```
state_summary = function(x){
  mean = mean(x)
```

4

```
  max = max(x)
  min = min(x)
  median = median(x)
  var = var(x)
  sd = sd(x)
  sample_size = length(x) - sum(is.na(x))
  tibble(mean, max, min, median, var, sd, sample_size)
}

#cancer_county %>% dplyr::select(-income_cat) %>% gather() %>% group_by(key) %>% nest() %>% mutate(summ

df_target_death_rate = state_summary(cancer_county$target_death_rate)
df_incidence_rate = state_summary(cancer_county$incidence_rate)
df_poverty_percent = state_summary(cancer_county$poverty_percent)
df_median_age = state_summary(cancer_county$median_age)
df_median_agemale = state_summary(cancer_county$median_age_male)
df_median_agefemale = state_summary(cancer_county$median_age_female)
df_avg_household_size = state_summary(cancer_county$avg_household_size)
df_pct_unemployed16_over = state_summary(cancer_county$pct_unemployed16_over)
df_pct_white = state_summary(cancer_county$pct_white)
df_pct_black = state_summary(cancer_county$pct_black)
df_pct_asian = state_summary(cancer_county$pct_asian)
df_pct_other_race = state_summary(cancer_county$pct_other_race)
df_pct_married_households = state_summary(cancer_county$pct_married_households)
df_pct_upto_hs18_24 = state_summary(cancer_county$pct_upto_hs18_24)
df_pct_with_coverage = state_summary(cancer_county$pct_with_coverage)

state_des <- bind_rows(df_target_death_rate,
                       df_incidence_rate,
                       df_poverty_percent,
                       df_median_age,
                       df_median_agemale,
                       df_median_agefemale,
                       df_avg_household_size,
                       df_pct_unemployed16_over,
                       df_pct_white,
                       df_pct_black,
                       df_pct_asian,
                       df_pct_other_race,
                       df_pct_married_households,
                       df_pct_upto_hs18_24,
                       df_pct_with_coverage)
variable = c("target_death_rate", "incidence_rate","poverty_percent", "median_age", "median_agemale", "m

state_wholedes = cbind(variable, state_des)

knitr::kable(state_wholedes)
```

variable	mean	max	min	median	var	sd	sample_size
target_death_rate	178.664063	362.80000	59.70000	178.1000000	770.1463805	27.7515113	3047
incidence_rate	448.268586	1206.90000	201.30000	453.5494221	2976.8735549	54.5607327	3047
poverty_percent	16.878175	47.40000	3.20000	15.9000000	41.0763948	6.4090869	3047
median_age	45.272333	624.00000	22.30000	41.0000000	2052.4959218	45.3044802	3047

variable	mean	max	min	median	var	sd	sample_size
median_agemale	39.570725	64.70000	22.40000	39.6000000	27.3112504	5.2260167	3047
median_agefemale	42.145323	65.70000	22.30000	42.4000000	28.0142518	5.2928491	3047
avg_household_size	2.479662	3.97000	0.02210	2.5000000	0.1841906	0.4291744	3047
pct_unemployed16_over	7.852412	29.40000	0.40000	7.6000000	11.9188640	3.4523708	3047
pct_white	83.645286	100.00000	10.19916	90.0597742	268.3052265	16.3800252	3047
pct_black	9.107978	85.94780	0.00000	2.2475763	211.2527926	14.5345379	3047
pct_asian	1.253965	42.61942	0.00000	0.5498117	6.8135428	2.6102764	3047
pct_other_race	1.983523	41.93025	0.00000	0.8261852	12.3742846	3.5177101	3047
pct_married_households	51.243872	78.07540	22.99249	51.6699411	43.2018812	6.5728138	3047
pct_upto_hs18_24	53.226518	100.00000	4.80000	53.9000000	160.1814371	12.6562805	3047
pct_with_coverage	83.595011	95.70000	54.60000	84.0000000	35.3664623	5.9469709	3047

Model building:

Stepwise:

```
# building full model
full_model <- lm(target_death_rate ~., data = cancer_county)
summary(full_model)
```

```
##
## Call:
## lm(formula = target_death_rate ~ ., data = cancer_county)
##
## Residuals:
##      Min      1Q   Median      3Q      Max
## -129.883  -11.469    0.163   12.142  126.523
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          72.058821  12.583888   5.726 1.13e-08 ***
## incidence_rate        0.219657   0.007547  29.104  < 2e-16 ***
## poverty_percent       1.036531   0.120008   8.637  < 2e-16 ***
## median_age           -0.004080   0.008394  -0.486 0.626969
## median_age_male      -0.241798   0.212259  -1.139 0.254726
## median_age_female     0.046110   0.209093   0.221 0.825476
## avg_household_size   -0.117704   1.007617  -0.117 0.907015
## pct_unemployed16_over 0.781391   0.153410   5.093 3.73e-07 ***
## pct_white             0.067342   0.058298   1.155 0.248127
## pct_black            -0.016016   0.057020  -0.281 0.778818
## pct_asian            -0.628303   0.178918  -3.512 0.000452 ***
## pct_other_race       -0.940645   0.124524  -7.554 5.56e-14 ***
## pct_married_households -0.220555  0.088361  -2.496 0.012611 *
## pct_upto_hs18_24      0.392918   0.038241  10.275  < 2e-16 ***
## pct_with_coverage    -0.194259   0.101672  -1.911 0.056145 .
## income_cat           -4.104213   1.507502  -2.723 0.006516 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 20.77 on 3031 degrees of freedom
## Multiple R-squared:  0.4427, Adjusted R-squared:  0.4399
## F-statistic: 160.5 on 15 and 3031 DF,  p-value: < 2.2e-16
```

```r
# Using the stepwise
stepwise_model = stepAIC(full_model, direction = "both", trace = FALSE)
summary(stepwise_model)
```

```
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + pct_unemployed16_over + pct_white + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage + income_cat, data = cancer_county)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -129.978  -11.453    0.127   12.095  126.386
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)            70.812109  11.698781   6.053 1.60e-09 ***
## incidence_rate          0.219430   0.007509  29.223  < 2e-16 ***
## poverty_percent         1.038613   0.119140   8.718  < 2e-16 ***
## median_age_male        -0.202308   0.086539  -2.338 0.019465 *
## pct_unemployed16_over   0.774783   0.152081   5.095 3.71e-07 ***
## pct_white               0.080440   0.034847   2.308 0.021043 *
## pct_asian              -0.613378   0.167491  -3.662 0.000254 ***
## pct_other_race         -0.933301   0.119239  -7.827 6.84e-15 ***
## pct_married_households -0.222728   0.086039  -2.589 0.009680 **
## pct_upto_hs18_24        0.394452   0.037753  10.448  < 2e-16 ***
## pct_with_coverage      -0.194337   0.099299  -1.957 0.050430 .
## income_cat             -4.069227   1.500008  -2.713 0.006709 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 20.76 on 3035 degrees of freedom
## Multiple R-squared:  0.4426, Adjusted R-squared:  0.4406
## F-statistic: 219.1 on 11 and 3035 DF,  p-value: < 2.2e-16
```

```r
vif(stepwise_model)
```

```
##         incidence_rate        poverty_percent        median_age_male
##               1.186642               4.122196               1.446080
##   pct_unemployed16_over              pct_white              pct_asian
##               1.948976               2.303407               1.351383
##         pct_other_race pct_married_households       pct_upto_hs18_24
##               1.243892               2.261059               1.614089
##      pct_with_coverage             income_cat
##               2.465515               1.729209
```

```r
# Cp and AIC and Adjusted R2
model_dig = glance(stepwise_model) %>%
  as.data.frame() %>%
  dplyr::select(adj.r.squared, sigma, p.value, AIC, BIC) %>%
  rename(RES = sigma) %>%
  mutate(cp = ols_mallows_cp(stepwise_model, full_model))

model_dig
```

```
##   adj.r.squared        RES p.value      AIC       BIC       cp
## 1     0.4405848 20.75648        0 27143.23 27221.51 8.35992
```

Cross validation and Criterion method summery

```r
cross_df = crossv_mc(cancer_county, n = 100, test = 0.2)

cross_result =
  cross_df %>%
  mutate(
    step_mod = map(train, ~lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_white + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage + income_cat, data = .x)),
    rmse_train = map2_dbl(step_mod, train, ~rmse(model = .x, data = .y)),
    rmse_test = map2_dbl(step_mod, test, ~rmse(model = .x, data = .y))
    )


mse_results = cross_result %>%
  dplyr::select(rmse_train, rmse_test) %>%
  summarize(mse_train = (mean(rmse_train))^2,
            mse_test = (mean(rmse_test))^2) #mse results

#LOOCV
glm.fit = glm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_white + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage + income_cat, data = cancer_county)

cv.err = cv.glm(cancer_county, glm.fit)

# The two delta values should be similar: we use the first one
# The second value is bias corrected
cv.err$delta   #434.8355
```

```
## [1] 434.8355 434.8346
```

```r
anova(stepwise_model)[12, 3] #MSE: 431
```

```
## [1] 430.8316
```

```r
tibble(
  mse_model = anova(stepwise_model)[12, 3],
  mse_LOOCV = cv.err$delta[1],
  mse_CV_train = mse_results$mse_train,
  mse_CV_test = mse_results$mse_test
)
```

```
## # A tibble: 1 x 4
##   mse_model mse_LOOCV mse_CV_train mse_CV_test
##       <dbl>     <dbl>        <dbl>       <dbl>
## 1      431.      435.         428.        437.
```

Bootstrap

```
cancer_county %>%
  modelr::bootstrap(n = 1000) %>%
  mutate(models = map(strap, ~lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_white + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage + income_cat, data = .x)),
        results = map(models, broom::tidy)) %>%
  dplyr::select(-strap, -models) %>%
  unnest() %>%
  group_by(term) %>%
  summarize(boot_se = sd(estimate))
```

```
## # A tibble: 12 x 2
##    term                   boot_se
##    <chr>                    <dbl>
##  1 (Intercept)            14.8
##  2 incidence_rate          0.0129
##  3 income_cat              1.65
##  4 median_age_male         0.0970
##  5 pct_asian               0.270
##  6 pct_married_households  0.102
##  7 pct_other_race          0.154
##  8 pct_unemployed16_over   0.192
##  9 pct_upto_hs18_24        0.0428
## 10 pct_white               0.0406
## 11 pct_with_coverage       0.126
## 12 poverty_percent         0.142
```

Outliers

```
par(mfrow = c(2,2))
plot(stepwise_model) # we observe the 282, 1059 are outliers
```
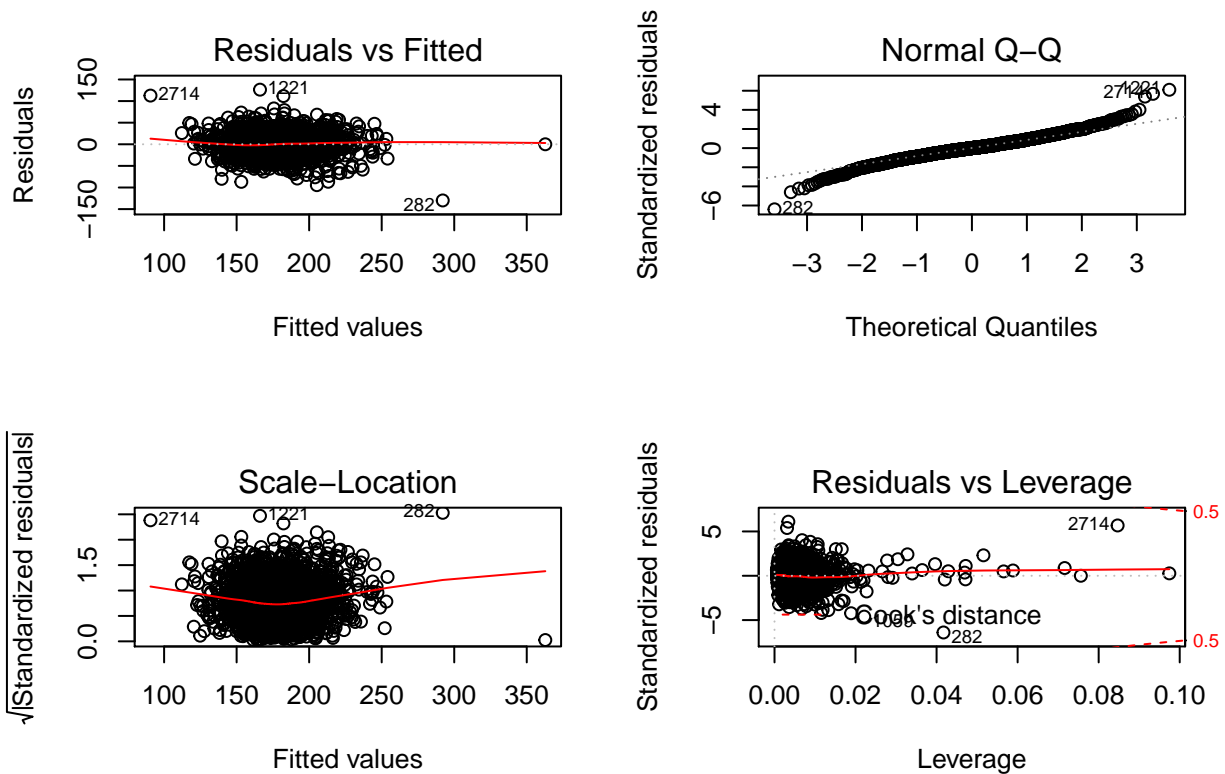
```r
# Using the studentized residuals
stu_res_step <- rstandard(stepwise_model)
outliers_y_step = stu_res_step[abs(stu_res_step) > 2.5]
outliers_y_step
```

```
##      116       119       120       122       124       166       189
## 3.832977 -2.987984 -2.938723  3.451322 -3.218087  3.004467 -2.722478
##      209       250       254       256       264       282       522
## 2.634644  2.588483  3.557345 -2.852694 -3.008080 -6.396845  2.942781
##      524       621       627       666       775       783       803
## 2.568705 -2.758364  3.045997  2.920921  3.334436 -2.537021 -2.663472
##      812       845       912       921       979      1048      1058
## -3.536931 -3.028088 -3.843379 -3.048353  2.507593 -2.742014 -2.740598
##     1059      1066      1076      1094      1217      1221      1261
## -4.608218 -2.851923  2.589435 -3.878191  2.599136  6.099415  3.086750
##     1310      1331      1345      1366      1429      1497      1797
## 2.535483 -2.754403 -2.677687  5.386441 -3.247185  4.014689 -2.821788
##     1868      1942      1958      1965      2016      2036      2066
## -2.751254 -4.227918  3.000271 -2.799419  2.516370  2.505926 -3.205862
##     2174      2176      2318      2323      2444      2549      2563
## 2.961474  2.732626 -3.324763 -2.721648 -3.437022  2.598223  2.685328
##     2590      2600      2626      2637      2642      2646      2659
## 2.708745  3.313439 -3.205136  3.444507 -2.786091 -4.202767 -3.695226
##     2669      2674      2696      2714      2726      2727      2809
## -2.505761 -3.095519 -2.594155  5.675093  2.838797  3.252953 -2.983391
```

```r
# various measure of influence
influence.measures(stepwise_model) %>%
  summary() #we observe the 282, 1059 are potential outliers
```

```
## Potentially influential observations of
##   lm(formula = target_death_rate ~ incidence_rate + poverty_percent +     median_age_male + pct_uner
##
##        dfb.1_ dfb.incd_ dfb.pvr_ dfb.md__ dfb.p_16 dfb.pct_w dfb.pct_s
## 21     0.03    0.04     -0.07    0.04     0.01    -0.05     -0.05
## 116    0.19    0.04     -0.23    0.02     0.13     0.13     -0.04
## 119   -0.04   -0.01      0.12    0.09    -0.12    -0.04      0.01
## 120    0.00   -0.01      0.05    0.06    -0.10    -0.03      0.01
## 122    0.05   -0.01     -0.09    0.15     0.14     0.03      0.05
## 124    0.00   -0.01      0.01    0.02    -0.02    -0.03      0.00
## 140    0.00    0.00      0.00    0.00     0.00     0.00     -0.01
## 147    0.01    0.00      0.00    0.00     0.00     0.01      0.02
## 150    0.00    0.01      0.00    0.01     0.00     0.00      0.07
## 156    0.00    0.00      0.00    0.00     0.00     0.00      0.02
## 161    0.01    0.00      0.00    0.02    -0.01     0.00      0.00
## 165    0.00    0.00      0.00    0.00     0.00     0.00      0.00
## 166   -0.05    0.05     -0.01    0.14    -0.09     0.02     -0.03
## 176   -0.11    0.07      0.01    0.03     0.01     0.12      0.04
## 177    0.00    0.00      0.00    0.03    -0.01     0.00     -0.02
## 180    0.00    0.00      0.00    0.00     0.00     0.00      0.00
## 181    0.00   -0.02      0.02   -0.01     0.01     0.01     -0.03
## 184    0.00    0.00      0.00    0.06    -0.03     0.01     -0.04
## 188    0.00    0.01      0.01   -0.03    -0.01     0.00      0.01
## 189    0.11   -0.11     -0.13   -0.06     0.01    -0.03     -0.03
## 191    0.01    0.00     -0.01    0.00     0.00     0.00      0.00
## 194    0.02   -0.01      0.00   -0.01     0.00     0.00      0.01
## 209    0.02   -0.11      0.02    0.00     0.05     0.06      0.01
## 210   -0.01   -0.01      0.00    0.00     0.00    -0.01      0.06
## 217    0.00    0.01     -0.02    0.01     0.01    -0.01     -0.01
## 237    0.02   -0.06      0.01    0.02     0.01     0.03      0.00
## 245   -0.01    0.00      0.01    0.00    -0.01    -0.01      0.00
## 250   -0.01   -0.09      0.05   -0.02     0.05     0.05      0.00
## 253    0.01   -0.01     -0.01    0.00     0.00     0.00      0.00
## 254    0.12   -0.26     -0.10   -0.06     0.08     0.14      0.01
## 256    0.03   -0.24     -0.11    0.04     0.17    -0.05     -0.11
## 264   -0.02   -0.13     -0.12    0.10     0.10    -0.12     -0.07
## 270    0.01    0.00     -0.01    0.00     0.00     0.02      0.01
## 271   -0.02   -0.06      0.04   -0.01     0.01     0.05      0.02
## 274    0.00    0.00      0.00    0.01     0.00    -0.01      0.00
## 282    0.13   -1.22_*   -0.06    0.14     0.16    -0.11     -0.15
## 284    0.01    0.00      0.00    0.01    -0.01     0.00      0.01
## 292    0.00    0.00      0.00    0.00     0.00     0.00      0.00
## 294    0.00    0.00      0.00    0.00     0.00     0.00      0.00
## 296   -0.01    0.01     -0.01   -0.01     0.02     0.00     -0.02
## 300    0.00    0.00      0.00    0.00     0.00     0.00     -0.02
## 321    0.00    0.00     -0.01    0.01     0.00    -0.01      0.00
## 394   -0.01    0.00      0.00   -0.01     0.01    -0.02     -0.04
## 469    0.10   -0.02     -0.05    0.00    -0.07     0.02     -0.02
## 479    0.00    0.00      0.00    0.00     0.00     0.00      0.00
## 492    0.04    0.02      0.02    0.00    -0.06    -0.06     -0.02
## 522   -0.01   -0.09      0.08   -0.02    -0.05    -0.10     -0.04
## 524    0.03    0.03     -0.05    0.02    -0.05    -0.08      0.01
## 537    0.03    0.01     -0.01    0.04    -0.01    -0.04     -0.06
## 564    0.01    0.02      0.02   -0.01     0.01     0.05      0.00
```

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```
## 576   -0.03    0.00     0.02     0.01     0.01     0.00    -0.03
## 585   -0.01    0.00     0.01     0.02     0.00     0.00     0.12
## 591    0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 594    0.02    0.00    -0.02     0.00    -0.01    -0.01    -0.02
## 597    0.03    0.02    -0.01     0.01    -0.10    -0.03     0.02
## 621    0.04   -0.09     0.01    -0.05     0.04     0.05     0.00
## 627    0.07   -0.06    -0.02     0.14    -0.06    -0.01    -0.01
## 650   -0.08    0.02     0.04    -0.05     0.02    -0.01     0.03
## 660    0.06    0.01    -0.06    -0.07     0.07     0.01    -0.04
## 666    0.02    0.02     0.01     0.08    -0.09    -0.03    -0.01
## 670    0.02   -0.07    -0.01     0.04    -0.02     0.00    -0.02
## 727   -0.11   -0.03     0.14     0.00    -0.06     0.00     0.03
## 749   -0.07    0.02     0.06     0.02     0.04     0.03     0.01
## 775   -0.01   -0.04     0.08    -0.02    -0.12    -0.06     0.01
## 780   -0.07    0.02     0.06     0.03    -0.08    -0.08    -0.02
## 783   -0.04    0.03    -0.02     0.04     0.08    -0.03    -0.02
## 796   -0.05    0.00     0.04     0.06    -0.07    -0.09    -0.01
## 803    0.09   -0.06    -0.03     0.02     0.00     0.03     0.00
## 809    0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 812   -0.09   -0.05     0.03     0.05     0.03    -0.01     0.00
## 840    0.01   -0.01    -0.01     0.01     0.02     0.01     0.00
## 845   -0.19    0.04     0.11    -0.03    -0.02     0.03     0.02
## 853   -0.03   -0.01     0.03     0.01     0.00    -0.01     0.00
## 884    0.00    0.00     0.00     0.00     0.00     0.01    -0.03
## 886    0.00    0.01     0.01    -0.01     0.00     0.01    -0.04
## 900   -0.04    0.03    -0.09     0.06     0.06    -0.06    -0.03
## 905   -0.02    0.03    -0.06     0.06     0.02    -0.08    -0.04
## 912   -0.13    0.09    -0.02     0.22    -0.03    -0.20    -0.06
## 913   -0.10    0.08     0.02     0.09    -0.03    -0.14     0.00
## 921   -0.07    0.03     0.07     0.05    -0.06    -0.03     0.00
## 922   -0.01    0.00     0.00     0.00     0.00     0.00     0.00
## 925   -0.07    0.03     0.09     0.05    -0.01    -0.05    -0.01
## 927    0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 937   -0.05    0.00     0.06     0.08    -0.01     0.00     0.01
## 961    0.01   -0.01    -0.01     0.00     0.00     0.00     0.01
## 979    0.00   -0.09     0.01     0.00     0.01     0.04     0.00
## 982    0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 1000   0.00    0.00     0.00     0.00     0.00     0.00     0.01
## 1005  -0.01    0.00     0.01     0.00     0.01     0.00     0.00
## 1007  -0.11    0.07     0.12    -0.01    -0.11    -0.04     0.03
## 1013   0.00    0.00     0.00     0.00     0.00     0.00     0.02
## 1016   0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 1017   0.00    0.00     0.00     0.00     0.00     0.00     0.01
## 1019  -0.01    0.00     0.00     0.00     0.01     0.00     0.01
## 1022   0.00    0.00     0.01     0.02    -0.01     0.02     0.14
## 1023  -0.01    0.00     0.01     0.00     0.01     0.00     0.02
## 1025  -0.01    0.00     0.00     0.01     0.00     0.00     0.04
## 1027  -0.02    0.00     0.01     0.02     0.00     0.00     0.11
## 1033  -0.01    0.01     0.00     0.01     0.02     0.00     0.06
## 1036   0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 1043  -0.01    0.00     0.01     0.00     0.00     0.00     0.02
## 1048  -0.02    0.01     0.03    -0.10    -0.02     0.01     0.00
## 1050   0.01    0.01    -0.02     0.00     0.00     0.00     0.00
## 1058  -0.05    0.12     0.01    -0.07    -0.07    -0.10    -0.04
```

```
## 1059  0.33   0.18    -0.24   -0.02   -0.46   -0.20   -0.03
## 1063  0.00  -0.01     0.00    0.00    0.00    0.00    0.00
## 1066 -0.12   0.07     0.12    0.06    0.00   -0.02    0.04
## 1074 -0.04  -0.01     0.08   -0.09   -0.08   -0.05    0.00
## 1076  0.07  -0.05     0.01    0.03   -0.07   -0.03   -0.03
## 1094 -0.26   0.22     0.28    0.02   -0.11   -0.15    0.03
## 1105  0.00   0.00     0.00    0.00    0.00    0.00    0.00
## 1139  0.01   0.00     0.00   -0.01    0.00   -0.03    0.00
## 1174  0.07  -0.01    -0.09   -0.10   -0.01    0.02   -0.03
## 1202  0.00  -0.01    -0.01    0.00    0.00    0.02    0.01
## 1203  0.01  -0.03     0.01    0.01   -0.10    0.03    0.03
## 1204 -0.06   0.01     0.16    0.10   -0.09   -0.11    0.01
## 1217  0.00   0.06     0.02   -0.02   -0.03   -0.05   -0.03
## 1221  0.03   0.01    -0.01    0.01   -0.11   -0.30   -0.09
## 1236  0.04  -0.03    -0.03    0.02    0.13   -0.05   -0.04
## 1261  0.07  -0.08    -0.05    0.02   -0.03    0.05    0.01
## 1297 -0.04   0.05    -0.03   -0.02    0.02   -0.02   -0.06
## 1299 -0.03   0.02     0.03    0.07   -0.02   -0.05   -0.03
## 1310 -0.06   0.04     0.05   -0.05   -0.07   -0.06   -0.06
## 1311 -0.02  -0.01     0.03    0.01    0.00   -0.01    0.01
## 1331  0.03  -0.01    -0.05   -0.03    0.09    0.03    0.02
## 1345 -0.01   0.01     0.02   -0.07    0.01   -0.01    0.02
## 1350  0.00   0.01    -0.01    0.00    0.01    0.00   -0.01
## 1366  0.07   0.03     0.04    0.13   -0.14    0.07    0.02
## 1390 -0.04   0.06     0.09    0.03   -0.04    0.03    0.03
## 1422  0.00   0.00     0.00    0.00    0.00    0.00    0.00
## 1429 -0.02  -0.01     0.04   -0.10   -0.10    0.19    0.08
## 1490  0.00   0.00     0.00    0.00    0.00    0.00    0.00
## 1497 -0.07   0.08     0.09    0.08   -0.18   -0.01   -0.02
## 1542  0.01  -0.02     0.03    0.00   -0.01   -0.04   -0.01
## 1554  0.00   0.01     0.00    0.00   -0.02    0.00   -0.01
## 1568  0.06   0.00    -0.01   -0.04   -0.09   -0.03   -0.01
## 1601  0.00   0.00    -0.01    0.01    0.00   -0.01    0.00
## 1633 -0.06   0.01     0.03    0.04    0.01   -0.01   -0.01
## 1687 -0.04  -0.02     0.00    0.03   -0.03   -0.04   -0.05
## 1695  0.03   0.02    -0.03   -0.07    0.00    0.01    0.00
## 1723 -0.02   0.00     0.02   -0.01   -0.02   -0.01    0.00
## 1771  0.01   0.02    -0.01   -0.01   -0.02    0.02    0.01
## 1797 -0.07   0.02    -0.07    0.09    0.04   -0.12   -0.05
## 1813  0.03   0.01    -0.04    0.00    0.02    0.00   -0.01
## 1817 -0.02   0.01    -0.03    0.01    0.00   -0.03   -0.07
## 1818 -0.12   0.04     0.05    0.08   -0.08   -0.10   -0.11
## 1824  0.00   0.00     0.00    0.00    0.00    0.00    0.00
## 1828  0.00   0.00     0.00    0.00    0.00    0.00    0.00
## 1840  0.00   0.00     0.00    0.00    0.00    0.00   -0.01
## 1843  0.00   0.00     0.00    0.01    0.01    0.00    0.00
## 1844  0.02   0.00    -0.01   -0.02   -0.01    0.00    0.00
## 1846 -0.01  -0.04     0.06    0.01   -0.05   -0.01    0.01
## 1848  0.05  -0.01    -0.01   -0.04   -0.01    0.02    0.02
## 1849 -0.03   0.02     0.00    0.05   -0.03   -0.03   -0.07
## 1858 -0.01  -0.02     0.00    0.04    0.06    0.00    0.00
## 1868 -0.10   0.03    -0.05    0.09    0.03   -0.10   -0.05
## 1888 -0.03   0.01     0.03    0.00   -0.02   -0.01   -0.02
## 1898  0.00   0.02    -0.03    0.00    0.01   -0.02    0.01
```

```
## 1916 -0.09    0.01     0.04     0.07    -0.04    -0.07    -0.01
## 1918  0.01   -0.01    -0.01     0.00     0.00     0.00     0.00
## 1933  0.01    0.00     0.00     0.03     0.00     0.00     0.00
## 1942 -0.37    0.25     0.23     0.10    -0.03    -0.22    -0.17
## 1945  0.01    0.01    -0.01     0.01    -0.02    -0.01    -0.02
## 1946  0.01   -0.01     0.00     0.01     0.01     0.00     0.00
## 1958  0.06    0.08    -0.04     0.06    -0.05    -0.03    -0.09
## 1965 -0.15    0.01    -0.01     0.11    -0.03    -0.15    -0.05
## 1968  0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 1979 -0.01   -0.01    -0.01     0.04    -0.04    -0.07    -0.11
## 2016  0.03    0.03     0.02    -0.02    -0.02     0.04     0.02
## 2022  0.04   -0.11     0.00    -0.01     0.01     0.00     0.00
## 2036  0.01   -0.06    -0.01     0.03     0.02    -0.02    -0.02
## 2066 -0.15   -0.02     0.04     0.05    -0.12     0.13     0.04
## 2087  0.00    0.00     0.00    -0.01     0.00     0.00    -0.04
## 2157  0.03   -0.11    -0.02    -0.01     0.03    -0.07    -0.06
## 2174 -0.02   -0.04     0.03     0.00     0.00    -0.01    -0.03
## 2176 -0.09    0.06     0.14     0.00    -0.05     0.08     0.06
## 2204 -0.05   -0.01     0.03     0.03     0.00    -0.01     0.00
## 2292  0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 2305 -0.01    0.02     0.00     0.00     0.01     0.02     0.01
## 2313  0.01    0.00    -0.01    -0.01     0.00     0.01    -0.02
## 2314 -0.01    0.00     0.01     0.01    -0.01     0.00     0.08
## 2315 -0.04   -0.01     0.05     0.04    -0.03    -0.02     0.22
## 2316  0.02    0.00    -0.02    -0.01     0.01     0.01    -0.08
## 2318 -0.04    0.00     0.09    -0.08    -0.09    -0.06    -0.04
## 2323 -0.05    0.04     0.06    -0.02     0.03    -0.02     0.01
## 2328 -0.03    0.07     0.01     0.01    -0.01    -0.01     0.00
## 2347  0.12    0.05    -0.17     0.07    -0.03     0.01     0.00
## 2353  0.03    0.05     0.01     0.07    -0.05    -0.03     0.04
## 2355 -0.05    0.05     0.08     0.08    -0.05    -0.05     0.02
## 2395  0.04    0.09    -0.04    -0.02     0.01     0.09     0.02
## 2426  0.00   -0.05    -0.01     0.03     0.02     0.04     0.00
## 2444  0.00    0.09    -0.12     0.01     0.13     0.14    -0.03
## 2452  0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 2510  0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 2546 -0.01    0.04    -0.06     0.00     0.01     0.09     0.03
## 2549  0.04   -0.03    -0.02    -0.02     0.09    -0.10    -0.07
## 2563 -0.05    0.09     0.07    -0.02    -0.05     0.05     0.04
## 2573 -0.06    0.01     0.07     0.00     0.01     0.02     0.02
## 2579 -0.08    0.02     0.07    -0.02     0.05     0.05     0.03
## 2590 -0.03    0.11     0.03    -0.01    -0.02     0.04     0.02
## 2594 -0.09    0.02     0.15     0.02    -0.07     0.06     0.06
## 2596 -0.05    0.10     0.02    -0.01     0.05     0.08     0.03
## 2598 -0.04    0.13     0.01    -0.05    -0.05     0.10     0.04
## 2600 -0.18    0.08     0.18     0.09    -0.07     0.02     0.03
## 2626 -0.02    0.07     0.00     0.01    -0.06     0.08     0.02
## 2637  0.01    0.01     0.06     0.03    -0.02    -0.02     0.01
## 2642 -0.03    0.09    -0.01    -0.02     0.03     0.09     0.03
## 2646 -0.09   -0.26     0.03    -0.02     0.04    -0.08     0.00
## 2659  0.04   -0.08    -0.15    -0.09     0.16     0.18     0.00
## 2669 -0.01   -0.02     0.04    -0.01    -0.08     0.01     0.01
## 2671  0.00   -0.01     0.02    -0.01    -0.01     0.00     0.00
## 2674  0.02   -0.06    -0.13    -0.02     0.21     0.12    -0.01
```

```
## 2682 -0.06    0.02       0.03    -0.06       0.07    -0.02       0.00
## 2684  0.00    0.01      -0.09     0.05       0.07    -0.04      -0.04
## 2689  0.01   -0.02       0.00     0.01       0.01    -0.05      -0.03
## 2696  0.02    0.00       0.00    -0.01      -0.03     0.10       0.03
## 2699  0.02   -0.02      -0.05    -0.01       0.03     0.02       0.00
## 2706  0.02   -0.01       0.01     0.02       0.00    -0.03      -0.01
## 2714  0.22   -0.38       0.02     0.19      -0.31     0.07       1.54_*
## 2716  0.05   -0.08      -0.04    -0.06       0.06    -0.12      -0.04
## 2718  0.10   -0.01      -0.08    -0.03       0.01    -0.12      -0.03
## 2720 -0.15   -0.01       0.11    -0.03       0.06     0.00      -0.04
## 2724  0.09    0.02      -0.05    -0.01      -0.02     0.00       0.24
## 2726  0.09    0.04      -0.07    -0.07       0.04    -0.15      -0.05
## 2727  0.18    0.06      -0.21    -0.02      -0.02    -0.13       0.03
## 2729  0.01   -0.01      -0.01    -0.01       0.01    -0.01      -0.01
## 2733 -0.04   -0.01       0.03     0.00      -0.01     0.02       0.01
## 2747  0.01    0.02      -0.01     0.00      -0.01    -0.01       0.00
## 2783  0.00    0.00       0.00    -0.01       0.00     0.00       0.00
## 2785  0.03    0.05       0.00     0.04      -0.12     0.02       0.01
## 2789  0.04    0.06      -0.01     0.02       0.03     0.00       0.01
## 2790 -0.05   -0.02       0.06     0.02      -0.05     0.02       0.02
## 2809 -0.02   -0.03      -0.07     0.02       0.09     0.08       0.00
## 2811  0.02    0.15      -0.04    -0.07       0.00    -0.01      -0.01
## 2826  0.00    0.00       0.00    -0.01       0.01     0.00       0.00
## 2842 -0.01    0.07      -0.02    -0.01       0.02     0.01      -0.01
## 2858 -0.02    0.07       0.03     0.02      -0.04     0.00      -0.01
## 2922 -0.03    0.03       0.00     0.02       0.03     0.02      -0.01
## 3040  0.03    0.03      -0.01     0.05      -0.06    -0.02      -0.02
##       dfb.pct_t_ dfb.pct_m_ dfb.p__1 dfb.pct_w_ dfb.incm_ dffit   cov.r
## 21     0.01       0.01       0.02    -0.05      -0.03     -0.13    1.01
## 116    0.12      -0.23       0.02    -0.18      -0.01      0.36_*  0.96_*
## 119    0.01       0.02      -0.10     0.03       0.02     -0.21_*  0.97_*
## 120    0.03      -0.05      -0.04     0.03      -0.01     -0.16    0.97_*
## 122    0.06      -0.16      -0.04    -0.06       0.05      0.31_*  0.97_*
## 124   -0.01       0.01      -0.05     0.02      -0.04     -0.11    0.96_*
## 140    0.00       0.00       0.00     0.00       0.00     -0.01    1.02_*
## 147    0.01      -0.01       0.00    -0.01       0.00      0.03    1.02_*
## 150   -0.01       0.01       0.00    -0.01       0.00      0.08    1.03_*
## 156    0.00       0.01       0.00     0.00       0.00      0.03    1.02_*
## 161    0.00       0.01      -0.02    -0.01      -0.01      0.04    1.02_*
## 165    0.00       0.00       0.00     0.00       0.00      0.00    1.01_*
## 166    0.27      -0.11       0.05     0.07      -0.16      0.37_*  0.98_*
## 176    0.05      -0.04       0.04     0.06       0.04     -0.24_*  0.99
## 177    0.07       0.00      -0.03     0.00      -0.02      0.08    1.05_*
## 180   -0.02       0.00       0.00     0.00       0.01     -0.02    1.02_*
## 181    0.08       0.00      -0.04     0.01       0.01      0.10    1.01_*
## 184    0.22      -0.06      -0.03     0.02      -0.06      0.25_*  1.05_*
## 188   -0.05       0.02       0.00     0.00      -0.01     -0.07    1.02_*
## 189   -0.04      -0.05       0.00     0.00      -0.10     -0.20_*  0.98_*
## 191   -0.02       0.00       0.00    -0.01       0.00     -0.02    1.01_*
## 194   -0.08       0.02       0.00    -0.03       0.02     -0.09    1.05_*
## 209   -0.02       0.03      -0.07     0.01      -0.10      0.21_*  0.98_*
## 210   -0.01       0.03       0.01     0.01      -0.01      0.08    1.02_*
## 217    0.00       0.00       0.01    -0.01      -0.01     -0.03    1.01_*
## 237   -0.02      -0.01      -0.02    -0.02       0.03      0.10    0.98_*
```

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## 245    0.00     0.00     0.01     0.02     0.01     0.03      1.02_*
## 250   -0.03    -0.01    -0.02     0.03     0.05     0.14      0.98_*
## 253    0.00    -0.01     0.00     0.00     0.00     0.02      1.01_*
## 254   -0.02    -0.18     0.03     0.05    -0.19     0.37_*    0.97_*
## 256    0.00     0.09     0.02     0.02    -0.06    -0.38_*    0.99
## 264    0.01     0.08     0.08     0.04    -0.07    -0.33_*    0.98_*
## 270    0.00    -0.02     0.00     0.00    -0.02     0.03      1.01_*
## 271    0.00     0.03    -0.01     0.01     0.04    -0.11      1.01_*
## 274    0.00     0.01     0.00    -0.01     0.01    -0.02      1.02_*
## 282   -0.10     0.02     0.24     0.22    -0.02    -1.34_*    0.89_*
## 284   -0.04    -0.01    -0.01    -0.01     0.00    -0.05      1.03_*
## 292   -0.01     0.00     0.00     0.00     0.00    -0.01      1.02_*
## 294    0.02     0.00     0.00     0.00     0.00     0.02      1.02_*
## 296    0.08     0.00     0.01     0.01     0.00     0.09      1.01_*
## 300    0.00     0.00     0.00     0.00     0.00    -0.02      1.01_*
## 321    0.00     0.00     0.01    -0.01    -0.01    -0.03      1.01_*
## 394   -0.03     0.05     0.00     0.00     0.00    -0.08      1.02_*
## 469   -0.03    -0.07    -0.02    -0.06    -0.02     0.14      0.99_*
## 479    0.00     0.00     0.00     0.00     0.00     0.00      1.01_*
## 492   -0.03     0.01    -0.03    -0.04     0.03     0.11      1.02_*
## 522   -0.05    -0.03     0.04     0.08     0.10     0.22_*    0.98_*
## 524   -0.03     0.00     0.03    -0.01    -0.13     0.18      0.98_*
## 537    0.09     0.00    -0.06    -0.04     0.03     0.14      0.98_*
## 564   -0.01    -0.03     0.00    -0.03     0.04     0.10      0.98_*
## 576    0.15     0.01     0.00     0.02     0.02     0.16      1.01_*
## 585    0.00     0.01     0.01     0.00     0.00     0.12      1.04_*
## 591    0.00     0.00     0.00     0.00     0.00     0.00      1.02_*
## 594   -0.04    -0.01     0.00    -0.01    -0.01    -0.05      1.02_*
## 597   -0.14    -0.03     0.03    -0.01    -0.03    -0.19_*    1.01
## 621    0.00    -0.08    -0.03     0.02     0.02    -0.17      0.98_*
## 627   -0.02    -0.04    -0.07    -0.08     0.01     0.21_*    0.97_*
## 650    0.00     0.03     0.09     0.07     0.01    -0.14      0.99_*
## 660    0.01    -0.03    -0.07    -0.02    -0.03    -0.16      0.99_*
## 666   -0.01     0.02    -0.07    -0.04     0.00     0.15      0.97_*
## 670   -0.01    -0.03    -0.03     0.02    -0.01     0.12      0.98_*
## 727    0.01     0.03     0.07     0.11     0.00     0.19      1.01
## 749    0.01     0.04     0.00     0.02     0.05     0.11      0.98_*
## 775   -0.03     0.02     0.10     0.02     0.06     0.20_*    0.96_*
## 780    0.03     0.11     0.02     0.04     0.00     0.17      0.99_*
## 783   -0.08     0.00    -0.11     0.06    -0.03    -0.24_*    0.99_*
## 796   -0.05     0.03     0.01     0.05     0.05    -0.16      1.01_*
## 803   -0.01    -0.10    -0.05    -0.05     0.00    -0.16      0.98_*
## 809    0.00     0.00     0.00     0.00     0.00    -0.01      1.01_*
## 812    0.05     0.02     0.00     0.08     0.13    -0.21_*    0.96_*
## 840    0.00     0.00    -0.02    -0.01     0.01    -0.03      1.01_*
## 845    0.07     0.11     0.00     0.15     0.08    -0.28_*    0.98_*
## 853    0.01     0.01     0.00     0.03     0.02    -0.05      1.01_*
## 884    0.01    -0.01     0.00     0.00     0.00    -0.03      1.02_*
## 886    0.00    -0.01     0.00     0.00     0.01    -0.05      1.01_*
## 900    0.02    -0.03     0.03     0.07    -0.06    -0.18      1.01
## 905    0.02    -0.03    -0.01     0.05     0.02    -0.17      1.01
## 912    0.08    -0.05    -0.01     0.14     0.13    -0.42_*    0.96_*
## 913   -0.05     0.07     0.03     0.05     0.09    -0.23_*    0.99
## 921    0.06    -0.01    -0.01     0.08     0.01    -0.15      0.97_*
```

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## 922    0.00     0.01     0.00     0.00     0.00    -0.01    1.01_*
## 925    0.04     0.08    -0.11     0.04     0.01    -0.17    0.99_*
## 927    0.00    -0.01     0.00     0.00     0.00    -0.01    1.01_*
## 937    0.04    -0.05     0.01     0.04     0.04    -0.14    0.99_*
## 961    0.00    -0.01     0.00     0.00     0.00     0.02    1.01_*
## 979   -0.01     0.01    -0.03     0.04    -0.13     0.19    0.98_*
## 982    0.00     0.00     0.00     0.00     0.00    -0.01    1.02_*
## 1000   0.01     0.00     0.00     0.00     0.00     0.02    1.02_*
## 1005   0.02     0.00     0.00     0.00     0.00     0.02    1.02_*
## 1007  -0.05     0.07     0.05     0.08     0.02    -0.20_*   1.00
## 1013   0.01     0.00     0.00     0.00     0.00     0.03    1.02_*
## 1016  -0.01     0.00     0.00     0.00     0.00    -0.01    1.01_*
## 1017   0.00     0.00     0.00     0.00     0.00     0.01    1.01_*
## 1019   0.02     0.01     0.00     0.00     0.00     0.03    1.01_*
## 1022  -0.01    -0.03     0.01    -0.01     0.00     0.15    1.07_*
## 1023   0.01     0.01     0.00     0.00     0.00     0.03    1.02_*
## 1025   0.00     0.00     0.00     0.00     0.00     0.05    1.04_*
## 1027   0.00     0.02     0.01     0.00     0.00     0.12    1.06_*
## 1033   0.01     0.01     0.01     0.01     0.00     0.07    1.01_*
## 1036   0.00     0.00     0.00     0.00     0.00     0.00    1.02_*
## 1043   0.01     0.00     0.00     0.00     0.00     0.03    1.01_*
## 1048  -0.07    -0.02     0.02     0.07    -0.02    -0.17    0.98_*
## 1050   0.00     0.00    -0.01    -0.01    -0.01    -0.02    1.02_*
## 1058  -0.01     0.05     0.04     0.04     0.09    -0.25_*   0.98_*
## 1059  -0.18    -0.15     0.09    -0.28     0.02    -0.70_*   0.94_*
## 1063   0.00     0.00     0.00     0.00     0.00     0.01    1.01_*
## 1066  -0.05     0.06    -0.01     0.05     0.05    -0.18    0.98_*
## 1074  -0.05     0.06     0.04     0.05     0.10    -0.20_*   0.99
## 1076  -0.04     0.02    -0.11    -0.06     0.00     0.16    0.98_*
## 1094   0.03     0.37    -0.02     0.07     0.07    -0.45_*   0.96_*
## 1105   0.00    -0.01     0.00     0.00     0.00     0.01    1.01_*
## 1139  -0.02     0.00     0.02    -0.01     0.02     0.05    1.02_*
## 1174  -0.02    -0.04     0.04    -0.02    -0.05     0.15    0.98_*
## 1202   0.01     0.00     0.00    -0.01     0.00    -0.04    1.01_*
## 1203   0.01     0.02     0.00    -0.02     0.01    -0.18    1.01
## 1204  -0.03     0.05     0.01     0.00     0.14     0.24_*   1.00
## 1217  -0.02     0.02    -0.02     0.00     0.03     0.11    0.98_*
## 1221  -0.04     0.11    -0.11     0.05     0.00     0.36_*   0.87_*
## 1236  -0.03     0.00    -0.07    -0.02    -0.03     0.21_*   1.00
## 1261  -0.03    -0.10     0.03    -0.03     0.00     0.16    0.97_*
## 1297   0.19     0.05     0.03     0.02    -0.02     0.23_*   1.01
## 1299   0.05     0.07    -0.09     0.00     0.00     0.13    1.02_*
## 1310   0.11     0.11    -0.02     0.06    -0.01     0.22_*   0.99_*
## 1311   0.02     0.01    -0.01     0.02     0.01    -0.07    0.99_*
## 1331  -0.01    -0.01     0.02    -0.03    -0.01    -0.13    0.98_*
## 1345  -0.01     0.04     0.04     0.00     0.00    -0.12    0.98_*
## 1350   0.08    -0.01     0.00     0.00     0.00     0.09    1.03_*
## 1366  -0.02    -0.14    -0.02    -0.10     0.07     0.30_*   0.90_*
## 1390   0.00     0.10    -0.09    -0.03    -0.06     0.20_*   0.99
## 1422   0.00    -0.01     0.00     0.00     0.00     0.01    1.01_*
## 1429   0.03     0.00     0.07    -0.03     0.06    -0.33_*   0.97_*
## 1490   0.00     0.00     0.00     0.00     0.00     0.00    1.09_*
## 1497   0.23    -0.02     0.09     0.01     0.04     0.33_*   0.95_*
## 1542  -0.03     0.03    -0.01    -0.02     0.05     0.10    0.98_*
```

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## 1554  0.08      0.00      0.01      0.00      0.00      0.09      1.02_*
## 1568 -0.03     -0.02     -0.03     -0.03     -0.04     -0.13      0.99_*
## 1601  0.00      0.00      0.01     -0.01      0.01     -0.03      1.01_*
## 1633  0.04     -0.02     -0.01      0.07      0.00     -0.10      1.02_*
## 1687  0.16      0.03      0.03      0.05     -0.01      0.20_*     1.00
## 1695 -0.01     -0.03      0.05     -0.01      0.03     -0.11      1.01_*
## 1723  0.00      0.00      0.03      0.02      0.01      0.04      1.01_*
## 1771  0.00      0.00      0.01     -0.02      0.00     -0.05      1.01_*
## 1797 -0.01     -0.05      0.05      0.11      0.08     -0.29_*     0.98_*
## 1813  0.00     -0.02     -0.02     -0.02     -0.02     -0.05      1.02_*
## 1817  0.24     -0.01      0.02      0.03     -0.02      0.27_*     1.04_*
## 1818  0.49      0.09      0.02      0.09     -0.01      0.54_*     1.04_*
## 1824  0.00      0.00      0.00      0.00      0.00      0.00      1.01_*
## 1828  0.00      0.00      0.00      0.00      0.00      0.01      1.01_*
## 1840  0.00      0.00      0.00      0.00      0.00     -0.01      1.02_*
## 1843 -0.02      0.00     -0.01      0.00      0.01     -0.03      1.02_*
## 1844 -0.01      0.00      0.01     -0.02      0.00      0.03      1.02_*
## 1846  0.01      0.02      0.01      0.01      0.03      0.09      1.01_*
## 1848 -0.10     -0.02      0.00     -0.04     -0.01     -0.11      1.02_*
## 1849  0.31     -0.01      0.02      0.01      0.01      0.33_*     1.02_*
## 1858  0.00     -0.03     -0.04      0.02      0.01     -0.12      0.99_*
## 1868  0.00     -0.09      0.09      0.15      0.08     -0.32_*     0.99_*
## 1888  0.09      0.00      0.02      0.03      0.01      0.10      1.02_*
## 1898 -0.06      0.00      0.00      0.01     -0.02     -0.09      1.01_*
## 1916  0.01     -0.02      0.03      0.10      0.07     -0.18      1.01
## 1918  0.00      0.00      0.01     -0.01     -0.01      0.02      1.01_*
## 1933  0.01     -0.02     -0.02     -0.01      0.00     -0.04      1.01_*
## 1942  0.11      0.17     -0.11      0.30      0.23     -0.59_*     0.95_*
## 1945  0.09      0.01      0.00     -0.02     -0.01      0.11      1.05_*
## 1946  0.00      0.00     -0.01     -0.01      0.00      0.02      1.01_*
## 1958  0.32      0.04     -0.10     -0.11     -0.01      0.39_*     0.99_*
## 1965  0.03     -0.06      0.10      0.22      0.07     -0.36_*     0.99
## 1968 -0.01      0.00      0.00      0.00      0.00     -0.01      1.01_*
## 1979  0.40      0.04     -0.01      0.01     -0.01      0.45_*     1.01_*
## 2016 -0.03     -0.02      0.00     -0.05     -0.07      0.15      0.98_*
## 2022 -0.05      0.03     -0.04     -0.02      0.01      0.14      0.99_*
## 2036 -0.03      0.05     -0.04     -0.01      0.00      0.12      0.98_*
## 2066  0.14     -0.13      0.09      0.23     -0.13     -0.41_*     0.98_*
## 2087  0.00      0.00      0.00      0.00      0.00     -0.04      1.03_*
## 2157  0.00      0.00     -0.07      0.03      0.09     -0.20_*     0.99_*
## 2174 -0.02      0.05     -0.06      0.03      0.01      0.12      0.97_*
## 2176  0.01      0.05      0.00      0.04     -0.06      0.23_*     0.98_*
## 2204  0.03     -0.01      0.00      0.06      0.01     -0.08      1.03_*
## 2292  0.00      0.00      0.00      0.00      0.00      0.00      1.01_*
## 2305  0.01      0.00      0.01     -0.01      0.02     -0.04      1.01_*
## 2313  0.00      0.00      0.00      0.00      0.00     -0.03      1.03_*
## 2314 -0.02      0.01      0.01      0.00      0.00      0.09      1.11_*
## 2315 -0.05      0.04      0.04      0.01      0.01      0.24_*     1.08_*
## 2316  0.02     -0.01     -0.02     -0.01      0.00     -0.09      1.05_*
## 2318  0.02      0.06     -0.09      0.10     -0.03     -0.25_*     0.97_*
## 2323 -0.07      0.06     -0.02      0.02      0.02     -0.14      0.98_*
## 2328  0.03      0.00     -0.01      0.02     -0.01     -0.10      0.98_*
## 2347  0.02     -0.19      0.09     -0.08     -0.06     -0.27_*     1.01_*
## 2353 -0.09      0.01     -0.07     -0.07      0.00     -0.16      0.99_*
```

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## 2355 -0.02      0.05     -0.07      0.01      0.02     -0.15      0.99_*
## 2395  0.01      0.02     -0.08     -0.10      0.02     -0.19_*    1.00
## 2426  0.02      0.00     -0.05      0.00      0.06     -0.16      0.99_*
## 2444  0.09     -0.03     -0.06     -0.05      0.05     -0.31_*    0.97_*
## 2452 -0.01      0.01     -0.01      0.00      0.00     -0.02      1.02_*
## 2510  0.00      0.00      0.00      0.00      0.00      0.00      1.01_*
## 2546  0.03      0.01      0.04     -0.04      0.00     -0.19_*    1.00
## 2549 -0.04     -0.02     -0.07      0.03     -0.06      0.25_*    0.99_*
## 2563  0.00      0.08      0.00      0.00     -0.11      0.21_*    0.98_*
## 2573  0.01      0.04      0.01      0.04      0.01      0.09      1.02_*
## 2579  0.01      0.05      0.02      0.05     -0.01      0.14      1.01_*
## 2590 -0.01      0.01      0.03     -0.04      0.04      0.15      0.98_*
## 2594  0.01      0.02      0.03      0.05      0.01      0.19      1.01_*
## 2596  0.01      0.03      0.00     -0.01     -0.09      0.19_*    0.99
## 2598  0.02     -0.06      0.09      0.02     -0.10      0.23_*    0.99
## 2600  0.03      0.05      0.03      0.09      0.09      0.23_*    0.97_*
## 2626  0.06      0.05     -0.10     -0.03      0.04     -0.28_*    0.97_*
## 2637 -0.05      0.14     -0.13     -0.08      0.03      0.20_*    0.96_*
## 2642  0.00     -0.01     -0.04     -0.02      0.08     -0.21_*    0.98_*
## 2646 -0.19     -0.09      0.12      0.25      0.18     -0.46_*    0.95_*
## 2659  0.05     -0.10      0.00      0.04     -0.14     -0.31_*    0.96_*
## 2669 -0.02      0.00      0.00      0.02      0.09     -0.16      0.98_*
## 2671  0.00      0.00     -0.01      0.00      0.01      0.03      1.01_*
## 2674  0.00      0.01     -0.10     -0.02      0.03     -0.33_*    0.98_*
## 2682  0.00      0.10      0.00      0.04      0.01      0.15      1.01_*
## 2684  0.00      0.03      0.04     -0.04      0.04     -0.20_*    1.00
## 2689 -0.01     -0.01     -0.03      0.03     -0.02      0.09      1.01_*
## 2696  0.03      0.03     -0.07     -0.07      0.04     -0.22_*    0.98_*
## 2699  0.00     -0.01      0.01     -0.02     -0.01     -0.07      1.02_*
## 2706 -0.01      0.00     -0.04     -0.01     -0.01      0.07      1.01_*
## 2714 -0.32     -0.18      0.36     -0.23      0.00      1.74_*    0.97_*
## 2716 -0.08      0.03      0.06      0.00      0.05      0.23_*    1.01
## 2718 -0.07      0.01      0.01     -0.08      0.02      0.18      1.01
## 2720  0.05      0.08     -0.03      0.15      0.01     -0.21_*    1.00
## 2724 -0.08      0.03      0.01     -0.13     -0.02      0.29_*    1.02_*
## 2726 -0.10     -0.01      0.07     -0.07      0.08      0.30_*    0.98_*
## 2727 -0.07     -0.13      0.09     -0.12     -0.02      0.34_*    0.97_*
## 2729 -0.01      0.00      0.01     -0.01      0.00      0.03      1.02_*
## 2733  0.02      0.01      0.00      0.05     -0.02     -0.07      1.02_*
## 2747 -0.03     -0.01      0.00     -0.01     -0.01     -0.04      1.01_*
## 2783  0.00      0.00      0.00      0.00      0.00      0.01      1.01_*
## 2785  0.02     -0.03     -0.03     -0.05      0.01     -0.17      1.02_*
## 2789  0.01      0.02     -0.09     -0.08      0.01     -0.13      0.99_*
## 2790  0.02      0.01      0.00      0.04      0.03     -0.09      1.02_*
## 2809  0.07     -0.02     -0.03      0.04     -0.08     -0.19      0.97_*
## 2811  0.02      0.04     -0.04     -0.06     -0.04     -0.19_*    0.99_*
## 2826  0.00      0.00      0.00      0.00      0.00      0.02      1.02_*
## 2842  0.01      0.03     -0.02     -0.03      0.00      0.10      0.99_*
## 2858 -0.01      0.05     -0.03     -0.02      0.01      0.11      0.98_*
## 2922  0.00      0.01     -0.02      0.01      0.01      0.08      0.99_*
## 3040  0.02      0.01     -0.05     -0.05     -0.01      0.11      0.99_*
##      cook.d hat
## 21    0.00   0.01_*
## 116   0.01   0.01
```

```
## 119    0.00    0.00
## 120    0.00    0.00
## 122    0.01    0.01
## 124    0.00    0.00
## 140    0.00    0.01_*
## 147    0.00    0.01_*
## 150    0.00    0.03_*
## 156    0.00    0.01_*
## 161    0.00    0.02_*
## 165    0.00    0.01
## 166    0.01    0.02_*
## 176    0.00    0.01
## 177    0.00    0.05_*
## 180    0.00    0.01_*
## 181    0.00    0.01_*
## 184    0.01    0.05_*
## 188    0.00    0.01_*
## 189    0.00    0.01
## 191    0.00    0.01
## 194    0.00    0.05_*
## 209    0.00    0.01
## 210    0.00    0.02_*
## 217    0.00    0.01
## 237    0.00    0.00
## 245    0.00    0.01_*
## 250    0.00    0.00
## 253    0.00    0.01
## 254    0.01    0.01
## 256    0.01    0.02_*
## 264    0.01    0.01_*
## 270    0.00    0.01
## 271    0.00    0.01_*
## 274    0.00    0.01_*
## 282    0.15    0.04_*
## 284    0.00    0.02_*
## 292    0.00    0.01_*
## 294    0.00    0.01_*
## 296    0.00    0.01_*
## 300    0.00    0.01
## 321    0.00    0.01
## 394    0.00    0.01_*
## 469    0.00    0.00
## 479    0.00    0.01
## 492    0.00    0.02_*
## 522    0.00    0.01
## 524    0.00    0.00
## 537    0.00    0.00
## 564    0.00    0.00
## 576    0.00    0.01_*
## 585    0.00    0.04_*
## 591    0.00    0.01
## 594    0.00    0.02_*
## 597    0.00    0.01_*
## 621    0.00    0.00
```

```
## 627    0.00    0.00
## 650    0.00    0.00
## 660    0.00    0.00
## 666    0.00    0.00
## 670    0.00    0.00
## 727    0.00    0.01_*
## 749    0.00    0.00
## 775    0.00    0.00
## 780    0.00    0.01
## 783    0.00    0.01
## 796    0.00    0.02_*
## 803    0.00    0.00
## 809    0.00    0.01
## 812    0.00    0.00
## 840    0.00    0.01
## 845    0.01    0.01
## 853    0.00    0.01
## 884    0.00    0.01_*
## 886    0.00    0.01
## 900    0.00    0.01_*
## 905    0.00    0.01_*
## 912    0.01    0.01_*
## 913    0.00    0.01
## 921    0.00    0.00
## 922    0.00    0.01
## 925    0.00    0.01
## 927    0.00    0.01
## 937    0.00    0.00
## 961    0.00    0.01
## 979    0.00    0.01
## 982    0.00    0.02_*
## 1000   0.00    0.01_*
## 1005   0.00    0.02_*
## 1007   0.00    0.01
## 1013   0.00    0.02_*
## 1016   0.00    0.01
## 1017   0.00    0.01
## 1019   0.00    0.01
## 1022   0.00    0.06_*
## 1023   0.00    0.01_*
## 1025   0.00    0.03_*
## 1027   0.00    0.06_*
## 1033   0.00    0.01
## 1036   0.00    0.01_*
## 1043   0.00    0.01
## 1048   0.00    0.00
## 1050   0.00    0.01_*
## 1058   0.01    0.01
## 1059   0.04    0.02_*
## 1063   0.00    0.01
## 1066   0.00    0.00
## 1074   0.00    0.01
## 1076   0.00    0.00
## 1094   0.02    0.01_*
```

```
## 1105   0.00    0.01
## 1139   0.00    0.01_*
## 1174   0.00    0.00
## 1202   0.00    0.01
## 1203   0.00    0.01_*
## 1204   0.00    0.01_*
## 1217   0.00    0.00
## 1221   0.01    0.00
## 1236   0.00    0.01
## 1261   0.00    0.00
## 1297   0.00    0.02_*
## 1299   0.00    0.02_*
## 1310   0.00    0.01
## 1311   0.00    0.00
## 1331   0.00    0.00
## 1345   0.00    0.00
## 1350   0.00    0.02_*
## 1366   0.01    0.00
## 1390   0.00    0.01
## 1422   0.00    0.01
## 1429   0.01    0.01
## 1490   0.00    0.08_*
## 1497   0.01    0.01
## 1542   0.00    0.00
## 1554   0.00    0.02_*
## 1568   0.00    0.00
## 1601   0.00    0.01
## 1633   0.00    0.02_*
## 1687   0.00    0.01
## 1695   0.00    0.01_*
## 1723   0.00    0.01
## 1771   0.00    0.01
## 1797   0.01    0.01
## 1813   0.00    0.01_*
## 1817   0.01    0.04_*
## 1818   0.02    0.05_*
## 1824   0.00    0.01
## 1828   0.00    0.01
## 1840   0.00    0.02_*
## 1843   0.00    0.02_*
## 1844   0.00    0.01
## 1846   0.00    0.01
## 1848   0.00    0.02_*
## 1849   0.01    0.03_*
## 1858   0.00    0.00
## 1868   0.01    0.01_*
## 1888   0.00    0.02_*
## 1898   0.00    0.01
## 1916   0.00    0.01_*
## 1918   0.00    0.01
## 1933   0.00    0.01
## 1942   0.03    0.02_*
## 1945   0.00    0.04_*
## 1946   0.00    0.01
```

```
## 1958  0.01    0.02_*
## 1965  0.01    0.02_*
## 1968  0.00    0.01
## 1979  0.02    0.03_*
## 2016  0.00    0.00
## 2022  0.00    0.00
## 2036  0.00    0.00
## 2066  0.01    0.02_*
## 2087  0.00    0.03_*
## 2157  0.00    0.01
## 2174  0.00    0.00
## 2176  0.00    0.01
## 2204  0.00    0.02_*
## 2292  0.00    0.01
## 2305  0.00    0.01
## 2313  0.00    0.03_*
## 2314  0.00    0.10_*
## 2315  0.00    0.07_*
## 2316  0.00    0.04_*
## 2318  0.01    0.01
## 2323  0.00    0.00
## 2328  0.00    0.00
## 2347  0.01    0.02_*
## 2353  0.00    0.00
## 2355  0.00    0.00
## 2395  0.00    0.01_*
## 2426  0.00    0.00
## 2444  0.01    0.01
## 2452  0.00    0.02_*
## 2510  0.00    0.01
## 2546  0.00    0.01
## 2549  0.01    0.01
## 2563  0.00    0.01
## 2573  0.00    0.02_*
## 2579  0.00    0.01_*
## 2590  0.00    0.00
## 2594  0.00    0.02_*
## 2596  0.00    0.01
## 2598  0.00    0.01
## 2600  0.00    0.00
## 2626  0.01    0.01
## 2637  0.00    0.00
## 2642  0.00    0.01
## 2646  0.02    0.01
## 2659  0.01    0.01
## 2669  0.00    0.00
## 2671  0.00    0.01
## 2674  0.01    0.01
## 2682  0.00    0.01_*
## 2684  0.00    0.01
## 2689  0.00    0.01_*
## 2696  0.00    0.01
## 2699  0.00    0.02_*
## 2706  0.00    0.01
```

```
## 2714  0.25    0.08_*
## 2716  0.00    0.02_*
## 2718  0.00    0.01_*
## 2720  0.00    0.01
## 2724  0.01    0.03_*
## 2726  0.01    0.01
## 2727  0.01    0.01
## 2729  0.00    0.02_*
## 2733  0.00    0.02_*
## 2747  0.00    0.01
## 2783  0.00    0.01
## 2785  0.00    0.02_*
## 2789  0.00    0.00
## 2790  0.00    0.02_*
## 2809  0.00    0.00
## 2811  0.00    0.01
## 2826  0.00    0.01_*
## 2842  0.00    0.00
## 2858  0.00    0.00
## 2922  0.00    0.00
## 3040  0.00    0.00
```

Remove outliers:

```r
# filter outlier 282
step_model_no_282 <- cancer_county %>%
  dplyr::select(-median_age, -pct_black, -median_age_female, avg_household_size) %>%
  tibble::rowid_to_column() %>%
  filter(rowid != 282) %>%
  na.omit()

step_no_282 <- update(stepwise_model, . ~ ., data = step_model_no_282)
summary(step_no_282)
```

```
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + pct_unemployed16_over + pct_white + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage + income_cat, data = step_model_no_282)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -93.887 -11.689  -0.051  11.936 126.194
##
## Coefficients:
##                        Estimate Std. Error t value Pr(>|t|)
## (Intercept)           69.286035  11.623979   5.961 2.80e-09 ***
## incidence_rate         0.228536   0.007592  30.102  < 2e-16 ***
## poverty_percent        1.045635   0.118358   8.834  < 2e-16 ***
## median_age_male       -0.214490   0.085989  -2.494  0.01267 *
## pct_unemployed16_over  0.750476   0.151124   4.966 7.21e-07 ***
```

```
## pct_white                  0.084336    0.034622    2.436   0.01491 *
## pct_asian                 -0.587738    0.166433   -3.531   0.00042 ***
## pct_other_race            -0.920930    0.118468   -7.774 1.04e-14 ***
## pct_married_households    -0.224288    0.085471   -2.624   0.00873 **
## pct_upto_hs18_24           0.385467    0.037529   10.271   < 2e-16 ***
## pct_with_coverage         -0.215951    0.098701   -2.188   0.02875 *
## income_cat                -4.039980    1.490114   -2.711   0.00674 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 20.62 on 3034 degrees of freedom
## Multiple R-squared:  0.4501, Adjusted R-squared:  0.4481
## F-statistic: 225.7 on 11 and 3034 DF,  p-value: < 2.2e-16
```

```r
# filter #282, 1059
step_model_no_all <- cancer_county %>%
  dplyr::select(-median_age, -pct_black, -median_age_female, avg_household_size) %>%
  tibble::rowid_to_column() %>%
  filter(rowid != 282 & rowid != 1059) %>%
  na.omit()

step_no_all <- update(stepwise_model, . ~ ., data = step_model_no_all)
summary(step_no_all)
```

```
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + pct_unemployed16_over + pct_white + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage + income_cat, data = step_model_no_all)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -88.069 -11.710  -0.021  11.854 126.460
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)              65.423198  11.615333   5.632 1.94e-08 ***
## incidence_rate            0.227187   0.007572  30.002  < 2e-16 ***
## poverty_percent           1.073476   0.118117   9.088  < 2e-16 ***
## median_age_male          -0.212629   0.085703  -2.481 0.013155 *
## pct_unemployed16_over     0.820282   0.151376   5.419 6.47e-08 ***
## pct_white                 0.091233   0.034539   2.641 0.008297 **
## pct_asian                -0.583348   0.165881  -3.517 0.000443 ***
## pct_other_race           -0.900209   0.118158  -7.619 3.40e-14 ***
## pct_married_households   -0.211546   0.085231  -2.482 0.013117 *
## pct_upto_hs18_24          0.382276   0.037410  10.218  < 2e-16 ***
## pct_with_coverage        -0.188060   0.098557  -1.908 0.056468 .
## income_cat               -4.075167   1.485162  -2.744 0.006107 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 20.55 on 3033 degrees of freedom
## Multiple R-squared:  0.4528, Adjusted R-squared:  0.4508
## F-statistic: 228.2 on 11 and 3033 DF,  p-value: < 2.2e-16
```

```
par(mfrow = c(2,2))
plot(step_no_all)
```
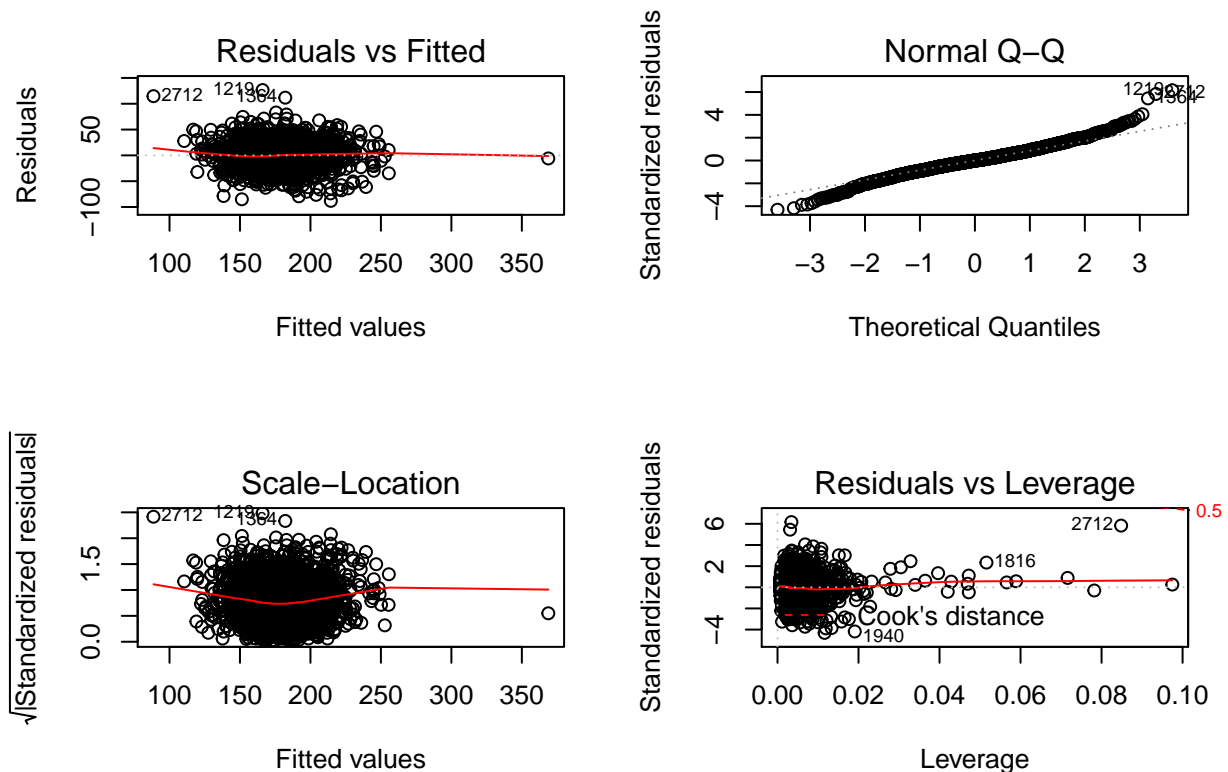

Separate Income Level

```
income_low_data <- cancer_county %>% filter(income_cat == 0) %>% dplyr::select(-income_cat)
income_high_data <- cancer_county %>% filter(income_cat == 1) %>% dplyr::select(-income_cat)

model_low_income <- lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_white + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = income_low_data)

model_high_income <- lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_white + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = income_high_data)

summary_table = cbind(summary(model_low_income)$coefficients[,1],
                      summary(model_low_income)$coefficients[,4],
                      summary(model_high_income)$coefficients[,1],
                      summary(model_high_income)$coefficients[,4])
summary_table

##                            [,1]         [,2]         [,3]          [,4]
## (Intercept)            -9.98041269 7.616353e-01 95.16691074  8.652255e-15
## incidence_rate          0.27773708 2.339449e-33  0.20015626 1.696636e-126
```
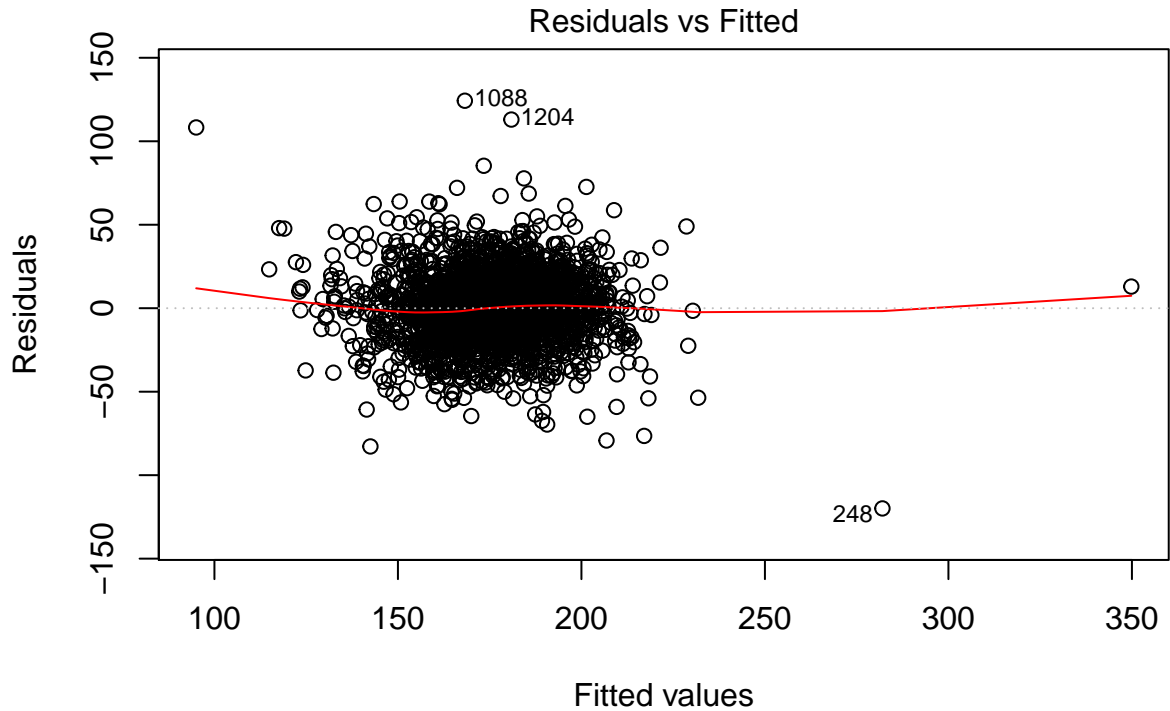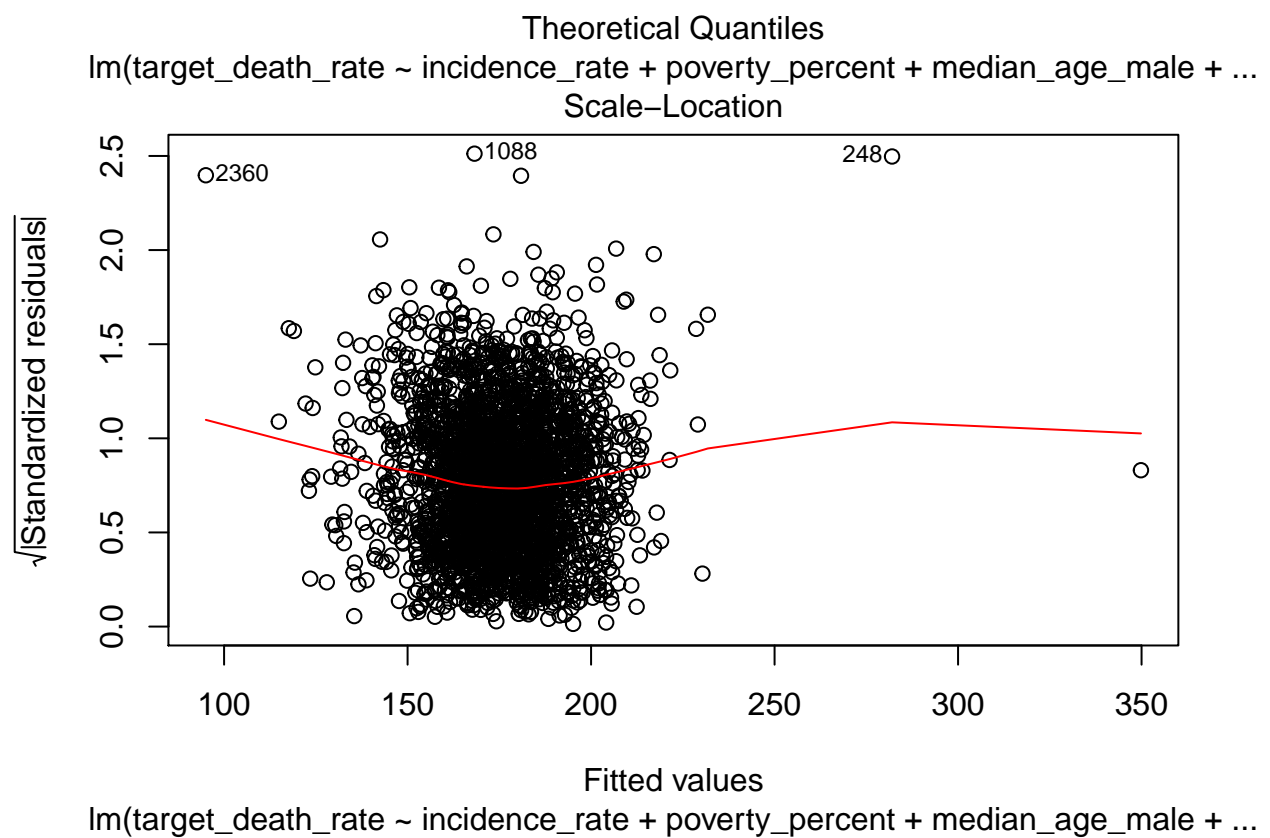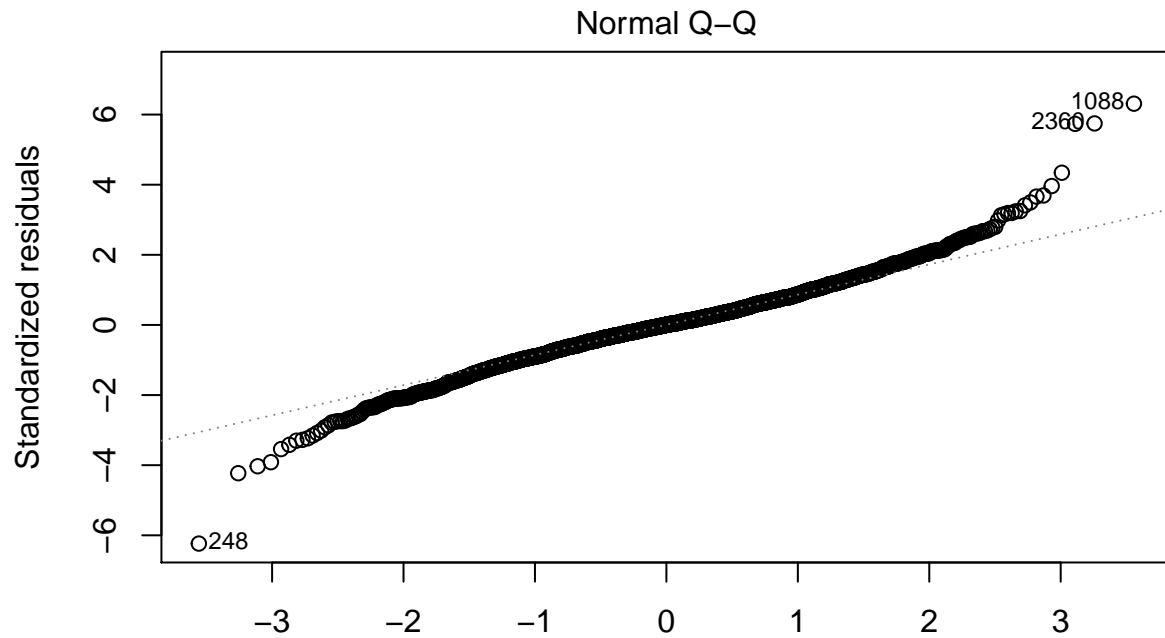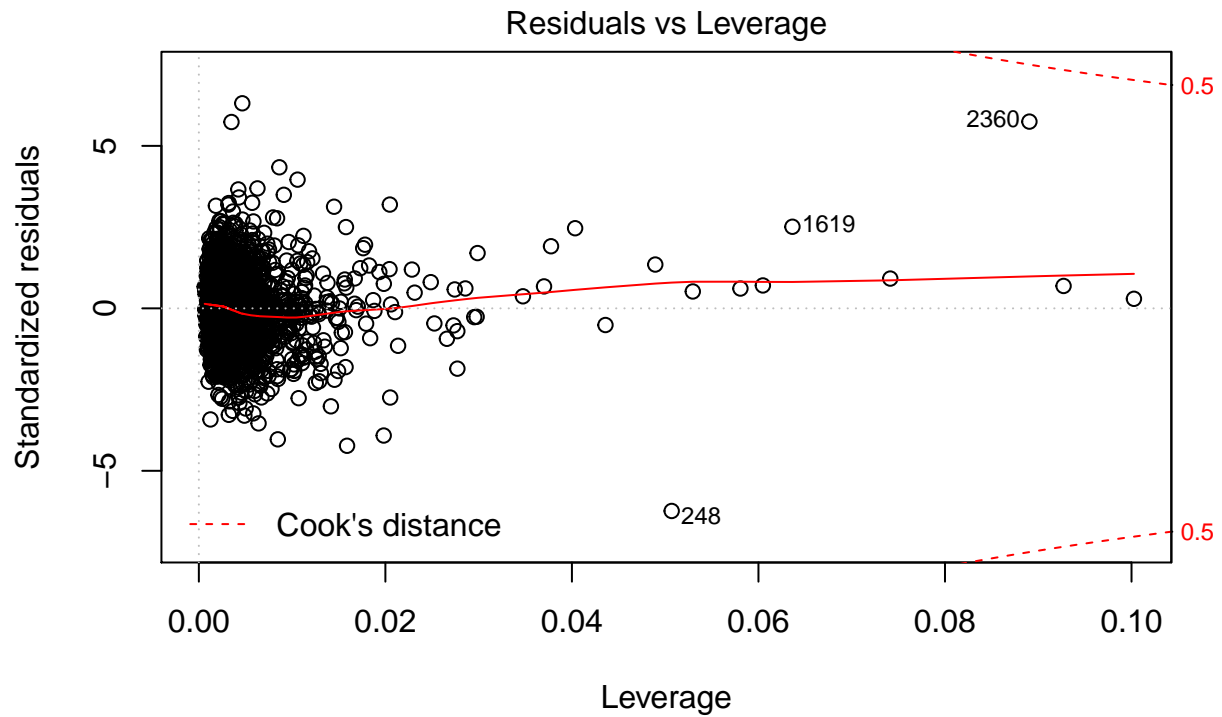
26

```
## poverty_percent          0.63536720 5.154360e-02  0.94031205  3.006044e-13
## median_age_male          -0.22206171 4.872790e-01 -0.27457885  1.840149e-03
## pct_unemployed16_over     0.01592747 9.670511e-01  0.98793425  1.865499e-09
## pct_white                 0.20031237 3.292692e-02 -0.01723638  6.683679e-01
## pct_asian                -5.19387943 1.079811e-02 -0.77626937  3.481646e-06
## pct_other_race           -0.90270280 5.383448e-03 -1.07379851  6.805986e-17
## pct_married_households   -0.45314232 1.701884e-01 -0.25796135  3.124664e-03
## pct_upto_hs18_24          0.28738237 1.442042e-02  0.40498578  7.434234e-25
## pct_with_coverage         0.92366136 2.082438e-03 -0.27491829  9.122972e-03
```
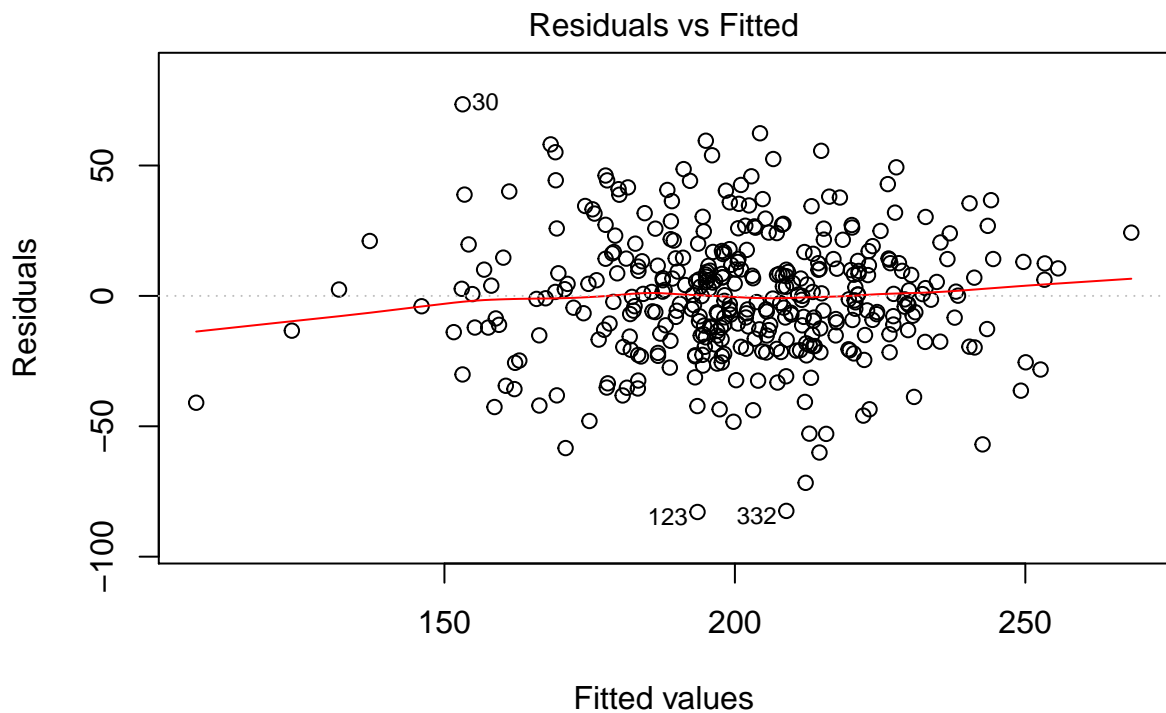
```
plot(model_high_income)
```


Residuals vs Fitted

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Normal Q−Q

Standardized residuals

1088

2360

248

Theoretical Quantiles

lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Scale−Location

√|Standardized residuals|

1088

2360

248

Fitted values

lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Residuals vs Leverage

Leverage
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

```
plot(model_low_income)
```

Residuals vs Fitted

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Normal Q-Q

Standardized residuals

30

123 332

Theoretical Quantiles
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Scale-Location

123 332

30

√|Standardized residuals|

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Residuals vs Leverage

lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

```r
dim(income_high_data)
```

```
## [1] 2669    15
```

```r
dim(income_low_data)
```

```
## [1] 378   15
```

Stepwise by Income Level

```r
# low income
full_model_low <- lm(target_death_rate ~., data = income_low_data)
summary(full_model_low)
```

```
##
## Call:
## lm(formula = target_death_rate ~ ., data = income_low_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -71.007 -13.685   0.306  13.741  70.463
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        -5.621931  35.161833  -0.160 0.873059
## incidence_rate      0.284582   0.020753  13.713  < 2e-16 ***
## poverty_percent     0.699413   0.326259   2.144 0.032718 *
## median_age         -0.001782   0.033246  -0.054 0.957295
## median_age_male    -1.604684   0.606440  -2.646 0.008498 **
## median_age_female   1.688740   0.597041   2.829 0.004936 **
```

```
## avg_household_size       -1.042002    3.058094   -0.341 0.733500
## pct_unemployed16_over    -0.009237    0.387431   -0.024 0.980992
## pct_white                -0.087916    0.135784   -0.647 0.517736
## pct_black                -0.374241    0.121281   -3.086 0.002186 **
## pct_asian                -5.128157    2.034947   -2.520 0.012162 *
## pct_other_race           -1.134103    0.334695   -3.388 0.000780 ***
## pct_married_households   -0.531820    0.332391   -1.600 0.110472
## pct_upto_hs18_24          0.221861    0.117064    1.895 0.058858 .
## pct_with_coverage         1.095918    0.300486    3.647 0.000304 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23.97 on 363 degrees of freedom
## Multiple R-squared:  0.4999, Adjusted R-squared:  0.4806
## F-statistic: 25.92 on 14 and 363 DF,  p-value: < 2.2e-16
```

```r
step(full_model_low, direction = "backward")
```

```
## Start:  AIC=2416.34
## target_death_rate ~ incidence_rate + poverty_percent + median_age +
##     median_age_male + median_age_female + avg_household_size +
##     pct_unemployed16_over + pct_white + pct_black + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage
##
##                          Df Sum of Sq    RSS    AIC
## - pct_unemployed16_over   1         0 208559 2414.3
## - median_age              1         2 208560 2414.3
## - avg_household_size      1        67 208625 2414.5
## - pct_white               1       241 208799 2414.8
## <none>                              208559 2416.3
## - pct_married_households  1      1471 210029 2417.0
## - pct_upto_hs18_24        1      2064 210622 2418.1
## - poverty_percent         1      2640 211199 2419.1
## - pct_asian               1      3649 212207 2420.9
## - median_age_male         1      4023 212581 2421.6
## - median_age_female       1      4597 213155 2422.6
## - pct_black               1      5471 214029 2424.1
## - pct_other_race          1      6597 215155 2426.1
## - pct_with_coverage       1      7642 216201 2427.9
## - incidence_rate          1    108036 316594 2572.1
##
## Step:  AIC=2414.35
## target_death_rate ~ incidence_rate + poverty_percent + median_age +
##     median_age_male + median_age_female + avg_household_size +
##     pct_white + pct_black + pct_asian + pct_other_race + pct_married_households +
##     pct_upto_hs18_24 + pct_with_coverage
##
##                          Df Sum of Sq    RSS    AIC
## - median_age              1         2 208561 2412.3
## - avg_household_size      1        67 208626 2412.5
## - pct_white               1       245 208804 2412.8
## <none>                              208559 2414.3
## - pct_married_households  1      1478 210037 2415.0
## - pct_upto_hs18_24        1      2064 210623 2416.1
```

```
## - poverty_percent             1        2857 211416 2417.5
## - pct_asian                    1        3663 212222 2418.9
## - median_age_male              1        4050 212609 2419.6
## - median_age_female            1        4621 213180 2420.6
## - pct_black                     1        5494 214053 2422.2
## - pct_other_race               1        6872 215431 2424.6
## - pct_with_coverage            1        7671 216230 2426.0
## - incidence_rate               1      108727 317286 2570.9
##
## Step:  AIC=2412.35
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     median_age_female + avg_household_size + pct_white + pct_black +
##     pct_asian + pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage
##
##                           Df Sum of Sq    RSS    AIC
## - avg_household_size       1          68 208628 2410.5
## - pct_white                1         243 208804 2410.8
## <none>                                  208561 2412.3
## - pct_married_households  1        1479 210039 2413.0
## - pct_upto_hs18_24         1        2064 210625 2414.1
## - poverty_percent          1        2875 211436 2415.5
## - pct_asian                1        3663 212223 2416.9
## - median_age_male          1        4058 212618 2417.6
## - median_age_female        1        4621 213182 2418.6
## - pct_black                1        5517 214078 2420.2
## - pct_other_race           1        6873 215434 2422.6
## - pct_with_coverage        1        7806 216367 2424.2
## - incidence_rate           1      109612 318173 2570.0
##
## Step:  AIC=2410.47
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     median_age_female + pct_white + pct_black + pct_asian + pct_other_race +
##     pct_married_households + pct_upto_hs18_24 + pct_with_coverage
##
##                           Df Sum of Sq    RSS    AIC
## - pct_white                1         200 208828 2408.8
## <none>                                  208628 2410.5
## - pct_married_households  1        1566 210195 2411.3
## - pct_upto_hs18_24         1        2130 210759 2412.3
## - poverty_percent          1        2808 211436 2413.5
## - pct_asian                1        3596 212224 2414.9
## - median_age_male          1        4072 212701 2415.8
## - median_age_female        1        4847 213475 2417.2
## - pct_black                1        5507 214136 2418.3
## - pct_other_race           1        6987 215616 2420.9
## - pct_with_coverage        1        7806 216435 2422.4
## - incidence_rate           1      110176 318805 2568.8
##
## Step:  AIC=2408.83
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     median_age_female + pct_black + pct_asian + pct_other_race +
##     pct_married_households + pct_upto_hs18_24 + pct_with_coverage
##
```

```
##                               Df Sum of Sq     RSS    AIC
## <none>                                       208828 2408.8
## - pct_upto_hs18_24            1        2393 211222 2411.1
## - pct_married_households      1        2520 211349 2411.4
## - poverty_percent            1        2690 211518 2411.7
## - pct_asian                  1        3771 212599 2413.6
## - median_age_male            1        4023 212852 2414.1
## - median_age_female          1        4647 213476 2415.2
## - pct_other_race             1        6788 215617 2418.9
## - pct_with_coverage          1        7623 216452 2420.4
## - pct_black                  1        8384 217212 2421.7
## - incidence_rate             1      110965 319793 2567.9
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + median_age_female + pct_black + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage, data = income_low_data)
##
## Coefficients:
##            (Intercept)          incidence_rate         poverty_percent
##                -6.7837                  0.2831                  0.6631
##        median_age_male        median_age_female                pct_black
##                -1.5990                  1.6474                 -0.3151
##              pct_asian          pct_other_race   pct_married_households
##                -5.1184                 -1.1093                 -0.6253
##       pct_upto_hs18_24        pct_with_coverage
##                 0.2354                  1.0621
```

```r
backward_model_low <- lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + median_age_female + pct_black + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = income_low_data)
summary(backward_model_low)
```

```
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + median_age_female + pct_black + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage, data = income_low_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -71.584 -13.813  -0.024  13.851  69.455
##
## Coefficients:
##                        Estimate Std. Error t value Pr(>|t|)
## (Intercept)            -6.78373   32.21806  -0.211 0.833350
## incidence_rate          0.28314    0.02028  13.965  < 2e-16 ***
## poverty_percent         0.66310    0.30497   2.174 0.030321 *
## median_age_male        -1.59902    0.60135  -2.659 0.008180 **
## median_age_female       1.64742    0.57646   2.858 0.004509 **
## pct_black              -0.31512    0.08210  -3.838 0.000146 ***
```

```
## pct_asian                -5.11844     1.98835  -2.574 0.010438 *
## pct_other_race           -1.10933     0.32118  -3.454 0.000617 ***
## pct_married_households   -0.62529     0.29711  -2.105 0.036009 *
## pct_upto_hs18_24          0.23543     0.11479   2.051 0.040992 *
## pct_with_coverage         1.06213     0.29018   3.660 0.000289 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23.85 on 367 degrees of freedom
## Multiple R-squared:  0.4992, Adjusted R-squared:  0.4856
## F-statistic: 36.59 on 10 and 367 DF,  p-value: < 2.2e-16
```

```r
# high income
full_model_high <- lm(target_death_rate ~., data = income_high_data)
summary(full_model_high)
```

```
##
## Call:
## lm(formula = target_death_rate ~ ., data = income_high_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -119.771  -11.264    0.223   11.410  123.636
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             92.662611  13.217700   7.010 3.00e-12 ***
## incidence_rate           0.199461   0.007958  25.063  < 2e-16 ***
## poverty_percent          0.927587   0.129691   7.152 1.10e-12 ***
## median_age              -0.002868   0.008358  -0.343 0.731525
## median_age_male         -0.247908   0.223519  -1.109 0.267482
## median_age_female       -0.038208   0.219559  -0.174 0.861860
## avg_household_size      -0.243315   1.044062  -0.233 0.815743
## pct_unemployed16_over    0.988191   0.165310   5.978 2.57e-09 ***
## pct_white                0.038794   0.066375   0.584 0.558956
## pct_black                0.073062   0.067584   1.081 0.279767
## pct_asian               -0.699572   0.181421  -3.856 0.000118 ***
## pct_other_race          -1.029068   0.134008  -7.679 2.24e-14 ***
## pct_married_households  -0.254272   0.089532  -2.840 0.004546 **
## pct_upto_hs18_24         0.409273   0.039506  10.360  < 2e-16 ***
## pct_with_coverage       -0.294225   0.108429  -2.714 0.006700 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 19.75 on 2654 degrees of freedom
## Multiple R-squared:  0.396,  Adjusted R-squared:  0.3928
## F-statistic: 124.3 on 14 and 2654 DF,  p-value: < 2.2e-16
```

```r
step(full_model_high, direction = "backward")
```

```
## Start:  AIC=15938.37
## target_death_rate ~ incidence_rate + poverty_percent + median_age +
##     median_age_male + median_age_female + avg_household_size +
##     pct_unemployed16_over + pct_white + pct_black + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
```

```
##     pct_with_coverage
##
##                          Df Sum of Sq     RSS   AIC
## - median_age_female       1        12 1034983 15936
## - avg_household_size       1        21 1034992 15936
## - median_age               1        46 1035017 15936
## - pct_white                1       133 1035104 15937
## - pct_black                1       456 1035427 15938
## - median_age_male          1       480 1035451 15938
## <none>                                1034971 15938
## - pct_with_coverage        1      2871 1037843 15944
## - pct_married_households    1      3145 1038116 15944
## - pct_asian                1      5799 1040770 15951
## - pct_unemployed16_over     1     13935 1048906 15972
## - poverty_percent          1     19949 1054920 15987
## - pct_other_race           1     22996 1057967 15995
## - pct_upto_hs18_24          1     41853 1076824 16042
## - incidence_rate           1    244965 1279936 16503
##
## Step:  AIC=15936.4
## target_death_rate ~ incidence_rate + poverty_percent + median_age +
##     median_age_male + avg_household_size + pct_unemployed16_over +
##     pct_white + pct_black + pct_asian + pct_other_race + pct_married_households +
##     pct_upto_hs18_24 + pct_with_coverage
##
##                          Df Sum of Sq     RSS   AIC
## - avg_household_size       1        18 1035001 15934
## - median_age               1        46 1035029 15934
## - pct_white                1       128 1035111 15935
## - pct_black                1       445 1035428 15936
## <none>                                1034983 15936
## - pct_with_coverage        1      2976 1037959 15942
## - pct_married_households    1      3135 1038118 15942
## - median_age_male          1      3633 1038616 15944
## - pct_asian                1      5793 1040776 15949
## - pct_unemployed16_over     1     13989 1048972 15970
## - poverty_percent          1     20051 1055034 15986
## - pct_other_race           1     23007 1057990 15993
## - pct_upto_hs18_24          1     42543 1077526 16042
## - incidence_rate           1    245682 1280665 16503
##
## Step:  AIC=15934.45
## target_death_rate ~ incidence_rate + poverty_percent + median_age +
##     median_age_male + pct_unemployed16_over + pct_white + pct_black +
##     pct_asian + pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage
##
##                          Df Sum of Sq     RSS   AIC
## - median_age               1        47 1035048 15933
## - pct_white                1       138 1035140 15933
## - pct_black                1       458 1035459 15934
## <none>                                1035001 15934
## - pct_with_coverage        1      2959 1037960 15940
## - pct_married_households    1      3409 1038410 15941
```

```
## - median_age_male          1        3805 1038806 15942
## - pct_asian                1        5832 1040834 15947
## - pct_unemployed16_over     1       14062 1049064 15968
## - poverty_percent           1       20167 1055168 15984
## - pct_other_race            1       23093 1058095 15991
## - pct_upto_hs18_24          1       42542 1077544 16040
## - incidence_rate            1      246317 1281319 16502
##
## Step:  AIC=15932.57
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     pct_unemployed16_over + pct_white + pct_black + pct_asian +
##     pct_other_race + pct_married_households + pct_upto_hs18_24 +
##     pct_with_coverage
##
##                            Df Sum of Sq     RSS   AIC
## - pct_white                 1         136 1035185 15931
## - pct_black                 1         452 1035500 15932
## <none>                                    1035048 15933
## - pct_with_coverage         1        2953 1038002 15938
## - pct_married_households    1        3398 1038446 15939
## - median_age_male           1        3944 1038992 15941
## - pct_asian                 1        5827 1040875 15946
## - pct_unemployed16_over     1       14025 1049073 15966
## - poverty_percent           1       20229 1055277 15982
## - pct_other_race            1       23114 1058162 15990
## - pct_upto_hs18_24          1       42533 1077581 16038
## - incidence_rate            1      246274 1281322 16500
##
## Step:  AIC=15930.92
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     pct_unemployed16_over + pct_black + pct_asian + pct_other_race +
##     pct_married_households + pct_upto_hs18_24 + pct_with_coverage
##
##                            Df Sum of Sq     RSS   AIC
## - pct_black                 1         387 1035572 15930
## <none>                                    1035185 15931
## - pct_with_coverage         1        2817 1038002 15936
## - pct_married_households    1        3262 1038447 15937
## - median_age_male           1        3811 1038996 15939
## - pct_asian                 1        9206 1044390 15953
## - pct_unemployed16_over     1       13889 1049073 15964
## - poverty_percent           1       20411 1055596 15981
## - pct_other_race            1       27135 1062320 15998
## - pct_upto_hs18_24          1       42605 1077789 16037
## - incidence_rate            1      247263 1282448 16501
##
## Step:  AIC=15929.92
## target_death_rate ~ incidence_rate + poverty_percent + median_age_male +
##     pct_unemployed16_over + pct_asian + pct_other_race + pct_married_households +
##     pct_upto_hs18_24 + pct_with_coverage
##
##                            Df Sum of Sq     RSS   AIC
## <none>                                    1035572 15930
## - pct_with_coverage         1        2790 1038362 15935
```

```
## - pct_married_households  1      4110 1039682 15938
## - median_age_male         1      4387 1039959 15939
## - pct_asian               1      9084 1044655 15951
## - pct_unemployed16_over    1     15086 1050658 15966
## - poverty_percent         1     21094 1056666 15982
## - pct_other_race          1     27742 1063313 15998
## - pct_upto_hs18_24        1     43134 1078706 16037
## - incidence_rate          1    249078 1284650 16503
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
##     pct_married_households + pct_upto_hs18_24 + pct_with_coverage,
##     data = income_high_data)
##
## Coefficients:
##           (Intercept)           incidence_rate          poverty_percent
##               94.8143                   0.2002                   0.9428
##       median_age_male    pct_unemployed16_over                pct_asian
##               -0.2847                   1.0012                  -0.7501
##        pct_other_race   pct_married_households         pct_upto_hs18_24
##               -1.0655                  -0.2695                   0.4069
##     pct_with_coverage
##               -0.2801
```

```r
backward_model_high <- lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
    pct_married_households + pct_upto_hs18_24 + pct_with_coverage,
    data = income_high_data)
summary(backward_model_high)
```

```
##
## Call:
## lm(formula = target_death_rate ~ incidence_rate + poverty_percent +
##     median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
##     pct_married_households + pct_upto_hs18_24 + pct_with_coverage,
##     data = income_high_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -120.096  -11.354    0.142   11.441  124.769
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)            94.814283  12.167303   7.793 9.34e-15 ***
## incidence_rate          0.200212   0.007917  25.289  < 2e-16 ***
## poverty_percent         0.942798   0.128106   7.360 2.45e-13 ***
## median_age_male        -0.284695   0.084824  -3.356 0.000801 ***
## pct_unemployed16_over   1.001186   0.160862   6.224 5.62e-10 ***
## pct_asian              -0.750069   0.155312  -4.829 1.45e-06 ***
## pct_other_race         -1.065515   0.126248  -8.440  < 2e-16 ***
## pct_married_households -0.269476   0.082954  -3.249 0.001175 **
## pct_upto_hs18_24        0.406944   0.038668  10.524  < 2e-16 ***
## pct_with_coverage      -0.280093   0.104649  -2.676 0.007485 **
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 19.73 on 2659 degrees of freedom
## Multiple R-squared:  0.3956, Adjusted R-squared:  0.3936
## F-statistic: 193.4 on 9 and 2659 DF,  p-value: < 2.2e-16
```

Check Assumption

```
plot(backward_model_low)
```


Residuals vs Fitted

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Normal Q–Q

lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Scale–Location

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Residuals vs Leverage
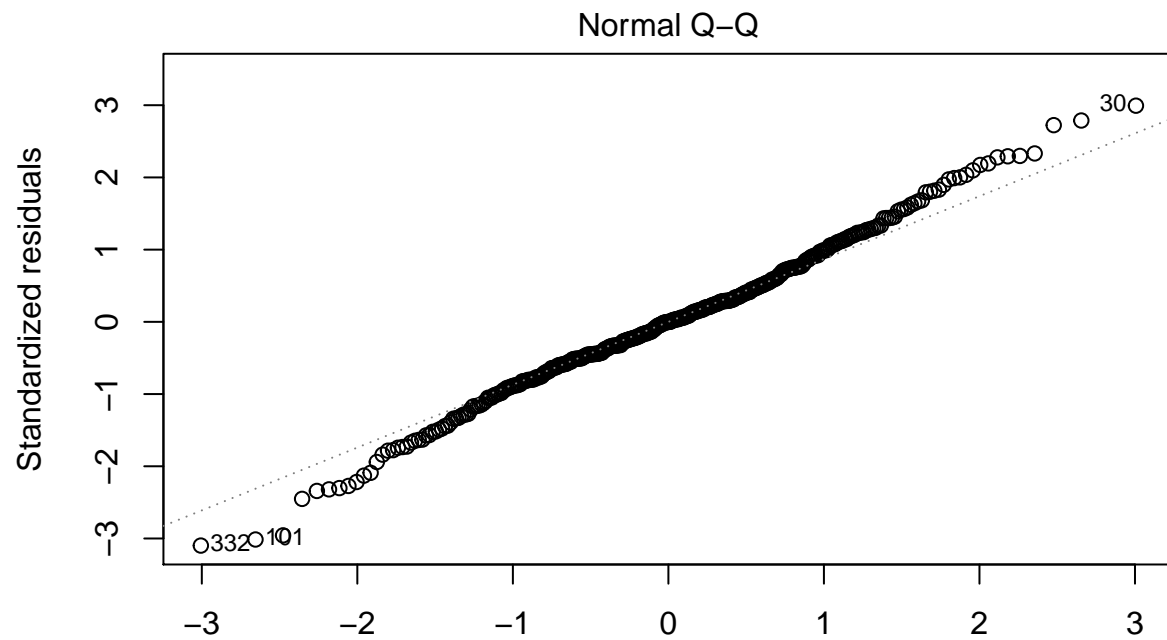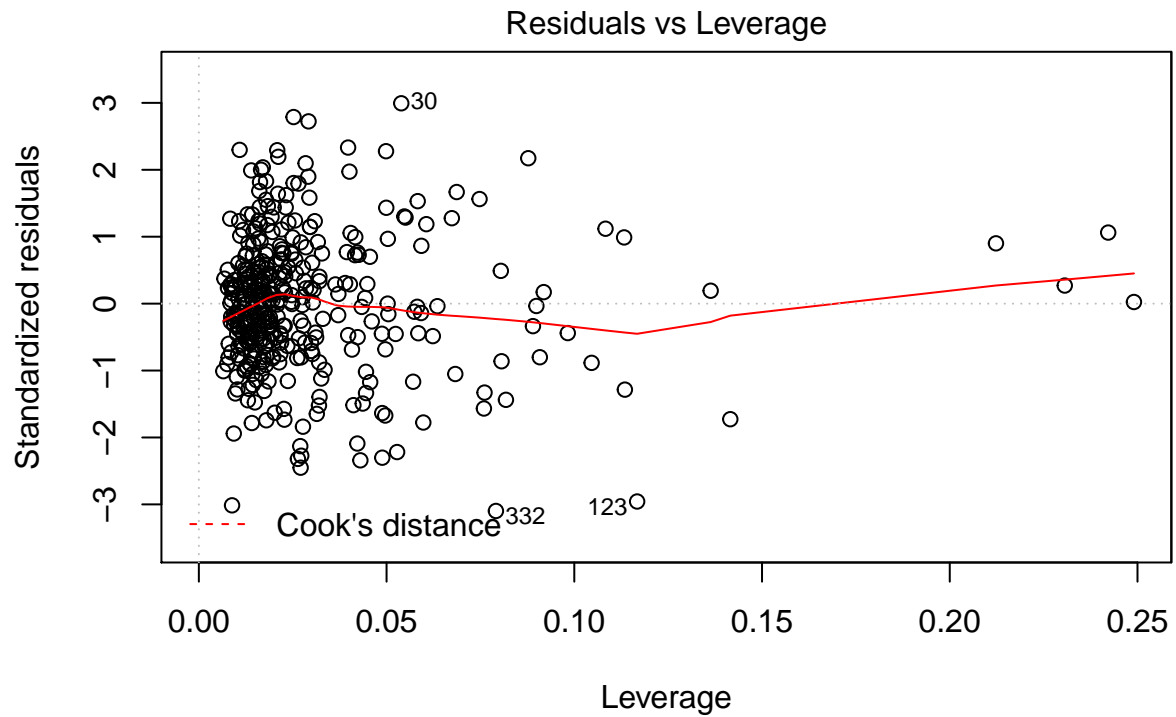
Leverage
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

```
plot(backward_model_high)
```

Residuals vs Fitted

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Normal Q–Q

Standardized residuals

1088
2360

248

Theoretical Quantiles
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Scale–Location

√|Standardized residuals|

1088
2360
248

Fitted values
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...

Residuals vs Leverage
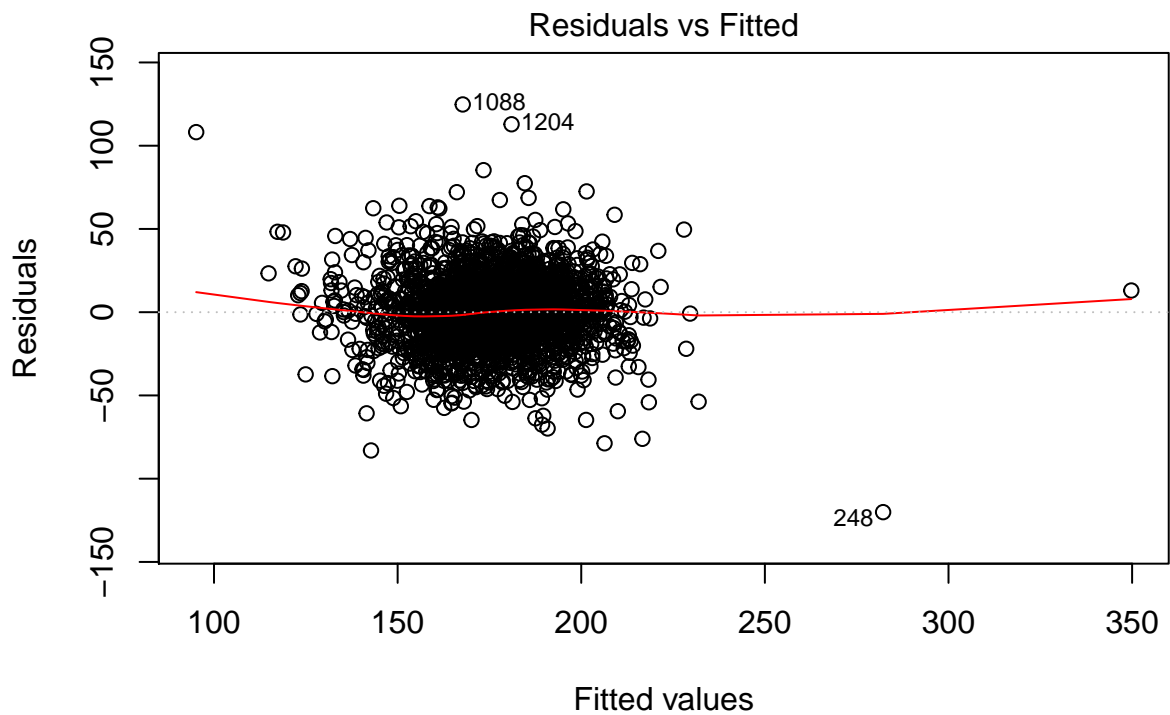
lm(target_death_rate ~ incidence_rate + poverty_percent + median_age_male + ...
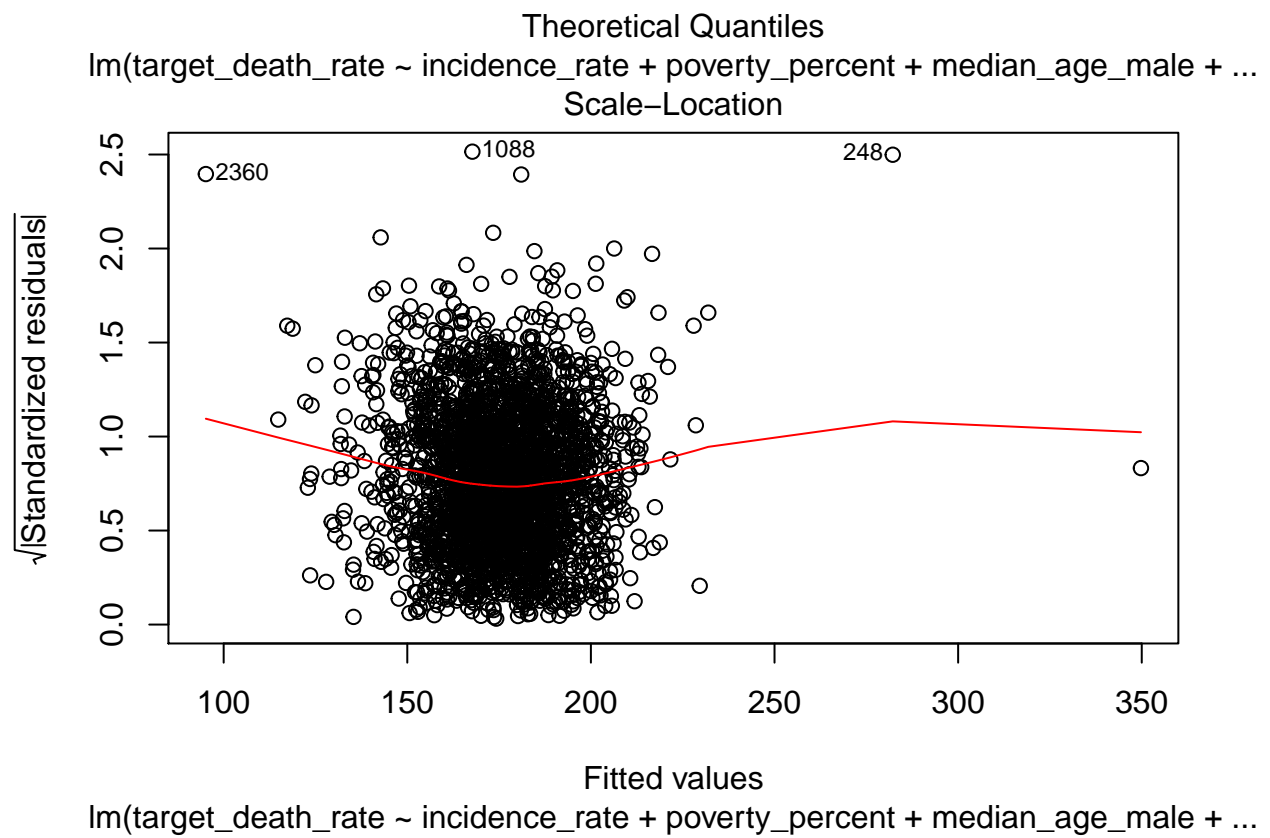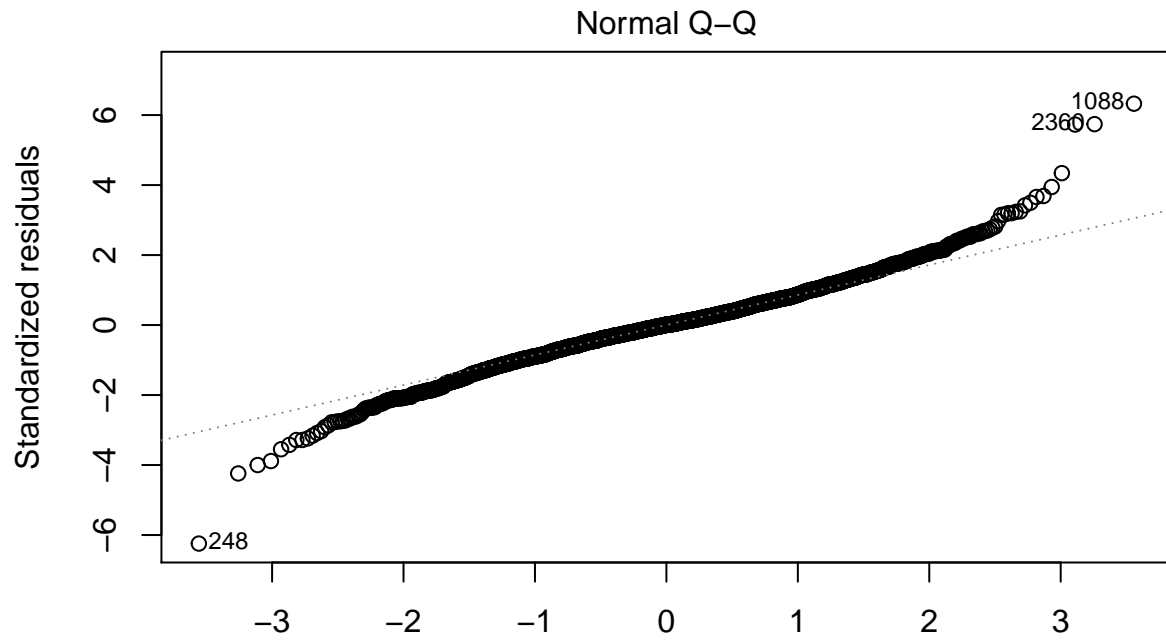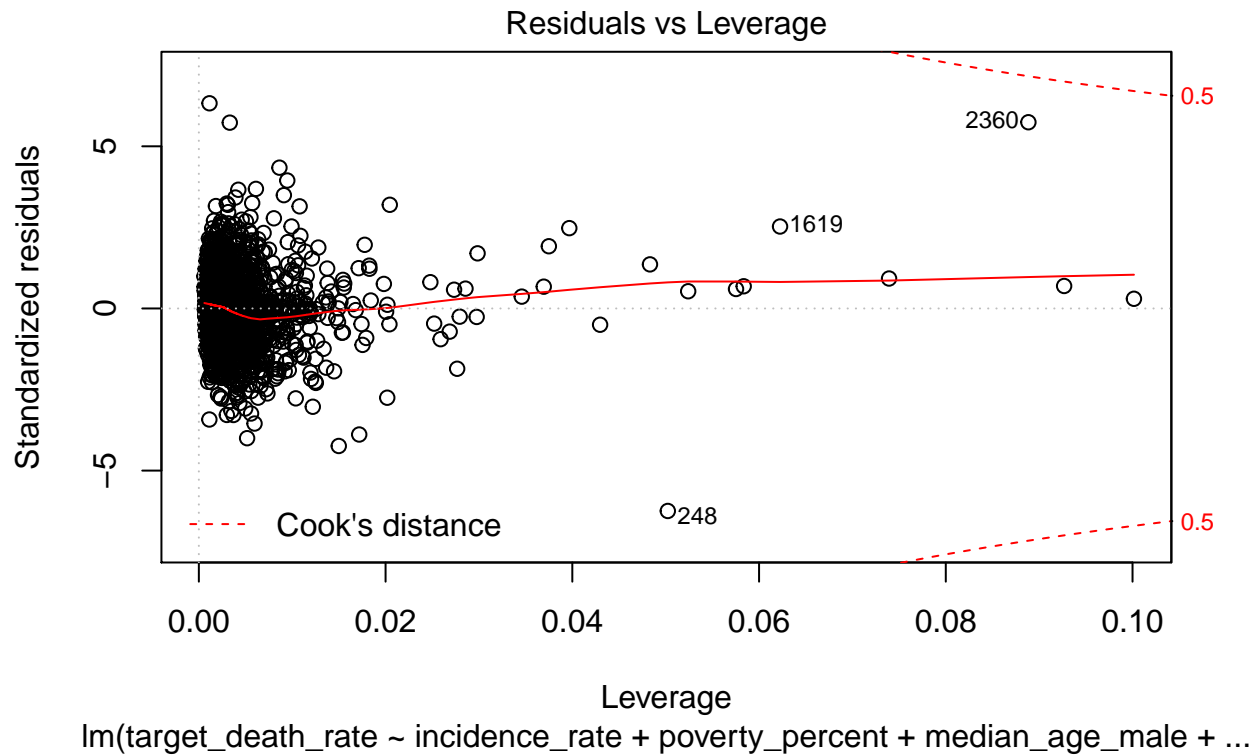
Criterion-based Approach

Low income

```
criterion_stats_low =
  regsubsets(target_death_rate ~ ., nvmax = 14, data = income_low_data) %>%
  summary()

par(mar = c(4,4,1,1))
par(mfrow = c(1,2))

plot(2:15, criterion_stats_low$cp, xlab = "No of parameters", ylab = "Cp Statistic")
abline(0,1)

plot(2:15, criterion_stats_low$adjr2, xlab = "No of parameters", ylab = "Adj R2")
```
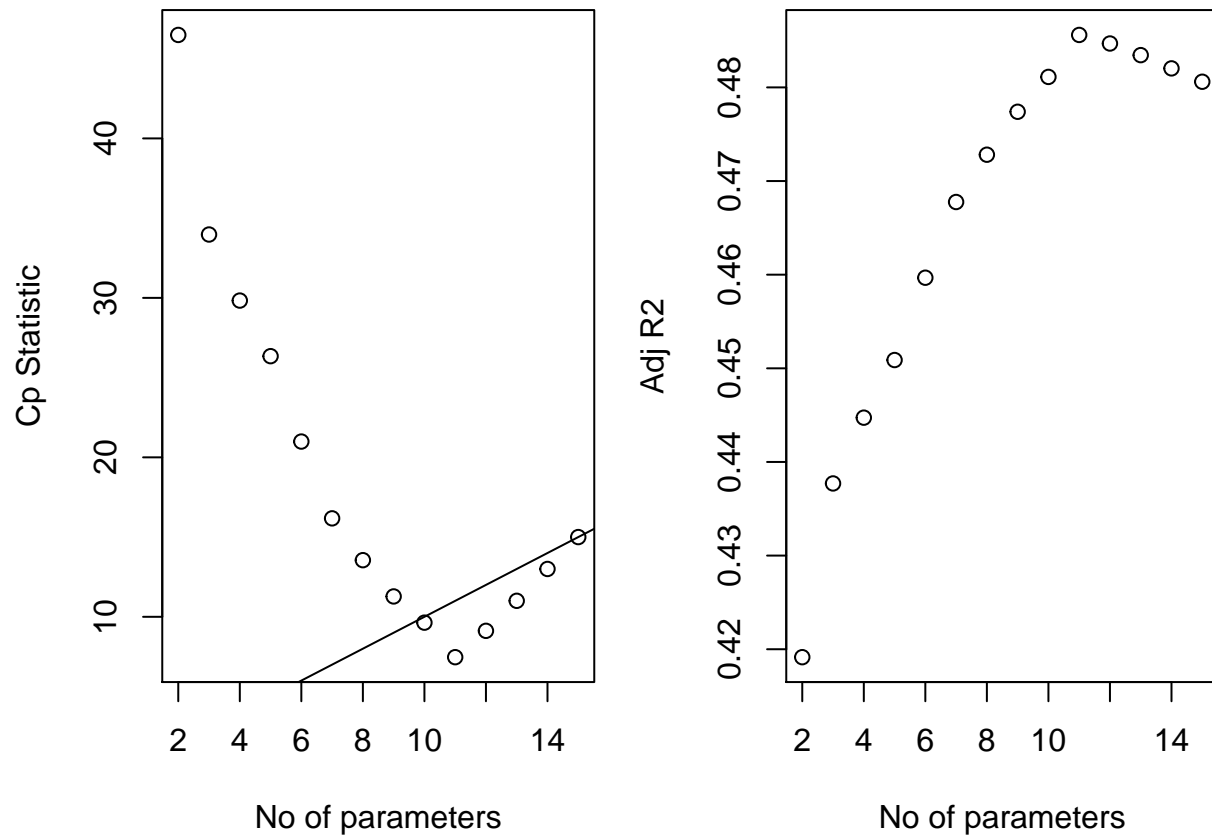
High income

```
criterion_stats_high =
  regsubsets(target_death_rate ~ ., nvmax = 14, data = income_high_data) %>%
  summary()

par(mar = c(4,4,1,1))
par(mfrow = c(1,2))

plot(2:15, criterion_stats_high$cp, xlab = "No of parameters", ylab = "Cp Statistic")
abline(0,1)

plot(2:15, criterion_stats_high$adjr2, xlab = "No of parameters", ylab = "Adj R2")
```
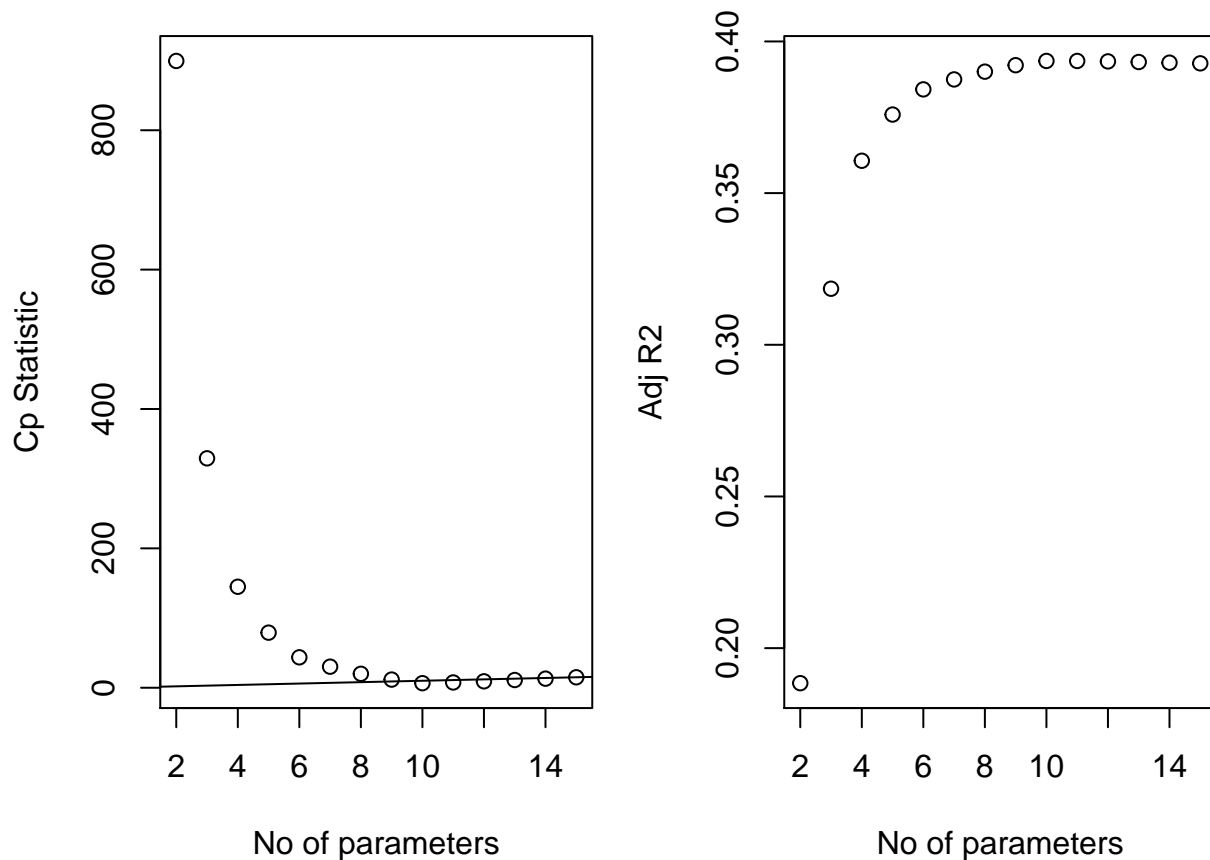
Cross Validation

```r
# low
set.seed(1)
data_train <- trainControl(method = "repeatedcv", number = 10, repeats = 100)

low_cv <- train(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + median_age_female + pct_black + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = income_low_data,
                trControl = data_train,
                method = 'lm',
                na.action = na.pass)

low_cv
```

```
## Linear Regression
##
## 378 samples
##  10 predictor
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 100 times)
## Summary of sample sizes: 341, 340, 341, 338, 340, 341, ...
## Resampling results:
```

```
##
##    RMSE       Rsquared    MAE
##    24.22195   0.4715015   18.7237
##
## Tuning parameter 'intercept' was held constant at a value of TRUE
```

```r
high_cv <- train(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
    pct_married_households + pct_upto_hs18_24 + pct_with_coverage,
    data = income_high_data,
                  trControl = data_train,
                  method = 'lm',
                  na.action = na.pass)

high_cv
```
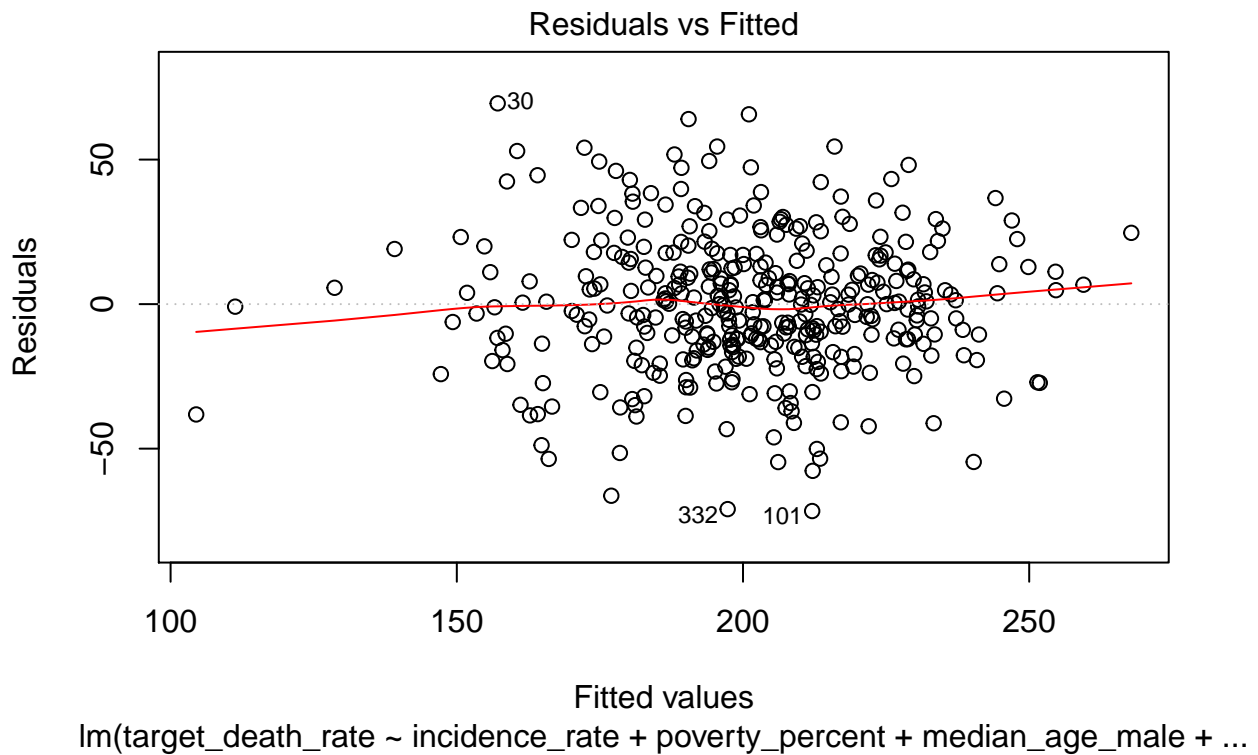
```
## Linear Regression
##
## 2669 samples
##    9 predictor
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 100 times)
## Summary of sample sizes: 2401, 2403, 2402, 2402, 2401, 2402, ...
## Resampling results:
##
##    RMSE       Rsquared    MAE
##    19.78867   0.3918871   14.65232
##
## Tuning parameter 'intercept' was held constant at a value of TRUE
```

Cross Validation

```r
cross_df_low = crossv_mc(income_low_data, n = 100, test = 0.2)
cross_df_high = crossv_mc(income_high_data, n = 100, test = 0.2)

cross_result_low =
  cross_df_low %>%
  mutate(
    step_mod = map(train, ~lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + median_age_female + pct_black + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = .x)),
    rmse_train = map2_dbl(step_mod, train, ~rmse(model = .x, data = .y)),
    rmse_test = map2_dbl(step_mod, test, ~rmse(model = .x, data = .y))
    )


mse_results_low = cross_result_low %>%
  dplyr::select(rmse_train, rmse_test) %>%
  summarize(mse_train_low = (mean(rmse_train))^2,
            mse_test_low = (mean(rmse_test))^2) #mse results
```

```r
cross_result_high =
  cross_df_high %>%
  mutate(
    step_mod = map(train, ~lm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
    pct_married_households + pct_upto_hs18_24 + pct_with_coverage, data = .x)),
    rmse_train = map2_dbl(step_mod, train, ~rmse(model = .x, data = .y)),
    rmse_test = map2_dbl(step_mod, test, ~rmse(model = .x, data = .y))
    )


mse_results_high = cross_result_high %>%
  dplyr::select(rmse_train, rmse_test) %>%
  summarize(mse_train_high = (mean(rmse_train))^2,
            mse_test_high = (mean(rmse_test))^2)

#LOOCV
glm.fit_low = glm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + median_age_female + pct_black + pct_asian +
    pct_other_race + pct_married_households + pct_upto_hs18_24 +
    pct_with_coverage, data = income_low_data)

cv.err_low = cv.glm(income_low_data, glm.fit_low)

glm.fit_high = glm(target_death_rate ~ incidence_rate + poverty_percent +
    median_age_male + pct_unemployed16_over + pct_asian + pct_other_race +
    pct_married_households + pct_upto_hs18_24 + pct_with_coverage, data = income_high_data)

cv.err_high = cv.glm(income_high_data, glm.fit_high)

# The two delta values should be similar: we use the first one
# The second value is bias corrected
cv.err_low$delta
```

[1] 595.1885 595.1301

```r
anova(backward_model_low)[11, 3] #MSE: 431
```

[1] 569.0145

```r
anova(backward_model_high)[10, 3]
```

[1] 389.4591

```r
mse_low =
  tibble(
  mse_model = anova(backward_model_low)[11, 3],
  mse_LOOCV = cv.err_low$delta[1],
  mse_CV_train = mse_results_low$mse_train_low,
  mse_CV_test = mse_results_low$mse_test_low
)

mse_high =
  tibble(
  mse_model = anova(backward_model_high)[10, 3],
  mse_LOOCV = cv.err_high$delta[1],
```

```
  mse_CV_train = mse_results_high$mse_train_high,
  mse_CV_test = mse_results_high$mse_test_high
)

rbind(mse_low, mse_high) %>% mutate(dataset = c("low income", "high income")) %>% dplyr::select(dataset
```

dataset	mse_model	mse_LOOCV	mse_CV_train	mse_CV_test
low income	569.014	595.189	550.119	583.890
high income	389.459	393.070	386.918	394.509

Influential points

Low Income

```
influence.measures(backward_model_low) %>% summary()
```

```
## Potentially influential observations of
##    lm(formula = target_death_rate ~ incidence_rate + poverty_percent +     median_age_male + median_
##
##      dfb.1_ dfb.inc_ dfb.pvr_ dfb.mdn_g_m dfb.mdn_g_f dfb.pct_b dfb.pct_s
## 14   -0.01   0.00    -0.02    -0.01        -0.03        0.01      0.00
## 15   -0.05   0.05    -0.08     0.40        -0.34       -0.05     -0.13
## 20    0.00   0.01     0.01     0.03        -0.02        0.01     -0.04
## 22    0.00   0.00     0.00     0.00         0.00        0.00      0.00
## 23    0.02   0.00    -0.01     0.04        -0.01       -0.06     -0.07
## 26    0.00   0.00     0.00     0.00         0.00        0.00      0.00
## 30    0.26  -0.52    -0.23    -0.19         0.14       -0.36     -0.04
## 32    0.05   0.03    -0.06     0.25        -0.21       -0.07      0.46
## 34   -0.07   0.06     0.03     0.03         0.05        0.13      0.00
## 91    0.21  -0.09     0.00     0.01        -0.03       -0.14     -0.03
## 95   -0.04  -0.02     0.01     0.10        -0.10        0.05     -0.04
## 101  -0.14  -0.09     0.07     0.09        -0.07        0.02      0.08
## 112  -0.18   0.14    -0.04     0.12         0.03        0.00      0.09
## 123   0.27   0.24    -0.59    -0.77         0.82       -0.15      0.13
## 142   0.13  -0.03     0.14     0.15        -0.08        0.15     -0.12
## 173   0.01  -0.07    -0.07    -0.14         0.04       -0.17      0.05
## 187   0.22  -0.11    -0.10     0.03         0.01       -0.14      0.01
## 189   0.00   0.00    -0.01     0.03         0.01        0.06     -0.13
## 199   0.05  -0.02    -0.02    -0.24         0.28       -0.02     -0.03
## 200   0.00  -0.01    -0.01    -0.02         0.00        0.01     -0.01
## 204   0.00   0.01     0.00    -0.01         0.01        0.00      0.00
## 206  -0.02   0.00     0.01     0.01         0.00       -0.01      0.00
## 208  -0.23   0.19     0.13    -0.01        -0.02        0.01     -0.48
## 211  -0.11   0.00    -0.05     0.00         0.02       -0.01      0.02
## 216   0.08   0.07     0.05    -0.04         0.07       -0.09     -0.06
## 231  -0.02  -0.01     0.00     0.00         0.01        0.01      0.00
## 243   0.08  -0.23    -0.05    -0.14         0.09        0.05     -0.05
## 263   0.06   0.05    -0.06     0.06        -0.06       -0.01      0.00
## 275   0.14   0.10    -0.17     0.17        -0.22       -0.15     -0.35
## 277  -0.01   0.02     0.01    -0.03         0.04       -0.02      0.02
## 290   0.12  -0.04     0.02     0.01        -0.05        0.12     -0.08
## 302  -0.10   0.03     0.13     0.01         0.01        0.00      0.00
```

```
## 332 -0.15   -0.45    -0.01    -0.44       0.48      -0.23      0.10
## 336  0.15    0.05    -0.07     0.14      -0.21       0.15     -0.12
## 344 -0.01    0.00    -0.09    -0.04       0.06       0.05     -0.33
## 366 -0.01    0.00     0.00     0.00       0.00       0.00      0.00
## 369  0.16   -0.07     0.08    -0.01      -0.04      -0.26     -0.06
##      dfb.pct_t_ dfb.pct_m_ dfb.p__1 dfb.pct_w_ dffit   cov.r   cook.d
## 14   0.01       0.00        0.08      0.04     -0.10   1.13_*   0.00
## 15   0.36      -0.21        0.15      0.12      0.68_*  0.98    0.04
## 20   0.13       0.01       -0.05     -0.01      0.15   1.34_*   0.00
## 22  -0.01       0.00        0.00      0.00     -0.01   1.09_*   0.00
## 23   0.40      -0.10       -0.06      0.02      0.47   1.28_*   0.02
## 26   0.01       0.00        0.00      0.00      0.01   1.37_*   0.00
## 30  -0.21      -0.42        0.04      0.26      0.72_*  0.83_*   0.05
## 32  -0.13      -0.15        0.07     -0.03      0.60_*  1.31_*   0.03
## 34   0.07       0.12        0.06     -0.13     -0.30   1.12_*   0.01
## 91  -0.06      -0.25       -0.07     -0.05     -0.38   0.91_*   0.01
## 95  -0.03       0.01        0.02      0.04     -0.15   1.14_*   0.00
## 101  0.07       0.03        0.04      0.14     -0.29   0.79_*   0.01
## 112  0.04      -0.18        0.00      0.16     -0.52_*  0.92    0.02
## 123 -0.18      -0.21        0.07     -0.24     -1.09_*  0.89_*   0.11
## 142 -0.05      -0.02       -0.25     -0.21      0.48   0.85_*   0.02
## 173  0.02       0.05        0.13      0.09     -0.41   0.88_*   0.02
## 187 -0.12      -0.15        0.02     -0.17      0.34   0.90_*   0.01
## 189  0.05       0.02        0.07     -0.07     -0.25   1.11_*   0.01
## 199  0.02       0.06       -0.18     -0.09      0.35   1.13_*   0.01
## 200  0.04       0.02        0.01      0.01      0.05   1.13_*   0.00
## 204  0.00       0.00        0.00      0.00     -0.01   1.10_*   0.00
## 206  0.00      -0.01        0.01      0.02     -0.04   1.09_*   0.00
## 208  0.14       0.00       -0.20      0.30     -0.70_*  1.10_*   0.04
## 211 -0.01      -0.09        0.08      0.17     -0.25   1.10_*   0.01
## 216 -0.06      -0.07       -0.04     -0.12      0.24   0.89_*   0.01
## 231  0.01       0.01        0.01      0.02     -0.03   1.09_*   0.00
## 243  0.02       0.01       -0.16      0.08     -0.38   0.90_*   0.01
## 263  0.00      -0.04       -0.04     -0.04     -0.13   1.09_*   0.00
## 275  0.07      -0.16       -0.09      0.02     -0.53_*  0.94    0.02
## 277  0.03      -0.02        0.03      0.00      0.08   1.19_*   0.00
## 290 -0.07      -0.07       -0.21      0.00      0.45   0.84_*   0.02
## 302  0.02       0.06        0.00      0.04      0.14   1.11_*   0.00
## 332 -0.41      -0.30        0.14      0.50     -0.92_*  0.84_*   0.07
## 336  0.33       0.13       -0.02     -0.22      0.52_*  0.93    0.02
## 344  0.08       0.03        0.09     -0.03     -0.46   1.11_*   0.02
## 366  0.00       0.01        0.00      0.01     -0.01   1.13_*   0.00
## 369 -0.12      -0.23        0.06     -0.03      0.39   1.11_*   0.01
##      hat
## 14   0.09_*
## 15   0.09_*
## 20   0.23_*
## 22   0.06
## 23   0.21_*
## 26   0.25_*
## 30   0.05
## 32   0.24_*
## 34   0.10_*
## 91   0.03
```

```
## 95    0.10_*
## 101   0.01
## 112   0.05
## 123   0.12_*
## 142   0.03
## 173   0.03
## 187   0.02
## 189   0.09_*
## 199   0.11_*
## 200   0.09_*
## 204   0.06
## 206   0.06
## 208   0.14_*
## 211   0.08
## 216   0.01
## 231   0.06
## 243   0.03
## 263   0.06
## 275   0.05
## 277   0.14_*
## 290   0.03
## 302   0.08
## 332   0.08
## 336   0.05
## 344   0.11_*
## 366   0.09_*
## 369   0.11_*
```

High Income

```r
influence.measures(backward_model_high) %>% summary()
```

```
## Potentially influential observations of
##    lm(formula = target_death_rate ~ incidence_rate + poverty_percent +      median_age_male + pct_unem
##
##       dfb.1_ dfb.inc_ dfb.pvr_ dfb.md__ dfb.p_16 dfb.pct_ dfb.pct_t_
## 21     0.04    0.05    -0.09     0.04     0.02    -0.04     0.02
## 27     0.01   -0.15     0.01    -0.03    -0.01     0.01    -0.05
## 93     0.00    0.00    -0.01     0.01     0.00     0.00     0.01
## 103    0.22    0.03    -0.27     0.07     0.12    -0.10     0.12
## 106   -0.05    0.00     0.15     0.10    -0.15     0.02     0.03
## 107   -0.01   -0.01     0.06     0.07    -0.11     0.02     0.05
## 109    0.08   -0.02    -0.12     0.17     0.16     0.03     0.06
## 111   -0.01   -0.02     0.01     0.01    -0.02     0.01    -0.01
## 127    0.00    0.00     0.00     0.00     0.00     0.00     0.00
## 134    0.00    0.00     0.00     0.00     0.00     0.01     0.01
## 137    0.00    0.01     0.00     0.01     0.00     0.09    -0.01
## 143   -0.01    0.01     0.00     0.01     0.00     0.04     0.00
## 151    0.00    0.00     0.00     0.00     0.00     0.00    -0.01
## 159    0.00   -0.02     0.02     0.00     0.01    -0.03     0.08
## 163    0.00    0.02     0.01    -0.04    -0.01     0.02    -0.08
## 164    0.12   -0.13    -0.14    -0.07     0.02    -0.02    -0.04
## 165    0.03   -0.03     0.02     0.02    -0.05    -0.02     0.07
## 166    0.01    0.00    -0.01     0.00     0.00     0.00    -0.02
## 175   -0.03    0.05    -0.02    -0.13     0.07    -0.02     0.00
```

```
## 182   -0.01   -0.02    0.00    0.00    0.00    0.07   -0.01
## 189    0.00    0.01   -0.02    0.01    0.01   -0.01    0.00
## 208    0.03   -0.07    0.01    0.03    0.01   -0.01   -0.03
## 216    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 221   -0.01   -0.10    0.05   -0.01    0.05   -0.01   -0.04
## 224    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 226    0.04   -0.26   -0.13    0.03    0.20   -0.10    0.00
## 229    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 233   -0.01   -0.15   -0.14    0.08    0.14   -0.04    0.02
## 241    0.01    0.00    0.00    0.00    0.00    0.00    0.00
## 247    0.00   -0.01    0.00    0.00    0.00    0.00    0.00
## 248    0.18   -1.33_*  -0.10    0.13    0.21   -0.13   -0.10
## 250    0.01    0.01   -0.01    0.01    0.00    0.01   -0.07
## 258    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 260    0.00    0.00    0.00    0.00    0.00    0.00    0.02
## 262   -0.01    0.01   -0.01    0.00    0.02   -0.02    0.09
## 266    0.00    0.00    0.00    0.00    0.00   -0.02    0.00
## 285    0.00    0.01   -0.02    0.01    0.00    0.00    0.00
## 313    0.00    0.00    0.00   -0.01    0.00    0.00    0.00
## 356   -0.01    0.00    0.00   -0.02    0.01   -0.03   -0.04
## 409   -0.02    0.02   -0.02    0.01   -0.05   -0.02    0.03
## 420    0.11   -0.03   -0.06    0.00   -0.09   -0.03   -0.03
## 425    0.10    0.08   -0.11   -0.03    0.08   -0.02   -0.01
## 430   -0.02    0.02    0.01    0.01    0.00    0.01    0.01
## 435    0.02   -0.01    0.00    0.11   -0.10   -0.01    0.01
## 443    0.03    0.01    0.02   -0.01   -0.04    0.00   -0.02
## 462    0.03    0.07   -0.05   -0.04   -0.07    0.01    0.03
## 469   -0.01   -0.10    0.09   -0.06   -0.02   -0.01   -0.04
## 480    0.04    0.01   -0.01    0.03    0.00   -0.05    0.10
## 494    0.01    0.03    0.02    0.00    0.00   -0.01   -0.02
## 502   -0.03    0.00    0.02    0.02    0.00   -0.04    0.17
## 507   -0.01    0.00    0.02    0.02   -0.01    0.13    0.00
## 512    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 515    0.03    0.00   -0.03   -0.01    0.00   -0.02   -0.05
## 518    0.03    0.02   -0.01    0.00   -0.12    0.05   -0.17
## 527    0.00   -0.04   -0.01   -0.03    0.03   -0.01    0.00
## 541    0.05   -0.10    0.01   -0.05    0.04   -0.02   -0.01
## 547    0.09   -0.07   -0.03    0.17   -0.07   -0.01   -0.01
## 567   -0.04    0.00    0.01    0.00    0.00   -0.01    0.16
## 570   -0.09    0.03    0.05   -0.07    0.03    0.04    0.00
## 580    0.06    0.01   -0.07   -0.07    0.09   -0.06    0.01
## 586    0.03    0.02    0.01    0.09   -0.10    0.00   -0.01
## 590    0.02   -0.08   -0.01    0.05   -0.02   -0.03   -0.01
## 631    0.00    0.00    0.00    0.00   -0.01    0.00    0.00
## 658   -0.08    0.02    0.07    0.04    0.04    0.00    0.00
## 664   -0.04    0.01    0.04    0.02    0.01    0.00   -0.01
## 667   -0.04    0.03    0.04   -0.01   -0.03    0.00   -0.01
## 681   -0.01   -0.04    0.09   -0.04   -0.13    0.03   -0.02
## 686   -0.09    0.03    0.07    0.02   -0.09    0.01    0.05
## 689   -0.05    0.03   -0.02    0.04    0.11   -0.01   -0.10
## 707    0.11   -0.07   -0.04    0.03    0.00   -0.01   -0.01
## 774    0.00    0.00    0.00    0.00    0.00   -0.03    0.01
## 776    0.00    0.01    0.01   -0.01    0.00   -0.05   -0.01
## 790   -0.05    0.04   -0.11    0.05    0.09   -0.02    0.04
```

```
## 803    0.02    0.05   -0.05    0.10   -0.01    0.01    0.01
## 808   -0.09    0.04    0.09    0.05   -0.07    0.01    0.08
## 809   -0.01    0.00    0.01    0.00    0.00    0.00    0.01
## 810    0.00    0.02   -0.06    0.08   -0.04    0.01    0.03
## 812   -0.09    0.04    0.11    0.04    0.00    0.01    0.05
## 814    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 817   -0.03    0.14   -0.10    0.09    0.04   -0.03    0.09
## 818    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 824   -0.05    0.00    0.06    0.09   -0.01    0.01    0.05
## 848    0.01   -0.01   -0.01    0.00    0.00    0.01    0.00
## 867    0.00    0.00    0.00    0.00    0.00   -0.01    0.00
## 884    0.00    0.00    0.00    0.00    0.00    0.01    0.01
## 889   -0.01    0.00    0.00    0.00    0.01    0.00    0.01
## 891   -0.15    0.09    0.17   -0.03   -0.14    0.06   -0.05
## 895    0.00    0.00    0.00    0.01    0.00    0.03    0.01
## 897    0.00    0.00    0.00   -0.01   -0.01    0.00    0.00
## 898    0.00    0.00    0.00    0.00   -0.01    0.00   -0.01
## 899    0.00    0.00    0.00    0.00    0.00    0.01    0.00
## 901   -0.01    0.00    0.00    0.00    0.01    0.00    0.02
## 904    0.01    0.00    0.01    0.04   -0.02    0.16   -0.01
## 905   -0.01    0.00    0.01    0.00    0.01    0.02    0.01
## 907   -0.01    0.00    0.00    0.01    0.00    0.06    0.00
## 909   -0.02    0.00    0.02    0.02   -0.01    0.14    0.00
## 912    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 915   -0.01    0.01    0.00    0.01    0.02    0.06    0.02
## 918    0.00    0.00    0.00    0.00   -0.01   -0.01    0.00
## 923   -0.01    0.00    0.01    0.00    0.00    0.02    0.01
## 928   -0.04    0.01    0.04   -0.12   -0.02    0.00   -0.09
## 930    0.02    0.01   -0.03    0.00    0.01   -0.01    0.00
## 937   -0.01   -0.01    0.02   -0.08   -0.05    0.00    0.00
## 940    0.00    0.01    0.00    0.00    0.00    0.00    0.00
## 943   -0.14    0.08    0.14    0.06    0.00    0.06   -0.05
## 950   -0.12    0.14    0.06    0.04   -0.03    0.05    0.05
## 952    0.08   -0.05    0.01    0.04   -0.08   -0.02   -0.03
## 969   -0.33    0.27    0.36   -0.03   -0.11    0.10    0.05
## 980    0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 1014   0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 1049   0.08   -0.01   -0.10   -0.11   -0.01   -0.04   -0.03
## 1055   0.00    0.00    0.00    0.00    0.00    0.00    0.00
## 1076  -0.05    0.01    0.16    0.06   -0.07    0.04   -0.02
## 1085   0.00    0.06    0.03   -0.04   -0.02   -0.01   -0.02
## 1088   0.03    0.01   -0.01   -0.08   -0.05   -0.01   -0.01
## 1104   0.01    0.01   -0.03    0.01    0.01    0.00    0.01
## 1106   0.09   -0.09   -0.06    0.04   -0.05    0.00   -0.04
## 1123   0.02    0.07    0.02    0.04   -0.06    0.00   -0.01
## 1135  -0.04    0.06   -0.03   -0.02    0.02   -0.06    0.22
## 1137  -0.04    0.02    0.05    0.09   -0.02   -0.02    0.08
## 1142   0.00   -0.05    0.02    0.07    0.04    0.01   -0.08
## 1148  -0.08    0.05    0.07   -0.07   -0.08   -0.05    0.15
## 1149  -0.02   -0.01    0.04    0.00    0.00    0.02    0.02
## 1154  -0.04   -0.01    0.02    0.02    0.02   -0.01    0.00
## 1169   0.03   -0.01   -0.06   -0.03    0.10    0.01   -0.02
## 1183  -0.01    0.01    0.02   -0.09    0.01    0.03   -0.01
## 1188   0.00    0.02   -0.01    0.00    0.00   -0.02    0.10
```

```
## 1194  0.03  -0.02  -0.02  -0.01   0.03   0.02  -0.10
## 1195  0.01  -0.02   0.00   0.01   0.01   0.01  -0.03
## 1204  0.09   0.03   0.04   0.18  -0.19   0.01  -0.02
## 1231 -0.14   0.11   0.12  -0.01  -0.02   0.05   0.03
## 1233 -0.14   0.12   0.10   0.02   0.00   0.04   0.00
## 1250  0.00   0.00   0.00   0.00   0.00   0.00   0.00
## 1312 -0.06   0.22   0.03   0.02  -0.03   0.02   0.03
## 1318 -0.08   0.10   0.11   0.10  -0.24  -0.01   0.29
## 1356  0.02  -0.02   0.03  -0.02   0.00   0.00  -0.03
## 1367  0.00   0.01   0.00   0.00  -0.02  -0.01   0.10
## 1381  0.07   0.00  -0.01  -0.06  -0.10   0.00  -0.03
## 1444 -0.09   0.01   0.05   0.06   0.02  -0.01   0.06
## 1469 -0.03  -0.01   0.00  -0.01   0.01  -0.01   0.01
## 1497 -0.05  -0.03   0.01   0.04  -0.04  -0.04   0.20
## 1532 -0.02   0.00   0.02  -0.01  -0.02   0.01   0.00
## 1556  0.00   0.00   0.00   0.00   0.00   0.01   0.00
## 1597 -0.01   0.00   0.01   0.00   0.01   0.01  -0.02
## 1603 -0.02   0.00   0.00   0.00   0.01   0.00   0.00
## 1615  0.03   0.01  -0.04   0.00   0.02  -0.01   0.00
## 1618 -0.02   0.01  -0.04   0.02  -0.01  -0.08   0.29
## 1619 -0.15   0.05   0.08   0.10  -0.11  -0.11   0.62
## 1625  0.00   0.00   0.00   0.00   0.00   0.00   0.00
## 1629  0.00   0.00   0.00   0.00   0.00   0.00   0.00
## 1641  0.00   0.00   0.00   0.00   0.00  -0.01   0.00
## 1644  0.01   0.00   0.00  -0.01   0.00   0.00   0.00
## 1646 -0.01  -0.04   0.06   0.01  -0.05   0.01   0.01
## 1648  0.05  -0.01  -0.02  -0.04  -0.01   0.02  -0.12
## 1649 -0.03   0.02   0.00   0.07  -0.04  -0.07   0.36
## 1657 -0.01  -0.03  -0.01   0.04   0.08   0.00   0.00
## 1665  0.10   0.04  -0.07  -0.01  -0.02  -0.03   0.05
## 1678  0.01  -0.03  -0.01   0.02   0.00   0.01   0.01
## 1684 -0.04   0.01   0.03   0.01  -0.03  -0.02   0.12
## 1694  0.00   0.03  -0.04  -0.01   0.02   0.02  -0.08
## 1708  0.01  -0.01  -0.01  -0.01  -0.01  -0.01   0.01
## 1726  0.01   0.00  -0.01   0.04   0.00   0.00   0.01
## 1737  0.01   0.02  -0.01   0.02  -0.02  -0.02   0.11
## 1738  0.00   0.00   0.00   0.01   0.00   0.00   0.00
## 1748  0.07   0.09  -0.05   0.08  -0.08  -0.10   0.39
## 1752  0.09  -0.10  -0.01   0.01  -0.03  -0.01  -0.01
## 1757  0.00   0.00   0.00   0.00   0.00   0.00  -0.01
## 1768 -0.02  -0.01  -0.01   0.05  -0.05  -0.11   0.47
## 1795  0.01   0.02   0.00   0.00  -0.01   0.00   0.02
## 1815  0.02  -0.07  -0.01   0.03   0.02  -0.01  -0.03
## 1834  0.01   0.00   0.00   0.00   0.00   0.00   0.00
## 1836 -0.23  -0.01   0.07   0.13  -0.23   0.01   0.19
## 1837 -0.12  -0.05   0.04   0.02  -0.03   0.02   0.06
## 1848 -0.02   0.10   0.08   0.13  -0.10   0.04   0.00
## 1856  0.00   0.00   0.00  -0.01   0.00  -0.04  -0.01
## 1870  0.00   0.00  -0.01   0.01   0.01  -0.02   0.01
## 1926 -0.02  -0.04   0.04   0.00   0.00  -0.03  -0.02
## 1955 -0.08  -0.02   0.05   0.04   0.01   0.00   0.04
## 2018 -0.02   0.01   0.01   0.00  -0.06  -0.01   0.00
## 2036  0.00   0.01   0.00   0.01   0.00   0.00   0.00
## 2047  0.01   0.01  -0.01  -0.01   0.00  -0.04   0.01
```

```
## 2048 -0.02    0.00      0.02     0.01    -0.01     0.10      -0.02
## 2049 -0.05   -0.01      0.06     0.04    -0.04     0.26      -0.05
## 2050  0.02    0.01     -0.02    -0.01     0.01    -0.10       0.02
## 2052 -0.06    0.00      0.11    -0.11    -0.09    -0.02       0.04
## 2057 -0.06    0.05      0.07    -0.03     0.04     0.02      -0.08
## 2062 -0.04    0.09      0.01     0.01    -0.01     0.00       0.04
## 2081  0.14    0.05     -0.20     0.08    -0.03    -0.01       0.03
## 2085 -0.03   -0.03     -0.01     0.01    -0.02     0.00       0.00
## 2087  0.04    0.06      0.01     0.07    -0.05     0.06      -0.10
## 2089 -0.07    0.06      0.10     0.08    -0.05     0.04      -0.01
## 2145  0.00    0.00      0.00     0.00     0.00     0.00       0.00
## 2154  0.01   -0.01      0.02     0.01    -0.06     0.01       0.02
## 2232  0.00    0.00      0.00     0.00     0.00     0.00       0.00
## 2282 -0.03    0.13      0.04     0.00    -0.04     0.01      -0.02
## 2287 -0.22    0.10      0.23     0.12    -0.10     0.04       0.04
## 2311  0.02    0.01      0.07     0.03    -0.03     0.03      -0.06
## 2322  0.03   -0.10     -0.18    -0.04     0.16    -0.07       0.04
## 2332  0.00    0.00      0.01    -0.01     0.00     0.00       0.00
## 2340 -0.07    0.02      0.03    -0.08     0.09     0.01      -0.01
## 2358 -0.01    0.00     -0.01    -0.01     0.05     0.00      -0.01
## 2360  0.27   -0.43      0.01     0.21    -0.38     1.63_*    -0.35
## 2362  0.04   -0.06     -0.04    -0.08     0.07    -0.01      -0.05
## 2366 -0.19   -0.02      0.14    -0.03     0.08    -0.05       0.06
## 2370  0.10    0.02     -0.06    -0.01    -0.02     0.25      -0.09
## 2372  0.10    0.03     -0.07    -0.13     0.09    -0.01      -0.09
## 2373  0.20    0.06     -0.23    -0.07     0.02     0.06      -0.06
## 2374 -0.03    0.02      0.03     0.03    -0.05     0.01       0.02
## 2375  0.03   -0.02     -0.02    -0.01    -0.01     0.01      -0.01
## 2378 -0.10   -0.02      0.07     0.02    -0.05     0.00       0.05
## 2387  0.04    0.12     -0.04     0.04    -0.15     0.02       0.01
## 2390  0.01    0.03     -0.02     0.00    -0.01     0.01      -0.05
## 2419  0.00    0.00      0.00     0.00     0.00     0.00       0.00
## 2424  0.05    0.06     -0.01     0.02     0.04     0.01       0.01
## 2425  0.00    0.00      0.00     0.00     0.00     0.00       0.00
## 2442 -0.03   -0.04     -0.08     0.06     0.10    -0.03       0.07
## 2443 -0.01    0.00      0.01     0.00    -0.05    -0.02       0.00
## 2444  0.02    0.18     -0.04    -0.08     0.00    -0.01       0.02
## 2469 -0.01    0.09     -0.02     0.00     0.02    -0.02       0.01
## 2482 -0.03    0.08      0.04     0.02    -0.05     0.00      -0.01
## 2493  0.00    0.00      0.00     0.00     0.00     0.00       0.02
## 2544 -0.03    0.04      0.00     0.03     0.04    -0.01       0.00
## 2626  0.01    0.01     -0.02     0.02     0.01    -0.01       0.01
## 2662  0.04    0.04     -0.02     0.06    -0.07    -0.01       0.04
##      dfb.pct_m_ dfb.p__1 dfb.pct_w_  dffit   cov.r   cook.d hat
## 21   -0.01       0.02     -0.06      -0.14    1.01_*  0.00   0.01_*
## 27   -0.03       0.11      0.05       0.19_*  1.00    0.00   0.01_*
## 93    0.00       0.00      0.00      -0.02    1.01_*  0.00   0.01
## 103  -0.23       0.00     -0.19       0.39_*  0.96_*  0.01   0.01
## 106   0.01      -0.11      0.04      -0.24_*  0.97_*  0.01   0.01
## 107  -0.07      -0.04      0.04      -0.19_*  0.97_*  0.00   0.00
## 109  -0.18      -0.05     -0.05       0.34_*  0.97_*  0.01   0.01
## 111   0.00      -0.05      0.02      -0.12    0.96_*  0.00   0.00
## 127   0.00       0.00      0.00       0.00    1.02_*  0.00   0.01_*
## 134  -0.01       0.00      0.00       0.02    1.02_*  0.00   0.01_*
```

```
## 137    0.02     -0.01     -0.02      0.10     1.03_*   0.00     0.03_*
## 143    0.01      0.00      0.00      0.04     1.02_*   0.00     0.01_*
## 151    0.00      0.00      0.00     -0.01     1.01_*   0.00     0.01
## 159    0.00     -0.04      0.02      0.11     1.02_*   0.00     0.02_*
## 163    0.03      0.00     -0.01     -0.09     1.02_*   0.00     0.02_*
## 164   -0.09      0.01     -0.01     -0.22_*   0.98_*   0.00     0.01
## 165   -0.02     -0.03     -0.01      0.11     1.01_*   0.00     0.01_*
## 166    0.00      0.00     -0.01     -0.03     1.02_*   0.00     0.01_*
## 175    0.01      0.06      0.05     -0.17     1.01     0.00     0.01_*
## 182    0.03      0.01      0.00      0.08     1.02_*   0.00     0.02_*
## 189    0.00      0.01     -0.01     -0.03     1.01_*   0.00     0.01
## 208    0.01     -0.03     -0.02      0.11     0.98_*   0.00     0.00
## 216    0.00      0.01      0.01      0.01     1.02_*   0.00     0.01_*
## 221    0.02     -0.02      0.04      0.15     0.98_*   0.00     0.00
## 224    0.00      0.00      0.00      0.00     1.02_*   0.00     0.01_*
## 226    0.07      0.01      0.00     -0.40_*   1.00     0.02     0.02_*
## 229    0.00      0.00      0.00      0.00     1.01_*   0.00     0.01
## 233    0.03      0.10      0.02     -0.34_*   0.98_*   0.01     0.01_*
## 241   -0.02      0.00      0.00      0.02     1.01_*   0.00     0.01
## 247    0.01     -0.01      0.00     -0.01     1.01_*   0.00     0.01
## 248   -0.06      0.25      0.20     -1.45_*   0.91_*   0.21     0.05_*
## 250   -0.01     -0.01     -0.01     -0.08     1.03_*   0.00     0.03_*
## 258    0.00      0.00      0.00      0.00     1.02_*   0.00     0.01_*
## 260    0.00      0.00      0.00      0.02     1.02_*   0.00     0.02_*
## 262    0.00      0.01      0.01      0.10     1.02_*   0.00     0.02_*
## 266    0.00      0.00      0.00     -0.02     1.01_*   0.00     0.01
## 285    0.00      0.01     -0.01     -0.03     1.01_*   0.00     0.01
## 313    0.00      0.00      0.00     -0.01     1.01_*   0.00     0.01
## 356    0.06      0.00     -0.01     -0.09     1.02_*   0.00     0.02_*
## 409   -0.03      0.04      0.03      0.12     0.99_*   0.00     0.00
## 420   -0.08     -0.02     -0.07      0.16     0.99_*   0.00     0.00
## 425   -0.07     -0.07     -0.10     -0.20_*   0.99     0.00     0.01
## 430    0.01      0.00      0.01     -0.03     1.01_*   0.00     0.01
## 435   -0.06     -0.04     -0.02      0.18     0.99_*   0.00     0.01
## 443   -0.01     -0.01     -0.03      0.06     1.02_*   0.00     0.01_*
## 462    0.01     -0.01     -0.04     -0.17     0.98_*   0.00     0.00
## 469   -0.08      0.06      0.09      0.21_*   0.98_*   0.00     0.01
## 480   -0.02     -0.07     -0.04      0.15     0.98_*   0.00     0.00
## 494   -0.01      0.00     -0.03      0.09     0.98_*   0.00     0.00
## 502    0.00      0.00      0.03      0.18     1.02_*   0.00     0.02_*
## 507    0.01      0.01      0.00      0.13     1.04_*   0.00     0.04_*
## 512    0.00      0.00      0.00      0.00     1.02_*   0.00     0.01
## 515   -0.01      0.00     -0.02     -0.06     1.02_*   0.00     0.02_*
## 518   -0.04      0.04     -0.02     -0.24_*   1.00     0.01     0.01_*
## 527    0.00     -0.01      0.02     -0.06     1.01_*   0.00     0.01
## 541   -0.07     -0.04      0.03     -0.18     0.98_*   0.00     0.00
## 547   -0.05     -0.09     -0.09      0.25_*   0.97_*   0.01     0.01
## 567    0.02      0.01      0.04      0.17     1.01     0.00     0.01_*
## 570    0.03      0.11      0.08     -0.16     0.99_*   0.00     0.00
## 580   -0.03     -0.08     -0.02     -0.17     0.99_*   0.00     0.01
## 586    0.02     -0.08     -0.06      0.18     0.97_*   0.00     0.00
## 590   -0.04     -0.04      0.02      0.13     0.98_*   0.00     0.00
## 631    0.00     -0.01     -0.01     -0.02     1.01_*   0.00     0.01
## 658    0.07     -0.01      0.03      0.12     0.98_*   0.00     0.00
```

```
## 664    0.05    -0.01    0.01     0.08    0.99_*    0.00    0.00
## 667    0.04     0.02    0.02     0.08    0.99_*    0.00    0.00
## 681    0.00     0.12    0.02     0.21_*  0.96_*    0.00    0.00
## 686    0.11     0.04    0.04     0.19_*  0.98_*    0.00    0.01
## 689   -0.02    -0.12    0.07    -0.28_*  0.99_*    0.01    0.01
## 707   -0.11    -0.06   -0.05    -0.17    0.98_*    0.00    0.00
## 774   -0.01     0.00    0.00    -0.03    1.02_*    0.00    0.01_*
## 776    0.00     0.00    0.00    -0.06    1.01_*    0.00    0.01
## 790   -0.07     0.04    0.07    -0.21_*  1.00      0.00    0.01_*
## 803   -0.11     0.06   -0.03    -0.19_*  1.00      0.00    0.01
## 808   -0.03     0.00    0.09    -0.18    0.97_*    0.00    0.00
## 809    0.01    -0.01    0.01    -0.02    1.01_*    0.00    0.01
## 810   -0.12     0.07    0.02    -0.18_*  0.99      0.00    0.01
## 812    0.09    -0.13    0.05    -0.19_*  0.99_*    0.00    0.01
## 814   -0.01     0.00    0.00    -0.01    1.02_*    0.00    0.01_*
## 817   -0.06    -0.03    0.00    -0.24_*  1.00      0.01    0.01_*
## 818    0.00     0.00    0.00     0.01    1.01_*    0.00    0.01
## 824   -0.06     0.01    0.05    -0.16    0.99_*    0.00    0.00
## 848   -0.01     0.00    0.00     0.02    1.01_*    0.00    0.01
## 867    0.00     0.00    0.00    -0.01    1.02_*    0.00    0.02_*
## 884    0.00     0.00    0.00     0.02    1.02_*    0.00    0.02_*
## 889    0.00     0.00    0.00     0.02    1.02_*    0.00    0.02_*
## 891    0.08     0.08    0.11    -0.25_*  1.00      0.01    0.01_*
## 895    0.01     0.00    0.00     0.03    1.02_*    0.00    0.02_*
## 897    0.00     0.01    0.00    -0.01    1.01_*    0.00    0.01
## 898    0.00     0.00    0.00    -0.02    1.01_*    0.00    0.01
## 899    0.00     0.00    0.00     0.01    1.01_*    0.00    0.01
## 901    0.00     0.00    0.00     0.02    1.01_*    0.00    0.01
## 904   -0.02     0.00   -0.01     0.17    1.06_*    0.00    0.06_*
## 905    0.01     0.00    0.00     0.03    1.02_*    0.00    0.01_*
## 907    0.01     0.00    0.00     0.07    1.04_*    0.00    0.03_*
## 909    0.03     0.01    0.00     0.15    1.06_*    0.00    0.06_*
## 912    0.00     0.00    0.00     0.00    1.01_*    0.00    0.01
## 915    0.00     0.01    0.01     0.08    1.01_*    0.00    0.01_*
## 918    0.00     0.00    0.00    -0.02    1.02_*    0.00    0.01_*
## 923    0.00     0.00    0.01     0.03    1.01_*    0.00    0.01
## 928   -0.02     0.03    0.09    -0.19_*  0.98_*    0.00    0.00
## 930   -0.01    -0.02   -0.02    -0.04    1.02_*    0.00    0.01_*
## 937   -0.03     0.04    0.05    -0.11    1.01_*    0.00    0.01_*
## 940    0.00     0.00    0.00    -0.01    1.01_*    0.00    0.01
## 943    0.07     0.00    0.07    -0.22_*  0.97_*    0.00    0.00
## 950    0.09     0.05    0.02    -0.19_*  1.00      0.00    0.01
## 952    0.02    -0.12   -0.07     0.19_*  0.98_*    0.00    0.00
## 969    0.41     0.00    0.08    -0.52_*  0.95_*    0.03    0.01_*
## 980    0.00     0.00    0.00     0.01    1.01_*    0.00    0.01
## 1014   0.00     0.00    0.00     0.00    1.02_*    0.00    0.01_*
## 1049  -0.04     0.05   -0.03     0.16    0.98_*    0.00    0.00
## 1055   0.00     0.00    0.00    -0.01    1.01_*    0.00    0.01
## 1076   0.01     0.03    0.01     0.21_*  1.00      0.00    0.01_*
## 1085   0.00    -0.01   -0.01     0.11    0.98_*    0.00    0.00
## 1088  -0.02    -0.07    0.02     0.22_*  0.86_*    0.00    0.00
## 1104  -0.01     0.02   -0.01    -0.05    1.01_*    0.00    0.01
## 1106  -0.10     0.03   -0.03     0.18    0.97_*    0.00    0.00
## 1123   0.04    -0.07   -0.07     0.13    0.99_*    0.00    0.00
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## 1135  0.05      0.03      0.02      0.26_*  1.01    0.01    0.02_*
## 1137  0.07     -0.12     -0.01      0.17    1.02_*  0.00    0.02_*
## 1142 -0.05     -0.08      0.02     -0.19_*  0.99    0.00    0.01
## 1148  0.11     -0.01      0.06      0.25_*  0.98_*  0.01    0.01
## 1149  0.01     -0.01      0.02     -0.07    0.99_*  0.00    0.00
## 1154  0.02      0.01      0.04      0.07    0.99_*  0.00    0.00
## 1169 -0.01      0.02     -0.03     -0.14    0.98_*  0.00    0.00
## 1183  0.05      0.05      0.00     -0.13    0.98_*  0.00    0.00
## 1188 -0.01      0.00      0.01      0.10    1.03_*  0.00    0.03_*
## 1194 -0.02      0.01     -0.02     -0.11    1.01_*  0.00    0.01_*
## 1195 -0.03     -0.01      0.00     -0.06    1.01_*  0.00    0.01
## 1204 -0.14     -0.03     -0.11      0.33_*  0.89_*  0.01    0.00
## 1231  0.15      0.05      0.04     -0.21_*  0.99_*  0.00    0.01
## 1233  0.07      0.05      0.08     -0.19_*  1.00    0.00    0.01
## 1250  0.00      0.00      0.00     -0.01    1.02_*  0.00    0.01_*
## 1312  0.04      0.01     -0.03      0.22_*  1.10_*  0.00    0.09_*
## 1318 -0.03      0.11      0.02      0.41_*  0.94_*  0.02    0.01
## 1356  0.01      0.00     -0.02      0.09    0.98_*  0.00    0.00
## 1367 -0.01      0.01      0.00      0.11    1.02_*  0.00    0.02_*
## 1381 -0.04     -0.03     -0.04     -0.15    0.99_*  0.00    0.00
## 1444 -0.04     -0.01      0.11     -0.15    1.03_*  0.00    0.03_*
## 1469  0.01      0.03      0.04      0.07    0.99_*  0.00    0.00
## 1497  0.01      0.03      0.05      0.23_*  1.00    0.01    0.01
## 1532  0.00      0.04      0.03      0.04    1.01_*  0.00    0.01_*
## 1556 -0.01      0.00      0.00      0.02    1.01_*  0.00    0.01
## 1597  0.01     -0.01      0.01     -0.04    1.01_*  0.00    0.01
## 1603 -0.01      0.00      0.02     -0.03    1.01_*  0.00    0.01
## 1615 -0.02     -0.02     -0.02     -0.05    1.02_*  0.00    0.01_*
## 1618 -0.03      0.03      0.04      0.31_*  1.05_*  0.01    0.05_*
## 1619  0.05      0.03      0.10      0.65_*  1.04_*  0.04    0.06_*
## 1625  0.00      0.00      0.00      0.00    1.01_*  0.00    0.01
## 1629  0.00      0.00      0.00     -0.01    1.01_*  0.00    0.01
## 1641 -0.01      0.00      0.00     -0.01    1.02_*  0.00    0.02_*
## 1644  0.00      0.00     -0.01      0.02    1.02_*  0.00    0.01_*
## 1646  0.02      0.01      0.01      0.09    1.02_*  0.00    0.01_*
## 1648 -0.01     -0.01     -0.04     -0.12    1.02_*  0.00    0.02_*
## 1649 -0.03      0.02      0.01      0.38_*  1.03_*  0.01    0.04_*
## 1657 -0.03     -0.05      0.03     -0.13    0.99_*  0.00    0.00
## 1665  0.07     -0.09     -0.14      0.20_*  1.00    0.00    0.01
## 1678 -0.02      0.03     -0.01      0.07    1.01_*  0.00    0.01_*
## 1684 -0.01      0.03      0.04      0.13    1.03_*  0.00    0.02_*
## 1694 -0.01      0.01      0.00     -0.11    1.01_*  0.00    0.01_*
## 1708 -0.01      0.01     -0.01      0.02    1.01_*  0.00    0.01
## 1726 -0.02     -0.02     -0.01     -0.05    1.01_*  0.00    0.01
## 1737  0.00      0.00     -0.02      0.12    1.06_*  0.00    0.05_*
## 1738  0.00      0.00     -0.01      0.01    1.01_*  0.00    0.01
## 1748  0.03     -0.12     -0.13      0.46_*  0.99_*  0.02    0.02_*
## 1752  0.06     -0.07     -0.09      0.19_*  0.99    0.00    0.01
## 1757 -0.01      0.00      0.01     -0.02    1.02_*  0.00    0.01_*
## 1768  0.00     -0.01      0.01      0.50_*  1.02_*  0.03    0.04_*
## 1795  0.02     -0.05     -0.02     -0.07    0.99_*  0.00    0.00
## 1815  0.06     -0.05     -0.02      0.13    0.98_*  0.00    0.00
## 1834 -0.03      0.00      0.00      0.04    1.01_*  0.00    0.01
## 1836 -0.11      0.10      0.31     -0.52_*  0.96_*  0.03    0.02_*
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## 1837  0.00      0.07     0.15     -0.18_*  1.00     0.00     0.01
## 1848  0.07     -0.06    -0.08      0.20_*  1.00     0.00     0.01
## 1856  0.00      0.00     0.01     -0.05    1.03_*   0.00     0.03_*
## 1870  0.00      0.01    -0.01     -0.04    1.01_*   0.00     0.01
## 1926  0.07     -0.07     0.03      0.14    0.97_*   0.00     0.00
## 1955 -0.02      0.00     0.10     -0.12    1.03_*   0.00     0.03_*
## 2018 -0.04      0.05     0.04      0.10    0.99_*   0.00     0.00
## 2036  0.01     -0.01    -0.01      0.02    1.02_*   0.00     0.01_*
## 2047  0.00     -0.01    -0.01     -0.04    1.03_*   0.00     0.03_*
## 2048  0.01      0.02     0.00      0.10    1.12_*   0.00     0.10_*
## 2049  0.04      0.04     0.01      0.26_*  1.08_*   0.01     0.07_*
## 2050 -0.01     -0.03    -0.01     -0.11    1.05_*   0.00     0.04_*
## 2052  0.04     -0.09     0.11     -0.28_*  0.96_*   0.01     0.01
## 2057  0.07     -0.02     0.03     -0.16    0.98_*   0.00     0.00
## 2062 -0.01     -0.01     0.02     -0.12    0.98_*   0.00     0.00
## 2081 -0.24      0.10    -0.10     -0.31_*  1.02_*   0.01     0.03_*
## 2085 -0.03     -0.02     0.08     -0.15    0.99_*   0.00     0.00
## 2087  0.01     -0.07    -0.09     -0.18    0.98_*   0.00     0.00
## 2089  0.05     -0.08     0.01     -0.17    0.98_*   0.00     0.00
## 2145  0.00      0.00     0.00      0.00    1.01_*   0.00     0.01
## 2154 -0.03     -0.01     0.00     -0.09    0.99_*   0.00     0.00
## 2232  0.00      0.00     0.00      0.00    1.01_*   0.00     0.01
## 2282  0.05      0.03    -0.04      0.17    0.97_*   0.00     0.00
## 2287  0.09      0.03     0.12      0.29_*  0.96_*   0.01     0.01
## 2311  0.18     -0.15    -0.10      0.24_*  0.96_*   0.01     0.00
## 2322 -0.04     -0.04     0.06     -0.29_*  0.95_*   0.01     0.01
## 2332  0.00     -0.01     0.00      0.02    1.01_*   0.00     0.01
## 2340  0.11      0.00     0.04      0.16    1.02_*   0.00     0.02_*
## 2358  0.01      0.00     0.00      0.05    1.01_*   0.00     0.01
## 2360 -0.19      0.38    -0.25      1.80_*  0.97_*   0.32     0.09_*
## 2362 -0.03      0.06     0.00      0.15    1.01_*   0.00     0.01_*
## 2366  0.11     -0.03     0.19     -0.26_*  1.00     0.01     0.01_*
## 2370  0.03      0.00    -0.14      0.30_*  1.02_*   0.01     0.03_*
## 2372 -0.08      0.09    -0.07      0.25_*  0.99     0.01     0.01
## 2373 -0.22      0.12    -0.15      0.33_*  0.98_*   0.01     0.01
## 2374  0.01     -0.02     0.02     -0.07    1.02_*   0.00     0.02_*
## 2375 -0.02      0.02    -0.01      0.04    1.01_*   0.00     0.01
## 2378  0.05     -0.01     0.10     -0.15    1.02_*   0.00     0.02_*
## 2387 -0.01     -0.04    -0.08     -0.22_*  1.00     0.00     0.01_*
## 2390 -0.01      0.01    -0.02     -0.07    1.01_*   0.00     0.01_*
## 2419  0.00      0.00     0.00      0.01    1.01_*   0.00     0.01
## 2424  0.02     -0.10    -0.09     -0.15    0.99_*   0.00     0.00
## 2425  0.00      0.00     0.00      0.00    1.01_*   0.00     0.01
## 2442  0.01     -0.06     0.04     -0.20_*  0.97_*   0.00     0.00
## 2443  0.01     -0.01     0.02      0.09    0.99_*   0.00     0.00
## 2444  0.05     -0.05    -0.08     -0.23_*  0.99_*   0.01     0.01
## 2469  0.04     -0.03    -0.03      0.12    0.98_*   0.00     0.00
## 2482  0.07     -0.04    -0.02      0.13    0.98_*   0.00     0.00
## 2493  0.00      0.00     0.00      0.02    1.01_*   0.00     0.01
## 2544  0.03     -0.03     0.01      0.09    0.98_*   0.00     0.00
## 2626  0.00      0.01    -0.02     -0.05    1.01_*   0.00     0.01
## 2662  0.00     -0.06    -0.07      0.14    0.99_*   0.00     0.00
```