Preliminary analyses GCCR001 April 19th 4 PM

Database creation

1. Confirm there are no email duplicates.

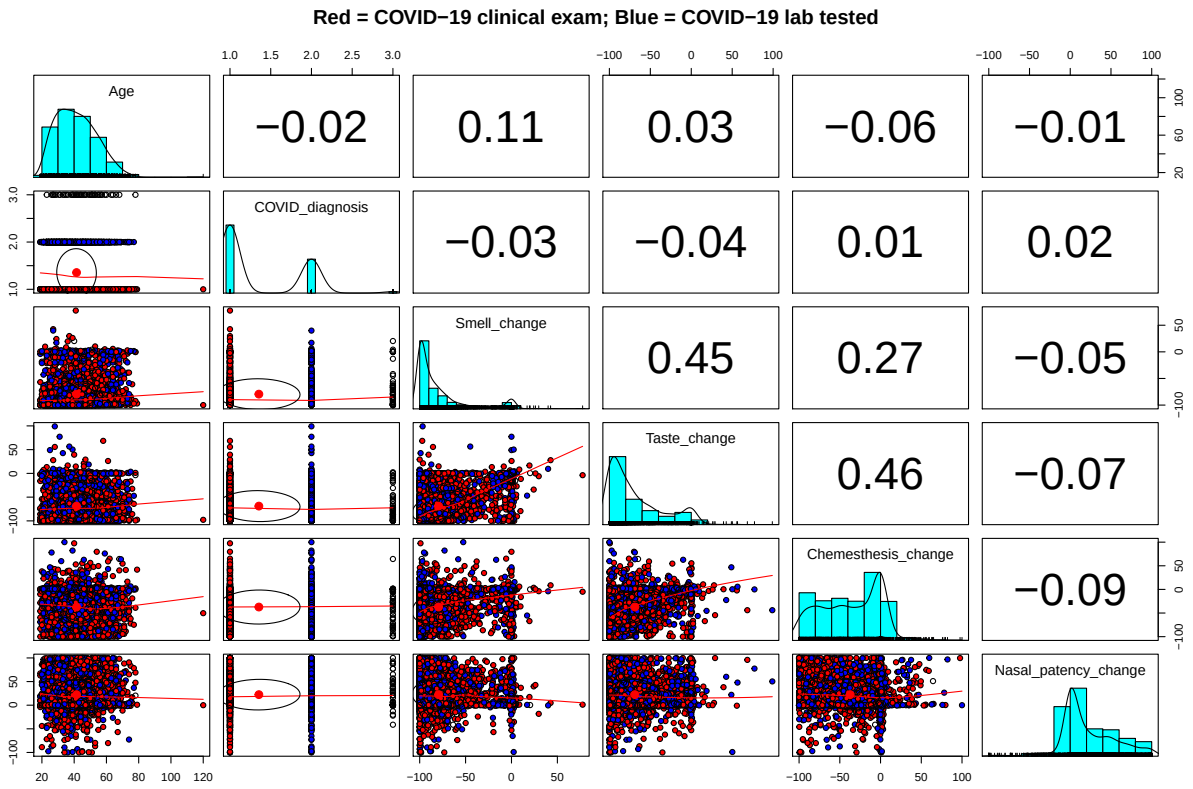
Descriptives

```
## Non-numerical variable(s) ignored: Country_of_Residence, Gender, Group

## Descriptive Statistics
## data_GCCR001
## N: 3858
##
##                         Age   Changes_in_basic_tastes_bitter   Changes_in_basic_tastes_salty
## ----------------- --------- -------------------------------- --------------------------------
##              Mean     41.48                             0.40                             0.46
##           Std.Dev     12.28                             0.49                             0.50
##               Min     19.00                             0.00                             0.00
##                Q1     32.00                             0.00                             0.00
##            Median     40.00                             0.00                             0.00
##                Q3     50.00                             1.00                             1.00
##               Max    120.00                             1.00                             1.00
##               MAD     13.34                             0.00                             0.00
##               IQR     18.00                             1.00                             1.00
##                CV      0.30                             1.24                             1.09
##          Skewness      0.44                             0.42                             0.17
##       SE.Skewness      0.04                             0.04                             0.04
##          Kurtosis     -0.17                            -1.82                            -1.97
##           N.Valid   3858.00                          3858.00                          3858.00
##         Pct.Valid    100.00                           100.00                           100.00
##
## Table: Table continues below
##
##
##
##                     Changes_in_basic_tastes_savory/umami   Changes_in_basic_tastes_sour
## ----------------- -------------------------------------- --------------------------------
##              Mean                                   0.27                             0.38
##           Std.Dev                                   0.44                             0.48
##               Min                                   0.00                             0.00
##                Q1                                   0.00                             0.00
##            Median                                   0.00                             0.00
##                Q3                                   1.00                             1.00
##               Max                                   1.00                             1.00
```

```
##               MAD                                  0.00                          0.00
##               IQR                                  1.00                          1.00
##                CV                                  1.65                          1.29
##          Skewness                                  1.04                          0.51
##       SE.Skewness                                  0.04                          0.04
##          Kurtosis                                 -0.91                         -1.74
##           N.Valid                                3858.00                       3858.00
##         Pct.Valid                                 100.00                        100.00
##
## Table: Table continues below
##
##
##
##                     Changes_in_basic_tastes_sweet   Chemesthesis_change
## ----------------- -------------------------------- ---------------------
##              Mean                             0.45                -37.30
##           Std.Dev                             0.50                 36.04
##               Min                             0.00               -100.00
##                Q1                             0.00                -69.50
##            Median                             0.00                -33.10
##                Q3                             1.00                 -0.80
##               Max                             1.00                100.00
##               MAD                             0.00                 48.63
##               IQR                             1.00                 68.65
##                CV                             1.12                 -0.97
##          Skewness                             0.22                 -0.14
##       SE.Skewness                             0.04                  0.04
##          Kurtosis                            -1.95                 -0.96
##           N.Valid                          3858.00               3858.00
##         Pct.Valid                           100.00                100.00
##
## Table: Table continues below
##
##
##
##                     Combustible_cigarette_use_no   COVID_diagnosis   E-cigarette_use_no
## ----------------- -------------------------------- ----------------- --------------------
##              Mean                             0.55              1.35                 0.75
##           Std.Dev                             0.50              0.51                 0.43
##               Min                             0.00              1.00                 0.00
##                Q1                             0.00              1.00                 1.00
##            Median                             1.00              1.00                 1.00
##                Q3                             1.00              2.00                 1.00
##               Max                             1.00              3.00                 1.00
##               MAD                             0.00              0.00                 0.00
##               IQR                             1.00              1.00                 0.00
##                CV                             0.91              0.37                 0.57
##          Skewness                            -0.19              0.91                -1.16
##       SE.Skewness                             0.04              0.04                 0.04
##          Kurtosis                            -1.96             -0.48                -0.64
##           N.Valid                          3858.00           3858.00              3858.00
##         Pct.Valid                           100.00            100.00               100.00
##
## Table: Table continues below
```

##
##
##
Nasal_patency_change   parosmia   phantosmia   Sanity_check   Smell_change
------------------ ---------------------- ---------- ------------ -------------- --------------
Mean   22.34   0.08   0.08   0.00   -79.43
Std.Dev   32.40   0.27   0.28   0.00   28.91
Min   -100.00   0.00   0.00   0.00   -100.00
Q1   0.00   0.00   0.00   0.00   -99.10
Median   10.20   0.00   0.00   0.00   -91.40
Q3   44.40   0.00   0.00   0.00   -74.60
Max   100.00   1.00   1.00   0.00   77.50
MAD   16.01   0.00   0.00   0.00   12.75
IQR   44.40   0.00   0.00   0.00   24.50
CV   1.45   3.47   3.30   NaN   -0.36
Skewness   0.48   3.18   3.00   NaN   1.83
SE.Skewness   0.04   0.04   0.04   0.04   0.04
Kurtosis   0.52   8.11   6.99   NaN   2.44
N.Valid   3858.00   3858.00   3858.00   3858.00   3858.00
Pct.Valid   100.00   100.00   100.00   100.00   100.00
##
Table: Table continues below
##
##
##
smell_fluctuations   smell_loss   Taste_change
------------------ -------------------- ------------ --------------
Mean   0.14   0.86   -68.88
Std.Dev   0.34   0.35   32.62
Min   0.00   0.00   -100.00
Q1   0.00   1.00   -95.70
Median   0.00   1.00   -80.60
Q3   0.00   1.00   -51.40
Max   1.00   1.00   99.00
MAD   0.00   0.00   26.39
IQR   0.00   0.00   44.28
CV   2.53   0.41   -0.47
Skewness   2.13   -2.05   1.09
SE.Skewness   0.04   0.04   0.04
Kurtosis   2.53   2.22   0.23
N.Valid   3858.00   3858.00   3858.00
Pct.Valid   100.00   100.00   100.00



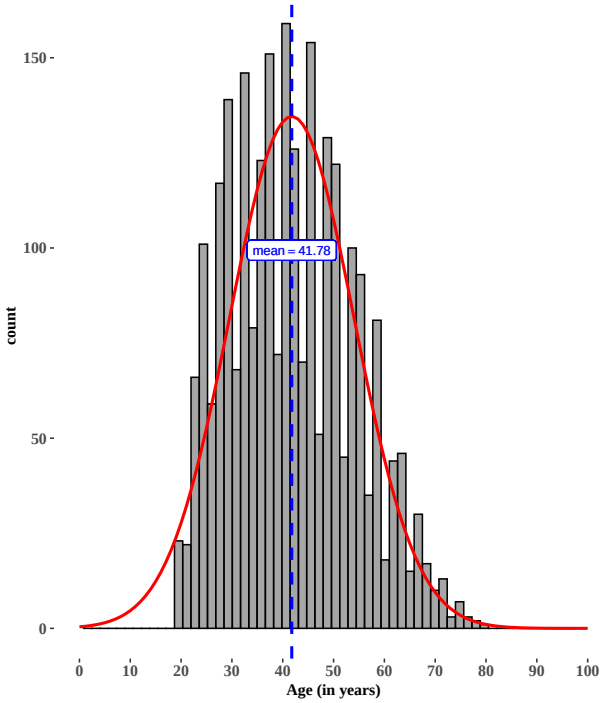
Age by Group

```
## t is large; approximation invoked.
## t is large; approximation invoked.
```

Age in COVID−19 lab tested vs. clinically examined respondents

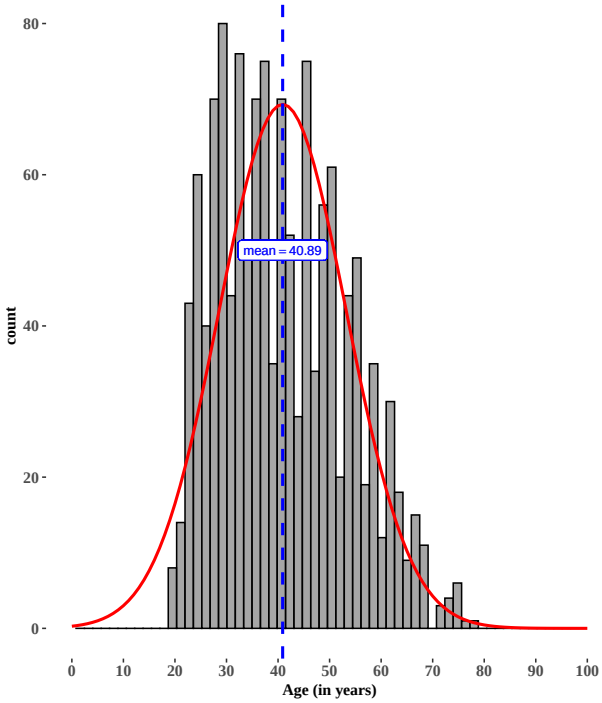
Reported diagnosis: Clinical exam

M_{robust} = 41.27, $CI_{95\%}$ [40.91, 41.74], p = < 0.001, n_{obs} = 2541



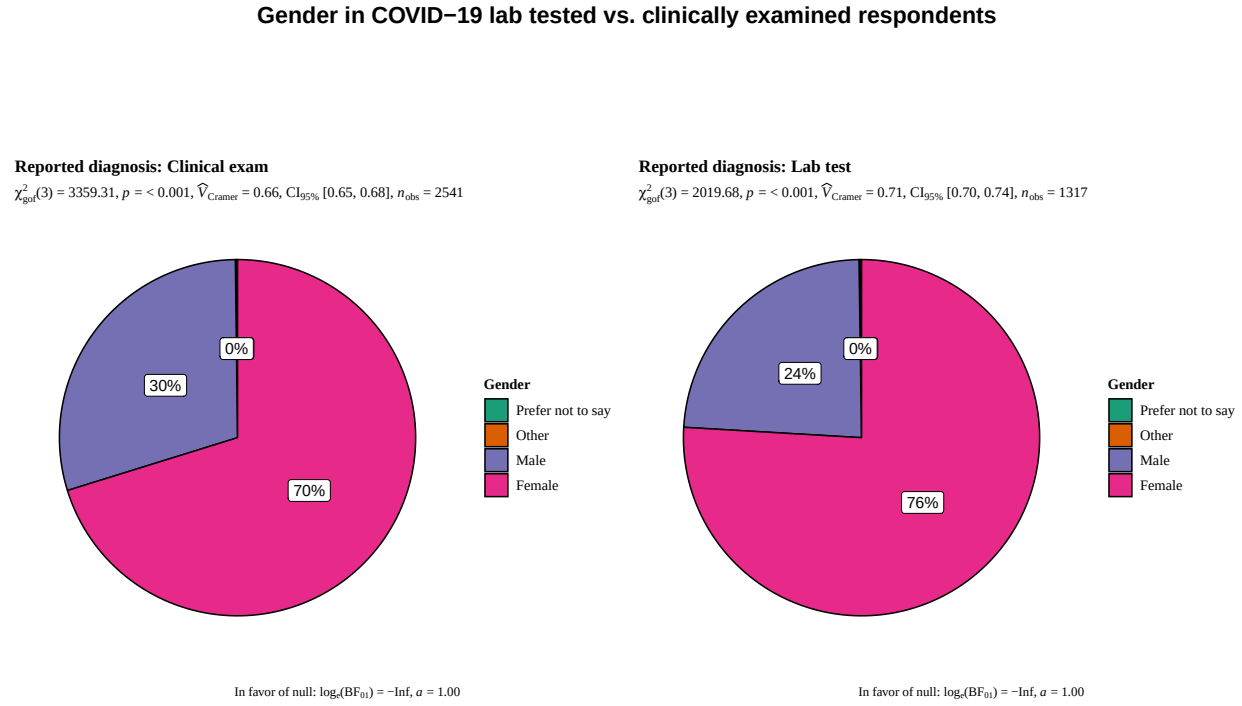
Reported diagnosis: Lab test

M_{robust} = 40.28, $CI_{95\%}$ [39.59, 41.00], p = < 0.001, n_{obs} = 1317



Gender by Group

!!!! Order of labels and color of the scale need adjustment Stats on comparison between groups missing



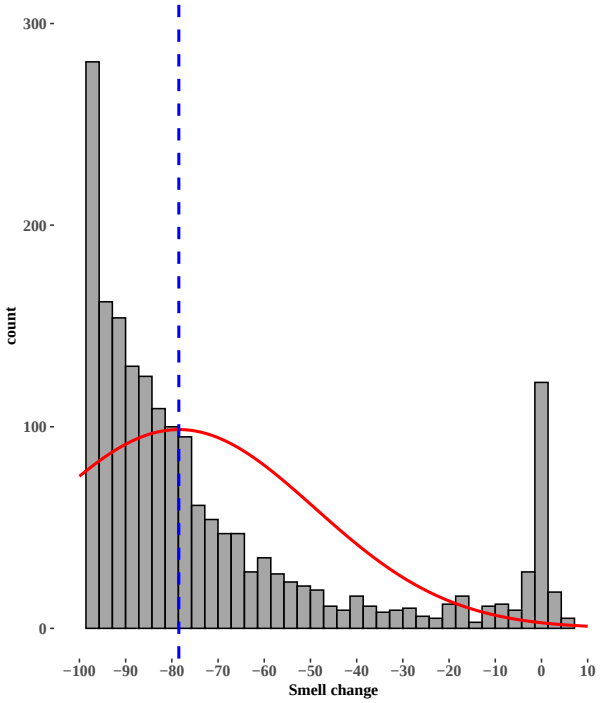
Smell Change by Group

```
## t is large; approximation invoked.
## t is large; approximation invoked.
```

Smell change during − before disease in COVID−19 lab tested vs. clinically examined respondents

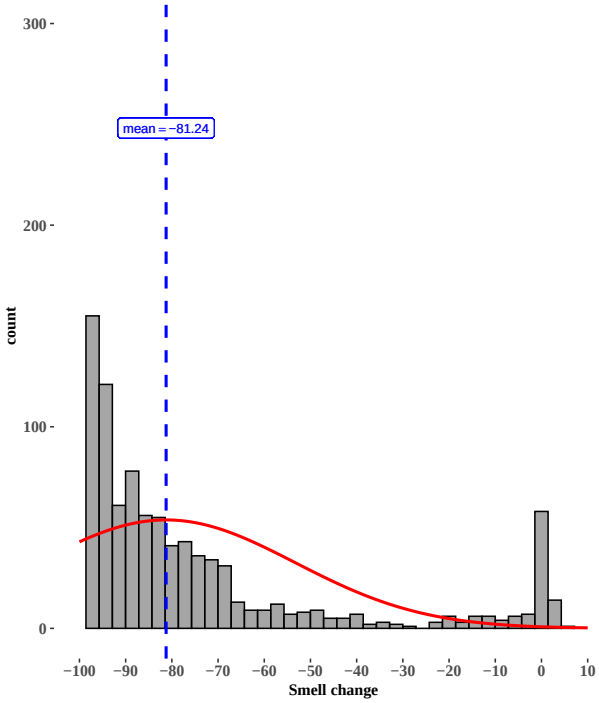
Reported diagnosis: Clinical exam

M_{robust} = −86.76, $CI_{95\%}$ [−87.58, −85.84], p = < 0.001, n_{obs} = 2541

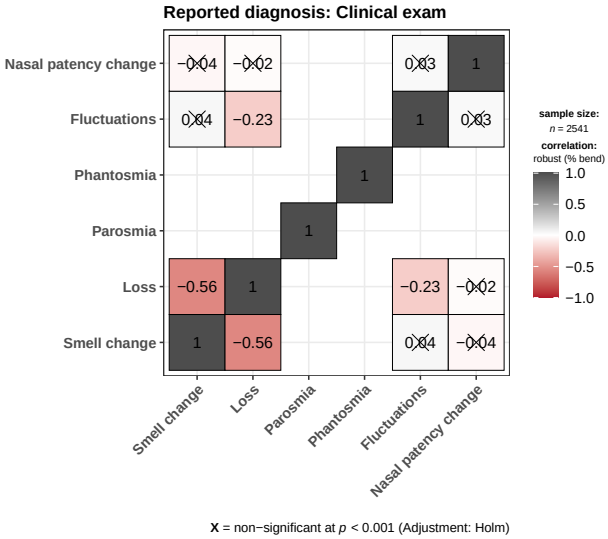


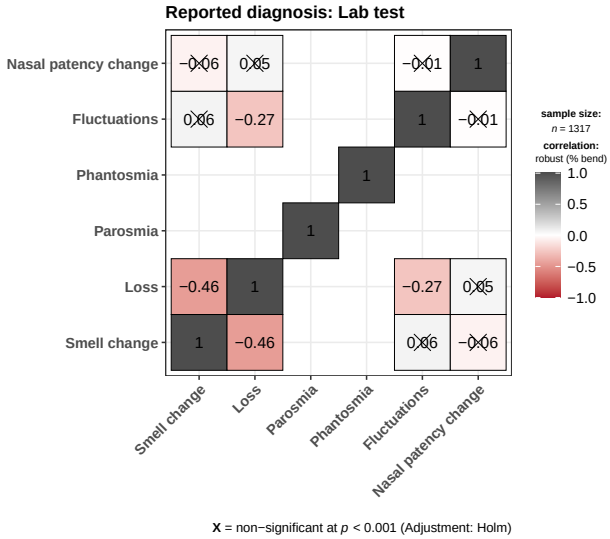
Reported diagnosis: Lab test

M_{robust} = −89.85, $CI_{95\%}$ [−91.03, −88.67], p = < 0.001, n_{obs} = 1317



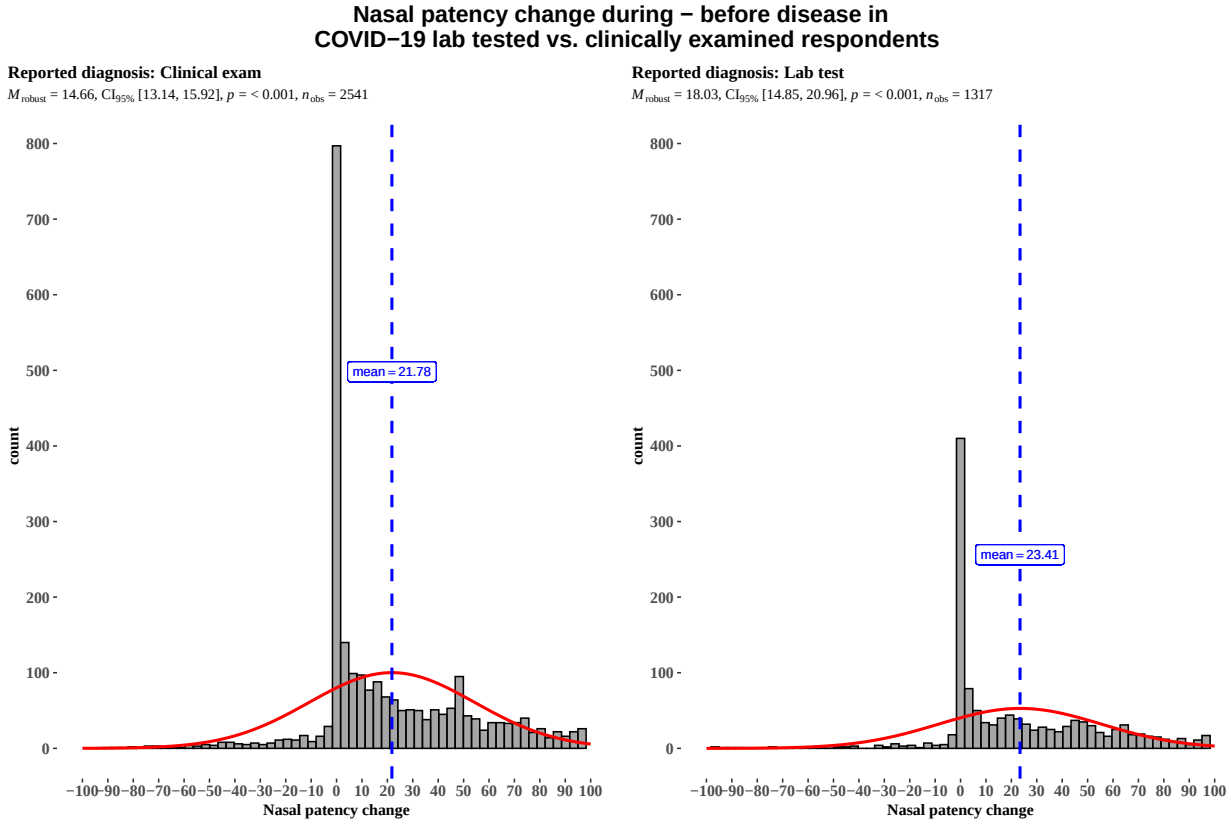
Characterization - Smell change





Nasal Patency Change by Group

```
## t is large; approximation invoked.
## t is large; approximation invoked.
```



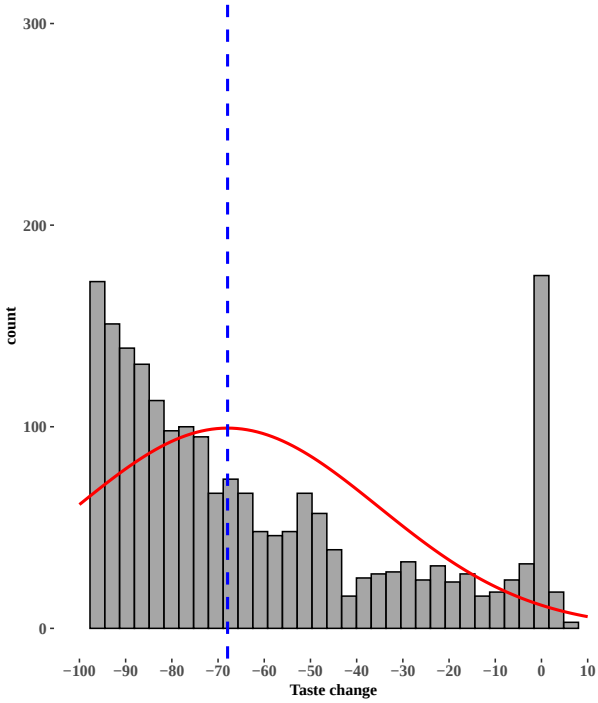
Taste Change by Group

```
## t is large; approximation invoked.
## t is large; approximation invoked.
```

Taste change during − before disease in COVID−19 lab tested vs. clinically examined respondents

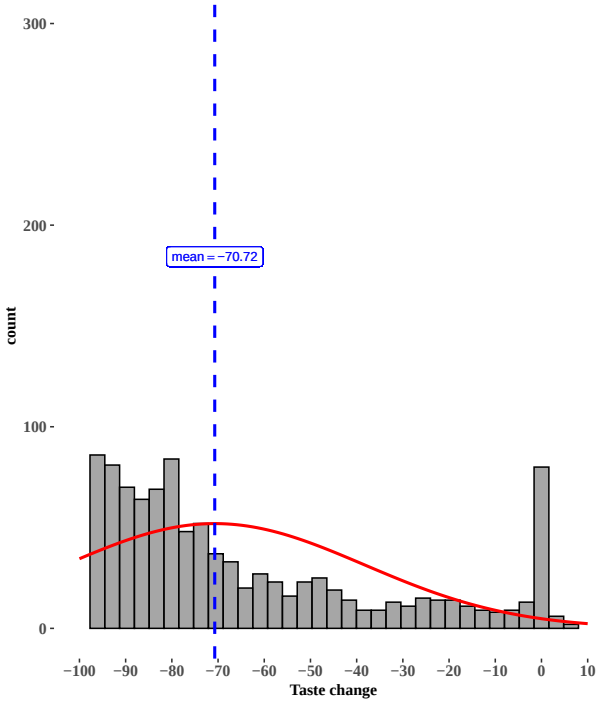
Reported diagnosis: Clinical exam

M_{robust} = −73.12, $CI_{95\%}$ [−74.73, −71.34], p = < 0.001, n_{obs} = 2541

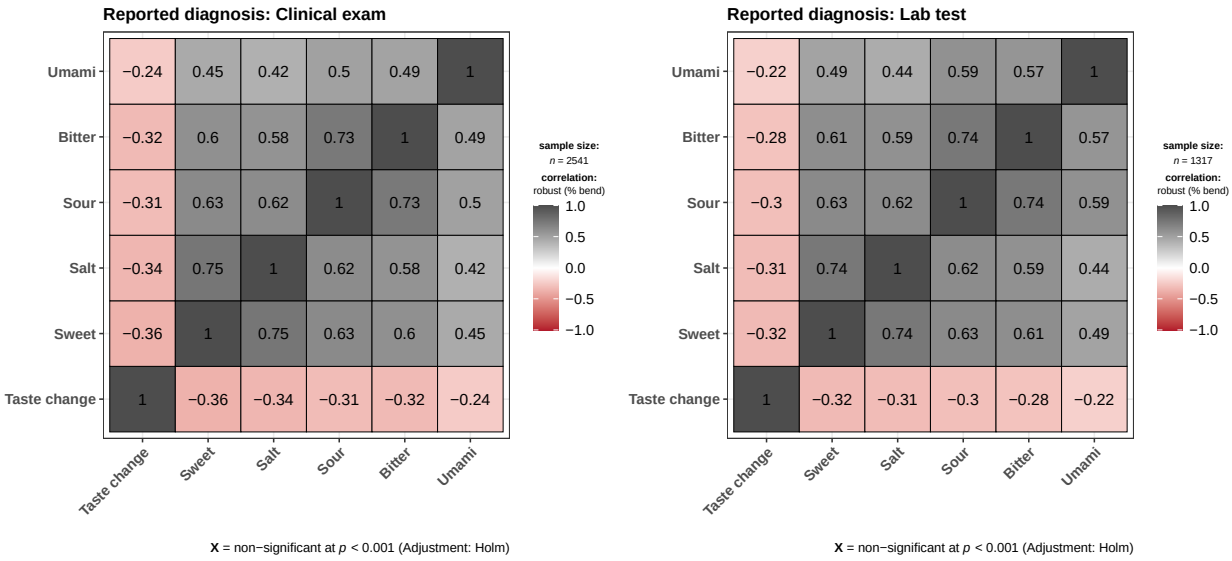


Reported diagnosis: Lab test

M_{robust} = −76.98, $CI_{95\%}$ [−78.60, −75.03], p = < 0.001, n_{obs} = 1317

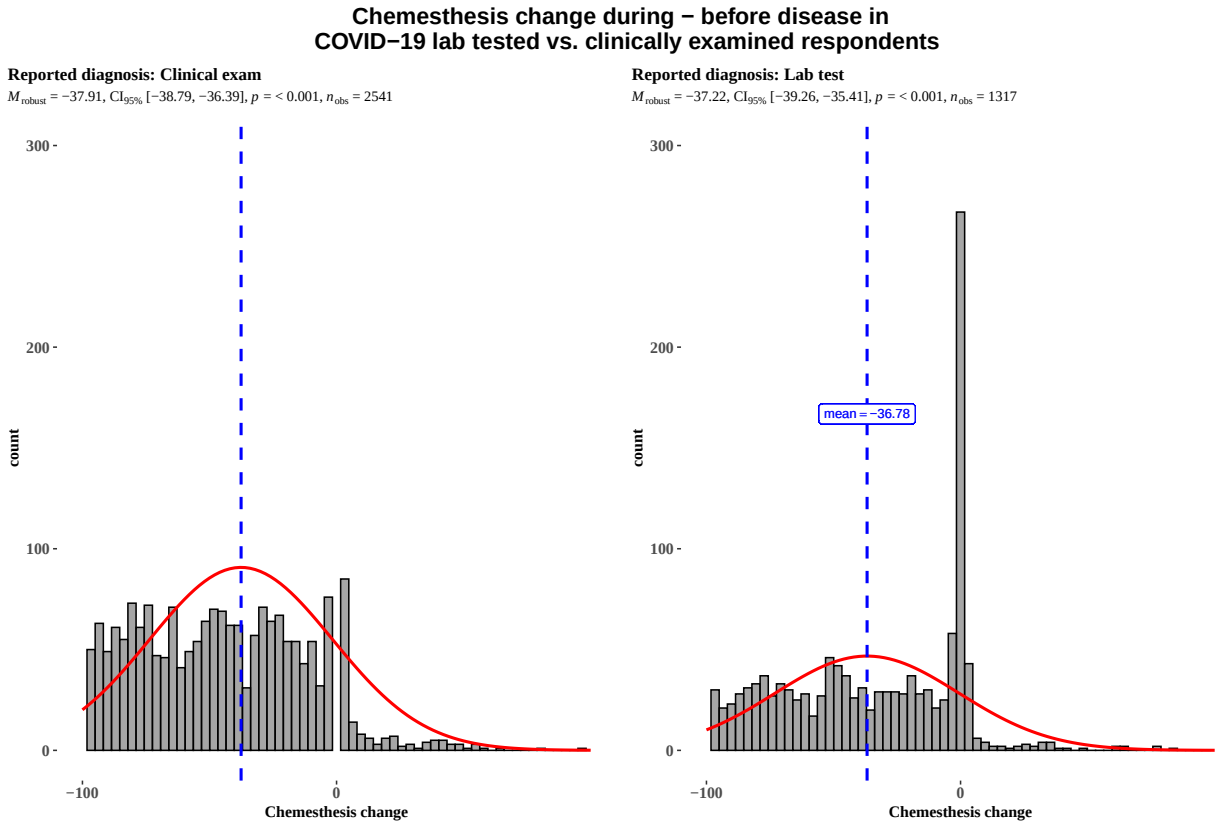


Characterization - Taste change



Chemestesis Change by Group

```
## t is large; approximation invoked.
## t is large; approximation invoked.
```



Bayesian analyses

Age

```
data_GCCR001$Group<-as.numeric(data_GCCR001$Group)
(bfttest_Age <- ttestBF(formula = Age ~ Group, data = data_GCCR001))[1]
```

```
## Bayes factor analysis
## --------------
## [1] Alt., r=0.707 : 0.3555399 ±0%
##
## Against denominator:
##   Null, mu1-mu2 = 0
## ---
## Bayes factor type: BFindepSample, JZS
```

```
#bfttest_smell[1] # Evidence for difference bigger than 0 vs null (no difference)
#bfttest_smell[1] / bfttest_smell[2] # Evidence for difference bigger than 0 vs smaller than zero

#On top of a Theory testing approach, we will quantify the uncertainty about the parameters by sampling
#(bfttest_smell2 <- ttestBF(formula = Smell_change ~ Group, data = data_GCCR001))
#chains_smell = posterior(bfttest_smell2, iterations = 1e4)
#summary(chains_smell[,'beta (1 - 2)'][chains[, 'beta (1 - 2)'] < 0])
#plot(chains_smell[,2])
```

Smell change

```
(bfttest_smell <- ttestBF(formula = Smell_change ~ Group, data = data_GCCR001))[1]
```

```
## Bayes factor analysis
## --------------
## [1] Alt., r=0.707 : 1.917936 ±0%
##
## Against denominator:
##   Null, mu1-mu2 = 0
## ---
## Bayes factor type: BFindepSample, JZS
```

```
#bfttest_smell[1] # Evidence for difference bigger than 0 vs null (no difference)
#bfttest_smell[1] / bfttest_smell[2] # Evidence for difference bigger than 0 vs smaller than zero

#On top of a Theory testing approach, we will quantify the uncertainty about the parameters by sampling
#(bfttest_smell2 <- ttestBF(formula = Smell_change ~ Group, data = data_GCCR001))
#chains_smell = posterior(bfttest_smell2, iterations = 1e4)
#summary(chains_smell[,'beta (1 - 2)'][chains[, 'beta (1 - 2)'] < 0])
#plot(chains_smell[,2])
```

Nasal patency

```
#(bfttest_nasalpatency <- ttestBF(formula = Nasal_Patency_change ~ Group, data = data_GCCR001))[1]
#bfttest_nasalpatency[1] # Evidence for difference bigger than 0 vs null (no difference)
#bfttest_nasalpatency[1] / bfttest_nasalpatency[2] # Evidence for difference bigger than 0 vs smaller t

#On top of a Theory testing approach, we will quantify the uncertainty about the parameters by sampling
#(bfttest_nasalpatency2 <- ttestBF(formula = Nasal_Patency_change ~ Group, data = data_GCCR001))
#chains_nasalpatency = posterior(bfttest_nasalpatency2, iterations = 1e4)
#summary(chains_nasalpatency[,'beta (1 - 2)'][chains[, 'beta (1 - 2)'] < 0])
#plot(chains_nasalpatency[,2])
```

Taste change

```
(bfttest_taste <- ttestBF(formula = Taste_change ~ Group, data = data_GCCR001))[1]
```

```
## Bayes factor analysis
## --------------
## [1] Alt., r=0.707 : 0.8917328 ±0%
##
## Against denominator:
##   Null, mu1-mu2 = 0
## ---
## Bayes factor type: BFindepSample, JZS
```

```r
#bfttest_taste[1] # Evidence for difference bigger than 0 vs null (no difference)
#bfttest_taste[1] / bfttest_taste[2] # Evidence for difference bigger than 0 vs smaller than zero

#On top of a Theory testing approach, we will quantify the uncertainty about the parameters by sampling
#(bfttest_taste2 <- ttestBF(formula = Taste_change ~ Group, data = data_GCCR001))
#chains_taste = posterior(bfttest_taste2, iterations = 1e4)
#summary(chains_taste[,'beta (1 - 2)'][chains[, 'beta (1 - 2)'] < 0])
#plot(chains_taste[,2])
```

Chemesthesis change

```r
(bfttest_chemesthesis <- ttestBF(formula = Chemesthesis_change ~ Group, data = data_GCCR001))[1]
```

```
## Bayes factor analysis
## --------------
## [1] Alt., r=0.707 : 0.04687988 ±0%
##
## Against denominator:
##   Null, mu1-mu2 = 0
## ---
## Bayes factor type: BFindepSample, JZS
```

```r
#bfttest_chemesthesis[1] # Evidence for difference bigger than 0 vs null (no difference)
#bfttest_chemesthesis[1] / bfttest_chemesthesis[2] # Evidence for difference bigger than 0 vs smaller t

#On top of a Theory testing approach, we will quantify the uncertainty about the parameters by sampling
#(bfttest_chemesthesis2 <- ttestBF(formula = Chemesthesis_change ~ Group, data = data_GCCR001))
#chains_chemesthesis = posterior(bfttest_chemesthesis2, iterations = 1e4)
#summary(chains_chemesthesis[,'beta (1 - 2)'][chains[, 'beta (1 - 2)'] < 0])
#plot(chains_chemesthesis[,2])
```

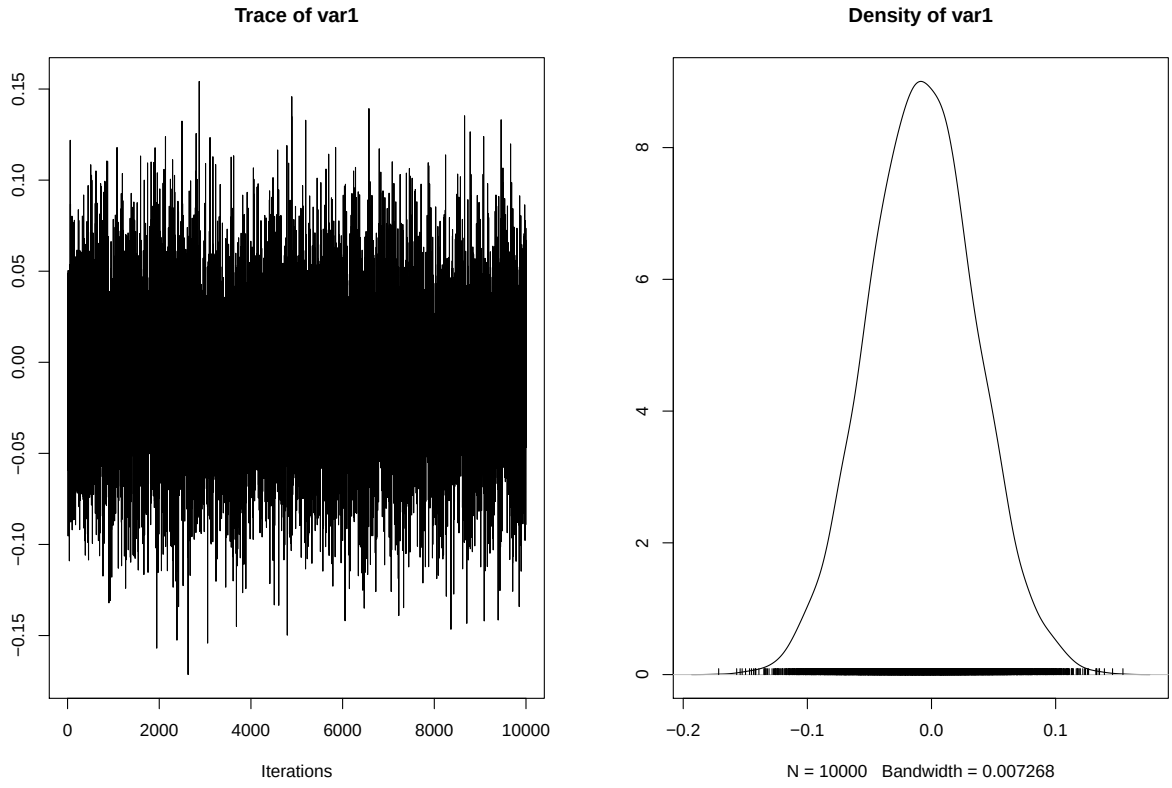
Smell nasal patency effect

!!! Computationally intense with random factor

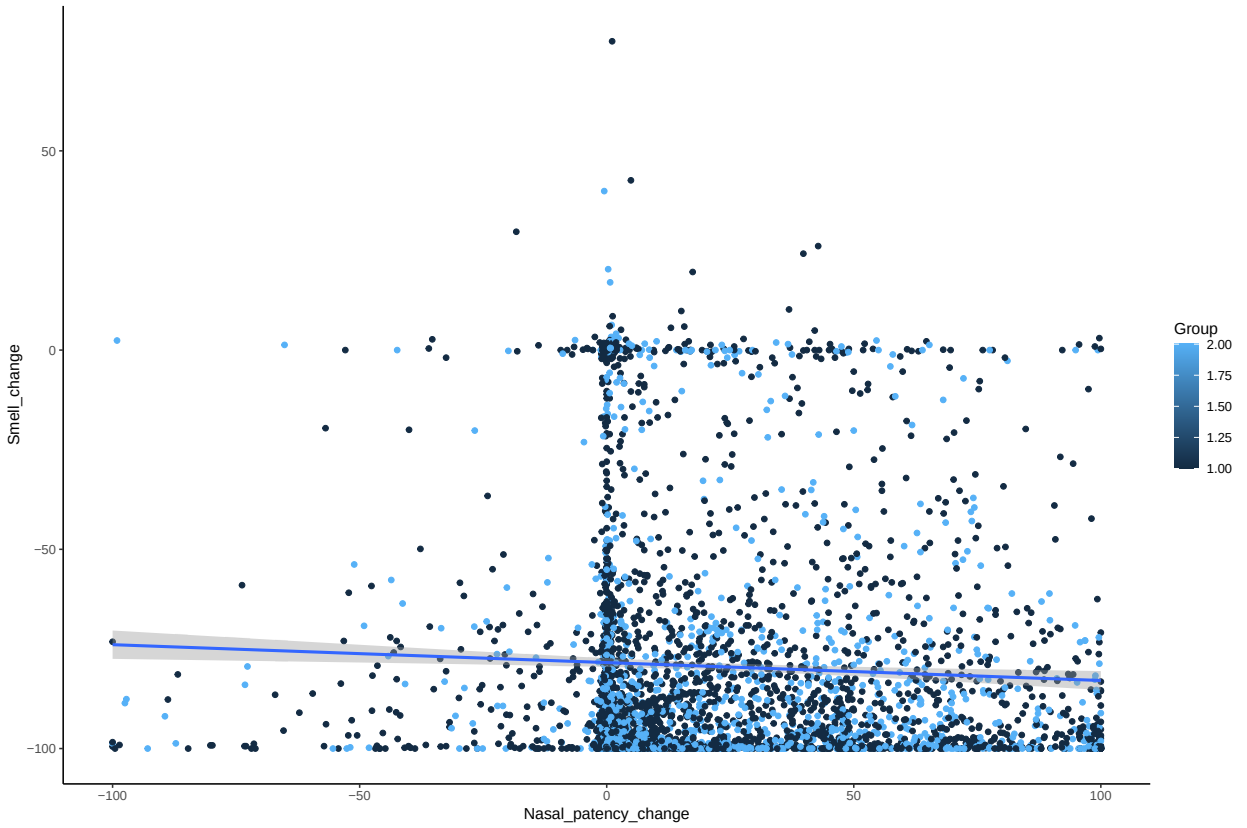
```
## Bayes factor analysis
## --------------
## [1] Nasal_patency_change + Group + Nasal_patency_change:Group : 0.1038786 ±0.01%
##
## Against denominator:
##   Smell_change ~ Nasal_patency_change + Group
## ---
## Bayes factor type: BFlinearModel, JZS

## Bayes factor analysis
## --------------
## [1] Nasal_patency_change + Group + Nasal_patency_change:Group : 0.1038786 ±0.01%
##
## Against denominator:
```

```
##   Smell_change ~ Nasal_patency_change + Group
## ---
## Bayes factor type: BFlinearModel, JZS
```




```
## `geom_smooth()` using formula 'y ~ x'
```


Smell_change
50
0
−50
−100
−100
−50
0
50
100
Nasal_patency_change
Group
2.00
1.75
1.50
1.25
1.00