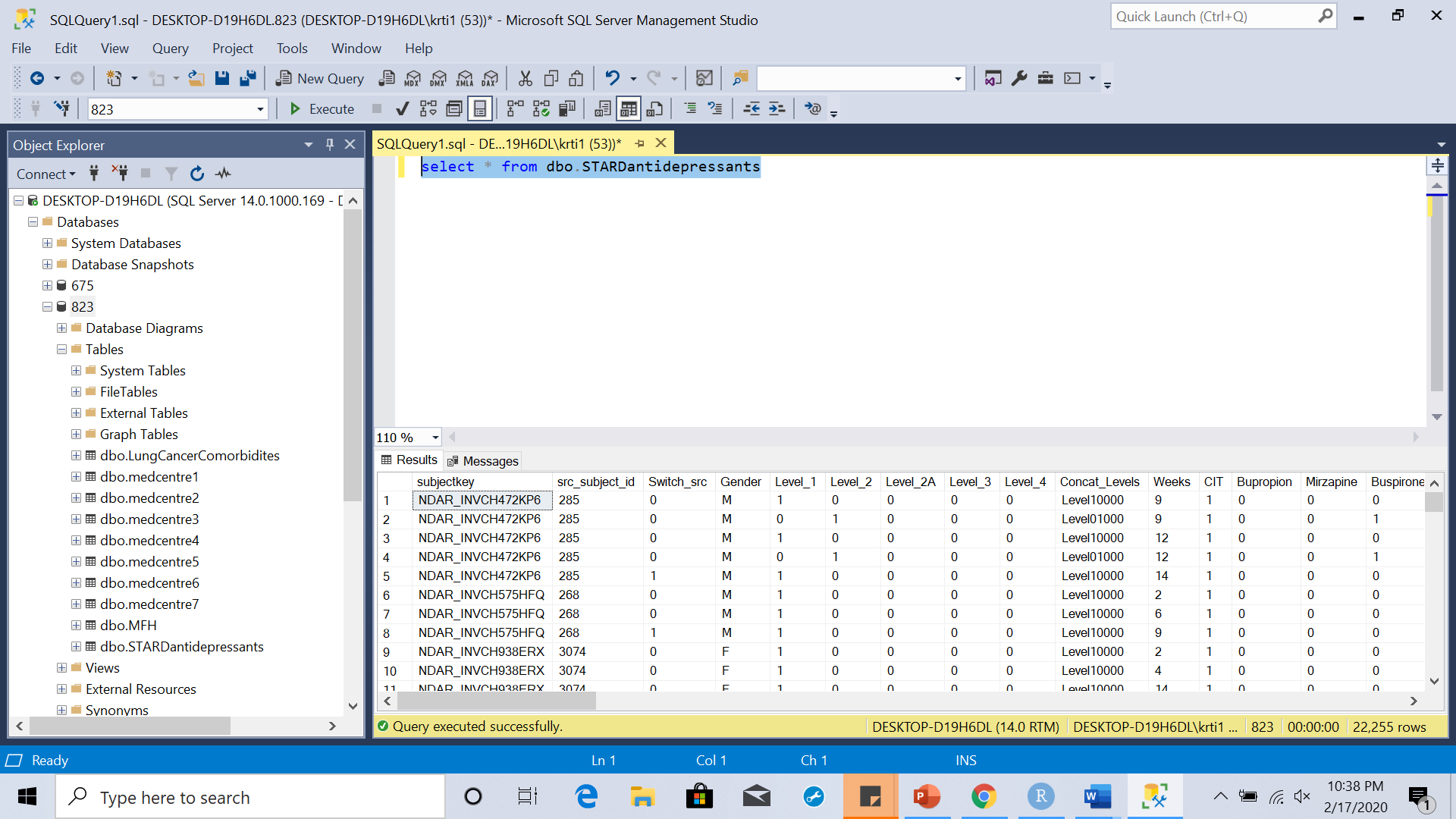
------------------------------------------------------------------------------------------------------------------------------------------Qu**estion 3:** The objective of this analysis is to find response to antidepressants.  You can select one of the antidepressants.

1. These data come from STAR\*D experiment conducted by National Institute of Medicine. Read about the study protocol. [**Protocol►**](http://www.edc.gsph.pitt.edu/stard/public/Protocol/)
2. Download data.  Use instructor's last name as password.  [**Data►**](http://openonlinecourses.com/causalanalysis/effectiveness%20of%20antidepressants.xlsx)
3. The data are report bi-weekly or monthly.  There are 22,254 records for about 4,000 patients. Organize the data so there is one row for each patient.    [**SQL►**](http://openonlinecourses.com/causalanalysis/SQLCodeCleanAntidepressantData.docx)
   * **Focus:** The enclosed data report on citalopram, bupropion, mirzapine, buspirone, lithium, nortriptyline, sertraline, thyroid, tranylclypromine, and venlafaxine.  Please focus the analysis on only one of the antidepressants or a combination of two antidepressants taken simultaneously.    For the time being ignore the dose of the medication.
   * **Exclusions**: Patients who did not receive bupropion are assumed to have received the alternative antidepressant.  The unit of the analysis is antidepressant trials and not necessary unique person.  So the ID that should be used is the combination of patient ID and Concat\_Levels.
   * **Treatment:**If the patient has taken the antidepressant at any time during the study period, then mark it as 1, otherwise 0. Notice that some patients have taken the medication and others have not.  Within the combination of ID and Concat\_levels look for any occasion of use of bupropion.
   * **Covariates:**For the covariates, include gender, risk of suicide, heart, vascular, haematopoietic, eyes ears nose throat larynx, gastrointestinal, renal, genitourinary, musculoskeletal Integument, neurological, psychiatric illness, respiratory, liver, endocrine, alcohol, amphetamine, cannibis use, opioid use, panic, specific phobia, social phobia, OCD, PTSD, anxiety, borderline personality, dependent personality, antisocial personality, paranoid personality, personality disorder, anorexia, bulimia, and cocaine use.  If the covariate is ever present assume that it is present. Exclude covariates that are not present for any of the patients.  Combine covariates that occur occasionally.
   * **Outcome:**The medication is considered to have caused the remission, if while on the medication, the patient is discharged to follow-up portion of the study, then "Treatment\_plan\_equal\_3" is set to 1.  Use "Treatment\_Plan\_Equal\_3" and not "Remission" variable as an indication of effectiveness of the antidepressant, since the remission variable does not indicate that the clinician was in agreement that the patients symptoms are well managed.

Solution:

select \* from dbo.STARDantidepressants



SELECT [subjectkey],[src\_subject\_id],[Switch\_src],[Gender],[Level\_1],[Level\_2],[Level\_2A]

,[Level\_3] ,[Level\_4],[Concat\_Levels]

,cast (weeks as float) as weeks

,cast (CIT as int) as Citalopram

,cast (Bupropion as int) as Bupropion

, cast (Mirzapine as int) as Mirzapine

, cast (Buspirone as int) as Buspirone

, cast (Lithium as int) as Lithium

, cast (Nortriptyline as int) as Nortriptyline

, cast (Sertraline as int) as Sertraline

, cast (Thyroid as int) as Thyroid

, cast (Tranylclypromine as int) as Tranylclypromine

, cast (Venlafaxine as int) as Venlafaxine

, [Concat]

, cast (Switches as int) as Switches

,cast (Patient\_Switch as int) as Patient\_Switch

,cast (Switches\_PerPatient as int) as Switches\_PerPatient

,[Med1\_dosage]

,[Med2\_dosage]

,[Med3\_dosage]

,[Med4\_dosage]

,cast (Treatment\_plan\_equal\_3 as int) as Treatment\_plan\_equal\_3

,cast (RiskOfSuicide as int) as RiskOfSuicide

,cast (Remission as int) as Remission

,cast (Heart as int) as Heart

,cast (Vascular as int) as Vascular

,cast (Haematopoietic as int) as Haematopoietic

,cast (Eyes\_Ears\_Nose\_Throat\_Larynx as int) as Eyes\_Ears\_Nose\_Throat\_Larynx

,cast (Gastrointestinal as int) as Gastrointestinal

,cast (Renal as int) as Renal

,cast (Genitourinary as int) as Genitourinary

,cast (Musculoskeletal\_Integument as int) as Musculoskeletal\_Integument

,cast (Neurological as int) as Neurological

,cast (Psychiatric\_Illness as int) as Psychiatric\_Illness

,cast (Respiratory as int) as Respiratory

,cast (Liver as int) as Liver

,cast (Endocrine as int) as Endocrine

,cast (Alcohol as int) as Alcohol

,cast (Amphetamine as int) as Amphetamine

,cast (Cannibis as int) as Cannibis

,cast (Opioid as int) as Opioid

,cast (Panic as int) as Panic

,cast (Specific\_Phobia as int) as Specific\_Phobia

,cast (Social\_Phobia as int) as Social\_Phobia

,cast (OCD as int) as OCD

,cast (PTSD as int) as PTSD

,cast (Anxiety as int) as Anxiety

,cast (Borderline\_Personality as int) as Borderline\_Personality

,cast (Dependent\_Personality as int) as Dependent\_Personality

,cast (Antisocial\_Personality as int) as Antisocial\_Personality

,cast (Paranoid\_Personality as int) as Paranoid\_Personality

,cast (Personality\_Disorder as int) as Personality\_Disorder

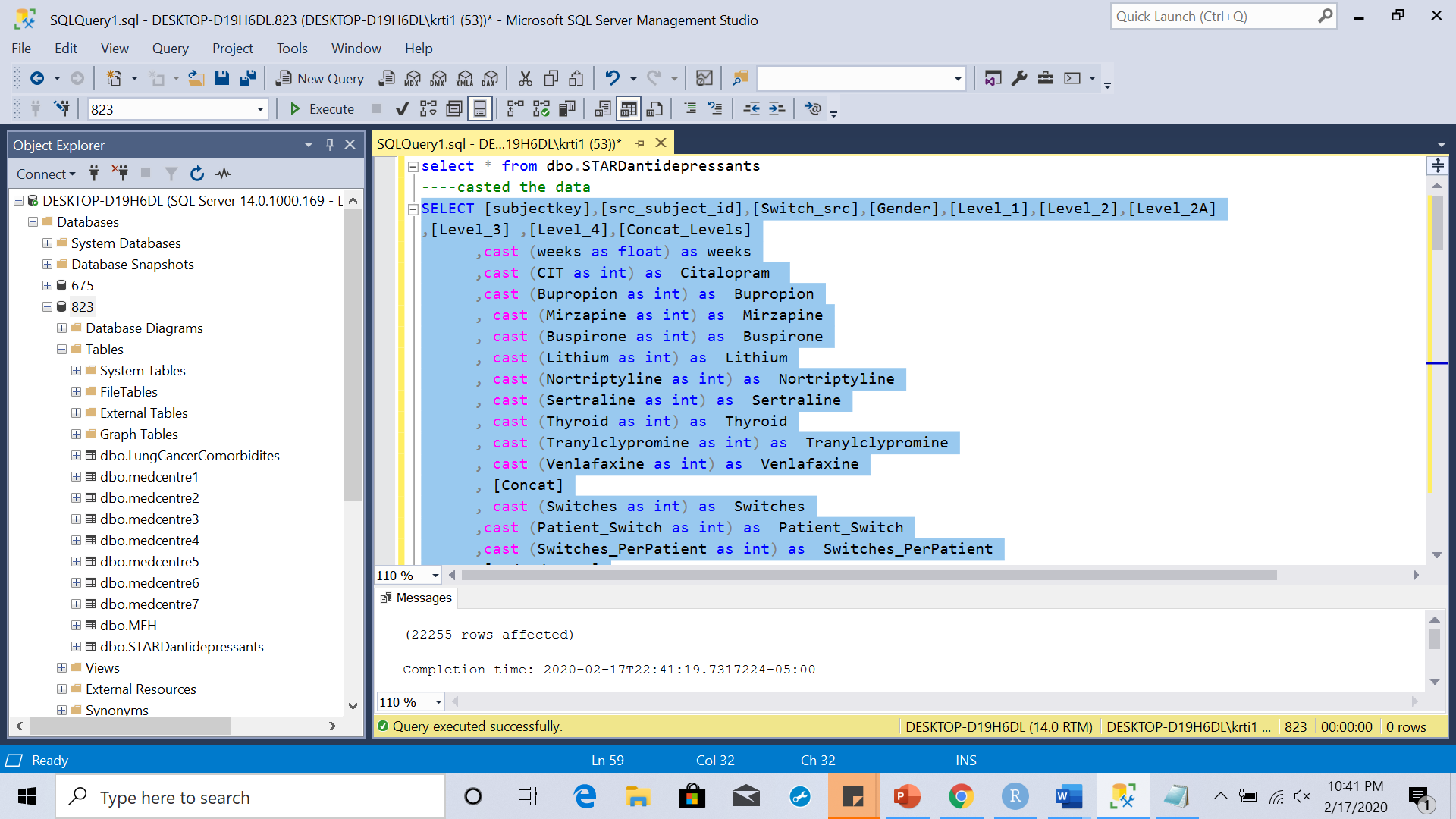
,cast (Anorexia as int) as Anorexia

,cast (Bulimia as int) as Bulimia

,cast (Cocaine as int) as Cocaine

into #cast

FROM dbo.STARDantidepressants



SELECT src\_subject\_id as id,concat([Concat],Concat\_Levels) as Med, concat, concat\_levels

,Max(Citalopram) as Citalopram

, Max(CAST([Treatment\_plan\_equal\_3] AS FLOAT)) as Remission

, CASE WHEN Sum([RiskOfSuicide])=0 THEN 0 ELSE 1 END AS [RiskOfSuicide]

, CASE WHEN Sum([Heart])=0 THEN 0 ELSE 1 END AS [Heart]

, CASE WHEN Sum([Vascular])=0 THEN 0 ELSE 1 END AS [vascular]

, CASE WHEN Sum([Haematopoietic])=0 THEN 0 ELSE 1 END AS [Haematopoietic]

, CASE WHEN Sum([Eyes\_Ears\_Nose\_Throat\_Larynx])=0 THEN 0 ELSE 1 END AS [Eyes\_Ears\_Nose\_Throat\_Larynx]

, CASE WHEN Sum([Gastrointestinal])=0 THEN 0 ELSE 1 END AS [Gastrointestinal]

, CASE WHEN Sum([Renal])=0 THEN 0 ELSE 1 END AS [Renal]

, CASE WHEN Sum([Genitourinary])=0 THEN 0 ELSE 1 END AS [Genitourinary]

, CASE WHEN Sum([Musculoskeletal\_Integument])=0 THEN 0 ELSE 1 END AS [Musculoskeletal\_Integument]

, CASE WHEN Sum([Neurological])=0 THEN 0 ELSE 1 END AS [Neurological]

, CASE WHEN Sum([Psychiatric\_Illness])=0 THEN 0 ELSE 1 END AS [Psychiatric\_Illness]

, CASE WHEN Sum([Respiratory])=0 THEN 0 ELSE 1 END AS [Respiratory]

, CASE WHEN Sum([Liver])=0 THEN 0 ELSE 1 END AS [Liver]

, CASE WHEN Sum([Endocrine])=0 THEN 0 ELSE 1 END AS [Endocrine]

, CASE WHEN Sum([Alcohol])=0 THEN 0 ELSE 1 END AS [Alcohol]

, CASE WHEN Sum([Amphetamine])=0 THEN 0 ELSE 1 END AS [Amphetamine]

, CASE WHEN Sum([Cannibis])=0 THEN 0 ELSE 1 END AS [Cannibis]

, CASE WHEN Sum([Opioid])=0 THEN 0 ELSE 1 END AS [Opioid]

, CASE WHEN Sum([Panic])=0 THEN 0 ELSE 1 END AS [Panic]

, CASE WHEN Sum([Specific\_Phobia])=0 THEN 0 ELSE 1 END AS [Specific\_Phobia]

, CASE WHEN Sum([OCD])=0 THEN 0 ELSE 1 END AS [OCD]

, CASE WHEN Sum([PTSD])=0 THEN 0 ELSE 1 END AS [PTSD]

, CASE WHEN Sum([Anxiety])=0 THEN 0 ELSE 1 END AS [Anxiety]

, CASE WHEN Sum([Borderline\_Personality])=0 THEN 0 ELSE 1 END AS [Borderline\_Personality]

, CASE WHEN Sum([Dependent\_Personality])=0 THEN 0 ELSE 1 END AS [Dependent\_Personality]

, CASE WHEN Sum([Antisocial\_Personality])=0 THEN 0 ELSE 1 END AS [Antisocial\_Personality]

, CASE WHEN Sum([Paranoid\_Personality])=0 THEN 0 ELSE 1 END AS [Paranoid\_Personality]

, CASE WHEN Sum([Personality\_Disorder])=0 THEN 0 ELSE 1 END AS [Personality\_Disorder]

, CASE WHEN Sum([Anorexia])=0 THEN 0 ELSE 1 END AS [Anorexia]

, CASE WHEN Sum([Bulimia])=0 THEN 0 ELSE 1 END AS [Bulimia]

, CASE WHEN Sum([Cocaine])=0 THEN 0 ELSE 1 END AS [Cocaine]

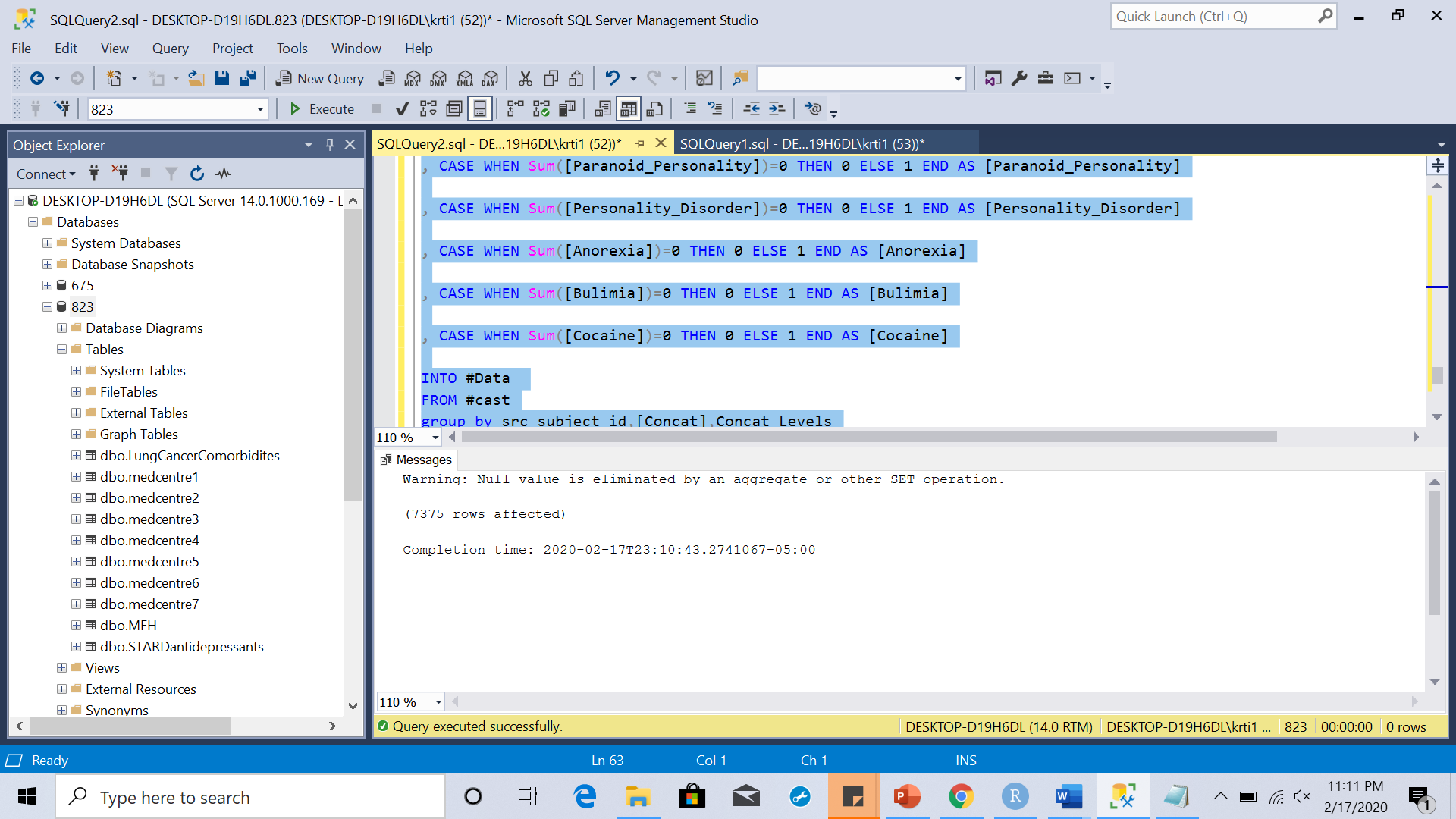
INTO #Data

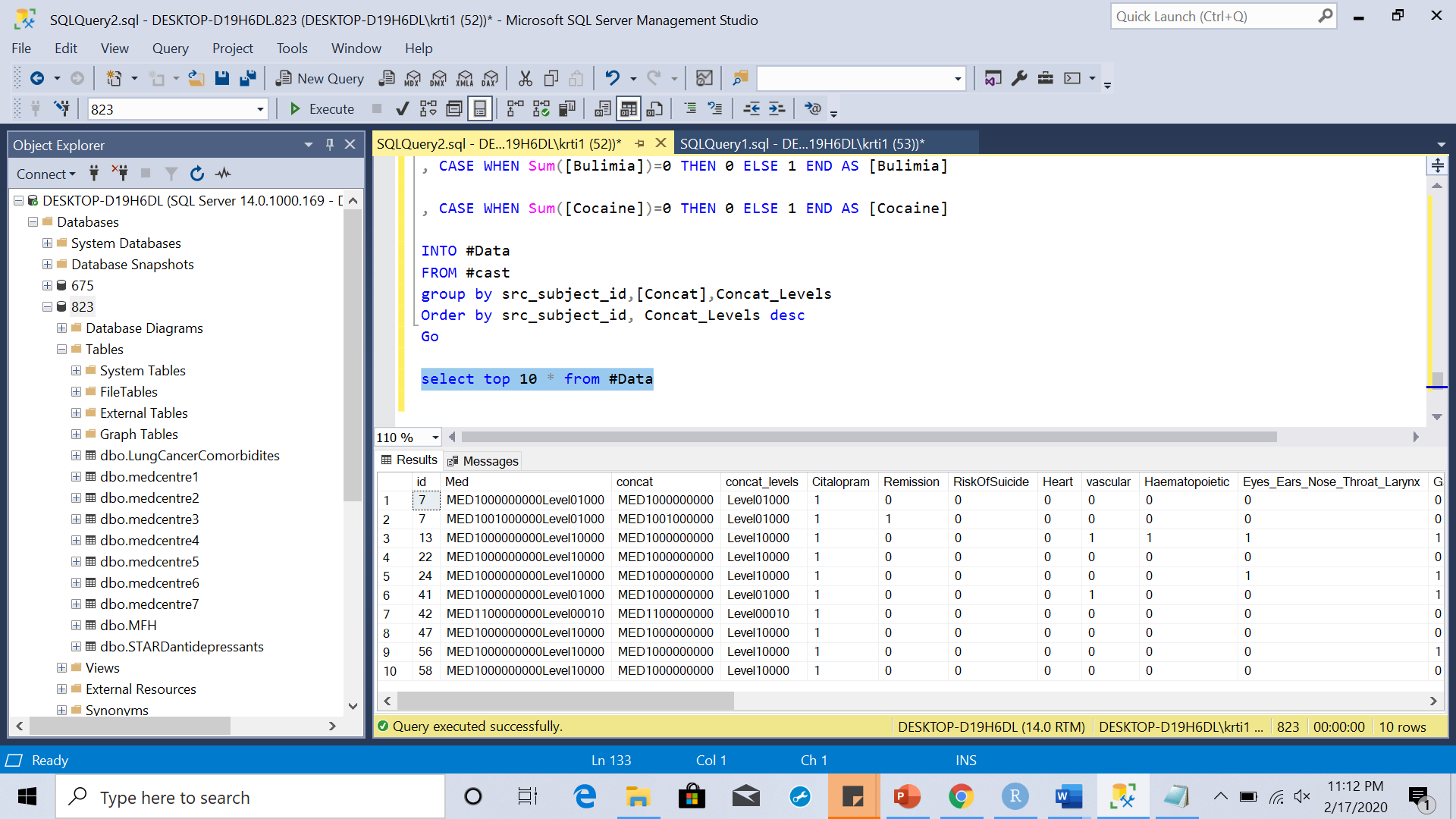
FROM #cast

group by src\_subject\_id,[Concat],Concat\_Levels

Order by src\_subject\_id, Concat\_Levels desc

Go





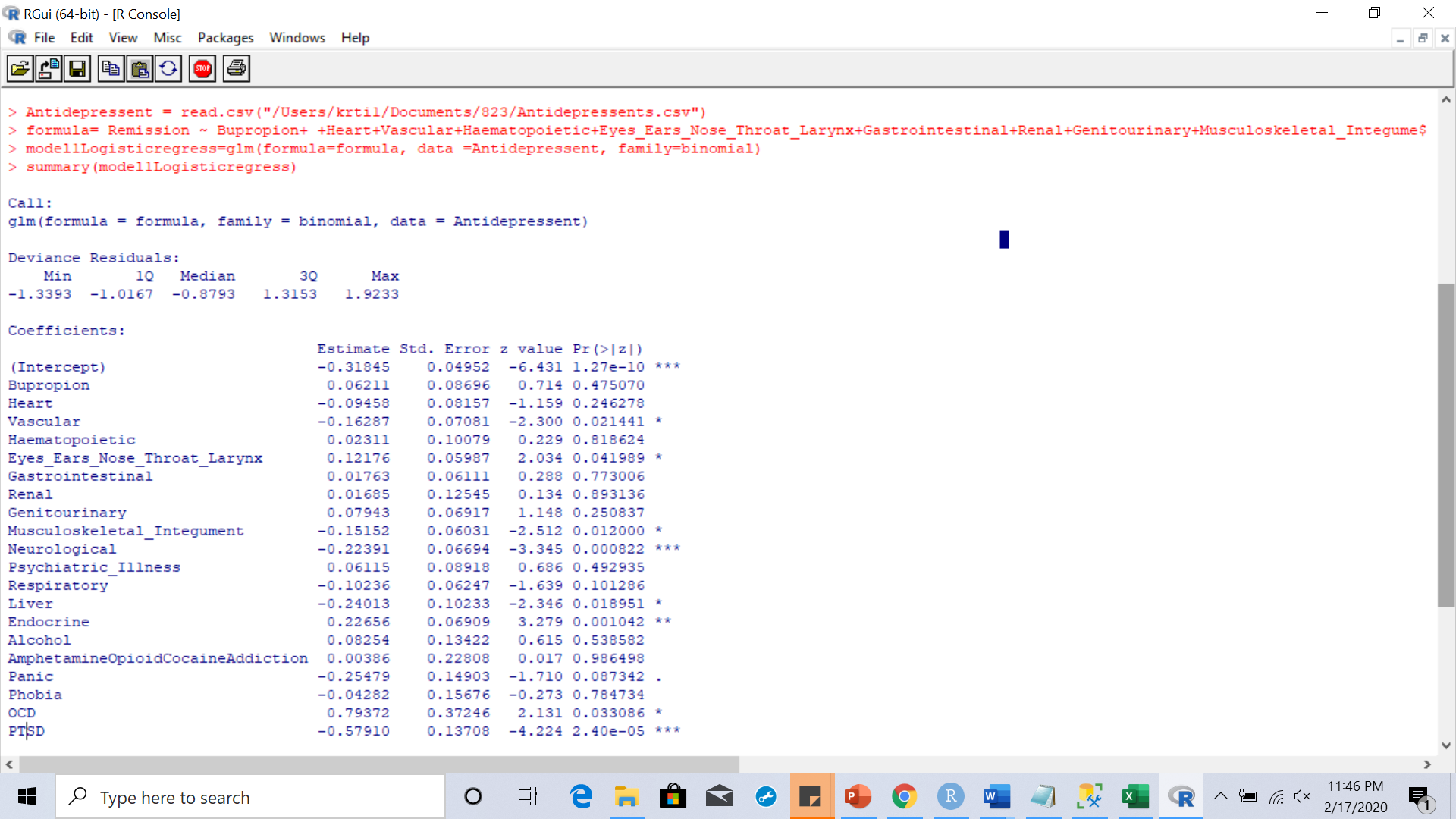
Rcode:

> Antidepressent = read.csv("/Users/krti1/Documents/823/Antidepressents.csv")

> formula= Remission ~ Bupropion+ +Heart+Vascular+Haematopoietic+Eyes\_Ears\_Nose\_Throat\_Larynx+Gastrointestinal+Renal+Genitourinary+Musculoskeletal\_Integument+Neurological+Psychiatric\_Illness+Respiratory+Liver+Endocrine+Alcohol+AmphetamineOpioidCocaineAddiction+Panic+Phobia+OCD+PTSD+Anxiety+Personality

> model1Logisticregress=glm(formula=formula, data =Antidepressent, family=binomial)

> summary(model1Logisticregress)

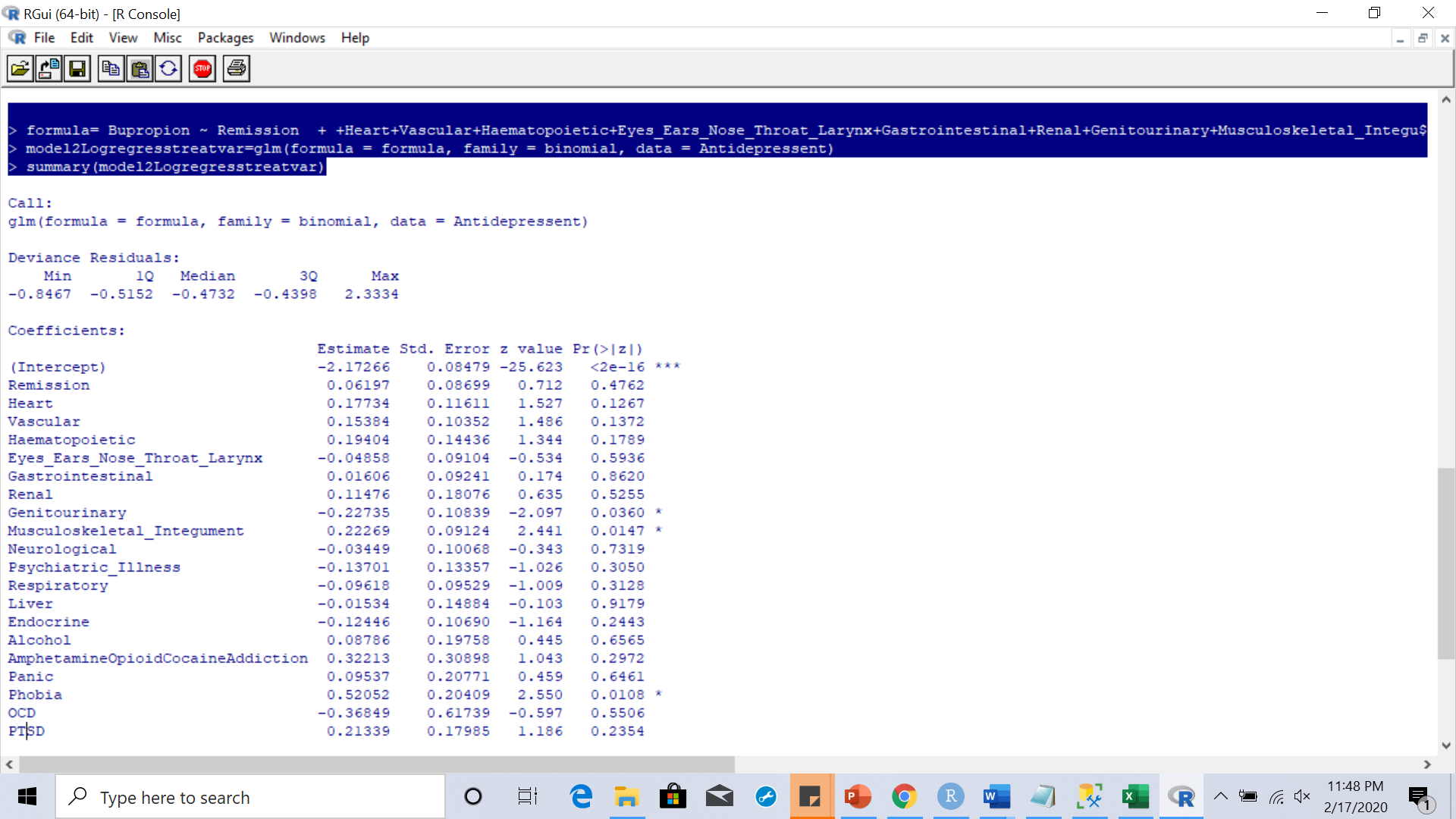


**run model to see the significance of variables using logistic regression with outcome variable (Bupropion)**

> formula= Bupropion ~ Remission + +Heart+Vascular+Haematopoietic+Eyes\_Ears\_Nose\_Throat\_Larynx+Gastrointestinal+Renal+Genitourinary+Musculoskeletal\_Integument+Neurological+Psychiatric\_Illness+Respiratory+Liver+Endocrine+Alcohol+AmphetamineOpioidCocaineAddiction+Panic+Phobia+OCD+PTSD+Anxiety+Personality

> model2Logregresstreatvar=glm(formula = formula, family = binomial, data = Antidepressent)

> summary(model2Logregresstreatvar)

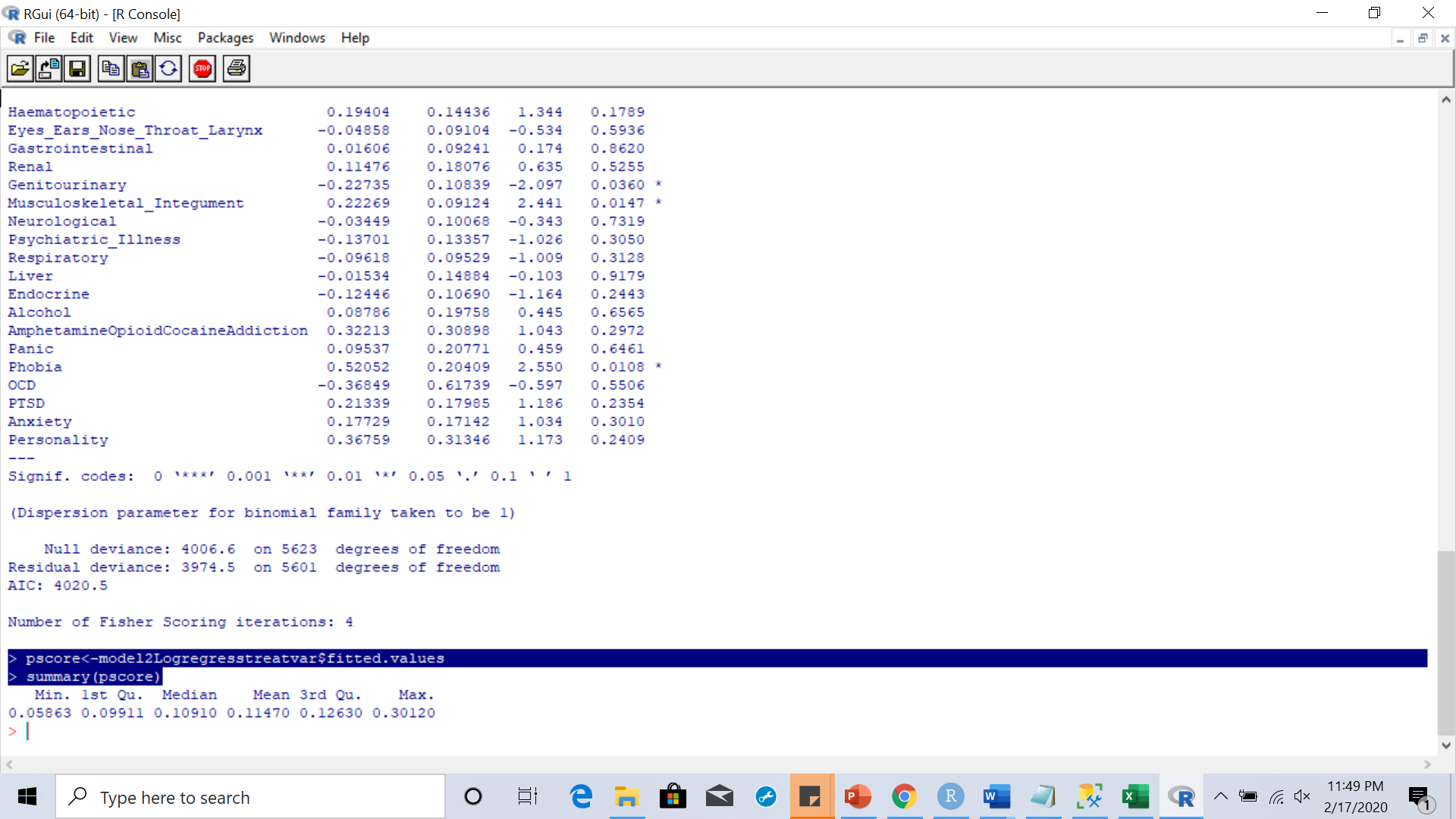


Create Propensity score

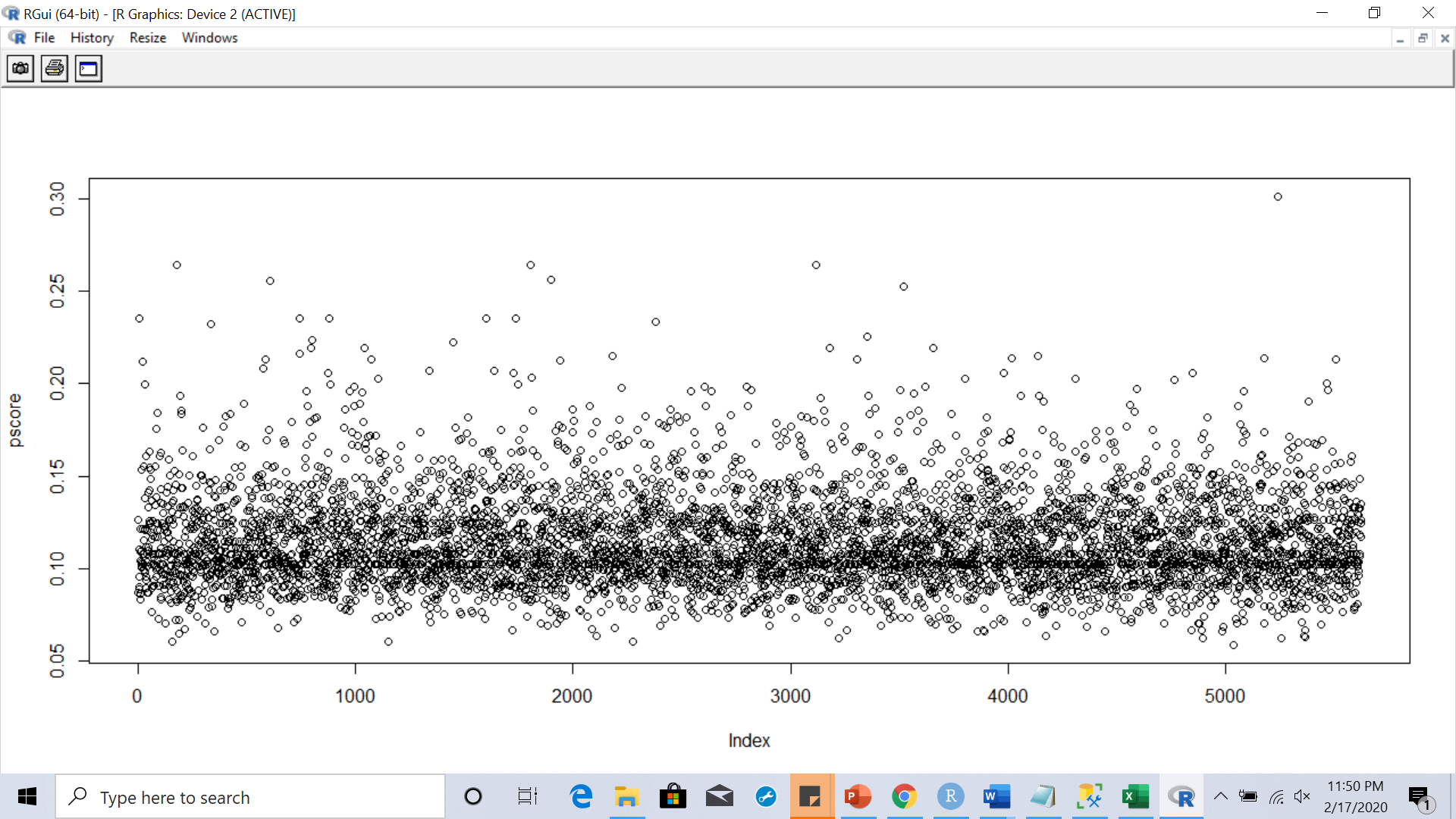
**We can create propensity score model using fitted score**

> pscore<-model2Logregresstreatvar$fitted.values

> summary(pscore)



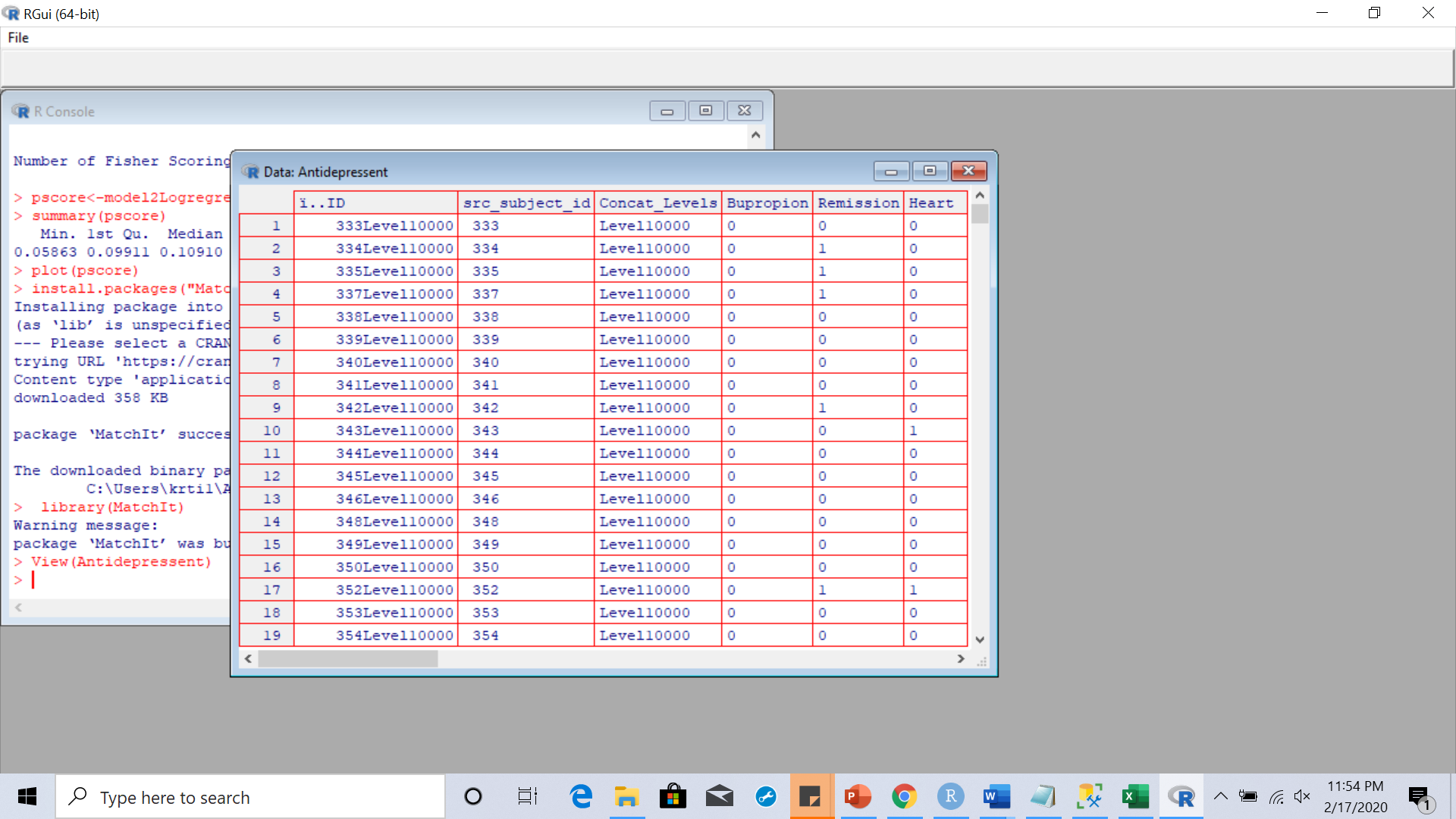
plot(pscore)



**Using matchit function find matching observation with treatment and control group. I’ve put the codes but unable to read the results for matching.**

> library(MatchIt)

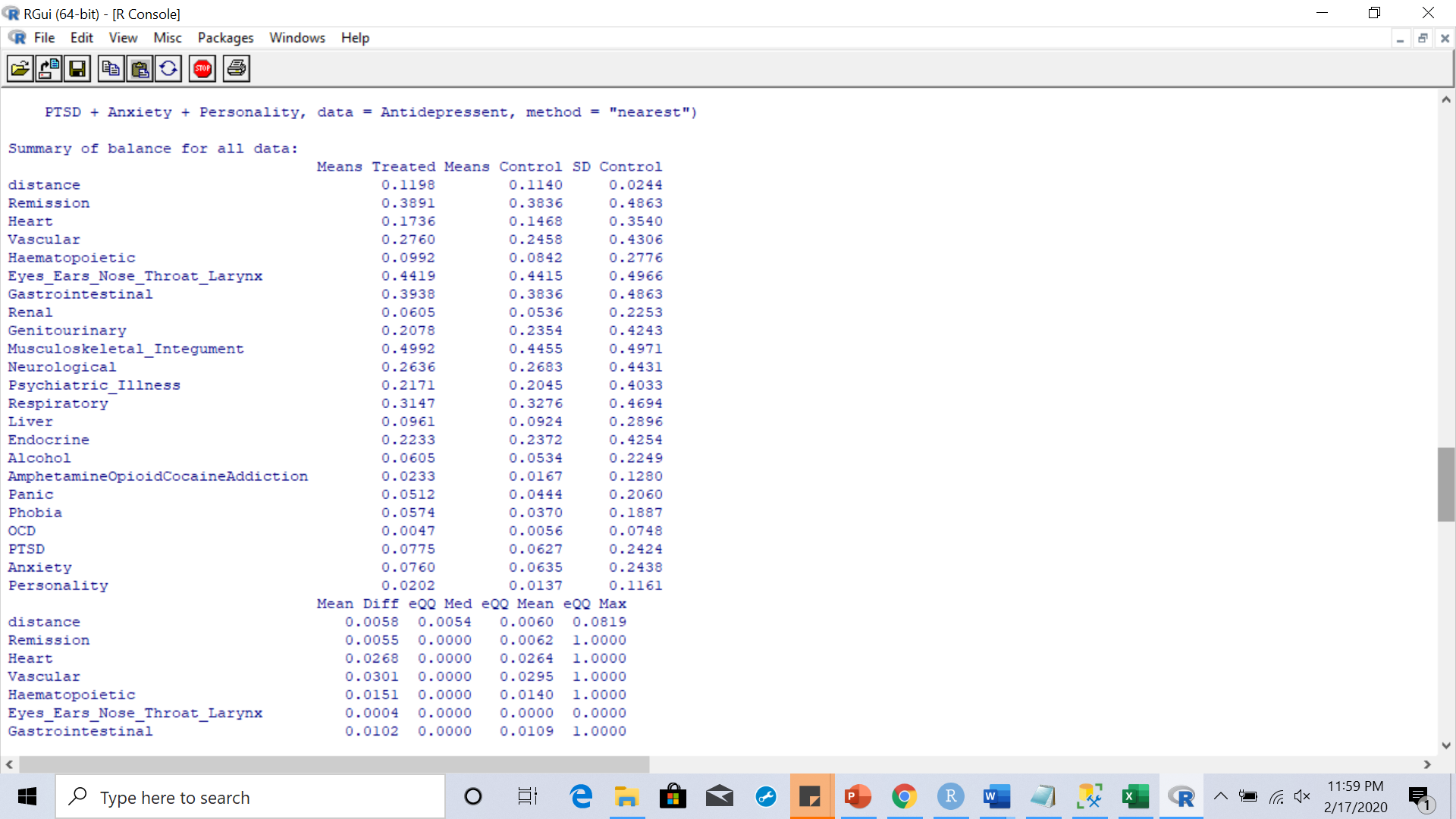
> View(Antidepressent)

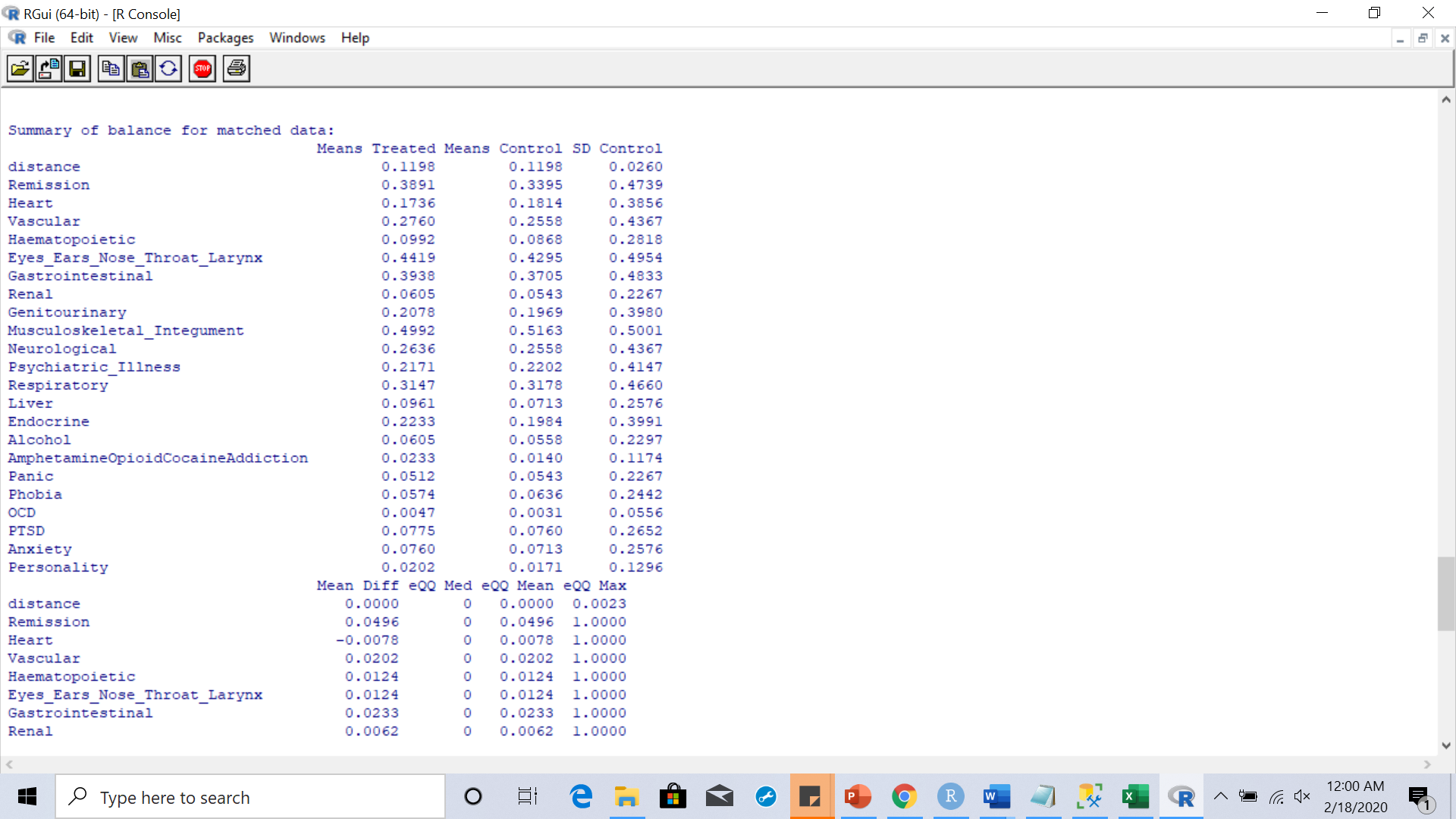


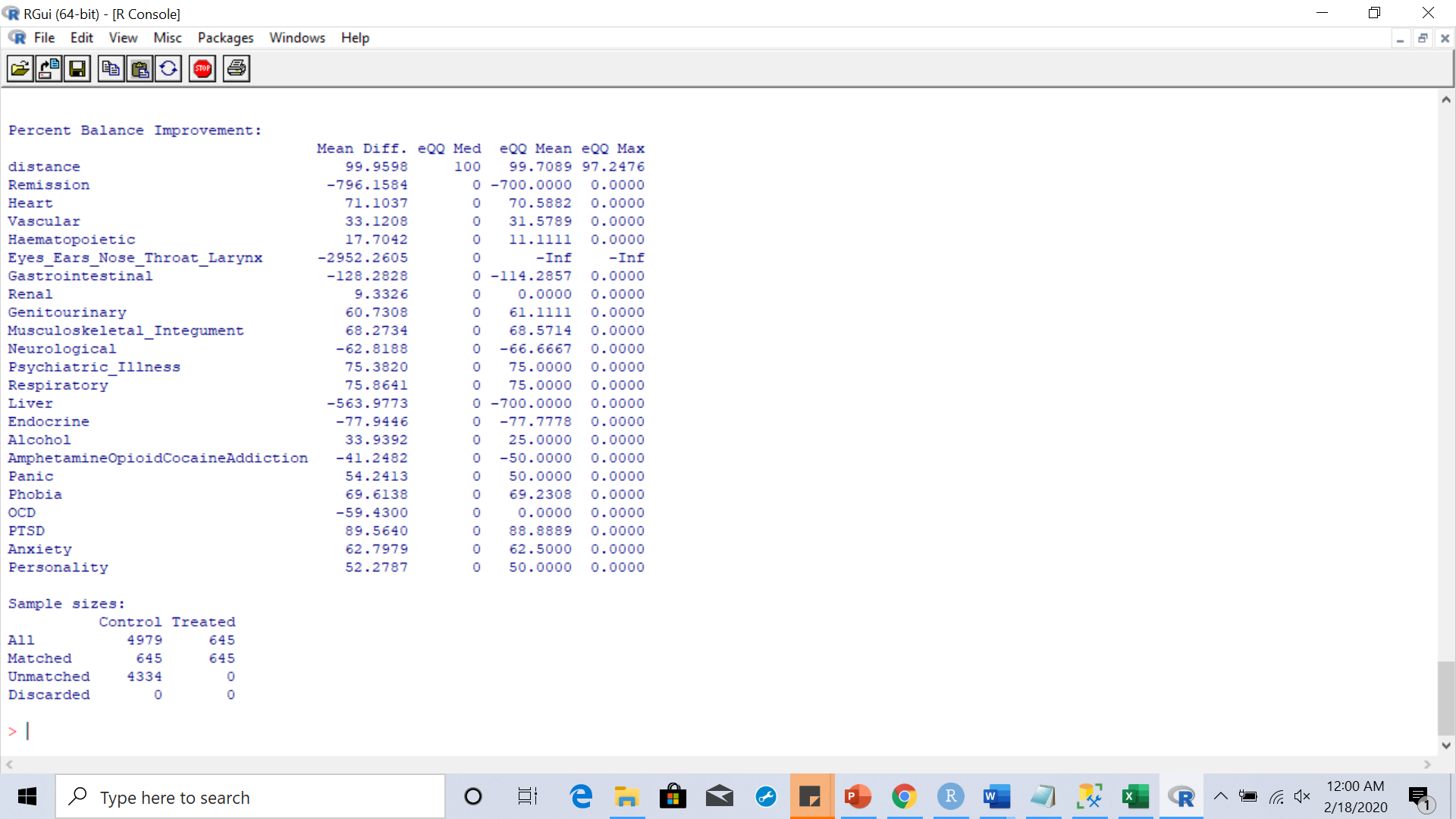
> Antidepressent = read.csv("/Users/krti1/Documents/823/Antidepressents.csv")

> m.out<-matchit(Bupropion~ Remission+Heart+Vascular+Haematopoietic+Eyes\_Ears\_Nose\_Throat\_Larynx+Gastrointestinal+Renal+Genitourinary+Musculoskeletal\_Integument+Neurological+Psychiatric\_Illness+Respiratory+Liver+Endocrine+Alcohol+AmphetamineOpioidCocaineAddiction+Panic+Phobia+OCD+PTSD+Anxiety+Personality, data=Antidepressent, method="nearest")

> summary(m.out)





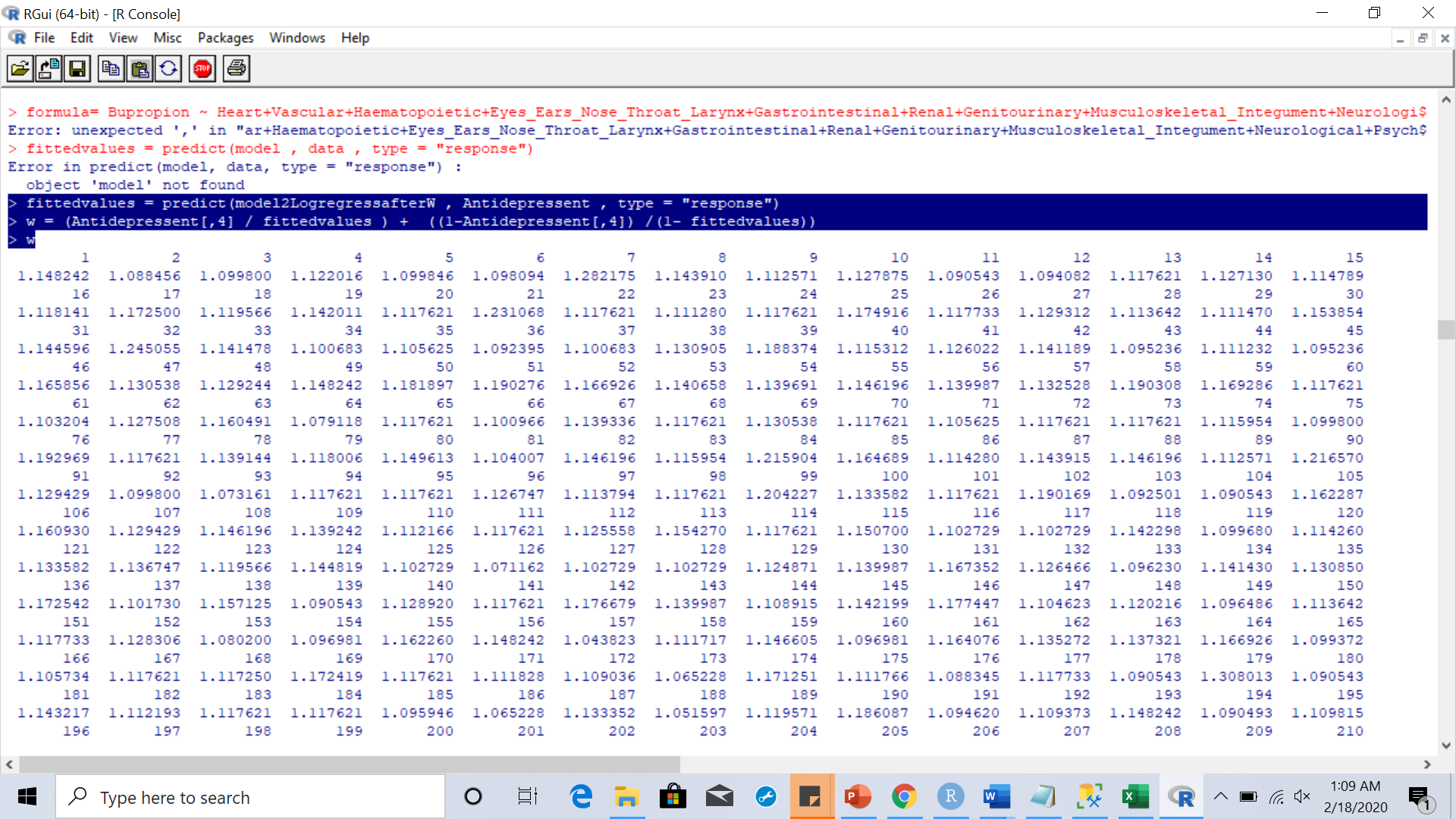


**Running regression model after adding weights with Treatment variable: Not any variable remained significant after adding weights.**

> fittedvalues = predict(model2LogregressafterW , Antidepressent , type = "response")

> w = (Antidepressent[,4] / fittedvalues ) + ((1-Antidepressent[,4]) /(1- fittedvalues))

> w



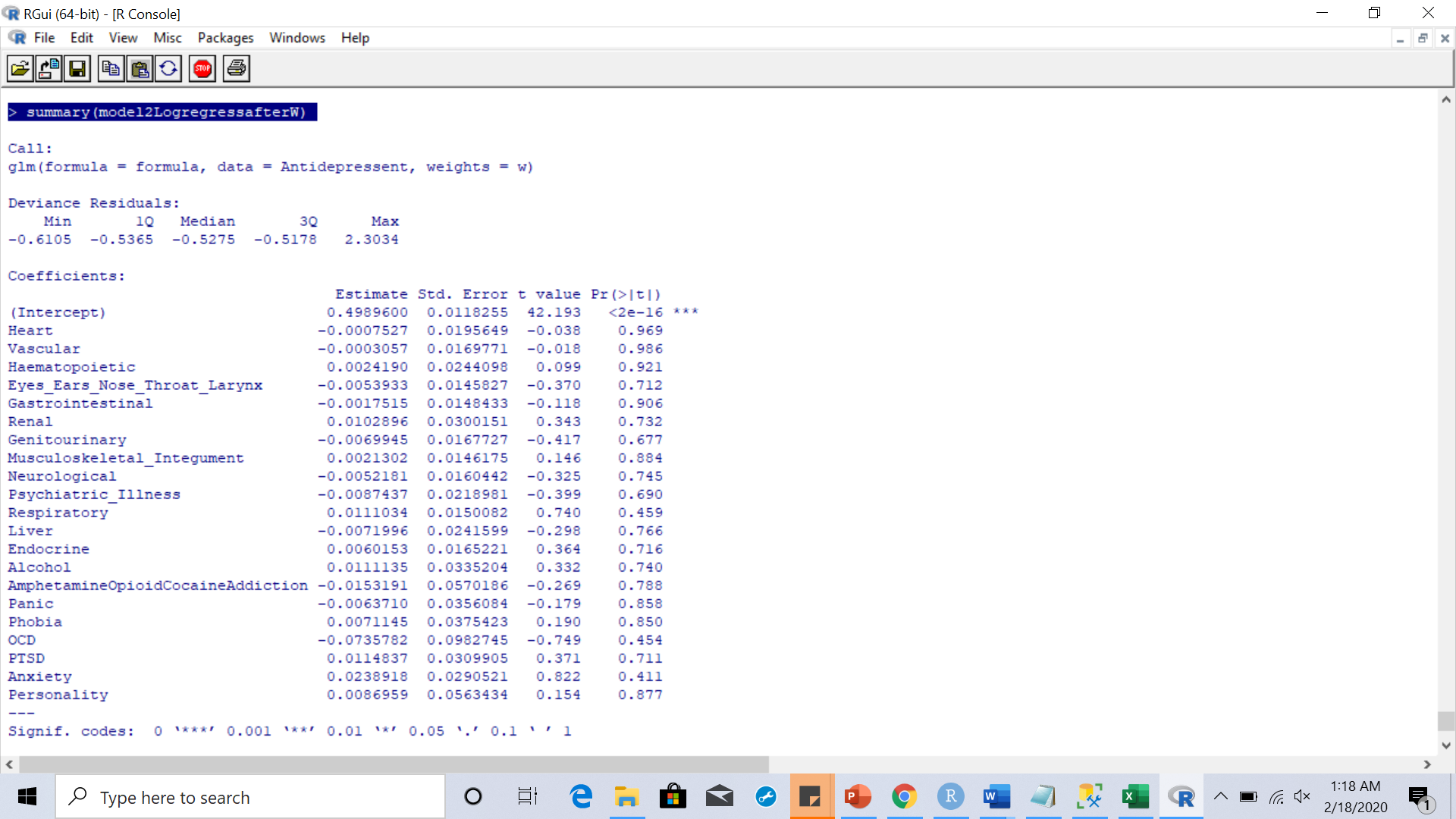
> formula= Bupropion ~ Heart+Vascular+Haematopoietic+Eyes\_Ears\_Nose\_Throat\_Larynx+Gastrointestinal+Renal+Genitourinary+Musculoskeletal\_Integument+Neurological+Psychiatric\_Illness+Respiratory+Liver+Endocrine+Alcohol+AmphetamineOpioidCocaineAddiction+Panic+Phobia+OCD+PTSD+Anxiety+Personality

>

>

> model2LogregressafterW=glm(formula = formula, data = Antidepressent, weights=w)

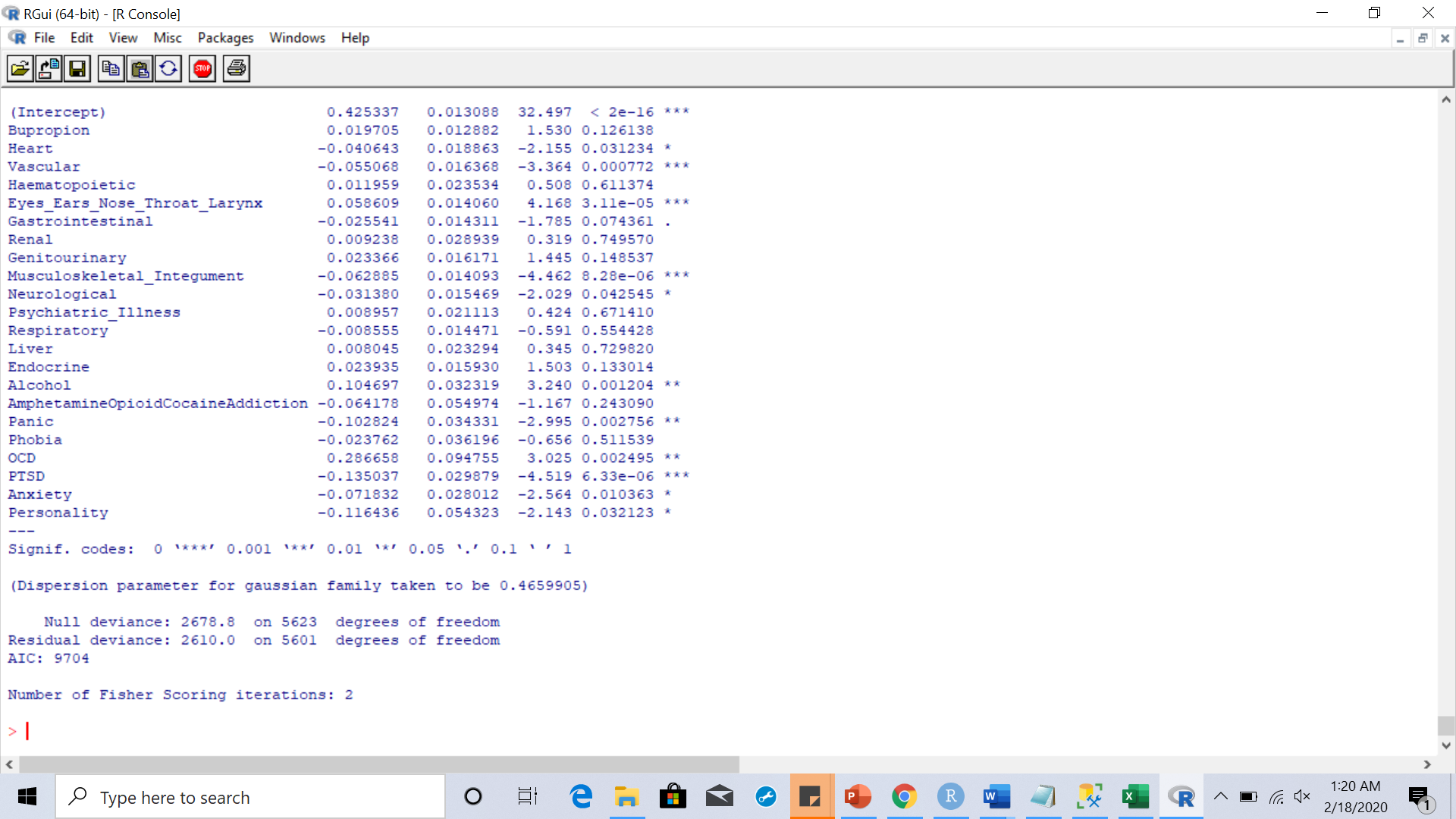
> summary(model2LogregressafterW)



> formula= Remission ~ Bupropion+Heart+Vascular+Haematopoietic+Eyes\_Ears\_Nose\_Throat\_Larynx+Gastrointestinal+Renal+Genitourinary+Musculoskeletal\_Integument+Neurological+Psychiatric\_Illness+Respiratory+Liver+Endocrine+Alcohol+AmphetamineOpioidCocaineAddiction+Panic+Phobia+OCD+PTSD+Anxiety+Personality

> model2regressafterW\_Remission=glm(formula = formula, data = Antidepressent, weights=w)

> summary( model2regressafterW\_Remission)



From the above results it’s clear that Bupropion drug does not have a significant effect on Remission.

There is effect of bupropion on the treatment(remission). Since the bupropion variable is significant (at level of significance 0.1)

Three variables Gender, Musculoskeletal and phobia were significant on the antidepressant before the weights. After the weights, there is no effect of covariates on the antidepressant. There is effect of bupropion on the treatment(remission). Since the bupropion variable is significant (at level of significance 0.1)

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**Question 4**: The following problem was first created by Morgan and Harding and we have adjusted it to fit within health care. In this example, the outcome are length of stay in the hospital, the treatment is the clinician/his peer group and the strata are a mix of medical history and demographic variables that account for the pattern of self-selection into treatment.  This mix have been divided into 3 strata: low, medium and high risk. What is the impact of clinician on length of stay, after removing confounding associated with severity of the patients' illness?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Strata** | **Probability** | | **Total** |  | **Strata** | **Length of Stay** | | **Net Impact** |
| **Untreated** | **Treated** | **Untreated** | **Treated** |
| Low | 0.36 | 0.08 | 0.44 | Low | 2 | 4 | 2 |
| Med | 0.12 | 0.12 | 0.24 | Med | 6 | 8 | 2 |
| High | 0.12 | 0.20 | 0.32 | High | 10 | 14 | 4 |
| Total | 0.60 | 0.40 | 1 |  | | | |

Solution:

**Formulas:**

1. **4.4=.36/.6\*2+.12/.6\*6+.12/.6\*10**
2. **10.2=.08/.4\*4+.12/.4\*8+.2/.4\*14**
3. **5.8=10.2-4.4**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Strata** | **Probability** | | **Total** |  | **Strata** | **Length of Stay** | | **Net Impact** |
| **Untreated** | **Treated** | **Untreated** | **Treated** |
| Low | 0.36 | 0.08 | 0.44 | Low | 2 | 4 | 2 |
| Med | 0.12 | 0.12 | 0.24 | Med | 6 | 8 | 2 |
| High | 0.12 | 0.20 | 0.32 | High | 10 | 14 | 4 |
| Total | 0.60 | 0.40 | 1 | Total 4.4 10.2 5.8 | | | |

**Question 5:**  The following data have been taken from nurses rounding in a facility.  The time they spent with patients has been recorded.  In addition, several characteristics of the patients have also been recorded and standardized.  Do any of the nurses have a significant impact on overall satisfaction in the unit?

Solution:

**Question 6:** In a nursing home, data were collected on residents' survival and disabilities.  The data are listed in the following order: ID, age, gender (M for male, F for Female), number of assessments completed on the person, number of days followed, days since first assessment, days to last assessment, unable to eat, unable to transfer, unable to groom, unable to toilet, unable to bathe, unable to walk, unable to dress, unable to bowel, unable to urine, dead (1) or alive (0), and assessment number.  Predict from the patient's assessments (i.e. their age and disabilities at time of assessment) if the patient is likely to die and should be admitted to the hospice program.  [**Data►**](http://openonlinecourses.com/causalanalysis/Assessments.zip)[**Sherline's Teach One►**](https://www.youtube.com/watch?v=BPXLbQcHM6M&feature=youtu.be)