Model:

$$\text{logit}(p)=\alpha_0+\alpha_1\times X_{time}+\alpha_2\times X_{age1}+\alpha_3\times X_{age2}+\alpha_4\times X_{age3}+\alpha_5\times X_{age4}+\alpha_6\times X_{edugp2}+\alpha_7\times X_{edugp3}+\alpha_8\times X_{edugp4}+\alpha_9\times X_{curs}+\alpha_{10}\times X_{cigs}+\alpha_{11}\times X^2_{cigs}+\alpha_{12}\times X_{sex}+\beta_1\times X_{bmi\_underweight}+\beta_2\times X_{bmi\_overweight}+\beta_3\times X_{bmi\_obese}+\gamma_1\times X_{sex}\times X_{bmi\_underweight}+\gamma_2\times X_{sex}\times X_{bmi\_overweight}+\gamma_3\times X_{sex}\times X_{bmi\_obese}$$

Where

p probability of being diagnosed of MI in a case-control study, given BMI, time since FHS baseline, age, attained education, current smoking status, average number of cigarets smoked per day, and gender

X_{time} = time since FHS study baseline(days) <—-Controls were matched on time to cases.

X_{age1} = age(years)

$$X_{age2} = \begin{cases} X_{age1}-50 & X>50 \\ 0 & X\leq 50 \end{cases}$$

$$X_{age3} = \begin{cases} X_{age1}-60 & X>60 \\ 0 & X\leq 60 \end{cases}$$

$$X_{age4} = \begin{cases} X_{age1}-70 & X>70 \\ 0 & X\leq 70 \end{cases}$$

$$X_{edugp2} = \begin{cases} 1 & \text{High school diploma or GED} \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{edugp3} = \begin{cases} 1 & \text{Some college or Vocational school} \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{edugp4} = \begin{cases} 1 & \text{College(BS, BA) degree or more} \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{curs} = \begin{cases} 1 & \text{Current smoker} \\ 0 & \text{Not current smoker} \end{cases}$$

$$X_{cigs} = \begin{cases} \text{Count} & \text{Average number of cigarettes smoked per day} \\ 0 & \text{Not current smoker} \end{cases}$$

$$X_{bmi\_underweight} = \begin{cases} 1 & BMI<18.5 \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{bmi\_overweight} = \begin{cases} 1 & 25 \leq BMI<30 \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{bmi\_obese} = \begin{cases} 1 & BMI \geq 30 \\ 0 & \text{Otherwise} \end{cases}$$

$$X_{sex} = \begin{cases} 1 & \text{Male} \\ 0 & \text{Female(recode sex 2=0)} \end{cases}$$

STATA CODE

```
*BIOST536 Project_CODE
*1. transformation of covariates

*1.1 recode sex-->>1=male, 0=female
recode sex 2=0


*1.2 BMI-->>dummy variable
gen bmicat = bmi
replace bmicat=0 if bmi>=18.5 & bmi<25
replace bmicat=1 if bmi<18.5
replace bmicat=2 if bmi>=25 & bmi<30
replace bmicat=3 if bmi>=30 & bmi~=.
tab bmi bmicat

lab var bmicat "BMI group"
lab def l_bmicat 0 "normal" 1 "underweight" 2 "overweight" 3 "obese"
lab val bmicat l_bmicat


*1.3 AGE-->>linear splines(50, 60, 70)
mkspline s1 50 s2 60 s3 70 s4= age, marginal

*2. fit model to the data

*2.1 model includes interaction between sex and BMI

logistic case time s1-s4 i.educ i.cursmoke c.cigpday##c.cigpday i.sex##i.bmicat

**OR comparing overweight to normal, among males with same age/cigs per day/smoking status/education
attainment
lincom 2.bmicat+1.sex#2.bmicat

**OR comparing overweight to normal, among females with same age/cigs per day/smoking status/education
attainment
lincom 2.bmicat
```

```
**OR comparing obese to normal, among males with same age, cigs per day/smoking status/education
attainment
lincom 3.bmicat+1.sex#3.bmicat

**OR comparing obese to normal, among females with same age/cigs per day/smoking status/education
attainment
lincom 3.bmicat

*2.2 model does not include interaction between sex and BMI
logistic case time s1-s4 i.educ i.cursmoke c.cigpday##c.cigpday i.sex i.bmicat
```

Raw results

***with interaction between BMI and sex

```
. logistic case time s1-s4 i.educ i.cursmoke c.cigpday##c.cigpday i.sex##i.bmicat
note: 1.sex#1.bmicat != 0 predicts failure perfectly
      1.sex#1.bmicat dropped and 1 obs not used


Logistic regression                                     Number of obs   =        708
                                                        LR chi2(17)     =     121.73
                                                        Prob > chi2     =     0.0000
Log likelihood = -429.87961                             Pseudo R2       =     0.1240

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        time |   .9999528   .0000424    -1.11   0.266     .9998698    1.000036
          s1 |   1.035987   .0757789     0.48   0.629     .8976185    1.195685
          s2 |   1.000127   .0993198     0.00   0.999     .8232368    1.215026
          s3 |   1.034026   .0643971     0.54   0.591      .915209    1.168268
          s4 |   1.005169   .0551849     0.09   0.925     .9026249    1.119364
             |
        educ |
          2  |   .9262506   .1866059    -0.38   0.704     .6240828    1.374722
          3  |   .8801926   .2198295    -0.51   0.609     .5394967    1.436041
          4  |   1.316496   .3725052     0.97   0.331     .7560843    2.292285
             |
 1.cursmoke |   1.711199   .6214631     1.48   0.139     .8397812    3.486863
    cigpday |   1.025127   .0239645     1.06   0.288     .9792171    1.073189
             |
c.cigpday#c.cigpday |   .9995899   .0003548    -1.16   0.248     .9988948    1.000285
             |
      1.sex |   2.718012   .7132967     3.81   0.000     1.625054    4.546058
             |
     bmicat |
          1  |   1.279097   1.667595     0.19   0.850     .0993499    16.46794
          2  |   1.314015   .3695555     0.97   0.332     .7571943    2.280308
          3  |   2.080731   .6753621     2.26   0.024     1.101371    3.930957
             |
 sex#bmicat |
        1 1  |          1  (empty)
        1 2  |    1.55397   .5799224     1.18   0.238     .7477991    3.229242
        1 3  |   .9452101   .4622167    -0.12   0.908     .3624789    2.464756
             |
```

```
              _cons |    .032611   .1137038    -0.98   0.326     .0000351    30.28474
------------------------------------------------------------------------------

.
. **OR comparing overweight to normal, among males with same age, cigs per day, smoking status, education at
> tainment
. lincom 2.bmicat+1.sex#2.bmicat

 ( 1)  [case]2.bmicat + [case]1.sex#2.bmicat = 0

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   2.041941   .5052619     2.89   0.004     1.257246    3.316394
------------------------------------------------------------------------------

. **OR comparing overweight to normal, among females with same age, cigs per day, smoking status, education
> attainment
. lincom 2.bmicat

 ( 1)  [case]2.bmicat = 0

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   1.314015   .3695555     0.97   0.332     .7571943    2.280308
------------------------------------------------------------------------------

. **OR comparing obese to normal, among males with same age, cigs per day, smoking status, education attainm
> ent
. lincom 3.bmicat+1.sex#3.bmicat

 ( 1)  [case]3.bmicat + [case]1.sex#3.bmicat = 0

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   1.966728   .7247889     1.84   0.066     .9551135      4.0498
------------------------------------------------------------------------------

. **OR comparing obese to normal, among females with same age, cigs per day, smoking status, education attai
> nment
. lincom 3.bmicat

 ( 1)  [case]3.bmicat = 0

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
```

(1)	2.080731	.6753621	2.26	0.024	1.101371	3.930957

****Without interaction between BMI and sex

```
. logistic case time s1-s4 i.educ i.cursmoke c.cigpday##c.cigpday i.sex i.bmicat

Logistic regression                                     Number of obs   =        709
                                                        LR chi2(15)     =     119.51
                                                        Prob > chi2     =     0.0000
Log likelihood = -431.68433                             Pseudo R2       =     0.1216

------------------------------------------------------------------------------
        case | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        time |   .9999475   .0000421    -1.25   0.212     .9998651     1.00003
          s1 |   1.039829   .0758974     0.54   0.593     .9012235    1.199752
          s2 |   .9970374   .0987603    -0.03   0.976     .8211014    1.210671
          s3 |   1.032373   .0641147     0.51   0.608     .9140574    1.166004
          s4 |   1.006213   .0551994     0.11   0.910     .9036377    1.120432
             |
        educ |
          2  |   .9316983   .1865216    -0.35   0.724     .6293161    1.379373
          3  |    .896096   .2213018    -0.44   0.657     .5522554    1.454016
          4  |   1.335945   .3774359     1.03   0.305     .7678988    2.324197
             |
 1.cursmoke |    1.67938   .6073252     1.43   0.152     .8266532    3.411729
    cigpday |   1.027047   .0236842     1.16   0.247     .9816604    1.074532
             |
c.cigpday#c.cigpday |   .9995552   .0003493    -1.27   0.203     .9988707     1.00024
             |
      1.sex |   3.154181   .5602443     6.47   0.000     2.226879    4.467625
             |
      bmicat |
          1  |   .5290175   .6587638    -0.51   0.609     .0460791    6.073463
          2  |   1.699963   .3147245     2.87   0.004     1.182637    2.443586
          3  |   2.059609   .5079754     2.93   0.003     1.270127    3.339815
             |
       _cons |   .0257504    .089494    -1.05   0.292     .0000283    23.39314
------------------------------------------------------------------------------
```