

BM2_HW2

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Problem_1

(a)

```
# load data
dose=c(0, 1, 2, 3, 4)## x_i
num=c(30, 30, 30, 30, 30) ## m_i
killed=c(2, 8, 15, 23, 27) ## y_i
data=data.frame(dose,num,killed) ## (x_i, m_i, y_i)

# data preparation
x=data$dose
y=data$killed
m=data$num
resp=cbind(y,m-y) ##### counts of success (death=1), failure (surv=0)

glm_logit=glm(resp~x, family=binomial(link='logit'))
glm_probit=glm(resp~x, family=binomial(link='probit'))
glm_clog=glm(resp~x, family=binomial(link='cloglog')) # asymmetric
summary(glm_logit) # Wald test of coefficients

##
## Call:
## glm(formula = resp ~ x, family = binomial(link = "logit"))
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.3238      0.4179  -5.561 2.69e-08 ***
## x             1.1619      0.1814   6.405 1.51e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 64.76327  on 4  degrees of freedom
## Residual deviance:  0.37875  on 3  degrees of freedom
## AIC: 20.854
##
## Number of Fisher Scoring iterations: 4
summary(glm_probit)
```

```
##
## Call:
```

```
## glm(formula = resp ~ x, family = binomial(link = "probit"))
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -1.37709    0.22781  -6.045 1.49e-09 ***
## x           0.68638    0.09677   7.093 1.31e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 64.76327  on 4  degrees of freedom
## Residual deviance:  0.31367  on 3  degrees of freedom
## AIC: 20.789
##
## Number of Fisher Scoring iterations: 4
summary(glm_clog)
```

```
##
## Call:
## glm(formula = resp ~ x, family = binomial(link = "cloglog"))
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -1.9942    0.3126  -6.378 1.79e-10 ***
## x           0.7468    0.1094   6.824 8.86e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 64.7633  on 4  degrees of freedom
## Residual deviance:  2.2305  on 3  degrees of freedom
## AIC: 22.706
##
## Number of Fisher Scoring iterations: 5
out=predict(glm_logit, data.frame(x=c(0.01)), se.fit=TRUE)
out
```

```
## $fit
##           1
## -2.312171
##
## $se.fit
## [1] 0.4163137
##
## $residual.scale
## [1] 1
```

(b)

```
dose=c(0, 1, 2, 3, 4)## x_i
num=c(30, 30, 30, 30, 30) ## m_i
```

```

killed=c(2, 8, 15, 23, 27) ## y_i
log10Dose=log10(dose)
data=data.frame(log10Dose,num,killed) ## (x_i, m_i, y_i)

# data preparation
x=data$log10Dose
y=data$killed
m=data$num
resp=cbind(y,m-y) ##### counts of success (death=1), failure (surv=0)

```

““