Preliminary Mortality Analysis

Mark Machin

October 26, 2015

### Mortality Analysis for the period 2003 to 2014

#### *HIV Mortality Analysis*

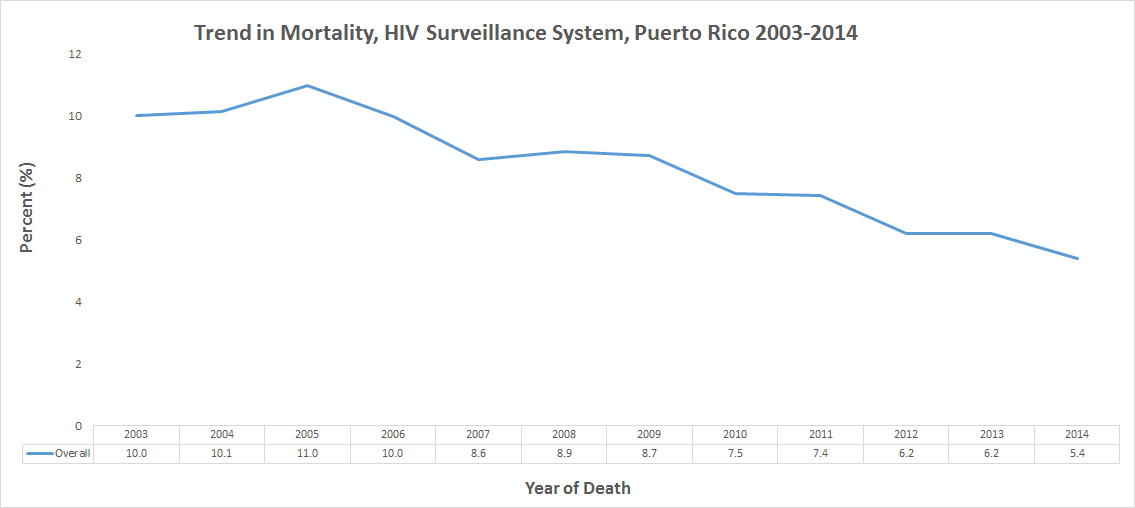
In order to explore HIV Mortality in Puerto Rico, we conducted a crude analysis using the data from the HIV Surveillance System for 2003 to 2014. The trend in HIV mortality can be seeing in figure 1:   


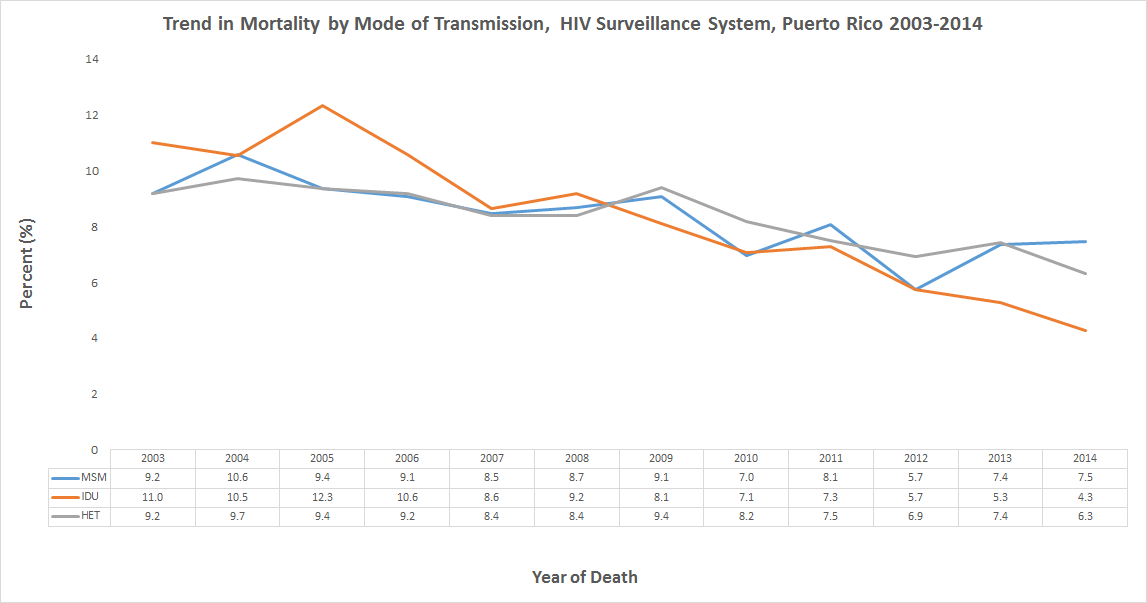
Figure 1 shows the crude HIV mortality trend in Puerto Rico for the period 2003-2014. This preliminar analysis shows a decreasing HIV trend of 4.6% (10.0% in 2003 compared with 5.6% in 2014) in Puerto Rico. In figure 2 we stratified by mode of transmission (Men who have Sex with Men, Injection Drugs Users and Heterosexual Contact):  
  


Figure 2 also shows a decreasing trend in HIV in Puerto Rico. In the IDU group, we can see a decrease of almost 7% which might explain the reason why the overall mortality is also decreasing.

#### *Comparing deaths of Men who have Sex with Men (MSM) and Injected Drugs Users (IDU)*

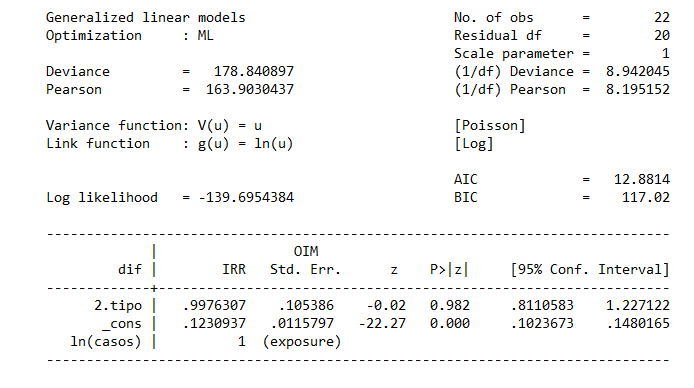
In order to compare deaths among MSM and IDU, we calculate the absolute difference between years (according to the CDC mathematical model) and verify whether there was a significant difference between these groups. The raw file can be accessed [here.](https://github.com/kramus/proptest/blob/master/propt3.csv)   
The structure of the data is as follows:

## year 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014  
## type case   
## msm yes 14 12 3 6 2 4 21 11 23 16 1  
## no 91 105 93 90 84 86 90 69 80 57 73  
## idu yes 17 66 64 72 20 39 38 7 57 17 36  
## no 405 388 454 390 318 338 299 261 268 211 194

The absolute differences of MSM and IDU cases for 2004-2014 are:

## ------------------  
## year MSM IDU   
## ------ ----- -----  
## 2004 0.154 0.042  
##   
## 2005 0.114 0.17   
##   
## 2006 0.032 0.141  
##   
## 2007 0.067 0.185  
##   
## 2008 0.024 0.063  
##   
## 2009 0.047 0.115  
##   
## 2010 0.233 0.127  
##   
## 2011 0.159 0.027  
##   
## 2012 0.288 0.213  
##   
## 2013 0.281 0.081  
##   
## 2014 0.014 0.186  
## ------------------

To perform the analysis we used a Poisson model to compare the proportions between MSM and IDU. Figure 3 show the crude model.



In order to validate the model, we need to evaluate interaction in the predictor variables. Figure 4 show a significance in the likelihood-ratio test (p-value < 0.00001).

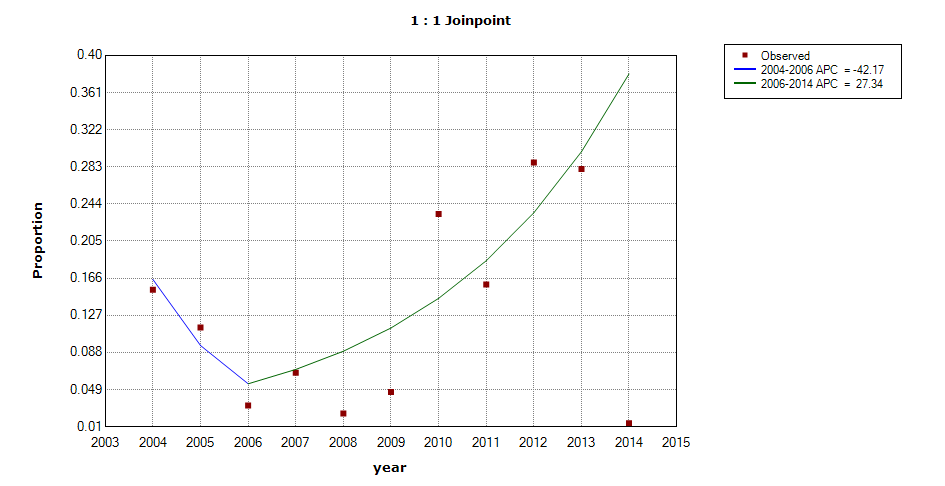
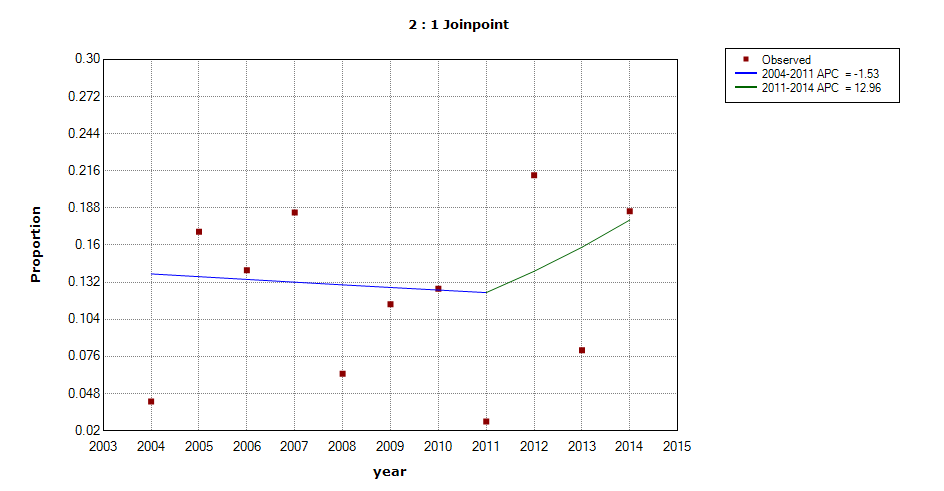


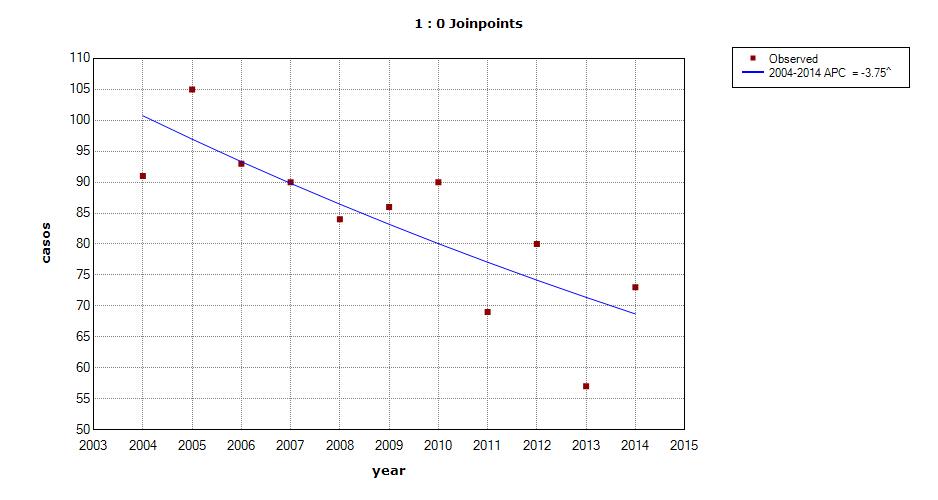
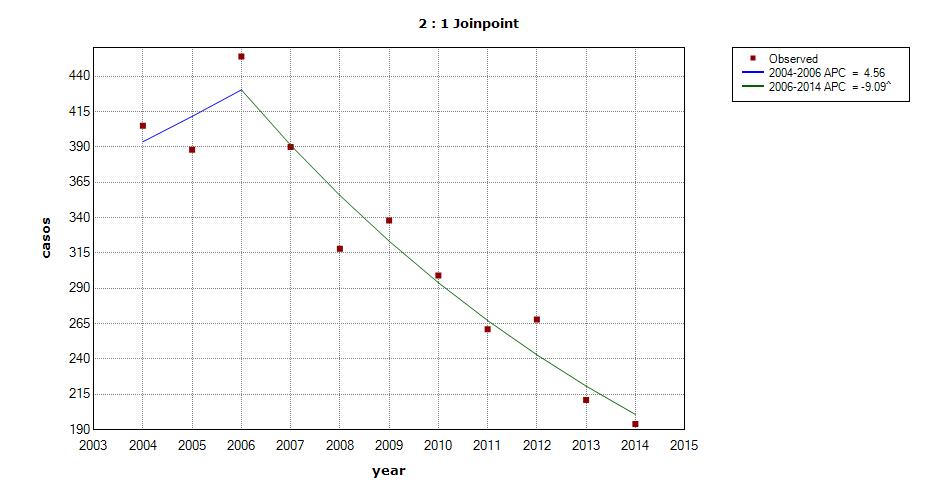
Table 1 show the respective p-values obtained in the Poisson model for the specific years:

|  |  |
| --- | --- |
| Year | p\_value |
| 2004 | < 0.0001 |
| 2005 | 0.205 |
| 2006 | 0.013 |
| 2007 | 0.017 |
| 2008 | 0.190 |
| 2009 | 0.084 |
| 2010 | 0.025 |
| 2011 | < 0.0001 |
| 2012 | 0.222 |
| 2013 | < 0.0001 |
| 2014 | 0.010 |
|  |  |

We can see that for years 2005, 2008, 2009 and 2012 the results were not statistically significant (0.205, 0.190, 0.084, 0.222 respectively).

#### JoinPoint Software

We used JoinPoint Software to verify if there were significant differences in the absolute differences calculated using the CDC mathematical model across the period of study. We ran the analysis for both MSM and IDU groups. Figure 5 show no significant annual percent change for the group MSM.    
Likewise, there was no statistical difference in the annual percent change for the IDU group.   


We found a statistical difference in the annual percent change for both groups (MSM and IDU) when we used the number of deaths as the dependent variable (figure 7 and 8, respectively):    
  


Further investigation will be needed in order to have a better insight of the behavior of HIV mortality in Puerto Rico.