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Birth and Assassination Simulation

Code:

```
BAgen = function(lambda, k, maxGen)
{
   maxGen = maxGen - 1
   gen1 = data.frame(PID=0, CID=1, birth = 0, death=rexp(1,rate=k))
   main = list(gen1)
   currentGeneration = 1
   for(i in 1:maxGen)
   {
      i = main[[i]]
      if(currentGeneration < length(main)){
         break
      }
      curGenList = data.frame("PID"=NULL, "CID"=NULL, "birth"=NULL,
"death"=NULL)
      kidCount = 1
      for(parent in 1:nrow(i))
      {
         numberOfKids = rpois(1, lambda*(i[parent, ]$death - i[parent, ]$birth))
         for(j in 1:numberOfKids){
            kidBirth = runif(1, min = i[parent, ]$birth, max = i[parent, ]$death)
            kidDeath = i[parent, ]$death + rexp(1, rate = k)
            curGenList = rbind(curGenList, data.frame("PID"= i[parent, ]$CID, "CID" =
kidCount, "birth" = kidBirth, "death" = kidDeath))
            kidCount = kidCount + 1
         }
      }
   currentGeneration = currentGeneration + 1
   curGenList = list(curGenList)
   main = c(main, curGenList)
   }
   return(main)
}
```

Summary:

These simulations use 10 trials with the maximum number of generations at six.

Lambda	Kappa	# People
0.05	0.1	41.3
0.1	0.1	258.4
0.2	0.1	1,938.3
0.3	0.1	overload

Lambda	Kappa	# People
0.05	0.05	88
0.05	0.1	52.1
0.05	0.2	39.3
0.05	0.3	44.8
0.05	0.4	46.1
0.05	0.5	47.8
0.05	0.6	48.2
0.05	0.7	55.3
0.05	0.8	56
0.05	0.9	50.6

By holding each kappa and lambda constant allows us to see the influence of the other variable. It is obvious to see that increases in lambda result in dramatic increases in the number of people in the family. Changes in kappa, however, are less clear; it seems that they minimize at K = .2 and increase on both sides with a more dramatic increase seen in smaller kappas.

Lambda	Kappa	Lifespan
0.1	0.3	4.98
0.2	0.3	5.13
0.3	0.3	6.24
0.4	0.3	5.83
0.5	0.3	6.26

Lambda	Kappa	Lifespan
0.1	0.1	22.42
0.1	0.2	9.61
0.1	0.3	3.21
0.1	0.4	3.3
0.1	0.5	3.84

Again, holding kappas and lambdas allows us to see the impact of the other variable. The impact of lambda is very small on the lifespan - there is a slight increase in the lifespan

for the increase of lambda. The pattern is more noticable for changes in kappa, with lifespan decreasing as kappa increases and the effect being more pronounced in changes in smaller kappa.