Juvenile Delinquency

Project Module Associated with
2nd Edition, Introduction to Computational Science:
Modeling and Simulation **by**
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Project 1 prerequisite: Module 4.3, "Modeling the Spread of SARS— Containing
Emerging Disease"
Project 2 prerequisite: Module 11.2, "Agents of Interaction: Steering a Dangerous
Course"

Introduction

Tiequon Cox was born in 1965 in a very poor neighborhood in South Los Angeles. His mother, a prostitute, drank heavily and physically abused her Tiequon and his sister. She was prone to other violent acts, including assaulting a police officer with a knife and attempting to set fire to her mother's house, where Tiequon was staying. At an early age, Tiequon showed great athletic skills, but he also displayed very aggressive, even violent, behavior. He frequently lost his temper. Tiequon's father was nowhere to be found.

Without a reliable and supportive family, Tiequon joined an arm of the Crips, the notorious gang. By that time the gang was aggressively recruiting such boys with money, car use, and sex; and they extolled violence. When Tiequon dropped out of school during the ninth grade, he was actively harassing and robbing other students and adults. At 18, he was hired by a local bar owner to kill a family that was suing the bar. Tiequon and his accomplices misread the address, invading the wrong house and murdering four people. Eventually, he was caught, convicted, and sentenced to death. After about 30 years, he still sits on death row in California.

Born in Louisiana in 1941, Kermit Alexander was the first of eleven children. The family moved to California, so he spent much of his childhood in the projects of Watts, South Los Angeles. Kermit was also very athletic, playing a variety of sports, including baseball, football and boxing. He also had a very violent tendency, quickly losing his temper. Fortunately for Kermit, he had two parents who held him to high standards of behavior and who would not countenance his outburst of temper. His mother, Ebora, a constant source of strength, love, and guidance, nurtured his desire to care for and serve others. At school, he had coaches that mentored him. In high school, he honed his natural athletic talents, which led to a college education and a 10-year career in the National Football League.

Throughout his athletic development and subsequent professional experience, Kermit was known as a merciless tackler. As a defensive back, he had many opportunities to tackle mercilessly. In November, 1968, Kermit launched himself toward a lead tackler, only to hit the right knee of the great running back for the Chicago Bears, Gale Sayers. Kermit has long been vilified for that 'hit.'

Although of very different ages, both are African-American; both grew up in impoverished Los Angeles neighborhoods; and both were athletic with aggressive personalities. Yet, Kermit channeled his violent tendencies and made a successful career in the NFL, whereas Tiequon channeled his violent tendencies and became a mass murderer.

Interestingly, these two men's lives intersected twice. After Kermit retired from the NFL, he was inspired to return to his home community, where many of the kids joined gangs, now rife in South L. A. To aid some of those kids, Kermit helped to establish a Pop Warner football team, the Watts Wildcats. Pop Warner football was for young boys (5-16), encouraging athletic and academic achievement. Kermit's Wildcats played another team from South Central L.A., which included the 8 year-old Tiequon Cox. Kermit was impressed by the boy's athletic prowess, but he was also disturbed by Tiequon's angry meltdown that occurred during the game. He realized that this was a young man in need of help and support, but he did not follow through with Tiequon or his coaches. Kermit could not possibly imagine how their lives would intersect the second time.

In 1984, Tiequon and his accomplices broke into the house of Ebora Alexander, Kermit's mother, and killed her, Kermit's sister, and two of his nephews. Kermit was devastated and guilt-ridden for years. Why hadn't he intervened with Tiequon as an 8 year-old?! His marriage fell apart, he entered into financially disastrous projects, and he was estranged from part of his family. Fortunately, with the help of his second wife, he managed to put his life back together, regaining his faith, making peace with his family, and adopting 5 Haitian orphans (siblings). Tiequon still sits on death row.

What made the difference in the life directions of these two men? They had much in common, but their lives followed such disparate paths. Could a stable, loving home make all the difference?

Projects

1.   (Lee and Do 2011) modeled the spread of gang membership and delinquency due to peer pressure among at-risk juveniles (from age 13 up to age 18). With the situation being similar to the spread of a disease, their system dynamics model incorporated the following at-risk adolescent groups:
   - S – susceptibles
   - G – non-delinquent gang members
   - D – delinquent gang members, who have committed crimes but are not detained
   - L – arrested and law-enforced, so that they do not interact with those from the other groups

   The model assumes the total such population, N, is constant, so that children mature to 13 years and become adults (age 18) at the same rate and so that there are no deaths. A susceptible youth can become a member of G due to interaction with (delinquent or non-delinquent) gang members. Some studies show that on the average, the number of members of S becoming gang members per year is 60% of possible interactions of susceptibles with the fraction of gang members (in G and D) in the juvenile society (N). Moreover, through fear, good influences, or other

reasons, members of G return to being susceptible in about $3 \frac{1}{3}$ years, on the average. However, gang members can transition to group D through peer pressure from delinquents (the number estimated to be 100% of possible interactions of members of G with the fraction of delinquents in the juvenile society) or with a constant rate (0.14/yr) because of personal issues. A fixed portion (0.235/yr) of those delinquents are caught and separated from the general society. These youths are incarcerated for about one-third of a year on the average, after which time they return to group S, G, or D. The researchers assumed the rates of returning to these groups were equal. Studies also determined that in some socioeconomically depressed areas, the initial percentages of the S, G, D, and L populations are 90.5%, 8%, 1%, and 0.5%, respectively.

   a.   Using this information, model the spread of gang membership and delinquency. Plot G, D, and L. For ease of comparison, in another graph, plot the percentage of G, D, and L in the juvenile population. Discuss the results. Does an "epidemic" occur? Does the system reach equilibrium? If so, give the equilibrium percentages of the various groups in the juvenile population.

   b.   Repeat Part a, considering a situation with a higher socioeconomic population and using 42% instead of 100% and 2 yr instead of $3 \frac{1}{3}$ yr above.

2.   Adjusting parameters appropriately, develop an agent-based simulation for Project 1.

3.   Using data from (Winters et al), (Do and Lee 2014) modeled the spread of gambling among adolescents aged 16 up to 18 years and young adults aged 18 up to 24. The models included the following three groups:

- S – susceptibles, who have no problem with gambling or who do not gamble
- A – at-risk gamblers, in danger of becoming problem gamblers
- P – problem gamblers

The model assumes the total such population, N, is constant, so that the entrance and removal rates are constant and the same. The model assumes that peers introduce susceptible individuals to gambling. Through urging by problem gamblers or because of their own inclinations, at-risk gamblers become problem gamblers. A problem gambler can cut back on his gambling to join group A at a rate of θ or may stop gambling completely at a rate of ψ.

     The peer pressure rate, β, is "directly related to the proportion of at-risk gamblers and problem gamblers already existing among the peer population." A proportion, η, of at risk gamblers adjust their gambling practices and return to the S group. However, other at-risk gamblers through inducement by peer problem gamblers or through their own inclinations move to group P. The number of the former is a fraction, α, of the proportion of problem gamblers in N; while number the latter is a fraction, γ, of the at-risk gamblers.

     The longitudinal study by (Winters et al) in 1990 at approximately age 16 (T1), in 1992 at about age 18 (T2), and in 1997–1998 at about 24 years (T3) assessed participants on their gambling habits the previous year. Initially, the study included 910 families with adolescents, but only 305 of these completed all three

parts of the study. Parameters for the two models (for adolescents and for young adults) were estimated to agree with data from the study.

a. Develop a model for the dynamics of gambling among adolescents using the following information: For adolescents (ages 16-18), 75% remained in the study at least until T2 (for at least 2 years), while the rest were in the study for an estimated average of one year. From this information, we can calculate the average amount of time in the adolescent study; and from this length of time, we can calculate the entrance/removal rate, μ. Initially, 47 adolescents were at-risk gamblers; 25 of these reverted to no-problem gamblers and 2 became problem gamblers by the end of the study. Also, at stage T1, 7 individuals already had a gambling problem. No problem gamblers recovered by the end of the study, but two of these reverted to being at-risk gamblers. Over the two-year period of the study, 13 of the 251 susceptibles (305 - 47 - 7) became at-risk gamblers. During this same period, 10 adolescents changed rapidly from no-problem gamblers to problem gamblers, presumably passing through an intermediate at-risk phase. Modelers estimated that these individuals were in class S for only 3 or 4 months. To estimate β, we can calculate the per capita rate of increase of at-risk gamblers divided by the initial fraction of at-risk and problem gamblers in the population. (Such division cancels out the initial value of $(A + P)/N$.)

The authors also assumed that α is an order of magnitude larger than γ. Using differential equations from the model and other derived values, they calculated estimates of $\alpha = 1.88$/yr and $\gamma = 0.18$/yr.

For ease of comparison, plot the percentage of S, A, and P in the adolescent population. Discuss the results. Do your results agree with various studies that find the percentage of adolescent problem gamblers to be between 2% and 7%?

b. Which has the most positive impact, decreasing β or increasing θ? What can be done to decrease β? To increase θ? Discuss your findings in relationship to public health recommendations for adolescents.

c. Develop a model for the dynamics of gambling among young adults using the following information: About 6 years transpired from T2 to T3; and in this study of young adults (ages 18-24), 305 of the 350 participants at T2 answered the survey questions at T3. Of the 16 problem gamblers at T2, 4 recovered completely by T3; while of the 36 at-risk gamblers at T2, 20 changed to group S by T3. From the 253 susceptible at T2, 45 became at-risk and 3 became problem gamblers by T3. The modelers assumed that these three were in group A for 3 or 4 months. Of the 36 members of A at T2, 2 transferred to P by T3; while over this same period, 5 of the T2 problem gamblers moved to group A. Assuming that factors other than peer pressure affect an at-risk young adult becoming a problem gambler, the authors assumed α and γ to be of the same order of magnitude with estimated values of $\alpha = 0.019$/yr and $\gamma = 0.04$/yr.

Plot the percentage of S, A, and P in the adolescent population. Discuss the results. Do your results agree with the national average of about 4% young adult problem gamblers? Do your results agree with the current

situation among young people that at-risk and problem gambling are endemic, that the prevalence of problem gambling is stable, and that at-risk gambling is increasing?

d.   Compare the results of Parts a and c. Do your results agree with the "common notion" that problem gambling is more prevalent among adolescents that young adults?

Reference

Do, Tae Sug and Young S. Lee. 2014. "A Differential Equation Model for the Dynamics of Youth Gambling," *Osong Public Health Res Perspect*. 2014 Aug;5(4):233-41. doi: 10.1016/j.phrp.2014.06.008. Epub 2014 Jul 1. http://www.kcdc-phrp.org/article/S2210-9099%2814%2900066-6/fulltext (accessed Nov. 10, 2015)

Lee, Young and Tae Sug Do. 2011. "A Modeling Perspective of Juvenile Crimes," International Journal of Numerical Analysis and Modeling, Series B Volume 2, Number 4, Pages 369–378.

Winters, K.C., R.C. Stinchfield, and J. Fulkerson. 1993. Toward the development of an adolescent gambling problem severity scale. J Gambl Stud. 1993; 9: 63–84