APPENDIX A. MODEL VALIDATION

According to Barlas (1994), model validation is an important process in the development and analysis of a system dynamic's model. It allows us to verify whether the model is consistent with reality and it gives us confidence in the results of the model. In this case, we will make three different tests: structure behavior tests, sensitivity tests and extreme conditions test.

Structure behavior tests

Structure behavior tests are useful to analyze how the behavior of the model arises from its structure. To do so, we cut some loops that we have identified as important and thereby determine the source of endogenous dynamics.

i. Cutting the diffusion loop (R1)

When we cut the diffusion loop, what happens is that crime is reduced greatly. The reason why this happens is that nobody is becoming a new potential violent criminal so, those who already were potential violent criminals either are aging so they are no longer at risk or they are criminals, prisoners, etc. Definitively, we can confirm that the diffusion loop (R1) did have an important effect on the increase of violent crimes.

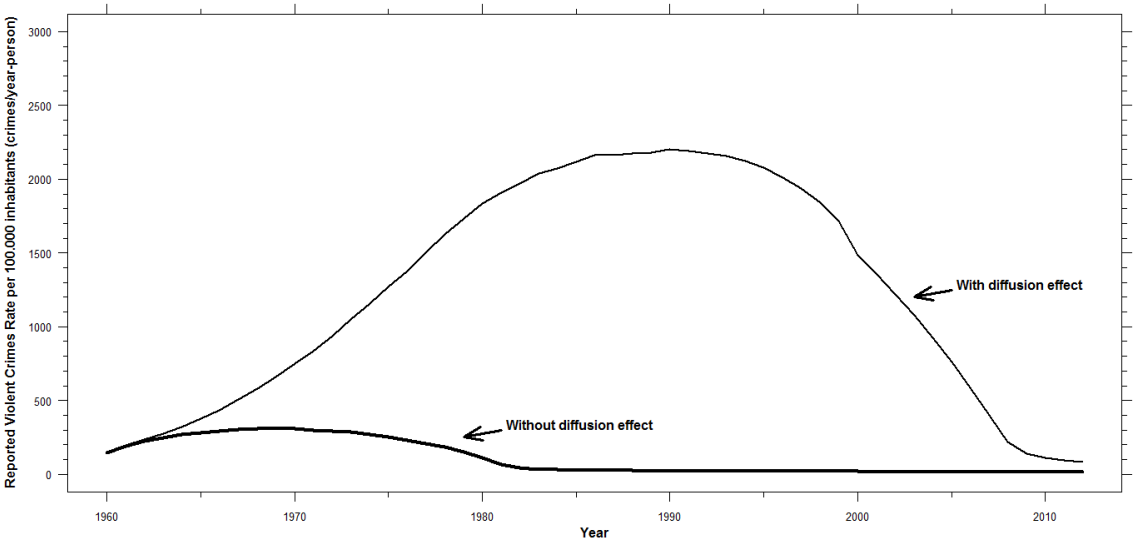

Figure B1. Comparison with and without diffusion loop.

ii. Cutting the aging loop (B1)

If we assume that nobody ages ever, then we can see how the reported violent crime rate increases sharply. This shows the importance of demographics in the fall of crime in New York City.

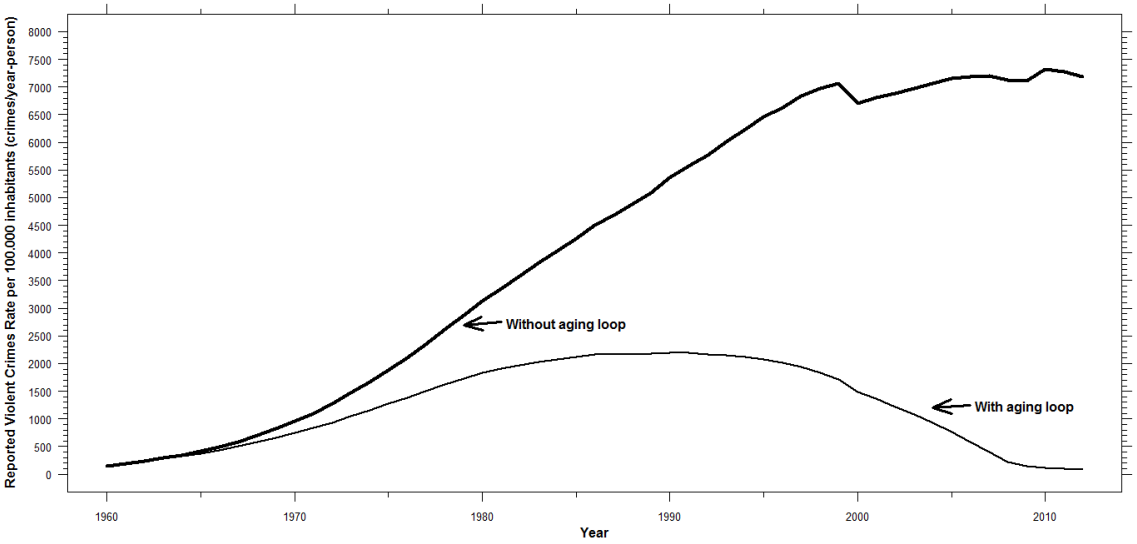

Figure B2. Comparison with and without aging loop.

iii. Cutting out recidivism loops (R2 & R3)

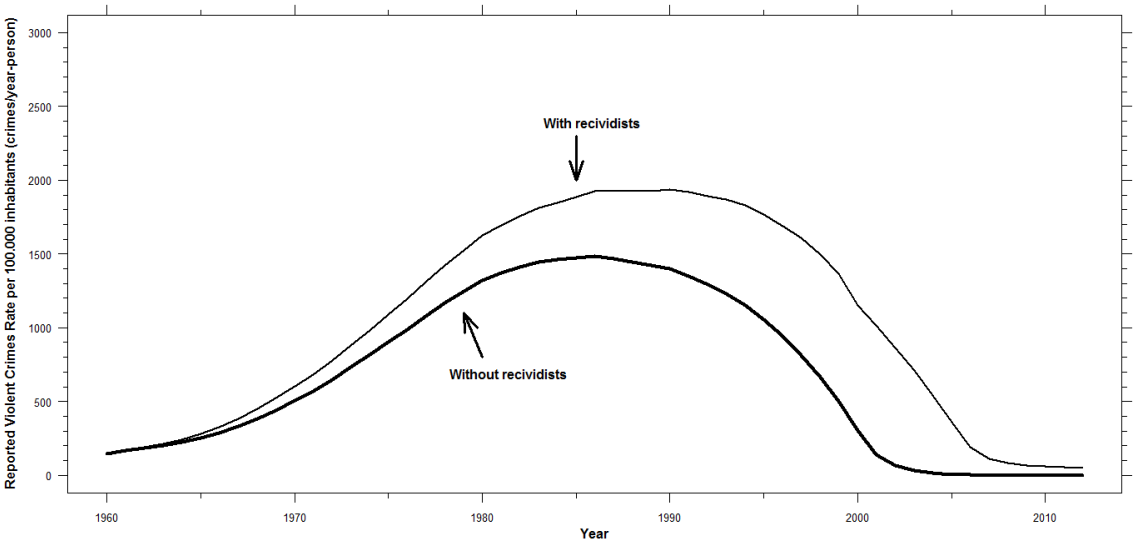

Figure B3. Comparison with and without recividists loops.

If we cut out recidivism loops (eliminating the recidivist fraction), then we can observe that the recidivists seemed to just increase the number of reported violent crimes without affecting much to the trend although it is true that, without recidivism, the crime starts increasing later and decreasing earlier.

iv. Cutting out law enforcement loop (B6)

When we eliminate arrests from the model, what we observe is an increase of violent criminals, at the beginning, exponentially, and, afterwards, with a goal-seeking pattern, because almost all potential violent criminals become actual violent criminals.

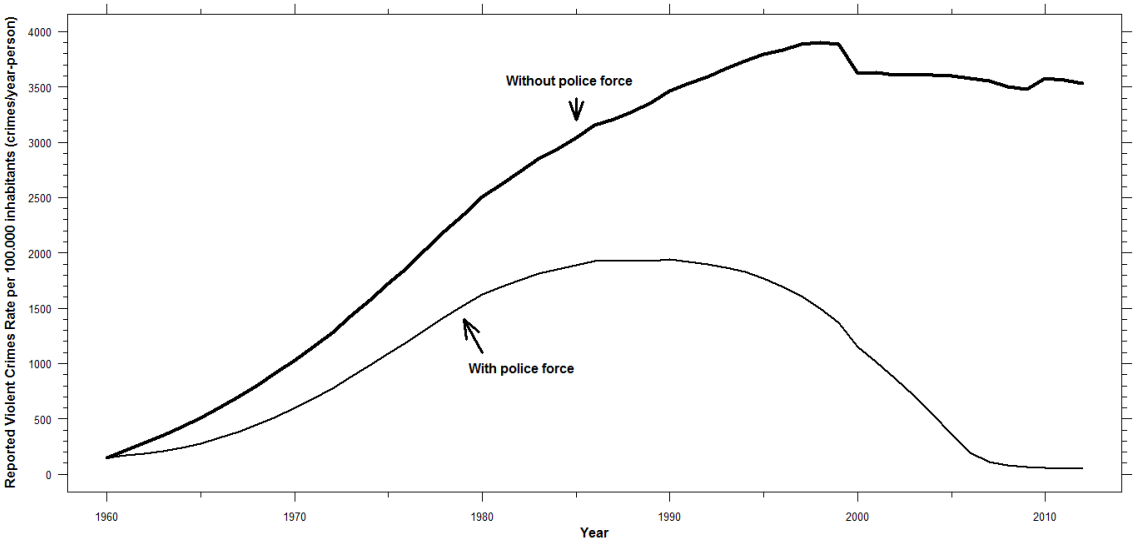

Figure. B4. Comparison with and without enforcement law loop.

Sensitivity tests

In this kind of tests, we are going to see how sensitive the model is to changes in some of the parameters we have assumed. The parameters are the following ones:

i. Normal fraction of youngsters becoming potential violent criminals

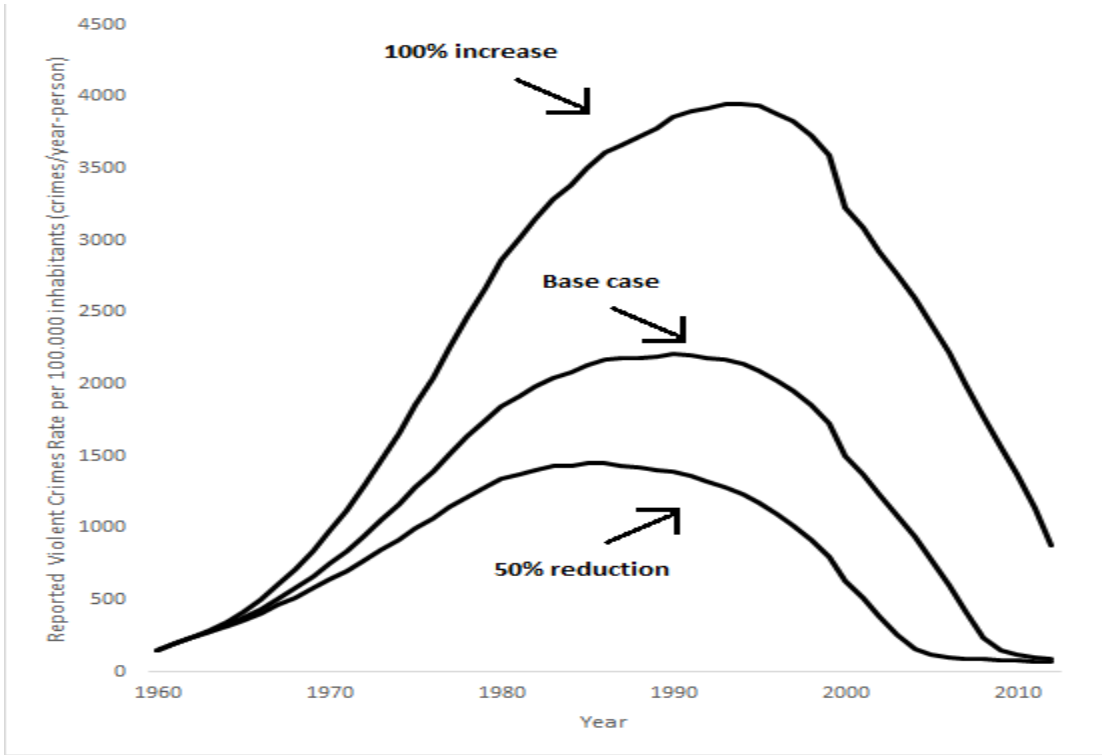

Figure B5- Comparison of different values for normal fraction of youngsters becoming potential violent criminals.

As we can see the system is very sensitive, so when we double the fraction, the number of reported violent crimes almost doubles. But this result seems logical since the potential

violent criminals that there are the more reported violent crimes that there will be in the end (more of them will become violent criminals).

ii. Normal probability of committing a violent crime

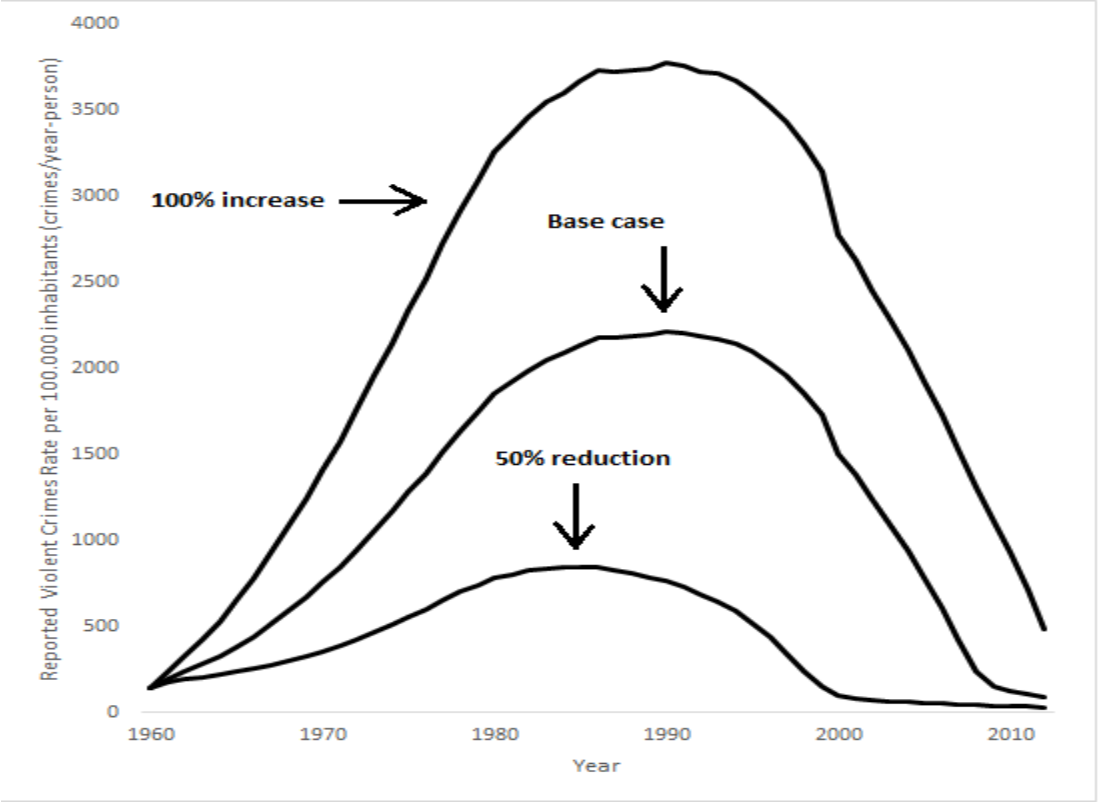

Figure B6. Comparison of different values for normal probability of committing a violent crime.

The effect is proportional and thus, the system is quite sensitive to this parameter, which seems logical (the more probability to commit violent crimes, the more violent crimes there will be. In addition, the more probability the earlier the reported violent crimes peaks and the earlier it stabilizes because they surpass the desired crime rate earlier and, therefore, police grows faster than normal.

Dimensional consistency test

The dimensional consistency test is used to verify that the equation is syntactically right. A lack of dimensional consistency reduces in a great manner the confidence on the validity of the model. In spite of this, this procedure is not commonly taken into account (Komanappalli, 2009). In our case, the units are consistent.

References

Barlas, Y. (1994). *Model validation in System Dynamics*. International System Dynamics conference. In Proceedings of the 12th International System Dynamics Conference. Stirling, Scotland.

Komanapalli, G. W. (2009). *Verifying Influence Diagrams using Dimensional Analysis*. In Proceedings of the 27th International System Dynamics Conference. Alburquerque, New Mexico, System Dynamics Society.

APPENDIX B. EQUATIONS.

Convicted_Prisoners(t) = Convicted_Prisoners(t - dt) + (conviction_rate - release_rate_with_high_chance_of_recidivism - release_rate_with_low_chance_of_recidivism) * dt
INIT Convicted_Prisoners = 24000

INFLOWS:
conviction_rate = fraction_convicted*(Prisoners_Awaiting_Trial/Avg_wait_for_trial)

OUTFLOWS:
release_rate_with_high_chance_of_recidivism = Recividist_fraction*(Convicted_Prisoners/Average_time_in_prison)

release_rate_with_low_chance_of_recidivism = (1-Recividist_fraction)*Convicted_Prisoners/Average_time_in_prison
Prisoners_Awaiting_Trial(t) = Prisoners_Awaiting_Trial(t - dt) + (Being_arrested - conviction_rate - release_rate_without_conviction) * dt
INIT Prisoners_Awaiting_Trial = Convicted_Prisoners*0.1
INFLOWS:
Being_arrested = MIN(arrest_rate,maximum_arrest_rate)

OUTFLOWS:
conviction_rate = fraction_convicted*(Prisoners_Awaiting_Trial/Avg_wait_for_trial)
release_rate_without_conviction = (1-fraction_convicted)*Prisoners_Awaiting_Trial/Avg_wait_for_trial
Cumulative_potential_violent_criminals_from_28_to_35(t) = Cumulative_potential_violent_criminals_from_28_to_35(t - dt) + (becoming_a_potential_violent_criminal_at_a_later_age - Late_potential_violent_criminals_aging_rate) * dt
INIT Cumulative_potential_violent_criminals_from_28_to_35 = Normal_fraction_of_youngsters_becoming_PVC*0.5*From_28_to_35

INFLOWS:
becoming_a_potential_violent_criminal_at_a_later_age = Maturation_rate*Potential_violent_criminal_fraction_at_a_later_age

OUTFLOWS:
Late_potential_violent_criminals_aging_rate = Male_aging_rate*Average_potential_violent_criminal_from_28_to_35

Cumulative_potential_violent_criminal_from_18_to_27(t) = Cumulative_potential_violent_criminal_from_18_to_27(t - dt) + (becoming_a_potential_violent_criminal_at_an_early_age - Early_potential_criminal_aging_rate) * dt
INIT Cumulative_potential_violent_criminal_from_18_to_27 = From_18_to_27*Normal_fraction_of_youngsters_becoming_PVC
INFLOWS:
becoming_a_potential_violent_criminal_at_an_early_age = Potential_violent_criminal_fraction_at_an_early_age*Growth_of_young_males
OUTFLOWS:
Early_potential_criminal_aging_rate = Maturation_rate*Average_potential_violent_criminal_from_18_to_27
Drug_stock(t) = Drug_stock(t - dt) + (Drugs_coming_in - Drugs_being_consumed - Drug_busts) * dt
INIT Drug_stock = 5000
INFLOWS:
Drugs_coming_in = Gross_growth_of_drug_stock

OUTFLOWS:
Drugs_being_consumed = Fraction_of_drug_consumption*Drug_stock
Drug_busts = Drug_stock*fractional_bust_per_year
From_18_to_27(t) = From_18_to_27(t - dt) + (Growth_of_young_males - Maturation_rate) * dt
INIT From_18_to_27 = Total_population*0.25*0.5
INFLOWS:
Growth_of_young_males = Population_18_years_old_males_growth_rate
OUTFLOWS:
Maturation_rate = From_18_to_27/Time_to_mature
From_28_to_35(t) = From_28_to_35(t - dt) + (Maturation_rate - Male_aging_rate) * dt
INIT From_28_to_35 = Total_population*0.15*0.5
INFLOWS:
Maturation_rate = From_18_to_27/Time_to_mature
OUTFLOWS:
Male_aging_rate = From_28_to_35/Time_to_age
Police_force(t) = Police_force(t - dt) + (Recruitment_rate - Attrition_rate) * dt
INIT Police_force = 28000
INFLOWS:
Recruitment_rate = (desired_police_recruitment_rate+Replacement_rate)
OUTFLOWS:
Attrition_rate = Police_force*Attrition_fraction
Potential__violent__criminals(t) = Potential__violent__criminals(t - dt) + (Total_increase_of_potential_violent_criminals + release_rate_without_conviction + release_rate_with_low_chance_of_recidivism - becoming_violent__criminals - Total_potential_violent_criminals_aging_rate - Excons_recovered_rate) * dt
INIT Potential__violent__criminals = 0.1*From_18_to_27+0.1*0.5 *From_28_to_35
INFLOWS:

Total_increase_of_potential_violent_criminals = becoming_a_potential_violent_criminal_at_a_later_age+becoming_a_potential_violent_criminal_at_an_early_age
release_rate_without_conviction = (1-fraction_convicted)*Prisoners_Awaiting_Trial/Avg_wait_for_trial
release_rate_with_low_chance_of_recidivism = (1-Recividist_fraction)*Convicted_Prisoners/Average_time_in_prison
OUTFLOWS:
becoming_violent__criminals = Probability_of_commiting_a_violent_crime*Potential__violent__criminals
Total_potential_violent_criminals_aging_rate = Late_potential_violent_criminals_aging_rate+Early_potential_criminal_aging_rate
Excons_recovered_rate = Excons_not_commiting_crimes_per_year
Violent_Criminals(t) = Violent_Criminals(t - dt) + (becoming_violent__criminals + release_rate_with_high_chance_of_recidivism - Being_arrested) * dt
INIT Violent_Criminals = Potential__violent__criminals*0.015*5
INFLOWS:
becoming_violent__criminals = Probability_of_commiting_a_violent_crime*Potential__violent__criminals
release_rate_with_high_chance_of_recidivism = Recividist_fraction*(Convicted_Prisoners/Average_time_in_prison)

OUTFLOWS:
Being_arrested = MIN(arrest_rate,maximum_arrest_rate)

arrest_rate = Police_force*Productivity_of_police
Attrition_fraction = 1/40
Average_potential_violent_criminal_from_18_to_27 = Cumulative_potential_violent_criminal_from_18_to_27/From_18_to_27
Average_potential_violent_criminal_from_28_to_35 = Cumulative_potential_violent_criminals_from_28_to_35/From_28_to_35
Average_time_in_prison = GRAPH(TIME)
(1960, 3.00), (1965, 3.00), (1970, 3.00), (1976, 3.00), (1981, 3.00), (1986, 3.00), (1991, 3.50), (1996, 4.20), (2002, 6.00), (2007, 6.25), (2012, 7.00)
Avg_wait_for_trial = 1
contacts_between__VC_and_nonpotential_violent_criminal_population = fraction_of_nonpotential_violent_population*yearly_contacts
contacts_with_violent_criminal_per_year = 100
Crimes_commited = Violent_Criminals*Violent_crimes_per_criminal_per_year
crime_adjustment_time = 1
desired_crime_adjustment_rate = min(0,(Desired_crime_rate-Perceived_crime_rate)/crime_adjustment_time)

Desired_crime_rate = 600
desired_pct_change_in_crime_rate = 100*desired_crime_adjustment_rate/Desired_crime_rate

desired_police = (1+desired_yearly_pct_change_in_police)*Police_force
desired_police_recruitment_rate = (desired_police-Police_force)/police_adj_time
desired_yearly_pct_change_in_police = max(0,min((-desired_pct_change_in_crime_rate/100),maximum_feasible_yearly_pct_change_in_police/100))
diffusion_effect_of_contacts = GRAPH(contacts_between__VC_and_nonpotential_violent_criminal_population/init(contacts_between__VC_and_nonpotential_violent_criminal_population))
(0.00, 0.00), (0.5, 0.5), (1.00, 1.00), (1.50, 1.50), (2.00, 2.00)
effect_of_being_arrested_on_commiting_violent_crime = GRAPH(Probability_of_being_arrested/INIT(Probability_of_being_arrested))
(0.00, 2.00), (6.25, 1.50), (12.5, 1.00), (18.8, 0.5), (25.0, 0.00)
Effect_of_consumption_of_drugs_on_being_violent = GRAPH(Drugs_being_consumed/init(Drugs_being_consumed))
(0.00, 0.00), (0.5, 0.535), (1.00, 1.00), (1.50, 2.23), (2.00, 2.92)
Effect_of_police_on_drug_busts = GRAPH(Police_force/init(Police_force))
(0.00, 0.00), (0.2, 0.162), (0.4, 0.317), (0.6, 0.521), (0.8, 0.838), (1.00, 1.00), (1.20, 1.34), (1.40, 1.48), (1.60, 1.58), (1.80, 1.61), (2.00, 1.61)
Excons_not_commiting_crimes_per_year = Real_efficiency_of_the_program*Policy&Implementation.Succesfully_completing_the_program
fractional_bust_per_year = GRAPH(normal_fractional_bust_per_year*Effect_of_police_on_drug_busts)
(0.00, 0.496), (0.5, 0.74), (1.00, 1.00), (1.50, 1.24), (2.00, 1.47)
fraction_convicted = 0.7
Fraction_of_crimes_being_reported = 0.6
Fraction_of_drug_consumption = GRAPH(TIME
{rename this variable})
(1960, 0.6), (1986, 0.8), (2012, 0.4)
fraction_of_nonpotential_violent_population = Nonpotential_violent_criminal__young_population/Total_male_young_population
Gross_growth_of_drug_stock = GRAPH(TIME)
(1960, 5000), (1986, 20000), (2012, 10000)
maximum_arrest_rate = Violent_Criminals/min_time_to_arrest_all_VC
maximum_feasible_yearly_pct_change_in_police = 2+STEP(6, 1993)-Step(4,2012)
min_time_to_arrest_all_VC = 1
Nonpotential_violent_criminal__young_population = Total_male_young_population-Potential__violent__criminals-Violent_Criminals
normal_fractional_bust_per_year = 0.1
Normal_fraction_of_youngsters_becoming_PVC = 0.1
Normal_probability_of_commiting_a_violent_crime = 0.015
NYC_Police_force_DATA = GRAPH(TIME)
(1960, 0.00), (1961, 0.00), (1962, 0.00), (1963, 0.00), (1964, 0.00), (1965, 0.00), (1966, 0.00), (1967, 0.00), (1968, 0.00), (1969, 0.00), (1970, 0.00), (1971, 0.00), (1972, 0.00), (1973, 0.00), (1974, 0.00), (1975, 0.00), (1976, 0.00), (1977, 0.00), (1978, 0.00), (1979, 0.00), (1980, 26939), (1981, 27831), (1982, 28731), (1983, 29289), (1984, 33014), (1985, 32328), (1986, 33853), (1987, 34764), (1988, 36027), (1989, 35605), (1990, 36407),

(1991, 36227), (1992, 37922), (1993, 39442), (1994, 39953), (1995, 46802), (1996, 48441), (1997, 48549), (1998, 50417), (1999, 62969), (2000, 55408), (2001, 56208), (2002, 53774), (2003, 0.00), (2004, 0.00), (2005, 0.00), (2006, 0.00), (2007, 0.00), (2008, 0.00), (2009, 0.00), (2010, 0.00), (2011, 0.00), (2012, 0.00)
Perceived_crime_rate = smth1(reported_crimes_rate,Time_to_adjust_crime_perception)
police_adj_time = 2
Population_18_years_old_males_growth_rate = GRAPH(TIME)
(1960, 100000), (1973, 150000), (1986, 125000), (1999, 50000), (2012, 100000)
Potential_violent_criminal_fraction_at_an_early_age = diffusion_effect_of_contacts*Normal_fraction_of_youngsters_becoming_PVC
Potential_violent_criminal_fraction_at_a_later_age = Potential_violent_criminal_fraction_at_an_early_age*0.5
Probability_of_being_arrested = Being_arrested/Violent_Criminals
Probability_of_commiting_a_violent_crime = Normal_probability_of_commiting_a_violent_crime*((effect_of_being_arrested_on_commiting_violent_crime+Effect_of_consumption_of_drugs_on_being_violent)/2)
Productivity_of_police = GRAPH(TIME

)
(1960, 0.05), (1977, 0.1), (1995, 0.25), (2012, 0.3)
Real_efficiency_of_the_program = 0.4
Recividist_fraction = 0.25
Replacement_rate = smth1(Attrition_rate,.08)

reported_crimes_rate = Crimes_commited*Fraction_of_crimes_being_reported
Reported_violent_crime_rate_per_100_000_inhabitants = (reported_crimes_rate/Total_population)*100000
Reported__violent_crime_rate_NYC_per_100_000_DATA = GRAPH(TIME)
(1960, 242), (1961, 248), (1962, 261), (1963, 268), (1964, 307), (1965, 337), (1966, 613), (1967, 794), (1968, 1076), (1969, 1161), (1970, 1376), (1971, 1604), (1972, 1535), (1973, 1514), (1974, 1640), (1975, 1764), (1976, 1806), (1977, 1670), (1978, 1709), (1979, 1862), (1980, 2126), (1981, 2220), (1982, 2028), (1983, 1868), (1984, 1846), (1985, 1881), (1986, 1995), (1987, 2036), (1988, 2218), (1989, 2300), (1990, 2384), (1991, 2318), (1992, 2164), (1993, 2090), (1994, 1861), (1995, 1573), (1996, 1344), (1997, 1269), (1998, 1167), (1999, 1064), (2000, 946), (2001, 851), (2002, 790), (2003, 734), (2004, 687), (2005, 673), (2006, 638), (2007, 614), (2008, 580), (2009, 552), (2010, 593), (2011, 624), (2012, 639)
Time_to_adjust_crime_perception = 2
Time_to_age = 7
Time_to_mature = 9
Total_male_young_population = From_28_to_35+From_18_to_27
Total_population = GRAPH(TIME)
(1960, 7.8e+006), (1961, 7.8e+006), (1962, 7.8e+006), (1963, 7.9e+006), (1964, 8e+006), (1965, 8e+006), (1966, 8e+006), (1967, 8e+006), (1968, 8e+006), (1969, 7.9e+006), (1970, 7.9e+006), (1971, 7.9e+006), (1972, 7.8e+006), (1973, 7.7e+006), (1974, 7.6e+006), (1975, 7.5e+006), (1976, 7.4e+006), (1977, 7.3e+006), (1978, 7.2e+006), (1979, 7.1e+006), (1980, 7e+006), (1981, 7.1e+006), (1982, 7.1e+006), (1983, 7.1e+006), (1984, 7.2e+006), (1985, 7.2e+006), (1986, 7.2e+006), (1987,

7.3e+006), (1988, 7.3e+006), (1989, 7.4e+006), (1990, 7.3e+006), (1991, 7.4e+006), (1992, 7.4e+006), (1993, 7.3e+006), (1994, 7.3e+006), (1995, 7.3e+006), (1996, 7.3e+006), (1997, 7.3e+006), (1998, 7.4e+006), (1999, 7.4e+006), (2000, 8e+006), (2001, 8e+006), (2002, 8.1e+006), (2003, 8.1e+006), (2004, 8.1e+006), (2005, 8.1e+006), (2006, 8.2e+006), (2007, 8.2e+006), (2008, 8.3e+006), (2009, 8.4e+006), (2010, 8.2e+006), (2011, 8.2e+006), (2012, 8.3e+006)

Violent_crimes_per_criminal_per_year = 2

yearly_contacts = Violent_Criminals*contacts_with_violent_criminal_per_year

Policy&Implementation.Succesfully_completing_the_program =

Policy&Implementation.Succesfully_completing_the_program =

NPV_of_Policy(t) = NPV_of_Policy(t - dt) + (yearly_net_benefits) * dt

INIT NPV_of_Policy = 0

INFLOWS:

yearly_net_benefits = if(time<policy_start_time)then(0)else (-yearly__total_costs/(1+discount_rate)^(TIME-policy_start_time))

Aggravated_assault = 47423

Average_cost_per_info_staff_per_year = 10000

Average_cost_per_mentor_coordinator_per_year = 28000

Average_cost_per_police_officer_per_year = 59652

Average_cost_per_prisoner_per_year = 167731

Average_cost_per_year = Other_costs_per_crime*.Crimes_commited

discount_rate = 0.5/12

Forcible_rape = 2848

Fraction_forcible_rape = Forcible_rape/Total_violent_crimes

Fraction_of_aggravated_assault = Aggravated_assault/Total_violent_crimes

Fraction_of_murder = Murder/Total_violent_crimes

Fraction_robbery = Robbery/Total_violent_crimes

Murder = 684

Other_costs_per_crime = (737517*Fraction_of_murder+5556*Fraction_forcible_rape+8700*Fraction_of_aggravated_assault+3299*Fraction_robbery)+(148555*Fraction_of_murder+9212*Fraction_forcible_rape+2126*Fraction_of_aggravated_assault+4272*Fraction_robbery)+(8442000*Fraction_of_murder+198212*Fraction_forcible_rape+13435*Fraction_of_aggravated_assault+4976*Fraction_robbery)+(1430*Fraction_forcible_rape+81588*Fraction_of_aggravated_assault+17599*Fraction_robbery)

policy_start_time = 2012

Robbery = 28655

Total_police_force_cost_per_year = .Police_force*Average_cost_per_police_officer_per_year

Total_policy_cost_per_year = Yearly_total_mentor_coordinators_cost+Yearly_total_info_staff_cost

Total_violent_crimes = Aggravated_assault+Robbery+Forcible_rape+Murder

Yearly_total_crimes_cost = Average_cost_per_year+Total_police_force_cost_per_year+Yearly_total_prisoners_cost

Yearly_total_info_staff_cost = Average_cost_per_info_staff_per_year*Policy&Implementation.Information_staff

Yearly_total_mentor_coordinators_cost = Average_cost_per_mentor_coordinator_per_year*Policy&Implementation.Mentor_coordinators
Yearly_total_prisoners_cost = .Convicted_Prisoners*Average_cost_per_prisoner_per_year
yearly__total_costs = Yearly_total_crimes_cost+Total_policy_cost_per_year
.Convicted_Prisoners(t) = .Convicted_Prisoners(t - dt)
INIT .Convicted_Prisoners =
.Crimes_commited =
.Police_force(t) = .Police_force(t - dt)
INIT .Police_force =
.Convicted_Prisoners(t) = .Convicted_Prisoners(t - dt)
INIT .Convicted_Prisoners =
.Crimes_commited =
Policy&Implementation.Information_staff(t) = Policy&Implementation.Information_staff(t - dt)
INIT Policy&Implementation.Information_staff =
Policy&Implementation.Mentor_coordinators(t) = Policy&Implementation.Mentor_coordinators(t - dt)
INIT Policy&Implementation.Mentor_coordinators =
.Police_force(t) = .Police_force(t - dt)
INIT .Police_force =
Policy&Implementation.Information_staff(t) = Policy&Implementation.Information_staff(t - dt)
INIT Policy&Implementation.Information_staff =
Policy&Implementation.Mentor_coordinators(t) = Policy&Implementation.Mentor_coordinators(t - dt)
INIT Policy&Implementation.Mentor_coordinators =
Information_staff(t) = Information_staff(t - dt) + (Net_chng_in_recruting_WF) * dt
INIT Information_staff = 0
INFLOWS:
Net_chng_in_recruting_WF = Recruiting_gap/Adj_time_for_recruiting_staff
Mentees_matched(t) = Mentees_matched(t - dt) + (Mentees_being_matched - Succesfully_completing_the_program - Mentees_dropping_out_rate) * dt
INIT Mentees_matched = 0
INFLOWS:
Mentees_being_matched = Max_mentees_matched__per_year
OUTFLOWS:
Succesfully_completing_the_program = ((Mentees_matched*(1-Dropping_out_fraction))/Time_in_program)
Mentees_dropping_out_rate = (Mentees_matched*Dropping_out_fraction)/Time_in_program
Mentors_in_training(t) = Mentors_in_training(t - dt) + (Mentors_being_recruited - mentors_finishing_training) * dt
INIT Mentors_in_training = 0
INFLOWS:
Mentors_being_recruited = min(Potential_mentors_adj,max_recruiting)

OUTFLOWS:
mentors_finishing_training = Mentors_in_training/Time_in_training
Mentor_coordinators(t) = Mentor_coordinators(t - dt) + (net_change_in__mentor_coordinator) * dt
INIT Mentor_coordinators = 0
INFLOWS:
net_change_in__mentor_coordinator = Mentor_coordinators_gap/Adjustment_time_for_mentor_coordinator
Potential_mentors(t) = Potential_mentors(t - dt) + (mentors_finishing_training + mentors_wanting_to_repeat - Mentors_being_matched) * dt
INIT Potential_mentors = 0
INFLOWS:
mentors_finishing_training = Mentors_in_training/Time_in_training
mentors_wanting_to_repeat = Succesfully_completing_the_program*Fraction_of_mentors_wanting_to_repeat/Mentees_per_mentor
OUTFLOWS:
Mentors_being_matched = Max_mentors_matched_per_year
Prisoners_&_exconvicts_willing_to_do_program(t) = Prisoners_&_exconvicts_willing_to_do_program(t - dt) + (Prisoners_convinced_to_participate_in_the_program - Mentees_being_matched) * dt
INIT Prisoners_&_exconvicts_willing_to_do_program = 0
INFLOWS:
Prisoners_convinced_to_participate_in_the_program = MIN(Potential_prisoners_attending_to_the_meetings*Fraction_of_convinced,Max_capacity_of_prisoners_in_information_meetings*Fraction_of_convinced)
OUTFLOWS:
Mentees_being_matched = Max_mentees_matched__per_year
Mentors_matched(t) = Mentors_matched(t - dt) + (Mentors_being_matched - mentors_quitting_rate - mentors_wanting_to_repeat) * dt
INIT Mentors_matched = 0
INFLOWS:
Mentors_being_matched = Max_mentors_matched_per_year
OUTFLOWS:
mentors_quitting_rate = (Mentees_dropping_out_rate/Mentees_per_mentor)+(Succesfully_completing_the_program*(1-Fraction_of_mentors_wanting_to_repeat)/Mentees_per_mentor)
mentors_wanting_to_repeat = Succesfully_completing_the_program*Fraction_of_mentors_wanting_to_repeat/Mentees_per_mentor
Adjustment_time_for_mentor_coordinator = 1/12
Adj_time_for_recruiting_staff = 1/12
Average_time_to_match = 0.5/12
Desired_info_staff = Expected_prisoners_attendance/prisoners_per_info_staff_per_year
Desired_mentor_coordinators = (Desired_potential_mentors+Mentors_matched)/Mentors_per_mentor_coordinator

Desired_potential_mentors = Expectancy_of_excons_willing_to_do_program/Mentees_per_mentor
Dropping_out_fraction = 0.5
Expectancy_of_excons_willing_to_do_program = SMTH1(Prisoners_&_exconvicts_willing_to_do_program,Time_to_form_expectations)
Expected_prisoners_attendance = if time<2012 then 0 else SMTH1((.Convicted_Prisoners/Time_for_information_meetings), Time_to_form_expectations)*Switch_button
Fraction_of_convinced = 0.5
Fraction_of_mentors_wanting_to_repeat = 0.7
Fraction_of_time_in_prison_for_information_meeting = 0.95
Max_capacity_of_prisoners_in_information_meetings = Information_staff*prisoners_per_info_staff_per_year
Max_mentees_matched__per_year = MIN(Potential_mentors*Mentees_per_mentor/Average_time_to_match,Prisoners_&_ex convicts_willing_to_do_program/Average_time_to_match)
Max_mentors_matched_per_year = Max_mentees_matched__per_year/Mentees_per_mentor
max_recruiting = Mentor_coordinators*Mentors_per_mentor_coordinator/Potential_mentors_adj_time
Mentees_per_mentor = 1
Mentors_per_mentor_coordinator = 40
Mentor_coordinators_gap = (Desired_mentor_coordinators-Mentor_coordinators)
Potential_mentors_adj = ((Desired_potential_mentors-Potential_mentors-Mentors_in_training)/Potential_mentors_adj_time)-mentors_wanting_to_repeat
Potential_mentors_adj_time = 1/12
Potential_prisoners_attending_to_the_meetings = (.Convicted_Prisoners/Time_for_information_meetings)*Switch_button
prisoners_per_info_staff_per_year = 240
Recruiting_gap = Desired_info_staff-Information_staff
Switch_button = 0
Time_for_information_meetings = Fraction_of_time_in_prison_for_information_meeting*Average_time_in_prison
Time_in_program = 6/12
Time_in_training = 0.25/12
Time_to_form_expectations = 3/12
.Average_time_in_prison =
.Convicted_Prisoners(t) = .Convicted_Prisoners(t - dt)
INIT .Convicted_Prisoners =
.Average_time_in_prison =
.Convicted_Prisoners(t) = .Convicted_Prisoners(t - dt)
INIT .Convicted_Prisoners =