APPENDIX 1

LISTING OF THE COMPUTER PROGRAM GCCONT

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00100  REM    THIS PROGRAM, GCCONT, FINDS PREVALENCE AND INCIDENCE OF GONORRHEA
00120  REM  FOR SEVERAL CONTROL SITUATIONS.TO MAKE A RUN, ENTER PARAMETERS WHEN
00140  REM  THEY ARE REQUESTED.
00180  REM
00200  REM    THE MODEL EQUATIONS ARE COMPUTED IN THE 'RATE' SUBROUTINE AND THE
00220  REM  'CONTROL' SUBROUTINE, USING THE CONTACT MATRIX WHICH THE 'PATTERN'
00240  REM  SUBROUTINE CALCULATED.
00260  REM
00280  REM     THE PROGRAM IS ORGANIZED AS FOLLOWS:
00300  REM  AFTER WE ENTER DATA,THE PROGRAM MAKES PRELIMINARY CALCULATIONS WHICH
00320  REM  INCLUDE CALLING THE PATTERN SUBROUTINE TO FORM THE CONTACT MATRIX.
00340  REM  THEN THE MAIN PROGRAM LOOP BEGINS:DURING A RUN THE LOOP VARIABLE R1
00360  REM  STEPS THROUGH THE FOLLOWING VALUES:
00380  REM       R1=1 FOR THE UNCONTROLLED CASE
00400  REM       R1=2 FOR POPULATION SCREENING (WOMEN)
00420  REM   R1=3 FOR POP SCREENING PLUS SUPPLEMENTARY POP SCREENING
00440  REM   R1=4 FOR POP SCREENING PLUS SUPPLEMENTARY INFECTEE TRACING
00460  REM   R1=5 FOR POP SCREENING PLUS SUPPLEMENTARY INFECTOR TRACING
00480  REM
00500  REM  FOR EACH CASE, THE MAIN PROGRAM CALLS THE 'SOLVER' SUBROUTINE WHICH
00520  REM  USES ITERATION PROCEDURES TO FIND PREVALENCES. THE MAIN PROGRAM ALSO
00540  REM  MAKES SUMMARY CALCULATIONS FOR EACH CASE AND PRINTS OUT A TABLE OF
00560  REM  RESULTS.  THE 'SOLVER' SUBROUTINE ORGANIZES THE ITERATION PROCESS.
00580  REM  THE 'RATE' SUBROUTINE ACTUALLY COMPUTES THE DIRECTION FIELD V(I,1):
00600  REM  IT CALLS THE 'CONTROL' SUBROUTINE TO FIND THE CONTROL RATE PORTION.
00620  REM  RATE ALSO STORES THE PREVIOUS VALUE OF THE DIRECTION FIELD IN V(I,2)
00640  REM  AND COMPUTES THE DIFFERENCE V(I,3)=V(I,1)-V(I,2).  (OTHER NUMERICAL
00660  REM  METHODS MIGHT REQUIRE MORE BACK VALUES WHICH COULD BE STORED IN
00680  REM  OTHER COLUMNS OF V.)  'SOLVER' USES AN EULER STEP METHOD TO BEGIN,
00700  REM  THEN CALLS THE 'NEWTON' SUBROUTINE FOR NEWTON'S METHOD.THE MATRIX OF
00720  REM  PARTIAL DERIVATIVES IS FOUND BY THE 'FDERIV' SUBROUTINE.  WHEN THE
00740  REM  RMS RATE IS SMALL ENOUGH, 'SOLVER' STOPS THE ITERATION PROCESS, AND
00760  REM  THE MAIN PROGRAM SUMMARIZES RESULTS, THEN STEPS TO THE NEXT CONTROL
00780  REM  CASE.
00800  REM
00820  REM  DIMENSIONS OF VECTORS AND MATRICES:
00840  REM  IF THE NUMBER OF GROUPS G IS NOT 4, REPLACE 4 BY G IN DIM STATEMENTS
00860  REM  AND ALSO MODIFY PRINT LINES IN WHICH WE LABEL 4 GROUPS EXPLICITLY.
00880  DIM N(8),Y(8),D(8),K(8),P(8)
00900  DIM R(8),Z(8),W(8),U(8),E(8)
00920  DIM M(8,8),B(8,8),T(8,8),L(8,8)
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00940  DIM A(8,8),V(8,3),F(8,1),X(8,1),H(8,1)
00960  DIM S(5,8),Q(11,8),O(1,8)
00980  REM
01000  REM  - - - - - - - - -   ENTER DATA   - - - - - - - - - - - - - - - - - -
01020  REM
01040  REM  INDEXING:   WOMEN ODD, MEN EVEN
01060  REM  ORDERING:  GP1 WOMEN, GP2 MEN, GP3 WOMEN, GP4 MEN
01080  REM  G=NUMBER OF GROUPS
01100  G=8
01120  PRINT'INPUT G1=SELF INTERACTION FRACTION'
01140  INPUT G1
01200  REM  G2 SELECTS PRINTOUT: G2=0 FOR SUMMARY ONLY:  G2=1 FOR ITERATION INFO
01220  G2=0
01240  REM N(I)=RELATIVE SIZE OF GROUP I,IN ANY UNITS
01260  PRINT 'INPUT GROUP FRACTIONS N(I)'
01280  MAT INPUT N
01300  PRINT'INPUT ACTIVITY RATIOS OF GROUPS:WOMEN AND MEN'
01320  INPUT R8,R9
01340  REM  Y(I)=INITIAL GUESS OF PREVALENCE, THE INFECTIVE FRACTION OF GROUP I
01360  FOR I=1 TO G STEP 1
01380  READ Y(I)
01400  NEXT I
01420  DATA .5,.5,.1,.1,.1,.1,.1,.1
01440  REM  D(I)=DURATION OF DISEASE (AVERAGE) FOR GROUP I,IN ANY UNITS (MONTHS)
01460  PRINT 'INPUT DURATIONS D(I)'
01480  MAT INPUT D
01500  PRINT'INPUT PROB OF TRANS BY INF MAN/PROB OF TRANS BY INF WOMAN'
01520  INPUT R7
01540  REM  K(I)=NUMBER OF EFFECTIVE CONTACTS OF EACH GROUP I INFECTIVE
01560  REM  DURING THE INFECTIOUS PERIOD.
01580  PRINT'INPUT K(1)'
01600  INPUT K(1)
01620  K(2)=K(1)*D(2)/D(1)*R7*(N(1)+N(5)+(N(3)+N(7))/R8)/(N(2)+N(6)+(N(4)+N(8))/R9)
01640  K(3)=K(1)*D(3)/D(1)/R8
01650  K(4)=K(2)*D(4)/D(2)/R9
01660  K(5)=K(1)*D(5)/D(1)
01670  K(6)=K(2)*D(6)/D(2)
01680  K(7)=K(1)*D(7)/D(1)/R8
01690  K(8)=K(2)*D(8)/D(2)/R9
01780  REM  - - - - - - - - - - - - - - - - -- - - - - - - - - - - - - - -
01800  REM PRELIMINARY CALCULATIONS
01820  MAT A=ZER(G,G)
01840  MAT F=ZER(G,1)
01860  MAT X=ZER(G,1)
01880  MAT H=ZER(G,1)
01900  MAT V=ZER(G,3)
01902  PRINT
01904  PRINT '#####   RUN NUMBER       #####'
01918  PRINT
01920  PRINT '  ','  GONORRHEA CONTROL MODEL'
01940  PRINT '  ',' ------------------------  '
01980  REM
02000  REM    GO BUILD CONTACT MATRIX B
02020  REM
02040  GOSUB 8680
02060  REM
02080  REM  *******************   MAIN PROGRAM LOOP *************************************
02100  REM
02120  REM    R1 INDEXES THE CONTROL METHOD: R1=1 BEFORE THE CONTROLS ARE USED
02140  R1=1
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02160  REM   GO TO THE SOLVER SUBROUTINE TO FIND THE SOLUTION
02180  GOSUB 4560
02200  IF G2=0 THEN 2280
02220  PRINT Y(1),Y(2),Y(3),Y(4),W5
02240  PRINT 'SOLUTION APPROACHED IS ON ABOVE LINE','  ','RMS RATE'
02280  IF R1>1 THEN 2680
02300  REM   SAVE VALUES FROM ORIGINAL CASE, BEFORE APPLYING CONTROLS
02320  S2=0
02340  S3=0
02360  S4=0
02380  S5=0
02400  FOR I=1 TO G STEP 1
02420  S(1,I)=Y(I)
02440  S(2,I)=Y(I)*N(I)
02460  S(3,I)=D(I)
02480  S(4,I)=S(2,I)/D(I)
02500  Z(I)=S(4,I)
02520  NEXT I
02540  FOR I=1 TO G-1 STEP 2
02560  S2=S2+Z(I+1)
02580  S3=S3+Z(I)
02600  S4=S4+S(2,I+1)
02620  S5=S5+S(2,I)
02640  NEXT I
02660  REM  STORE VALUES FOR PRINTING IN MATRIX Q
02680  Q2=0
02700  Q3=0
02720  Q4=0
02740  Q5=0
02760  FOR I=1 TO G STEP 1
02780  Q(1,I)=Y(I)
02800  Q(2,I)=(Q(1,I)-S(1,I))*100/S(1,I)
02820  Q(3,I)=Y(I)*N(I)
02840  Q(4,I)=(Q(3,I)-S(2,I))*100/S(2,I)
02860  Q(5,I)=D(I)
02880  Q(6,I)=1/(1/D(I)+C*R(I)/(Y(I)*N(I))+.1*C*P(I)/(Y(I)*N(I)))
02900  Q(7,I)=Q(3,I)/Q(6,I)
02920  Q(8,I)=(Q(7,I)-S(4,I))*100/S(4,I)
02940  Q(9,I)=C*R(I)+.1*C*P(I)
02960  Q(10,I)=N(I)
02980  Q(11,I)=K(I)
03000  NEXT I
03020  FOR I=1 TO G-1 STEP 2
03040  Q2=Q2+Q(7,I+1)
03060  Q3=Q3+Q(7,I)
03080  Q4=Q4+Q(3,I+1)
03100  Q5=Q5+Q(3,I)
03120  NEXT I
03160  ON R1 GOTO 3180,3220,3230,3260,3320
03180  PRINT '***********   RESULTS WITH NO EXTRA CURE RATE APPLIED  **********'
03200  GOTO 3340
03220  PRINT '***********  RESULTS FOR POPULATION SCREENING  ***************'
03221  PRINT 'THE NUMBER OF WOMEN DISCOVERED BY POPULATION SCREENING IS'
03222  PRINT 'SET EQUAL TO 10% OF THE INCIDENCE AND THE EFFECTIVE CONTACT'
03223  PRINT 'NUMBER IS CHOSEN SO THAT THIS POPULATION SCREENING CAUSES'
03224  PRINT 'APPROXIMATELY A 20% DECREASE IN INCIDENCE IN MEN.'
03225  GO TO 3340
03230  PRINT '*****RESULTS FOR SUPPLEMENTARY POPULATION SCREENING  **********'
03235  GO TO 3340
03260  PRINT '********  RESULTS FOR SUPPLEMENTARY INFECTEE TRACING  ************'
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03280  PRINT 'TRACE WOMEN REPORTED AS CONTACTEES OF DIAGNOSED MEN'
03300  GOTO 3340
03320  PRINT '**********  RESULTS FOR SUPPLEMENTARY INFECTOR TRACING  **********'
03330  PRINT 'TRACE WOMEN REPORTED AS INFECTORS OF DIAGNOSED MEN'
03340  PRINT ' ','GP1 WOMEN','GP2 MEN','GP3 WOMEN','GP4 MEN'
03440  FOR I1=1 TO 11 STEP 1
03460  FOR I=1 TO G STEP 1
03480  O(1,I)=Q(11,I)
03500  NEXT I
03540  ON I1 GOTO 3560,3600.3640,3680,3720.3760,3800,3840,3880,3920,3960
03560  PRINT 'PREVALENCE.FRAC':
03580  GOTO 3980
03600  PRINT 'CHANGE (%)      ':
03620  GOTO 3980
03640  PRINT 'PREVALENCE, POP':
03660  GOTO 3980
03680  PRINT 'CHANGE (%)      ':
03700  GOTO 3980
03720  PRINT 'DURATION,ORIG  ':
03740  GOTO 3980
03760  PRINT 'DURATION, NEW  ':
03780  GOTO 3980
03800  PRINT 'INCIDENCE,POP':
03820  GOTO 3980
03840  PRINT 'CHANGE (%)      ':
03860  GOTO 3980
03880  PRINT 'EXTRA CURE RATE':
03900  GOTO 3980
03920  IF R1>1 THEN 4040
03930  PRINT 'POPULAT. RATIOS':
03940  GOTO 3980
03960  PRINT 'CONTACT NUMBERS':
03980  PRINT O(1,1),O(1,2),O(1,3),O(1,4)
03990  PRINT' GPS 5,6,7,8',O(1,5),O(1,6),O(1,7),O(1,8)
04000  NEXT I1
04040  PRINT '  WOMEN,POP PREVALENCE =',Q5,'CHANGE (%)= ',(Q5-S5)*100/S5
04060  PRINT '  MEN,  POP PREVALENCE =',Q4,'CHANGE (%)=',(Q4-S4)*100/S4
04080  PRINT '  WOMEN,MONTHLY INCIDENCE =',Q3,'CHANGE (%)=',(Q3-S3)*100/S3
04100  PRINT '  MEN,  MONTHLY INCIDENCE =',Q2,'CHANGE (%)=',(Q2-S2)*100/S2
04105  IF R1=1 THEN 4200
04110  PRINT '  WOMEN,DISCOVERED BY POPULATION SCREENING=':C
04116  IF R1=2 THEN 4124
04120  PRINT '  WOMEN,DISCOVERED BY SUPPLEMENTARY CONTROL=':.1*C
04124  PRINT 'THE PROBABILITY THAT A WOMAN DISCOVERED BY POPULATION SCREENING'
04126  PRINT '       IS A GP1 MEMBER IS':R(1)
04130  IF R1>2 THEN 4136
04132  E2=Q2
04134  E3=Q3
04135  E7=Q5
04136  IF R1=2 THEN 4200
04138  PRINT 'THE PROBABILITY THAT A WOMAN DISCOVERED BY THE SUPPLEMENTARY'
04140  PRINT '       PROCEDURE IS A GP1 MEMBER IS':P(1)
04144  IF R1>3 THEN 4148
04146  C1=(E7-Q5)/E7*100
04148  C2=(E7-Q5)/E7*100
04150  PRINT 'IF THIS SUPPLEMENTARY CONTROL PROCEDURE INCREASES THE NUMBER OF'
04152  PRINT '       DISCOVERIES OF INFECTIOUS WOMEN BY 10%, THEN THE % DECREASE'
04154  PRINT '       IN PREVALENCE IN WOMEN IS':C2:'WHICH IS':C2/C1:'TIMES THE % '
04158  PRINT ' DECREASE IN PREVALENCE IN WOMEN DUE TO SUPPLEMENTARY POPULATIION'
04160  PRINT '       SCREENING.'
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04170  E4=(E2-Q2)/(.1*C)
04172  E5=(E3-Q3)/(.1*C)
04174  PRINT 'THE DISCOVERY AND CURE OF ONE INFECTIOUS WOMAN BY THIS '
04176  PRINT '     SUPPLEMENTARY CONTROL PROCEDURE PREVENTS':E5:'CASES IN'
04178  PRINT '      WOMEN AND':E4:' CASES IN MEN.'
04200  PRINT '- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -'
04210  IF R1<>1 THEN 4214
04212  PRINT
04214  IF R1<>3 THEN 4220
04215  PRINT
04220  R1=R1+1
04240  IF R1>5 THEN 4300
04280  GOTO 2180
04300  PRINT 'END OF PROGRAM'
04320  REM ***********  END OF MAIN PROGRAM LOOP  ****************************
04340  STOP
04360  REM  * * * * * * * * *  SUBROUTINES  * * * * * * * * * * * * * * * *
04380  REM
04400  REM   ############################################################
04410  REM
04420  REM                    SOLVER SUBROUTINE
04440  REM   THE PROCEDURE TO FIND PREVALENCES Y(I) BEGINS HERE
04460  REM
04480  REM  J2 COUNTS THE NUMBER OF ITERATIONS MADE SO FAR
04500  REM  J3 SELECTS THE METHOD:   J3=0 FOR EULER STEPS ALONG TRAJECTORY:
04520  REM                           J3=1 WHEN WE USE THE NEWTON METHOD
04540  REM  J5=0 IF WE DON'T WISH TO COMPUTE DIFFERENCES IN THE DIRECTION FIELD
04560  J2=0
04580  J3=0
04600  J5=0
04780  IF G2=0 THEN 5000
04800  PRINT 'PREVALENCES, AS FRACTIONS OF EACH GROUP'
04820  PRINT 'CORE WOMEN','CORE MEN','NONCORE WOMEN','NONCORE MEN','RMS RATE'
04840  PRINT Y(1),Y(2),Y(3),Y(4)
04860  GOTO 5000
04880  REM  THE ITERATION LOOP BEGINS HERE
04900  IF G2=0 THEN 5000
04920  PRINT Y(1),Y(2),Y(3),Y(4),W5
04940  REM
04960  REM  DECIDE WHICH SOLUTION METHOD TO APPLY NEXT
04980  REM
05000  IF J3=1 THEN 5400
05020  IF J4=G THEN 5030
05025  GO TO 5160
05030  IF J2>9 THEN 5060
05040  GOTO 5160
05060  J3=1
05080  IF G2=0 THEN 5160
05100  PRINT 'NEWTON METHOD BEGINS AFTER NEXT STEP'
05120  REM  THIS ITERATION PROCEDURE MAY BE USEFUL BEFORE NEWTON METHOD BEGINS:
05140  REM   GO TO THE RATE SUBROUTINE TO USE THE MODEL EQUATIONS
05160  GOSUB 6880
05180  J5=1
05200  FOR I=1 TO G STEP 1
05220  REM    Y(I)=(W(I)-S1*R(I))*D(I)/(1+D(I)*W(I))   IS AN ALTERNATIVE
05240  REM  EULER STEPS ALONG TRAJECTORY:
05260  Y(I)=Y(I)+.25*V(I,1)
05280  IF Y(I)>0 THEN 5320
05300  Y(I)=0
05320  NEXT I
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05340  GOTO 5720
05360  REM WE GO TO THE NEWTON SUBROUTINE AFTER SAVING THE OLD SOLUTION IN E
05380  REM  AND THE OLD RMS RATE IN W7
05400  MAT E=Y
05420  W7=W5
05440  GOSUB 5820
05460  IF W5<W7 THEN 5720
05480  IF G2=0 THEN 5520
05500  PRINT 'USE ONLY HALF OF INCREMENT SINCE THE RMS RATE=',W5
05520  MAT Y=E+Y
05540  MAT Y=(.5)*Y
05560  GOSUB 5820
05580  IF W5<W7 THEN 5720
05600  MAT Y=E
05620  J3=0
05640  IF G2=0 THEN 5680
05660  PRINT 'USE STARTER AGAIN SINCE RMS RATE=',W5
05680  GOTO 5160
05700  REM   STEP UP ITERATION COUNTER
05720  J2=J2+1
05740  IF W5>1E-06 THEN 5750
05745  RETURN
05750  IF J2<300 THEN 4900
05755  PRINT 'WARNING: 300 ITERATIONS'
05760  RETURN
05780  REM    ##################################################################
05800  REM
05820  REM     NEWTON SUBROUTINE STARTS HERE
05840  REM
05860  REM  WE WILL SOLVE F(X)=0, WHERE X CONTAINS PREVALENCES AND F CONTAINS
05880  REM  THEIR DIRECTION FIELD.
05900  REM
05920  FOR I=1 TO G STEP 1
05940  X(I,1)=Y(I)
05960  F(I,1)=V(I,1)
05980  NEXT I
06000  REM   GO TO SUB TO FORM PARTIAL DERIVATIVE MATRIX A
06020  GOSUB 6420
06040  REM
06060  REM   FIND NEW PREVALENCES X BY NEWTON METHOD, THEN STORE THEM IN Y
06080  REM
06100  MAT L=INV(A)
06120  MAT H=L*F
06140  MAT X=X-H
06160  REM
06180  FOR I=1 TO G STEP 1
06200  Y(I)=X(I,1)
06220  NEXT I
06240  GOSUB 6880
06260  RETURN
06280  REM   NEWTON ALGORITHM ENDS HERE
06300  REM
06320  REM   ##################################################################
06340  REM
06360  REM SUBROUTINE FDERIV:  FORM APPROXIMATE PARTIAL DERIVATIVE MATRIX A
06380  REM
06400  REM
06420  H9=.001
06440  J9=1
06460  Y(J9)=Y(J9)-H9
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06480  GOSUB 6880
06500  J5=1
06520  Y(J9)=Y(J9)+2*H9
06540  GOSUB 6880
06560  REM  STORE PARTIALS:  MATRIX A APPROXIMATES DF
06580  FOR I=1 TO G STEP 1
06600  A(I,J9)=V(I,3)/(2*H9)
06620  NEXT I
06640  Y(J9)=Y(J9)-H9
06660  J9=J9+1
06680  J5=0
06700  IF J9<=G THEN 6460
06720  RETURN
06740  REM
06760  REM    ###############################################################
06780  REM
06800  REM    ******************  RATE SUBROUTINE  **************************
06820  REM
06840  REM  WE COMPUTE THE DIRECTION FIELD V(I,1) USING THE MODEL EQUATIONS
06860  REM
06880  FOR I=1 TO G STEP 1
06920  W1=0
06940  FOR J1=1 TO G STEP 1
06960  W1=W1+B(I,J1)*Y(J1)
06980  NEXT J1
07000  W(I)=W1
07020  NEXT I
07040  REM
07060  REM GO TO SUB TO FORM EXTRA CURE RATES R(I)
07080  REM
07100  GOSUB 7580
07120  REM
07140  REM   COMPUTE V(I,1), TIME RATES OF CHANGE OF PREVALENCES  Y(I)
07160  REM
07180  W5=0
07200  J4=0
07220  FOR I=1 TO G STEP 1
07240  REM  ************   MODEL EQUATIONS:    *******************
07260  V(I,1)=(1-Y(I))*W(I)-(Y(I)/D(I))-C*R(I)/N(I)-.1*C*P(I)/N(I)
07280  IF J5=0 THEN 7400
07300  REM CALCULATE CHANGES IN SLOPES
07320  V(I,3)=V(I,1)-V(I,2)
07340  IF J3=1 THEN 7400
07360  IF SGN(V(I,3))=SGN(V(I,1)) THEN 7400
07380  J4=J4+1
07400  V(I,2)=V(I,1)
07420  W5=W5+V(I,1)*V(I,1)
07440  NEXT I
07460  W5=SQR(W5)
07480  RETURN
07500  REM ******************************************************************
07520  REM  ***************** CONTROL SUBROUTINE  **************************
07540  REM  THESE LOOPS FORM EXTRA CURE RATES R(I) AND P(I)
07560  REM
07580  IF R1=1 THEN 7770
07586  IF R1>2 THEN 7720
07590  T1=C
07600  C=0
07620  FOR I=1 TO G-1 STEP 2
07640  Z(I)=Y(I)*N(I)*(1/D(I)+T1*R(I)/(Y(I)*N(I)))
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07660  C=C+Z(I)
07680  NEXT I
07700  C=.1*C
07710  REM  C IS THE DISCOVERY RATE DUE TO POPULATION SCREENING
07720  IF R1<4 THEN 7880
07740  IF R1=4 THEN 8080
07760  IF R1=5 THEN 8360
07770  REM  UNCONTROLLED CASE
07780  FOR I=1 TO G STEP 1
07800  R(I)=0
07810  P(I)=0
07820  NEXT I
07860  RETURN
07880  REM POPULATION SAMPLING, WOMEN
07900  REM
07920  A3=0
07940  FOR I=1 TO G-1 STEP 2
07960  A3=A3+Y(I)*N(I)
07980  NEXT J
08000  FOR I=1 TO G-1 STEP 2
08020  R(I)=Y(I)*N(I)/A3
08040  NEXT I
08050  IF R1=2 THEN 8060
08052  FOR I=1 TO G-1 STEP 2
08054  P(I)=R(I)
08056  NEXT I
08060  RETURN
08080  REM INFECTEE SAMPLING, WOMEN
08100  A5=0
08120  FOR I=1 TO G-1 STEP 2
08140  A4=0
08160  FOR I9=2 TO G STEP 2
08180  A4=A4+M(I,I9)*(1-Y(I))*Y(I9)*N(I9)*K(I9)/D(I9)
08200  NEXT I9
08220  P(I)=A4
08240  A5=A5+P(I)
08260  NEXT I
08280  FOR I=1 TO G-1 STEP 2
08300  P(I)=P(I)/A5
08320  NEXT I
08340  RETURN
08360  REM INFECTOR SAMPLING, WOMEN
08380  A5=0
08400  FOR I=1 TO G-1 STEP 2
08420  A4=0
08440  FOR I9=2 TO G STEP 2
08460  A4=A4+M(I9,I)*(1-Y(I9))
08480  NEXT I9
08500  P(I)=A4*N(I)*Y(I)*K(I)/D(I)
08520  A5=A5+P(I)
08540  NEXT I
08560  FOR J=1 TO G-1 STEP 2
08580  P(I)=P(J)/A5
08600  NEXT I
08620  RETURN
08640  REM   ###############################################################
08660  REM
08680  MAT M=ZER(G,G)
08700  MAT T=ZER(G,G)
08720  MAT B=ZER(G,G)
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08760  REM SET UP PROPORTIONATE MIXING MODEL
08780  A1=0
08800  A2=0
08820  FOR I=1 TO G STEP 1
08840  U(I)=N(I)*K(I)/D(I)
08860  NEXT I
08880  FOR I=2 TO G STEP 2
08900  A1=A1+U(I-1)
08920  A2=A2+U(I)
08940  NEXT I
08960  FOR I9=1 TO G-1 STEP 2
08980  FOR I=2 TO G STEP 2
09000  M(I-1,I9+1)=U(I-1)/A1
09020  M(I,I9)=U(I)/A2
09040  NEXT I
09060  NEXT I9
09080  IF G1=0 THEN 9440
09120  MAT L=ZER(G,G)
09130  FOR K8=3 TO 7 STEP 4
09140  FOR K9=1 TO 2
09150  U8=U(K9)+U(K9+4)
09160  L(K9,K8-K9)=U(K9)/U8
09170  L(K9+4,K8-K9)=U(K9+4)/U8
09180  U9=U(K9+2)+U(K9+6)
09190  L(K9+2,K8-K9+2)=U(K9+2)/U9
09200  L(K9+6,K8-K9+2)=U(K9+6)/U9
09210  NEXT K9
09220  NEXT K8
09250  MAT L=(G1)*L
09260  MAT M=(1-G1)*M
09270  MAT M=M+L
09440  FOR I9=1 TO G STEP 1
09460  FOR I=1 TO G STEP 1
09480  T(I,I9)=M(I,I9)*K(I9)
09500  B(I,I9)=T(I,I9)*N(I9)/(D(I9)*N(I))
09520  NEXT I
09540  NEXT I9
09745  IF G1>0 THEN 9780
09748  PRINT
09750  PRINT 'PROB. OF TRANS. BY INF. MAN/PROB. OF TRANS. BY INF. WOMAN=':R7
09752  PRINT 'SEXUAL ACTIVITY OF GP1 WOMAN/SEXUAL ACT. OF GP3 WOMAN=':R8
09754  PRINT 'SEXUAL ACTIVITY OF GP2 MAN/SEXUAL ACTIVITY OF GP4 MAN=':R9
09756  P1=0
09758  P2=0
09760  FOR I=2 TO G STEP 2
09762  P1=P1+M(I,1)*K(I)
09764  P2=P2+M(I-1,2)*K(I-1)
09766  NEXT I
09768  K4=P1*P2
09770  PRINT'EFFECTIVE CONTACT NUMBER=':K4
09772  PRINT
09780  IF G2=0 THEN 9880
09800  PRINT 'MIXING MATRIX: M(I,J)=FRAC OF EFF. CONTACTS OF J THAT ARE WITH I'
09840  PRINT 'CONTACT MATRIX B'
09880  RETURN
09900  END
```