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A Morbidity Submodel of Infectious Diseases

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A MORBIDITY SUBMODEL OF INFECTIOUS DISEASES

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Preface

The aim of the IIASA Modeling Health Care Systems Task is to build a National Health Care System model and apply it in collaboration with national research centers as an aid to Health Service planners. The modeling work is proceeding along the lines proposed in earlier papers by Venedictov [1] and others. It involves the construction of linked submodels dealing with population, disease prevalence, resource need, resource supply, and resource allocation.

This paper deals with one part of the work on disease prevalence estimation. The general concept of our approach to building a universal health care model and the relations of this approach to other studies were already set out in a previous paper of ours [2]. In that paper, the morbidity submodel of degenerative diseases was dealt with.

The main part of this report deals with the morbidity submodel of infectious diseases, the second step towards realizing the integrated disease prevalence submodel. Descriptions of the morbidity submodel of accidents and other causes of diseases will be published in the future.

Related papers on disease prevalence estimation and other recent publications of the Health Care System Modeling Task are listed on the back pages of this report.

Abstract

Numbers of sick persons with infectious diseases in a country can be estimated by the morbidity submodel of infectious diseases. The input of the model is the population structure of the country and the outputs are numbers of sicks, deaths, and prevalence rates of infectious diseases. The model makes use of three disease specific rates which are assumed to be constant across developed countries, namely morbidity rate, recovery rate, and death rate per capita. For this paper values of these three rates were calculated from Japanese survey data describing disease specific prevalence rate, death rate, and duration of stay. The outputs of the model are in good agreement with WHO statistics from Japan and other developed countries.

A Morbidity Submodel of Infectious Diseases

INTRODUCTION

In the introduction, we want to write briefly the concept of our model from our previous published report [1].

The morbidity model analyzes the factors related to the incidence of diseases. The model inheres four essential factors, with which the health care demand can be easily interpreted from ordinary health statistics. These are population structure (PN), morbidity rate (MR), recovery rate (RECOV), and death rate (DR).

Population Structure: PN(i): As sick persons constitute a subset of the total population, it is necessary to know the size of the total population. Since diseases are dependent on age and sex, the population must be classified by age and sex.

Morbidity Rate: MR(i): As shown in Figure 1, the population is divided into two groups--healthy (HP) and sick (TS). Sick defines persons with some disease, regardless of the treatment. The person himself may not know that he is ill; these people are included with the TS at this stage.

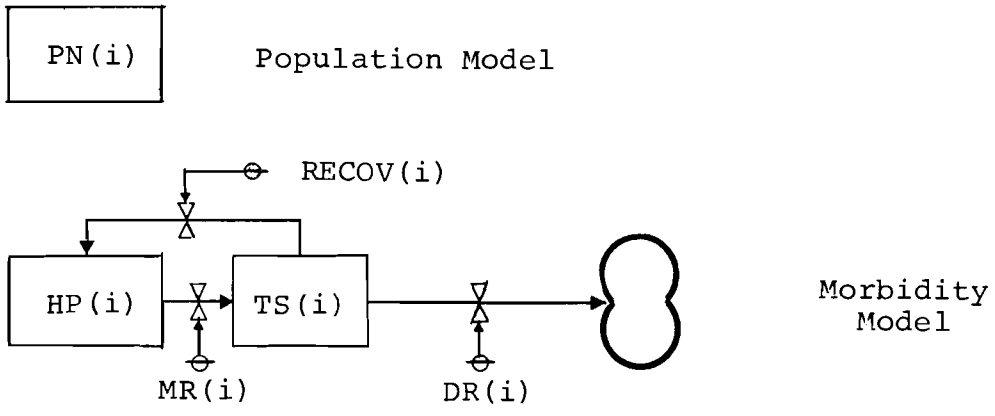

Figure 1

Since this is a dynamic process, a rate can be assumed between these two amounts, namely, the number of persons transferred from the healthy stage to the sick stage in a unit time. This rate is defined as the morbidity rate (MR).

Recovery Rate: RECOV(i): Persons who get illnesses may recover--in some cases after medical treatment and in others

spontaneously. This summary rate may be defined as the recovery rate (RECOV).

Death Rate: DR(i): Persons who get illnesses may die even after much medical treatment. This rate is defined as the disease specific death rate of patients (DR). Note that this rate is different from the ordinary disease specific death rate in health statistics (the number of persons who die from certain causes of death per unit of time, divided by the total population).

The primary factors defined in the previous sections are susceptible to the effects of various secondary factors. Most of the latter are of a social or economic nature. One of the reasons for defining the primary factors is to clarify the relationship of secondary factors to health care. Through the concept of primary factors, these relations are more easily understood than by using ordinary health statistics.

Population structure is influenced by birth, death, or migration rates. Birth rates are influenced by population policy as well as by the population structure itself. Death rates are influenced by health care. Therefore, it is easy to see that there are some feedback loops between population structure and other factors.

Morbidity rate is influenced by environmental factors and preventive medicine. Pollution or urbanization effects must be analyzed in relation to morbidity rates. In some types of diseases, this morbidity is inherent to human beings; most diseases related to the aging process belong to this category.

Recovery rate is dependent on the level of clinical medicine and health care. Although there is an inherent recovery rate in diseases, in some this recovery rate is strongly affected by the level of clinical medicine.

Death rate is a counterpart of the recovery rate. Persons who do not recover will eventually die. Clearly, therefore, death rate is affected by the same factors as recovery rate.

In the morbidity model, diseases must be classified according to the nature of their cause. The classification in this study is required for health planning. We used the classification of diseases proposed by A. Klementiev with some modification [2]. Degenerative diseases, infectious diseases, and diseases the causes of which lie in the progress of civilization are the three main types of diseases. According to the classification, three morbidity models that interact with each other will be developed. In this report, the morbidity submodel of infectious diseases will be discussed. The degenerative disease model was already reported [1] and the diseases of which causes are affected by civilization will be discussed in the future report.

CLASSIFICATION OF INFECTIOUS DISEASES

Infectious diseases are of external origin, and can therefore be prevented by removing the cause. It is also possible to recover completely from such diseases. Morbidity and recovery rates are generally influenced by the level of preventive and therapeutic medicine. And also the problems of infection and malnutrition are closely interrelated in most developing countries. There are two types of infectious diseases--epidemic diseases, which include enteritis and other diarrhoetic diseases, and infectious diseases of the respiratory system. In this study, two groups of diseases are defined as infectious diseases:

- Epidemic diseases, which include enteritis and diarrhoeal diseases (ICD A1 - A44);
- Infectious diseases of the respiratory system (ICS A89 - A94).

In order to analyze some developing country, we must include another cause of death of digestive diseases (ICD A104) because in those countries, death of the unknown gastro-enteritis is classified as the other cause of death, of digestive diseases.

STRUCTURE OF THE INFECTIOUS DISEASE MODEL

The structure of the morbidity model of infectious diseases is illustrated in Figure 1. The population of each age group is divided into two groups: healthy persons HP(i), and sick persons TS(i). The transfer rate from the healthy to sick stage is defined as the morbidity rate MR(i), that from the sick stage to the healthy stage as the recovery rate RECOV(i). The transfer from the sick to the death stage is called death rate DR(i), and the death rate per total population of the age group is referred to as DRPN(i).

With this structure, if the population structure PN(i) is given and the three essential rates--morbidity rates MR(i), recovery rates RECOV(i), and death rates DR(i)--are known, all the variables can be calculated from the following processes:

$$\underbrace{\Delta TS(i)}_{\text{increased sick persons}} = \underbrace{[PN(i) - TS(i)] \cdot MR(i)}_{\text{infected persons}} - \underbrace{TS(i)[RECOV(i) + DR(i)]}_{\text{recovered or dead persons}} \quad (1)$$

Under the steady state condition, $\Delta TS(i) = 0$,

$$TS(i) = \frac{PN(i) \cdot MR(i)}{MR(i) + RECOV(i) + DR(i)} \quad , \quad (2)$$

$$HP(i) = PN(i) - TS(i) \quad , \tag{3}$$

$$DP(i) = TS(i) \cdot DR(i) \quad . \tag{4}$$

Accordingly, from equations (2), (3), and (4) the prevalence rates PREV(i) and the disease specific death rate per total population DRPN(i) are given by equations (5) and (6). These two rates are common ordinal health statistics.

$$PREV(i) = TS(i)/PN(i) \tag{5}$$

$$DRPN(i) = DP(i)/PN(i) \tag{6}$$

ASSUMPTIONS IN THE INFECTIOUS DISEASE MODEL

Only one assumption was introduced about the nature of infectious diseases in the morbidity model.

- The morbidity rate MR(i), the recovery rate RECOV(i), and the death rate DR(i) of the infectious diseases are not so varied between well developed countries. These rates depend only upon the nature of the diseases.

For the following reasons we believe that the assumptions can safely be made in the well developed countries.

The morbidity rate of infectious diseases depends mainly upon the hygienic, preventive medical and environmental conditions of the country. However, every well developed country is supplied with good hygienic, preventive medical environmental conditions fundamentally. The infectiousness of the disease only affects the change in the rate. If a rapid epidemic disease such as influenza spreads over the country or the areas, it has strong influence on the morbidity rate [3].

The recovery rate of infectious diseases is affected by the medical care system of the country. But a major part of recovery rates of infectious diseases is composed of the spontaneous recovery rate of the diseases, which depends only on the aging process in well developed countries.

The death rate is the complement of the recovery rate. This rate is also affected by the medical care system. But according to medical considerations, almost all well developed countries have similar medical care levels and their death rates are assumed to be similar also.

Figures 2a and 2b show the death rate from epidemic diseases and infectious diseases of the respiratory system in various well developed countries obtained from the statistics

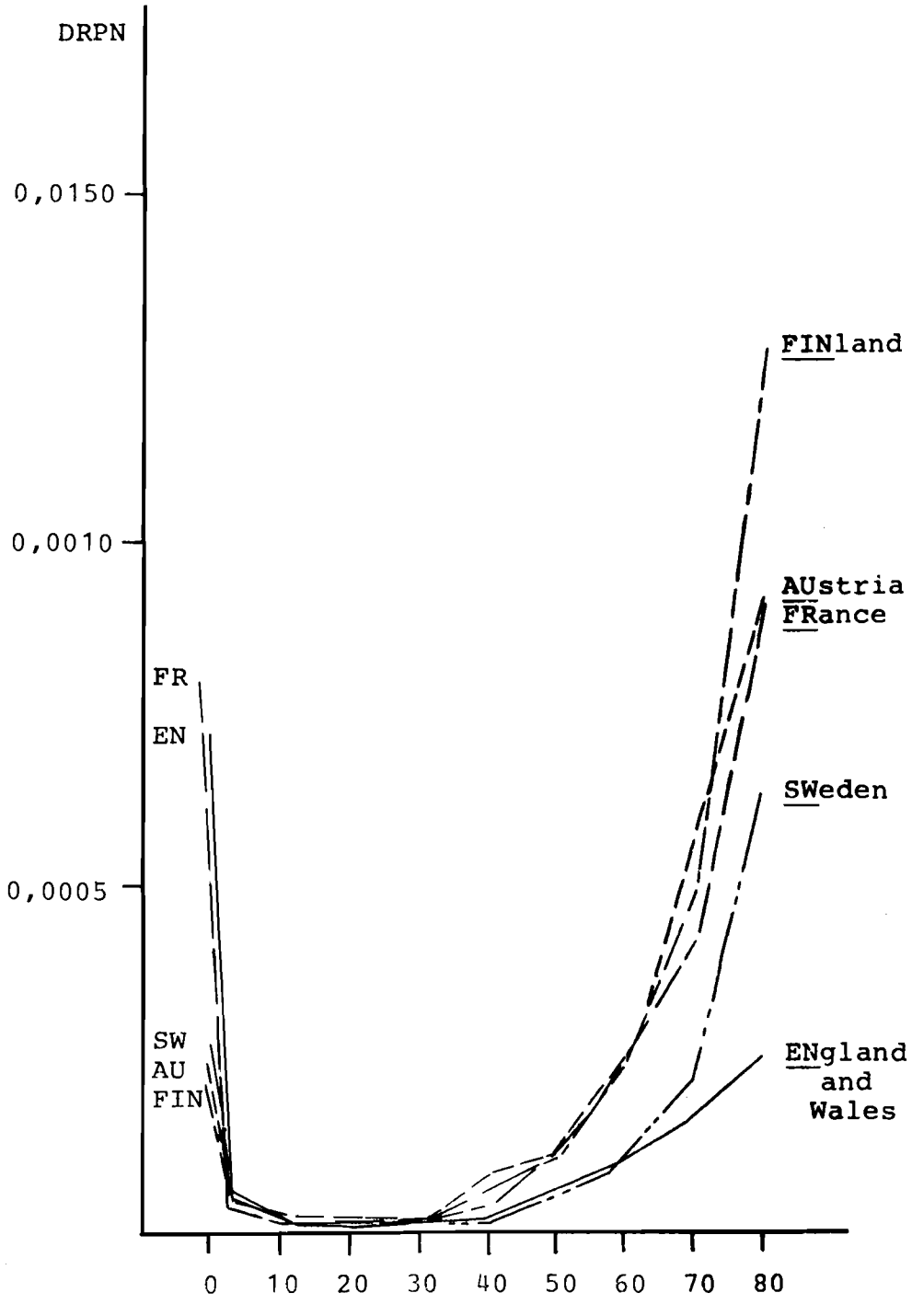

Figure 2a. Death rate per capita of infectious diseases (epidemic and gastrointestinal system: A1 A44), from WHO statistics.

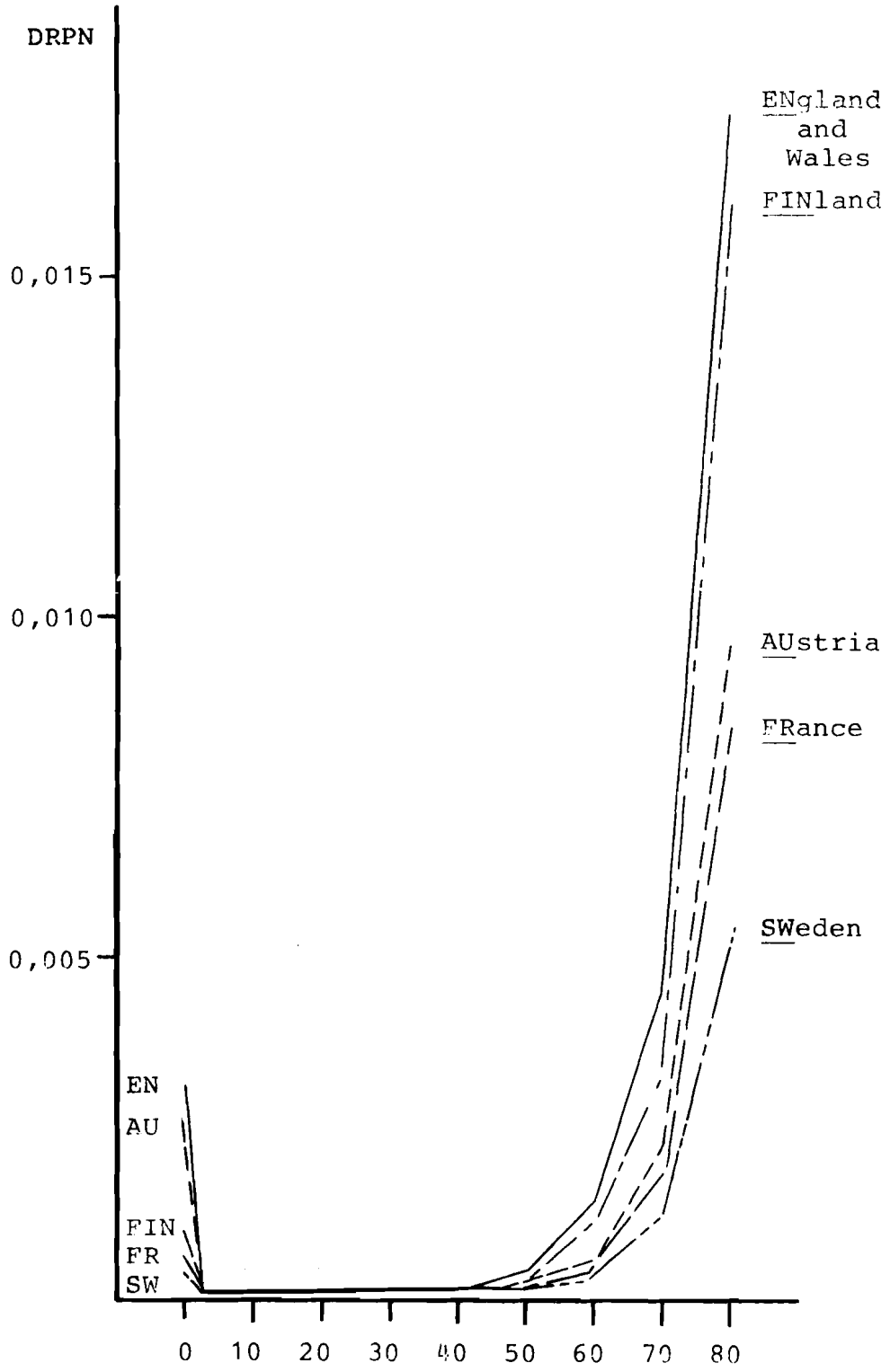

Figure 2b. Death rate per capita of infectious diseases (respiratory system: A89 A96), from WHO statistics.

of the World Health Organization [4]. The figures for age dependent death rates DRPN(i) of each of the countries coincide well. On the basis of this fact, each of the three rates seems to be dependent only on the biological nature of the diseases.

ESTIMATION OF THE THREE STANDARD RATES (MORBIDITY RATE, RECOVERY RATE, AND DISEASE SPECIFIC DEATH RATE PER PATIENT) OF THE MODEL FROM DOMESTIC HEALTH STATISTICS

In the morbidity model, population structure of a country is the only one essential input. We can estimate the demand of health care of the country from three standard rates in the model, such as morbidity rate (MR), recovery rate (RECOV) and disease specific death rate per patient (DR). Unfortunately, these three standard rates of the infectious disease cannot be obtained from conventional health statistics. Instead of these three standard rates, we can easily obtain prevalence rates (PREV), disease specific death rates per capita (DRPN), and mean length of stay in sick state (MST) from the domestic health statistics. If the assumption of the infectious disease morbidity model is true, these three standard rates could be calculated from two conventional rates and a time constant of a sampled country. In this section, the method we used to estimate the standard morbidity rate, the standard recovery rate, and the standard death rate is discussed.

If, in a country, the disease specific death rate per population DRPN(i), the prevalence rate PREV(i), and the mean length of stay in the sick state MST(i) of infectious diseases are given by the national statistics of the health survey, these rates can be obtained from the following equations.

- Morbidity Rate:

$$TS(i) = PN(i) \cdot PREV(i) \quad , \tag{7}$$

$$[PN(i) - TS(i)] \cdot MR(i) \cdot MST(i) = TS(i) \quad , \tag{8}$$

$$MR(i) = \frac{TS(i)}{MST(i) \cdot [PN(i) - TS(i)]} = \frac{PREV(i)}{MST(i) \cdot [1 - PREV(i)]} \quad . \tag{9}$$

- Recovery Rate: if, instead of equation (1), equation (9) is used, we can obtain the recovery rate with the following processes:

$$\Delta TS(i) = [PN(i) - TS(i)] \cdot MR(i) - TS(i) \cdot RECOV(i) - PN(i) \cdot DRPN(i) \quad . \tag{10}$$

From equation (10), the steady state is described as:

$$RECOV(i) = \frac{PN(i) - TS(i)}{TS(i)} \cdot MR(i) - \frac{PN(i) \cdot DRPN(i)}{TS(i)} \tag{11}$$

Now, using equation (9) and (7), we have:

$$RECOV(i) = \frac{1}{MST(i)} - \frac{PN(i) \cdot DRPN(i)}{TS(i)} = \frac{1}{MST(i)} - \frac{DRPN(i)}{PREV(i)} \tag{12}$$

- Death Rate:

$$DRPN(i) \cdot PN(i) = DR(i) \cdot TS(i) \quad , \tag{13}$$

$$DR(i) = DRPN(i)/PREV(i) \quad . \tag{14}$$

In this study, the prevalence rate and the mean length of stay in the sick state are mainly based on the data of Japan for 1974. The prevalence rate of infectious diseases was obtained from the national health survey of Japan [4] and the mean length of stay in the sick stage was obtained from the patient survey statistics of national Japanese hospitals [5]. The three kinds of rates obtained from these statistics and equations (8), (12), and (14) are shown in Figures 3 and 4.

RESULTS OF CALCULATIONS

To test the validity of the model, we applied it to the data of Japan in 1970 and compared it to various countries: Finland, Austria, Sweden, England, Japan, and France. In the calculation, a population structure of five-year intervals is only one input, and the variables for outputs were calculated separately for epidemics and infectious diseases of the respiratory system. The results for two of the diseases were then combined to obtain an estimation of prevalence for the total infectious diseases. The disease specific death rates per capita thus obtained as an example output were compared with those from WHO statistics as in Table 1.

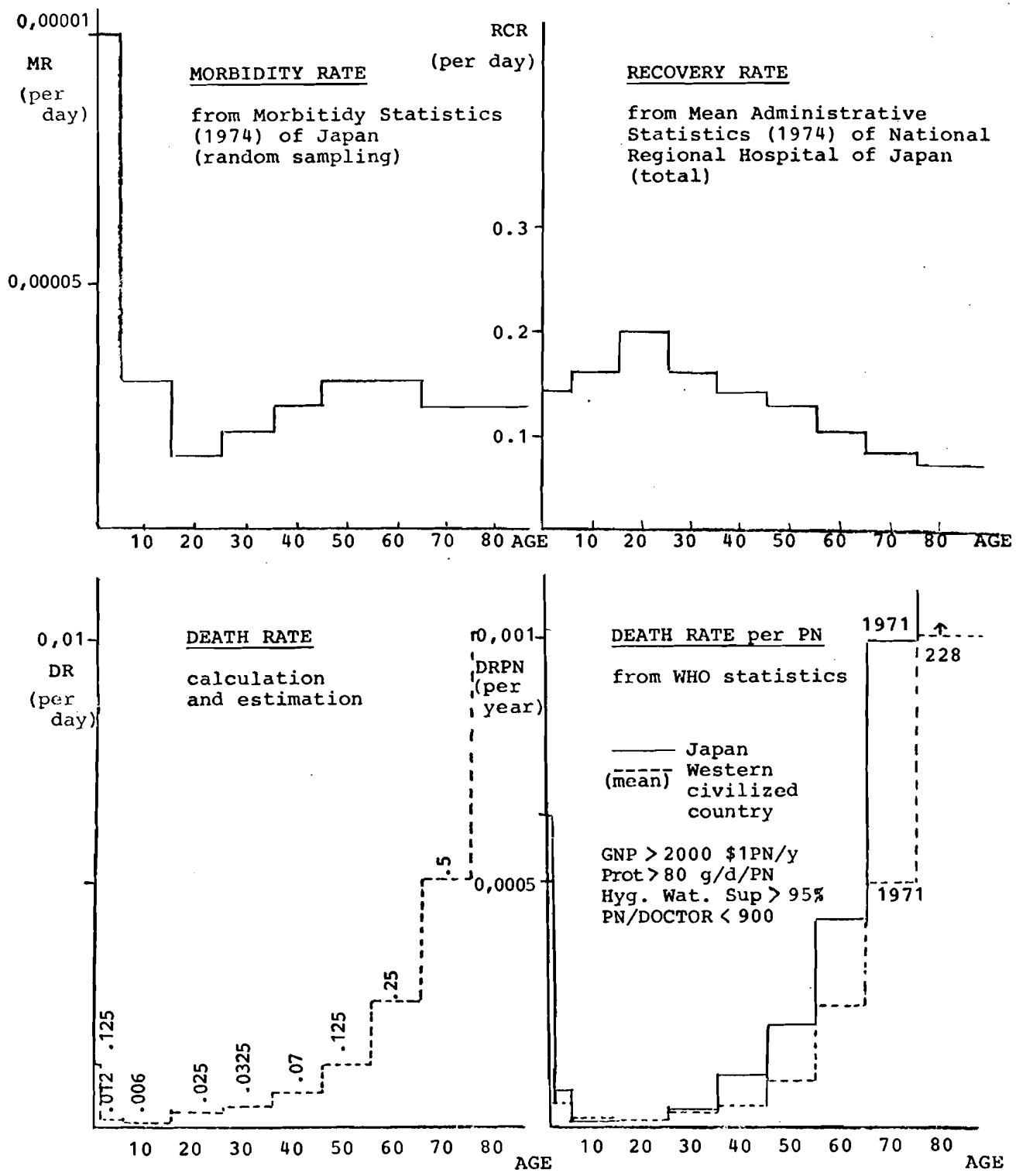

Figure 3. Rates for Morbidity Model of Infectious Disease (Epidemic and Gastrointestinal System, A1 ~ A44)

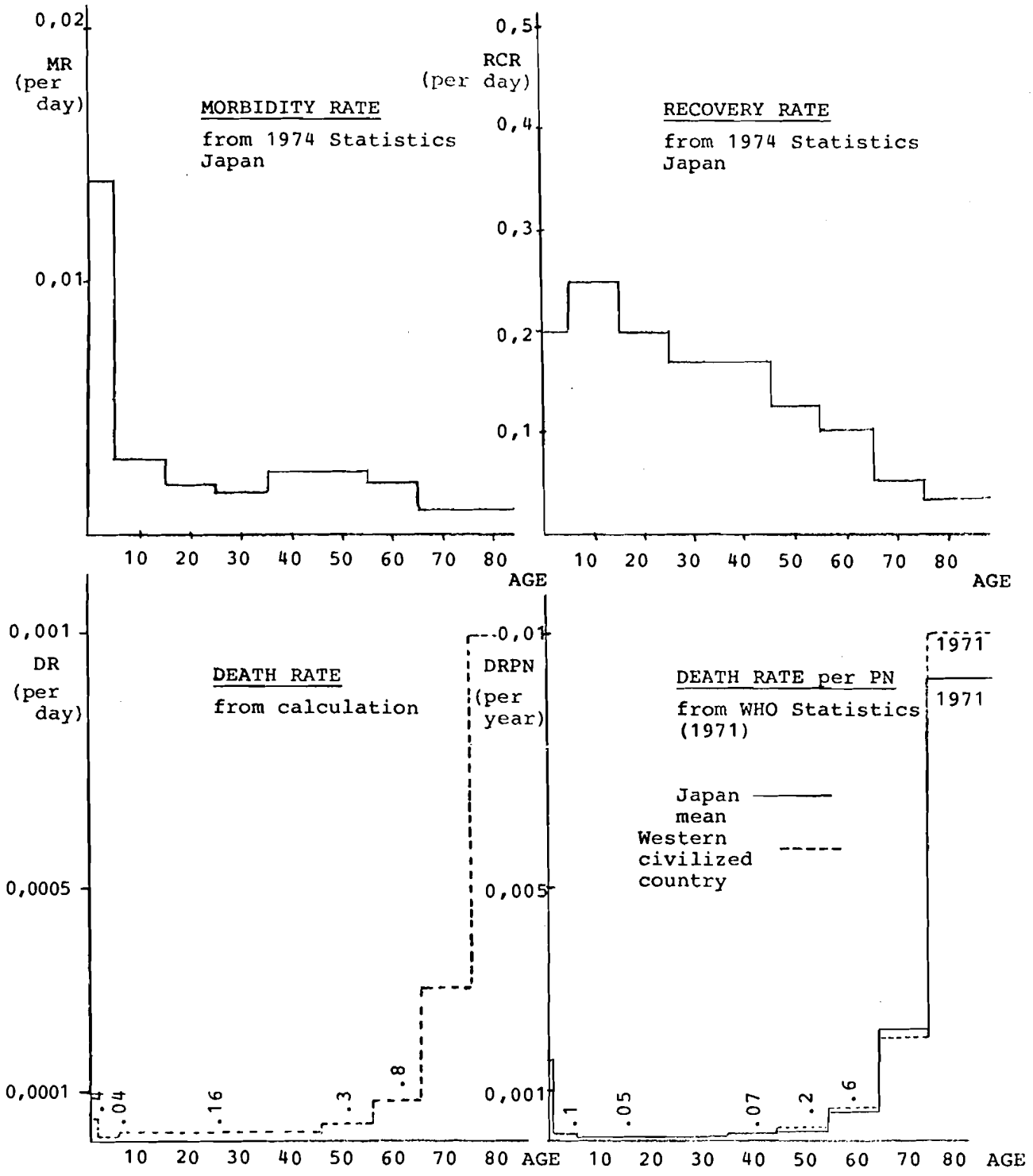

Figure 4. Rates for Morbidity Model of Infectious Disease (Respiratory System, A89 ~ A96).

Table 1. The Three Standard Rate (MR, RECOV, DR) of the Infectious Disease Morbidity Model and the Validation of the Model by Disease Specific Death Rate per Capita.

Age Groups	A1 - A44 Epidemic & Enteritis			DRPN			A89 - A96 Acute Respiratory Infection			DRPN		
	MR	RECOV	DR	Computed from JP*	Japan 1974	Austria 1974	MR	RECOV	DR	Computed from JP*	Japan 1974	Austria 1974
0	1400	0.2	4	95	98	244	10	0.14	125	32	62	24
1-4	1400	0.2	0.4	10	13	12	10	0.14	12.5	3	8	5
5-14	300	0.25	2	7	4	3	6	0.16	6.25	1	1	1
15-24	200	0.2	2	6	3	5	1.5	0.2	25	1	2	1
25-34	170	0.17	2	6	4	3	2	0.16	37.5	2	4	2
35-44	250	0.17	2	8	7	8	2.5	0.14	70	5	11	8
45-54	250	0.125	3	21	15	18	3	0.125	125	11	21	10
55-64	200	0.1	8	57	50	60	3	0.1	250	27	42	26
65-75	100	0.05	30	213	215	221	2.5	0.08	500	54	99	56
75 +	100	0.03	100	1141	911	957	2.5	0.065	1000	122	228	91

Standard Rates in the Model: MR, morbidity rate (per 100,000 healthy persons)
RECOV, recovery rate (per sick persons)
DR, death rate (per 100,000 sick persons)

Input: *PN, population of Japan 1970

Output: DRPN, death rate per population (per 100,000 population at the age group)
PREV, prevalence rate (omitted in table)
HP, healthy persons
TS, sick persons (omitted in table)

However, we cannot estimate the prevalence rate of developing countries by this morbidity model. Three essential rates of infectious diseases correlate with other socio-economic factors as net income, food supply, education, hygienity and preventive medicine of the developing countries. The correlation of these factors to infectious diseases will be discussed in a separate report.

CONCLUSION

The morbidity submodel of infectious disease was developed using the data of the World Health Organization and the National Health Survey of Japan, and showed its validity of data in well developed countries. The model can predict the fundamental part of infectious diseases. These results show that this type of approach is feasible in health planning.

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[3] Klementiev, A.A., *Mathematical Approach to Developing a Simulation Model of a Health Care System*, RM-76-65, International Institute for Applied Systems Analysis, Laxenburg, Austria, 1976.

[4] Assaad, F., W.C. Cockburn and T.K. Sundaresan, *Use of Excess Mortality from Respiratory Diseases in the Study of Influenza*, Bulletin of the World Health Organization, 49, 219-223, 1973.

[5] World Health Organization, *World Health Statistics Annual - Vol. 1, Vital Statistics and Cause of Death*, Geneva, 1974.

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Appendix A

The following notation is used in this study. The names of the variables are kept the same in text and computer programs.

i - number of sex-age group

PN(i) - population, or number of persons

HP(i) - healthy or non-sick persons

TS(i) - total sick persons

LS(i) - latent or non-registered sick in total sick

RS(i) - registered sick in total sick

UAS(i) - unaware sick in latent sick

AS(i) - aware sick in latent sick

MR(i) - morbidity rate, or number of persons who transfer from HP to TS per unit of time

DR(i) - death rate, or mortality rate from TS

AR(i) - awareness rate

RECOV(i) - recovery rate

RPR(i) - patient registration rate

DRPN(i) - death rate per population

MST(i) - duration of sickness

Appendix B

```
      DIMENSION HP(90),PN(90),TS(90),FS(90),FD(90),IAGE(90),AMR(90)
     1,DR(90),TS1(90),RCR(90),PREV(90),DRPN(90),TITLE(20)
     2,TS2(90),PP(90,2),HP2(90),FD2(90)
      INDEX=1
      READ(5,27) TITLE
   27 FORMAT(20A4)
   11 FORMAT(1H1,20A4,12HAGING INDEX=,F6.2)
C
      CALL POPSUP(PN)
      DO 33 I=1,90
      PP(I,1)=PN(I)
   33 CONTINUE
      CALL POPSUP(PN)
      DO 34 I=1,90
      PP(I,2)=PN(I)
   34 CONTINUE
C
      DO 26 I=1,90
      IAGE(I)=I-1
      PN(I)=PP(I,1)+PP(I,2)
      IF(PN(I).EQ.0.0) PN(I)=1.
   26 CONTINUE
C
      YOUNG=0.
      DO 14 I=1,15
      YOUNG=YOUNG+PN(I)
   14 CONTINUE
      OLD=0.
      DO 15 I=66,90
      OLD=OLD+PN(I)
   15 CONTINUE
      OLDCO=OLD/YOUNG*100.
  202 CONTINUE
      DO 32 I=1,90
      HP(I)=PN(I)
      TS(I)=0.
      DR(I)=0.
      DRPN(I)=0.
      RCR(I)=0.
      DP(I)=0.
   32 CONTINUE
      GO TO (1000,1001,1009,12),INDEX
 1000 CALL SUBDID(PN,AMR,HP,TS,DR,DRPN,RCR,FD)
C
      DO 500 I=1,90
      HP2(I)=HP(I)
      TS2(I)=TS(I)
      FD2(I)=FD(I)
```

```
  500 CONTINUE
      WRITE(6,11) TITLE,OLDCO
      WRITE(6,700)
  700 FORMAT(1H0,'INFECTIOUS DISEASE OF DIGESTIVE SYSTEM AND EPIDEMIC
     1 DISEASE.')
      GO TO 204
 1001 CALL SUBRES(PN,AMR,HP,TS,DR,DRPN,FD,RCR)
      WRITE(6,11) TITLE
      WRITE(6,701)
  701 FORMAT(1H0,'INFECTIOUS DISEASE OF RESPIRATORY SYSTEM')
      DO 802 I=1,90
      TS1(I)=TS(I)
  802 CONTINUE
      GO TO 204
 1009 CONTINUE
      DO 501 I=1,90
      TS(I)=TS1(I)+TS2(I)
      HP(I)=PN(I)-TS(I)
      FD(I)=FD(I)+FD2(I)
      DR(I)=FD(I)/TS(I)
      DRPN(I)=FD(I)*365.0/PN(I)
  501 CONTINUE
      WRITE(6,11) TITLE
      WRITE(6,402)
  402 FORMAT(1H0,'TOTAL INFECTIOUS DISEASE')
C
  204 CONTINUE
      DO 28 I=1,90
      PREV(I)=TS(I)/PN(I)
   28 CONTINUE
      THP=0.
      TTS=0.
      TPN=0.
      TD=0.
      DO 8 I=1,90
      TPN=TPN+PN(I)
      TD=TD+TS(I)*DR(I)
      THP=THP+HP(I)
      TTS=TTS+TS(I)
    8 CONTINUE
      TDRPN=TD*365.0/TPN
      TPREV=TTS/TPN
      TAMP=TTS/TPN
      TDR=TD/TTS
      WRITE(6,1103)
 1103 FORMAT(//1H ,'  AGE   POPULATION      HEALTHY  TOTAL SICK
     1 PREVARENCE MORBIDITY  RECOVERY R.   DEATH RATE  ',/
     21H ,9X,4H(PN),11X,4H(HP),7X,4H(TS),6X,7H(TS/PN),4X,4H(MR),6X
     3,5H(RCR),4X,4H(DR),4X,6H(DRPN)/)
      DO 129 I=1,90
      WRITE(6,1100) IAGE(I),PN(I),HP(I),TS(I),PREV(I),AMR(I),RCR(I)
     1,DR(I),DRPN(I)
 1100 FORMAT(1H ,I4,1X,3(F12.0,1X),3X, 5F10.6)
```

```
  129 CONTINUE
      WRITE(6,1101) TPN,THP,TTS,TPREV,TAMR,TRCR,TDR,TDRPN
 1101 FORMAT(/6H TOTAL,3(F12.0,1X),3X,5F10.6)
      IF(INDEX.EQ.3) GO TO 12
      INDEX=INDEX+1
      GO TO 202
   12 STOP
      END
C
      SUBROUTINE SUBDID(PN,AMR,HP,TS,DR,DRPN,FD,RCR)
      DIMENSION PN(90),HP(90),TS(90),FD(90),DRPN(90),DRPND(90)
     1,AMR(90),DR(90),RCR(90),AX(90),BX(90),CX(90)
      DATA AX/5*0.0001,10*0.00006,10*0.000015,10*0.00002,10*0.000025,20
     1*0.00003,25*0.000025/
      DATA BX/0.005,4*0.0005,10*0.00025,10*0.001,10*0.0015,10*0.0028,10
     1*0.005,10*0.01,10*0.02,15*0.04/
      DATA CX/5*0.14,10*0.16,10*0.2,10*0.16,10*0.14,10*0.125,10*0.1
     1,10*0.08,15*0.065/
      DO 2001 I=1,90
      AMR(I)=AX(I)
      DR(I)=BX(I)*0.5*0.5
      RCR(I)=CX(I)
 2001 CONTINUE
      DO 2030 I=1,90
      TS(I)=PN(I)*AMR(I)/(AMR(I)+DR(I)+RCR(I))
      FD(I)=TS(I)*DR(I)
      DRPND(I)=FD(I)/PN(I)
      DRPN(I)=DRPND(I)*365.0
      HP(I)=PN(I)-TS(I)
 2030 CONTINUE
      RETURN
      END
C
      SUBROUTINE SURRES(PN,AMR,HP,TS,DR,DRPN,FD,RCR)
      DIMENSION PN(90),HP(90),TS(90),FD(90)
     1,AMR(90),DR(90),RCR(90),AX(90),BX(90),CX(90),DRPN(90),DRPND(90)
      DATA AX/5*0.014,10*0.003,10*0.002,10*0.0017,20*0.0025,10*0.002,25
     1*0.001/
      DATA BX/0.0002,4*0.00002,40*0.00008,10*0.00015,10*0.0004,10*0.0015
     1,15*0.005/
      DATA CX/5*0.2,10*0.25,10*0.2,20*0.17,10*0.125,10*0.1,10*0.05
     1,15*0.03/
      DO 2002 I=1,90
      AMR(I)=AX(I)
      DR(I)=BX(I)*0.2
      RCR(I)=CX(I)
 2002 CONTINUE
      DO 2031 I=1,90
      TS(I)=PN(I)*AMR(I)/(AMR(I)+DR(I)+RCR(I))
      FD(I)=TS(I)*DR(I)
      DRPND(I)=FD(I)/PN(I)
      DRPN(I)=DRPND(I)*365.0
      HP(I)=PN(I)-TS(I)
 2031 CONTINUE
      RETURN
      END
```

```
C
      SUBROUTINE POPSUP(PP)
      DIMENSION P(18),PP(90)
      READ(5,25) (P(I),I=1,18)
   25 FORMAT(8F10.0)
      DO 3 I=1,17
      DO 2 J=1,5
      K=(I-1)*5+2+J
      PP(K)=P(I)+(P(I+1)-P(I))/5.0*FLOAT(J-1)
    2 CONTINUE
    3 CONTINUE
      PP(1)=P(1)-(P(2)-P(1))/5.0*2.0
      PP(2)=P(1)-(P(2)-P(1))/5.0*1.0
      PP(88)=P(18)+(P(18)-P(17))/5.*1.
      PP(89)=P(18)+(P(18)-P(17))/5.*2.
      PP(90)=P(18)+(P(18)-P(17))/5.*3.
      DO 4 K=1,90
      PP(K)=PP(K)/5.0
    4 CONTINUE
      DO 9 I=1,90
      IF(PP(I).LT.0.0) PP(I)=0.
    9 CONTINUE
      RETURN
```

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4565000.	4226000.	4067000.	4623000.	5345000.	4546000.	4216000.	4155000.
3691000.	2697000.	2172000.	2055000.	1766000.	1408000.	968000.	536000.
244000.	90000.						
4343000.	4041000.	3911000.	4544000.	5383000.	4602000.	4226000.	4118000.
3703000.	3223000.	2669000.	2400000.	1986000.	1598000.	1182000.	744000.
413000.	210000.						

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AGE	POPULATION (PN)	HEALTHY (HP)	TOTAL SICK (TS)	PREVARENCE (TS/PN)	MORBIDITY (MR)	RECOVERY R. (RCR)	(DR)	DEATH RATE (DRPN)
0	1832880.	1712994.	119886.	0.065	0.01400	0.20000	0.000004	0.000095
1	1807240.	1689012.	118228.	0.065	0.01400	0.20000	0.000000	0.000019
2	1781600.	1665049.	116551.	0.065	0.01400	0.20000	0.000000	0.000019
3	1755960.	1641086.	114874.	0.065	0.01400	0.20000	0.000000	0.000019
4	1730320.	1617124.	113196.	0.065	0.01400	0.20000	0.000000	0.000019
5	1704680.	1684468.	20212.	0.012	0.00300	0.25000	0.000002	0.000001
6	1679040.	1659132.	19908.	0.012	0.00300	0.25000	0.000002	0.000001
7	1653400.	1633796.	19604.	0.012	0.00300	0.25000	0.000002	0.000001
8	1641840.	1622373.	19467.	0.012	0.00300	0.25000	0.000002	0.000001
9	1630280.	1610950.	19330.	0.012	0.00300	0.25000	0.000002	0.000001
10	1618720.	1599527.	19193.	0.012	0.00300	0.25000	0.000002	0.000001
11	1607160.	1588104.	19056.	0.012	0.00300	0.25000	0.000002	0.000001
12	1595600.	1576681.	18919.	0.012	0.00300	0.25000	0.000002	0.000001
13	1643160.	1623677.	19483.	0.012	0.00300	0.25000	0.000002	0.000001

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