

# An Example of Using Big Data in Primary Prevention of Cardiovascular Disease

Hsing-Yi Chang

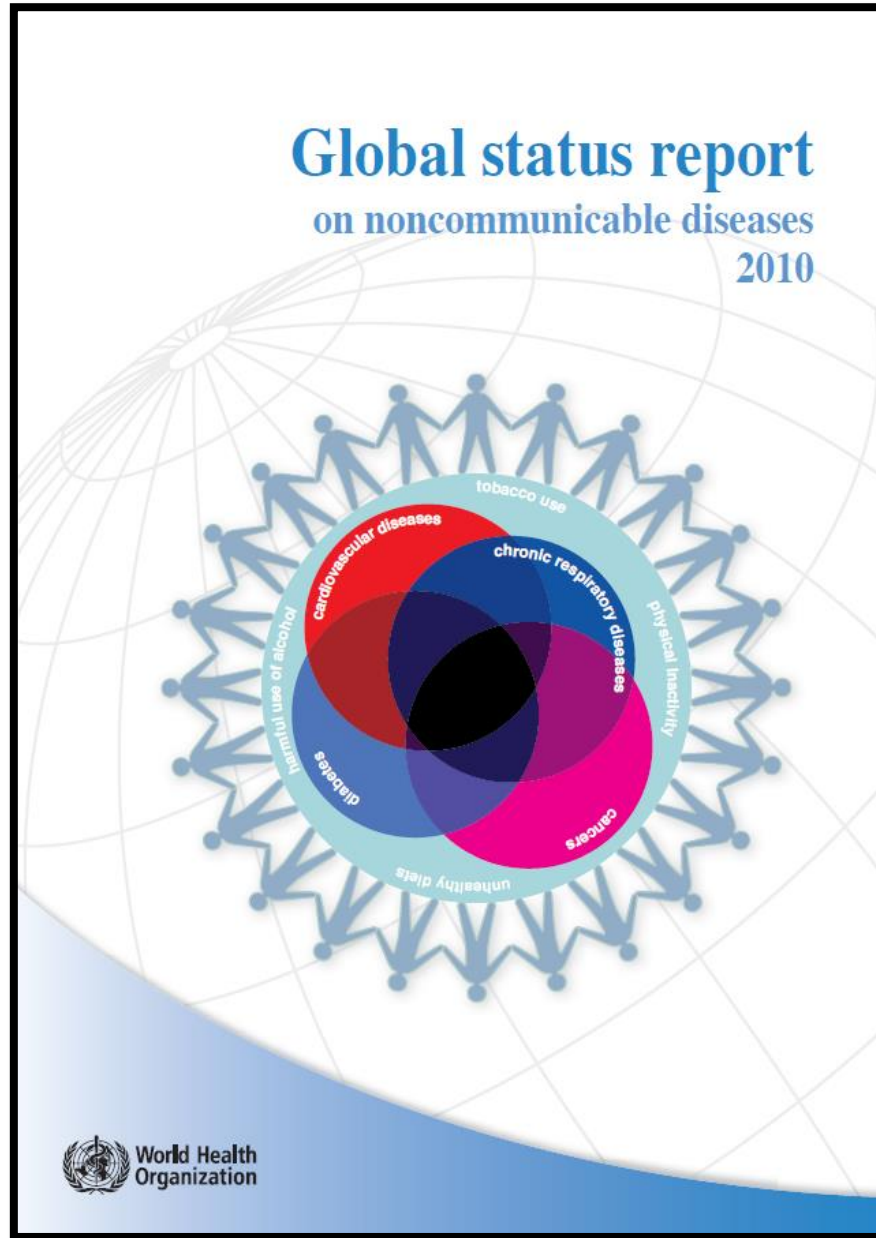
2018.06.27



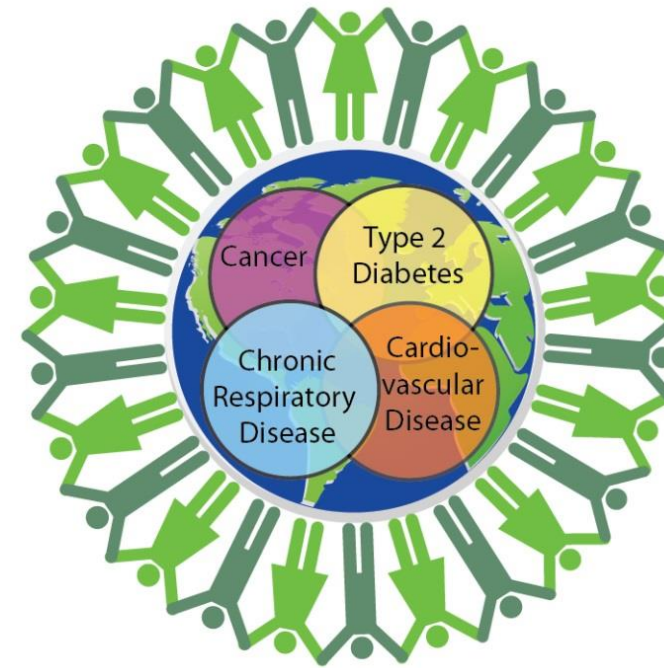
# Outline

- Importance of CVD prevention
- Method
  - Risk prediction
  - Platform for risk prediction
- Outcomes

# Importance



WHO goal: a 25% reduction of premature mortality from the four major NCDs by 2025



**Non-communicable disease**  
A **non-communicable disease**, or NCD, is a medical condition or disease which is non-infectious. NCDs are diseases of long duration and generally slow progression. They include heart disease, stroke, cancer, asthma, diabetes, chronic kidney disease, osteoporosis, Alzheimer's disease, cataracts,

# Current Situation in Taiwan

過去10年60%的死亡是因為慢性病，心血管疾病的加總高於癌症的加總。

	死亡人數(人)		死亡率 (每十萬人口)				標準化死亡率 (每十萬人口)		
	105年	較上年 增減%	104年 順位	105年 順位	105年	較上年 增減%	順位	105年	較上年 增減%
所有死亡原因	172,418	5.4			733.2	5.2		439.4	1.8
惡性腫瘤	47,760	2.0	1	1	203.1	1.8	1	126.8	-0.9
心臟疾病 (高血壓性疾病除外)	20,812	8.4	2	2	88.5	8.1	2	50.3	4.7
肺炎	12,212	13.5	4	3	51.9	13.2	4	26.9	9.3
腦血管疾病	11,846	6.1	3	4	50.4	5.8	3	28.6	2.4
糖尿病	9,960	4.5	5	5	42.4	4.3	5	24.5	0.8
事故傷害	7,206	2.5	6	6	30.6	2.2	6	23.1	1.2
慢性下呼吸道疾病	6,787	6.3	7	7	28.9	6.1	7	15.1	3.5
高血壓性疾病	5,881	6.2	8	8	25.0	6.0	8	13.5	2.3
腎炎、腎病症候群及腎病變	5,226	9.7	9	9	22.2	9.5	10	12.4	5.4
慢性肝病及肝硬化	4,738	1.1	10	10	20.1	0.8	9	13.4	-1.8

- 105年死亡人數增加8844，
- 心臟疾病增加1610 (8.4%)
  - 肺炎增加1451 (13.5%)
  - ~~癌症增加931 (-2.0%)~~
  - 腦血管疾病677 (6.1%)

癌症為total cancer，標準化後下降，心血管有關疾病都增加

# CHD Risk prediction in other countries: USA

The Calculator

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## Framingham Risk Score Calculator for Coronary Heart Disease

This **Framingham risk score calculator** estimates the 10-year coronary heart disease risk of any person based on certain criteria like gender, age, cholesterol and systolic pressure. You can discover more about this heart disease scoring system and about all the cardiovascular risk factors involved below the form.

Gender:\*

Age:\*

Total cholesterol (mg/dL):\*

HDL cholesterol (mg/dL):\*

Under hypertension treatment?

Systolic blood pressure (mmHg):\*

Smoker?

**Other Tools You May Find Useful**

- Sgarbossa Criteria for Left Bundle Branch Block (LBBB) Calculator
- Insulin to Carb Ratio Calculator
- Oxygen Content Calculator
- Target Heart Rate Calculator

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Ask.com Framingham Risk Score x

安全 | <https://www.thecalculator.co/health/Framingham-Risk-Score-Calculator-for-Coronary-Heart-Disease-745.html>


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# 英國QRISK2-2017

Ask.com x QRISK2-2017 x

安全 | <https://qrisk.org/2017/>

ClinRisk  **Welcome to the QRISK<sup>®</sup>2-2017 risk calculator: <https://qrisk.org>**

This calculator is only valid if you do not already have a diagnosis of coronary heart disease (including angina or heart attack) or stroke/transient ischaemic attack.

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About you

Age (25-84):

Sex:  Male  Female

Ethnicity:

UK postcode: leave blank if unknown

Postcode:

Clinical information

Smoking status:

Diabetes status:

Angina or heart attack in a 1st degree relative < 60?

Chronic kidney disease (stage 4 or 5)?

Atrial fibrillation?

On blood pressure treatment?

Rheumatoid arthritis?

Leave blank if unknown

Cholesterol/HDL ratio:

Systolic blood pressure (mmHg):


Body mass index

Height (cm):

Weight (kg):

[Calculate risk](#)

## Welcome to the QRISK<sup>®</sup>2-2017 cardiovascular disease risk calculator



Welcome to the QRISK<sup>®</sup>2-2017 Web Calculator. You can use this calculator to work out your risk of having a heart attack or stroke over the next ten years by answering some simple questions. It is suitable for people who do not already have a diagnosis of heart disease or stroke.

The QRISK<sup>®</sup>2 algorithm has been developed by doctors and academics working in the UK National Health Service and is based on routinely collected data from many thousands of GPs across the country who have freely contributed data for medical research. It is updated annually each April, refitted to the latest data to remain as accurate as possible.

Whilst QRISK2 has been developed for use in the UK, it is being used internationally. For non-UK use, if the postcode field is left blank the score will be calculated using an average value. Users should note, however, that CVD risk is likely to be under-estimated in patients from deprived areas and over-estimated for patients from affluent areas. All medical decisions need to be taken by a patient in consultation with their doctor. The authors and the sponsors accept no responsibility for clinical use or misuse of these score.

The science underpinning the QRISK<sup>®</sup>2 equations has been published here:

- [Predicting cardiovascular risk in England and Wales: prospective derivation and validation of QRISK2. BMJ 2008;336:1475-82.](#)

Click [here](#) for more information on QRISK<sup>®</sup>2.

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# Germany(RPOCOM)

www.kardiolab.ch/MONICA-PROCAM3\_RA1.html

Three calculators to estimate the ten year risk of CHD and CVD with algorithms on risk factors originating from the SCORE project, FRAMINGHAM study and PROCAM study (PROCAM algorithm for men only) and regional adjustment factors of prevalence according to the MONICA project. A comparison of cardiovascular riskengines designed by Romaners and Ackermann, Dec 9<sup>th</sup> 2004, version RA1.

Primary Care Risk Calculator	SCORE Algorithm Weibull (mortality)	FRAMING Algorithm Weibull (events)	PROCAM Algorithm Cox (events)
Male <input type="radio"/> ; Female Premenopause <input type="radio"/> Menopause <input type="radio"/>	M	M	M
Age (years)	52	52	52
Total Cholesterol (mmol/l)	9.17	9.17	
HDL-C (mmol/l)		0.65	0.65
LDL-C (mmol/l)			6.45
TGL (mmol/l)			4.55
BP systolic (mm Hg)	185	185	225
Smoker ?	no/yes	no/yes	<input type="radio"/> no, <input type="radio"/> yes
Diabetes mellitus (FBG > 6.66 mmol/l) ?		no/yes	<input type="radio"/> no, <input type="radio"/> yes
Premature CAD in family (1st°) ?			<input type="radio"/> no, <input type="radio"/> yes
LV-Hypertrophy by ECG ?		<input type="radio"/> no, <input type="radio"/> yes	
Prevalence adjustment factor according to the selected MONICA region on the right			0.7

**Results**

	SCORE	FRAM	PROCAM
10 Yr Risk [%] of hard CHD (AMI)	LRP: <input type="text"/> HRP: <input type="text"/>	<input type="text"/>	MONICA: <input type="text"/> PROCAM: <input type="text"/>
SCORE: 10 Yr Risk [%] of fatal non-CHD CVD in LowRisk- & HigRisk-Populations	LRP: <input type="text"/> HRP: <input type="text"/>		
SCORE: 10 Yr Risk [%] of fatal CVD in LowRisk- & HigRisk-Populations	LRP: <input type="text"/> HRP: <input type="text"/>		

**1. Select Region**

- Australia Newcastle
- Australia Perth
- Belgium Charleroi
- Belgium Ghent
- Canada Halifax Country
- China Beijing
- Czech Republic
- Denmark Glostrup
- Finland Kuopio Province
- Finland North Karelia
- Finland Turku/Loimaa
- France Lille

**2. Press Button "region"**

Switzerland AGLA 2003

Regional adjustment factors for

MONICA 0.7 PV men

MONICA 0.7 PV women

**Sources**

- SCORE Algorithm
- FRAMINGham Algorithm
- PROCAM pocket guide

**Remarks** about the principles of calculating and how to use the PROCAM option in this CHD / CVD riskcalculator.

- 1.) In the PROCAM calculation option you are computing with the PROCAM-algorithm for men statistically based on the Cox proportional hazards model in the PROCAM cohort with 325 ACE (fatal and non fatal) in 4818 men aged 35-65 years within 10 years. As typical for Cox-algorithms, you reach always a 100 % 10 year risk, if you compute with "full power" (meaning all risk factors as high as possible).
- 2.) In the PROCAM output field you receive as result the original, regional non adapted PROCAM posttest probability (P %) using the algorithm for men, if sex selection is male. If sex selection is female (premenopausal or menopausal) you get strictly a P % of men corrected by a reduction factor of 0.25 (if there is no Diabetes), according the recommendation of PROCAM.
- 3.) In the MONICA output field you receive a P % result epidemiological corrected by regional adjustment factors for men or women described in the procam pocket guide. You may define these factors

上午 10:15 2017/11/9

# Australia ( can download app )

## Australian absolute cardiovascular disease risk calculator

Enter patient information below:

10:21 - Thursday 9/11/2017

Sex  Male  Female

Age  years

Systolic blood pressure  mmHg

Smoking status  Yes  No [i](#)

Total cholesterol  mmol/L

HDL cholesterol  mmol/L

Diabetes  Yes  No [i](#)

ECG LVH  Yes  No  Unknown

RESET GO

An initiative of the National Vascular Disease Prevention Alliance





# Japan (Can download Excel for calculation)

ウイルス対策のため、マクロは使っていません

## 吹田スコアによる日本人の冠動脈疾患10年間発症率

名前 **田村 由美子** 今日の日付 **2017/11/9**

※冠動脈疾患の定義(心筋梗塞、冠動脈バイパス術、冠動脈形成術、24時間以内の内因性急性死をいずれか) 2014年5月 国立循環器病研究センター研究チームの発表

1)～8)は冠動脈危険因子の入力項目です。入力方法は右下の「入力と印刷方法」を参照してください。

主要冠動脈危険因子	スコア	範囲	変動幅
1) 年齢	45	30～53点	23点
2) 性別	-7	0～-7点	7点
3) 現在の喫煙	0	0～5点	5点
4) 糖尿病	0	0～6点	6点
5) 血圧 (mmHg)	0	-7～6点	13点
6) LDLC (mg/dl)	11	0～11点	11点
7) HDLC (mg/dl)	-6	-6～0点	6点
8) eGFR (mg/min) : 「危険因子8」を計算で求める	0	0～14点	14点

### LDLコレステロール値を計算で求める

総コレステロール値、HDL値、TG値からLDL値を計算します。なお、TG値は400mg/dl未満限定です。

総コレステロール値 **290** mg/dl  
 HDLコレステロール値 **67** mg/dl  
 中性脂肪値 **140** mg/dl  
 LDLC計算値 **195** mg/dl

### 冠動脈疾患発症率の計算結果

スコア合計点 **43** 点  
 10年間の冠動脈疾患発症率 **2%** /10年  
 発症率(計算上の代表値) **0.02** /10年  
 治療効率(NNT) **166** 人・10年  
ある薬剤(例えばスタチン)により発症が30%減少する  
 としたとき、NNT人を10年間治療すると1人の発症  
 が防げる  
 この場合のNNTは、1/(発症率×0.3)と計算できる

### eGFRを計算で求める。性別、年齢、血清クレアチニン値 (mg/dl) から計算します。

年齢(要入力) **62** 歳  
 血清クレアチニン値(要入力) **0.71** (mg/dl)  
 eGFR(計算結果) **64** (ml/min)※  
※eGFRは腎臓の血液浄化能力の推測値です。

### 参考資料(1) 冠動脈危険因子一覧

年齢	性別	現在喫煙	糖尿病	血圧	LDLC	HDLC	eGFR
35-44歳	男	あり	あり	120未満	100未満	40未満	60以上
45-54歳	女	なし	なし	120～139	101～139	40～59	30～59
55-64歳				140～159	140～159	60以上	30未満
65-69歳				160以上	160～179		
70歳以上					180以上		

### 参考資料(2) 10年間の冠動脈疾患発症率の計算と評価法

スコア	発症確率	代表値	評価基準(暫定)	NNT (治療効率)	NNT評価(暫定)
35% 点以下	1%未満	0.50%	極低リスク	666人・10年	極めて非効率的
36～40 点	1%	1%		333人・10年	
41～45 点	2%	2%		166人・10年	
46～50 点	3%	3%	低リスク	111人・10年	非効率的
51～55 点	5%	5%		66人・10年	
56～60 点	9%	9%	中リスク	37人・10年	中間帯
61～65 点	14%	14%	中高リスク	23人・10年	
66～70 点	22%	22%	高リスク	15人・10年	効率的
71 点以上	28%より大	35%	超高リスク	9人・10年	

### 入力と印刷方法

名前と左列黄色の8つの欄(危険因子)を入力してください。

1)～8)の黄色欄枠内をマウスでクリックすると右端に▼ボタンが表示されます。▼ボタンをクリックすると入力候補リストが表示されます。

総コレステロール値からLDL値を計算する場合は黄色の欄(総コレステロール値、HDL値、TG値に直接数字(mg/dl)を入力してください。

結果印刷は、最下段の中から印刷シートに画面変更し、用紙設定を横にして通常印刷してください。

# Our Approach in Building Model

## Model Building:

1. Data: Nutrition and Health Survey in Taiwan 1993-1996
2. Subjects aged between 35 and 70 yr.
3. Outcomes: National Health Insurance + Death registry to identify Conroy Heart Dis., Diabetes, Stroke, Hypertension, etc.
4. Risk factors: biomarkers like blood lipids, glucose, uric acid etc. Measurements like blood pressure, weight, height, and waist circumference, etc.

## Methods:

1. Model selection: C statistics, AIC
2. Model Validation:  $\chi^2$  statistics

## Model validation:

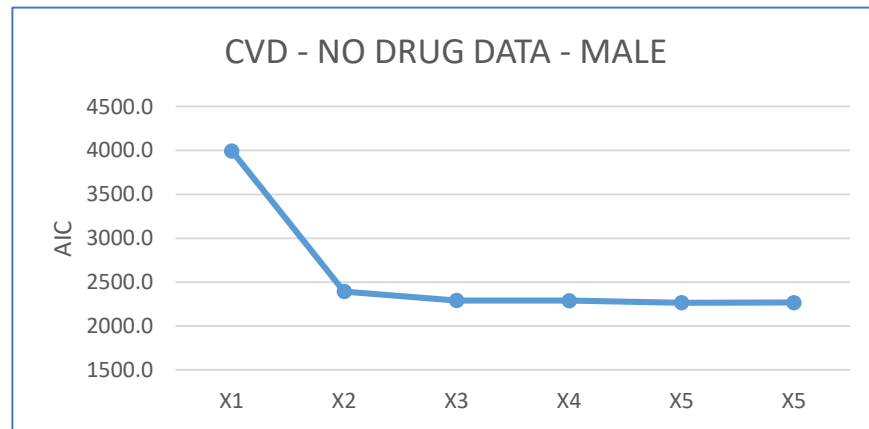
1. Data: Taiwan Survey of Hypertension, Hyperglycemia, and Hyperlipidemia (TwSHHH)
2. Subjects aged between 35 and 70 yr.
3. Outcomes: National Health Insurance + Death registry to identify Conroy Heart Dis., Diabetes, Stroke, Hypertension, etc.
4. Outcomes: National Health Insurance + Death registry to identify Conroy Heart Dis., Diabetes, Stroke, Hypertension, etc.

Models

# CVD - NO DRUG DATA - MALE

## 1993-1996年營養調查建立模型

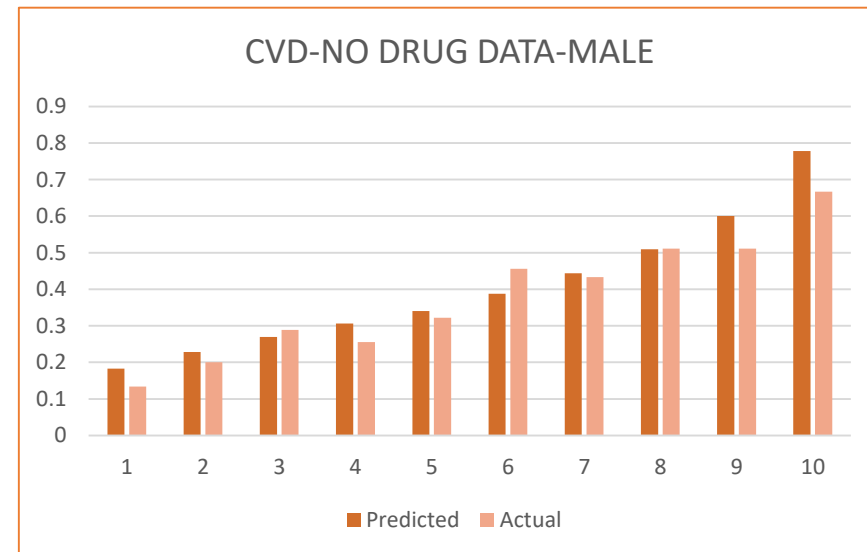
代號	變數組合	C	AIC
X1	AGE	0.656	3995.6
X2	AGE+BMI	0.679	2394.1
X3	AGE+BMI+UA	0.684	2291.6
X4	AGE+BMI+UA+SBP	0.688	2289.7
X5	AGE+BMI+UA+SBP+HDL	0.690	2265.6
X6	AGE+BMI+UA+SBP+HDL+DBP	0.691	2266.8



CVD - NO DRUG DATA - MALE	
C	0.69
$\chi^2$	3.90
AIC	2265.6
$S_0(10)$	0.56

## 2002年三高資料驗證結果

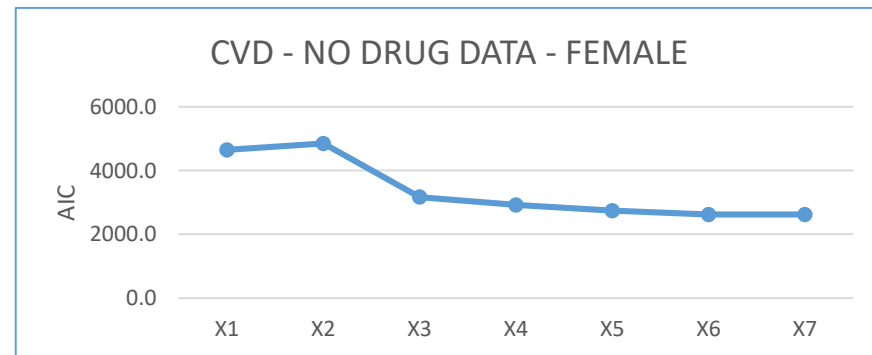
CVD - NO DRUG DATA - MALE	
AGE	0.0590
BMI	0.0225
UA	0.0967
SBP	0.0149
HDL	-0.0025
C	0.66
$\chi^2$	6.27
$S_0(10)$	0.61



# CVD - NO DRUG DATA - FEMALE

## 1993-1996年營養調查建立模型

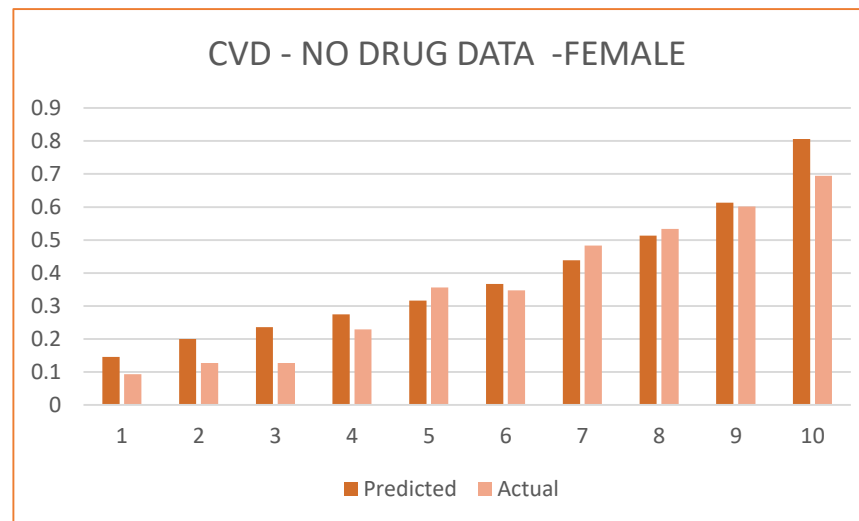
代號	變數組合	C	AIC
X1	AGE	0.622	4644.3
X2	AGE+SBP	0.662	4849.3
X3	AGE+SBP+Waist	0.673	3165.2
X4	AGE+SBP+Waist+Smoke	0.678	2920.2
X5	AGE+SBP+Waist+Smoke+UA	0.683	2738.6
X6	AGE+SBP+Waist+Smoke+UA+GLU	0.684	2616.5
X7	AGE+SBP+Waist+Smoke+UA+GLU+DBP	0.684	2618.5



CVD - NO DRUG DATA - FEMALE	
C	0.68
$\chi^2$	4.63
AIC	2616.5
$S_0(10)$	0.51

## 2002年三高資料驗證結果

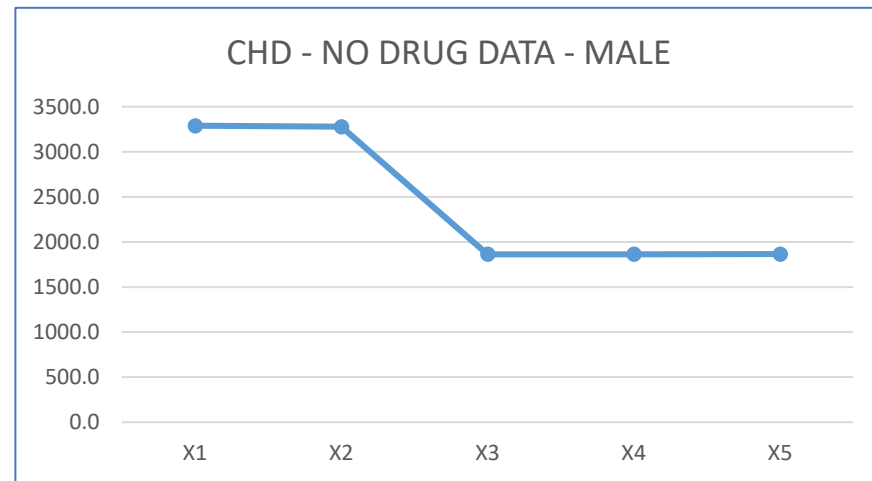
CVD - NO DRUG DATA - FEMALE	
AGE	0.0346
SBP	0.0265
Waist	0.0206
Smoke (yes)	0.7335
UA	0.1332
GLU	0.0088
C	0.71
$\chi^2$	15.34
$S_0(10)$	0.64



# CHD - NO DRUG DATA - MALE

## 1993-1996年營養調查建立模型

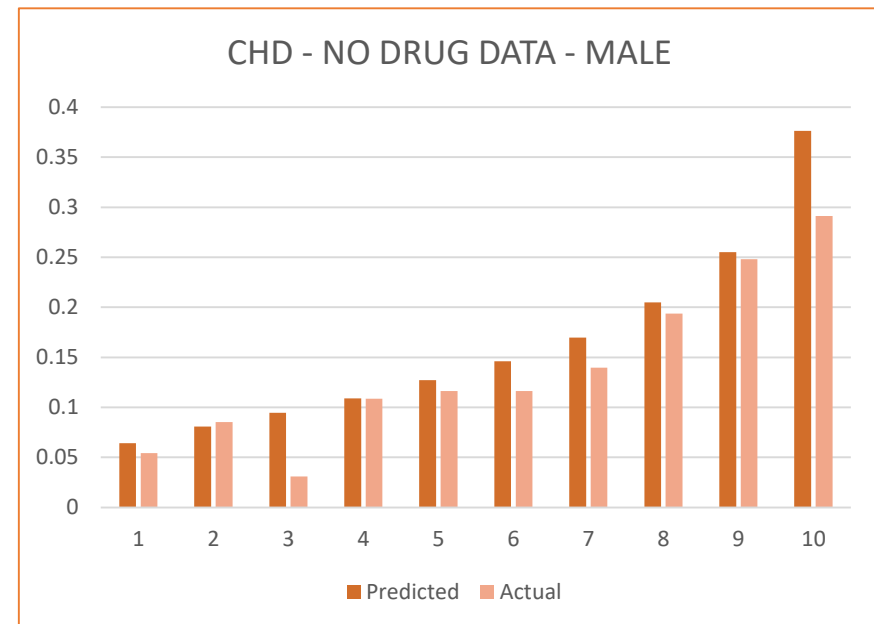
代號	變數組合	C	AIC
X1	AGE	0.648	3289.1
X2	AGE+SBP	0.673	3277.4
X3	AGE+SBP+CHOL/HDL	0.679	1864.0
X4	AGE+SBP+CHOL/HDL+Waist	0.681	1863.5
X5	AGE+SBP+CHOL/HDL+Waist+CHOL	0.682	1865.2



CHD - NO DRUG DATA - MALE	
C	0.68
$\chi^2$	16.86
AIC	1863.5
$S_0(10)$	0.77

## 2002年三高資料驗證結果

CHD - NO DRUG DATA - MALE	
AGE	0.0507
SBP	0.0130
CHOL/HDL	0.0795
Waist	0.0069
C	0.67
$\chi^2$	9.89
$S_0(10)$	0.86

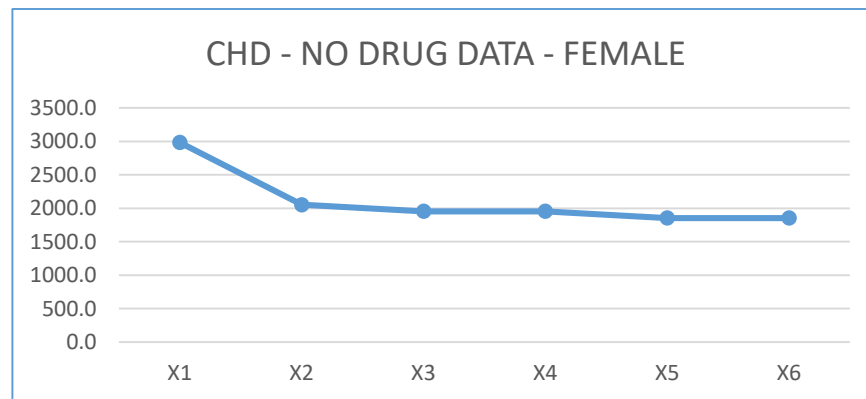




# CHD - NO DRUG DATA - FEMALE

## 1993-1996年營養調查建立模型

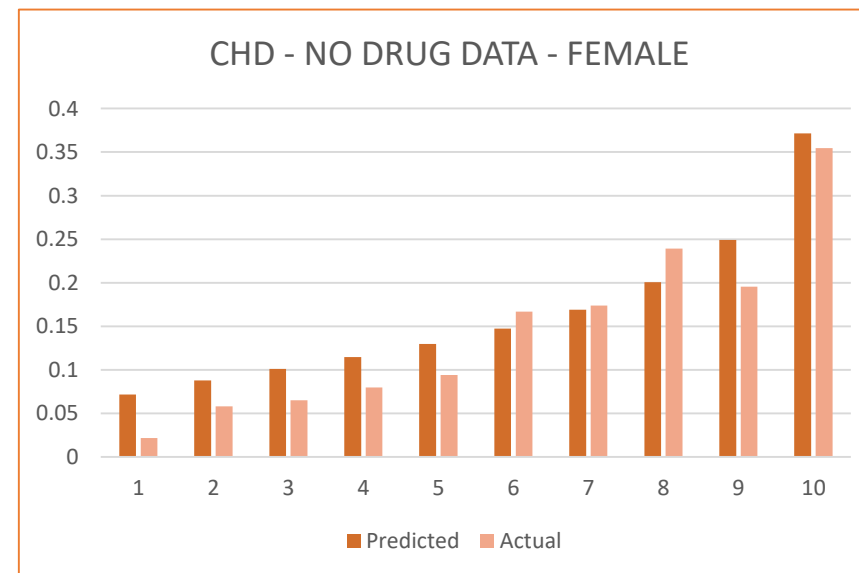
代號	變數組合	C	AIC
X1	AGE	0.643	2982.0
X2	AGE+Waist	0.680	2053.0
X3	AGE+Waist+CHOL/HDL	0.692	1955.2
X4	AGE+Waist+CHOL/HDL+UA	0.696	1954.8
X5	AGE+Waist+CHOL/HDL+UA+GLU	0.700	1853.2
X6	AGE+Waist+CHOL/HDL+UA+GLU+DBP	0.701	1854.1



CHD - NO DRUG DATA - FEMALE	
C	0.70
$\chi^2$	8.92
AIC	1853.2
$S_0(10)$	0.80

## 2002年三高資料驗證結果

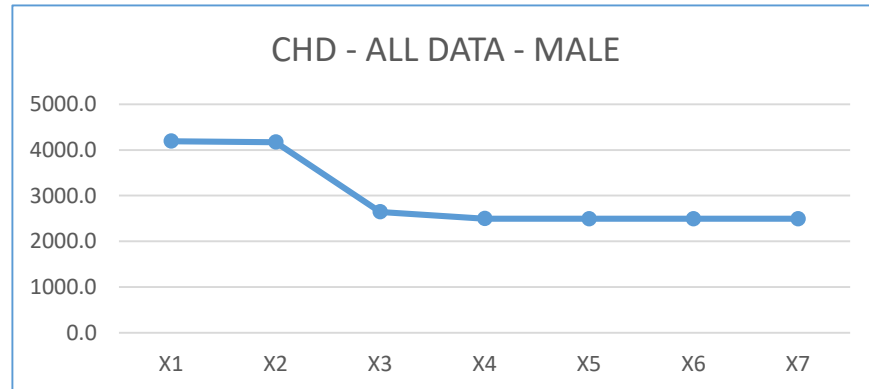
CHD - NO DRUG DATA - FEMALE	
AGE	0.0370
Waist	0.0164
CHOL/HDL	0.1992
UA	0.0886
GLU	0.0040
C	0.71
$\chi^2$	13.82
$S_0(10)$	0.85



# CHD - ALL DATA - MALE

## 1993-1996年營養調查建立模型

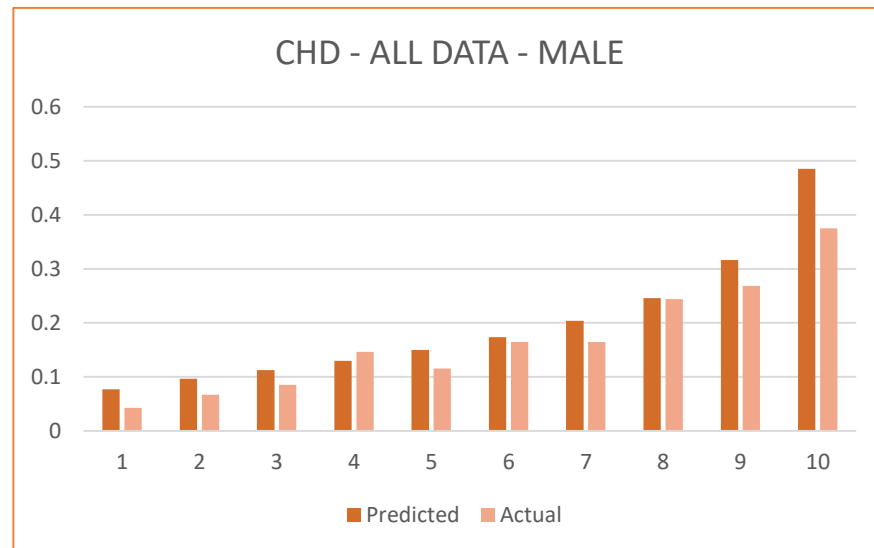
代號	變數組合	C	AIC
X1	AGE	0.649	4189.5
X2	AGE+SBP	0.675	4168.1
X3	AGE+SBP+Waist	0.681	2643.7
X4	AGE+SBP+Waist+HDL	0.685	2495.8
X5	AGE+SBP+Waist+HDL+HBP_drug	0.689	2493.8
X6	AGE+SBP+Waist+HDL+HBP_drug+HUA_drug	0.693	2494.2
X7	AGE+SBP+Waist+HDL+HBP_drug+HUA_drug+CHOL	0.693	2493.3



CHD - ALL DATA - MALE	
C	0.69
$\chi^2$	15.04
AIC	2494.2
$S_0(10)$	0.75

## 2002年三高資料驗證結果

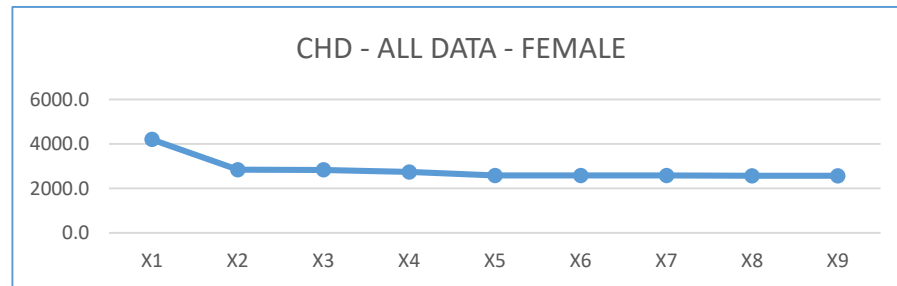
CHD - NO DRUG DATA - MALE	
AGE	0.0462
SBP	0.0101
Waist	0.0104
HDL	-0.0041
HBP_drug	0.4199
HUA_drug	0.5890
C	0.69
$\chi^2$	13.37
$S_0(10)$	0.83



# CHD - ALL DATA - FEMALE

## 1993-1996年營養調查建立模型

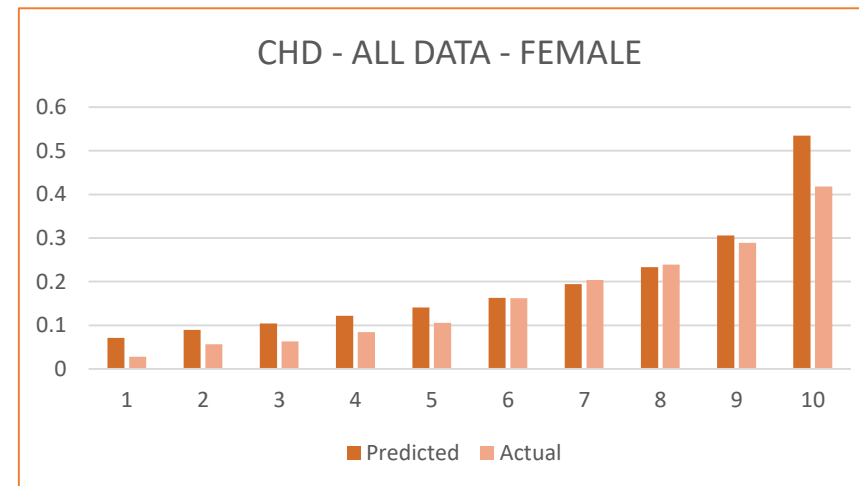
代號	變數組合	C	AIC
X1	AGE	0.662	4198.3
X2	AGE+RATIO	0.693	2837.6
X3	AGE+RATIO+Diab	0.702	2830.4
X4	AGE+RATIO+Diab+UA	0.711	2740.2
X5	AGE+RATIO+Diab+UA+HCHOL_drug*TG	0.714	2580.3
X6	AGE+RATIO+Diab+UA+HCHOL_drug*TG+DBP	0.717	2578.5
X7	AGE+RATIO+Diab+UA+HCHOL_drug*TG+DBP+HDL	0.719	2577.6
X8	AGE+RATIO+Diab+UA+HCHOL_drug*TG+DBP+HDL+BMI	0.721	2565.2
X9	AGE+RATIO+Diab+UA+HCHOL_drug*TG+DBP+HDL+BMI+HBP	0.721	2567.1



CHD - ALL DATA - FEMALE	
C	0.72
$\chi^2$	8.74
AIC	2565.2
$S_0(10)$	0.76

## 2002年三高資料驗證結果

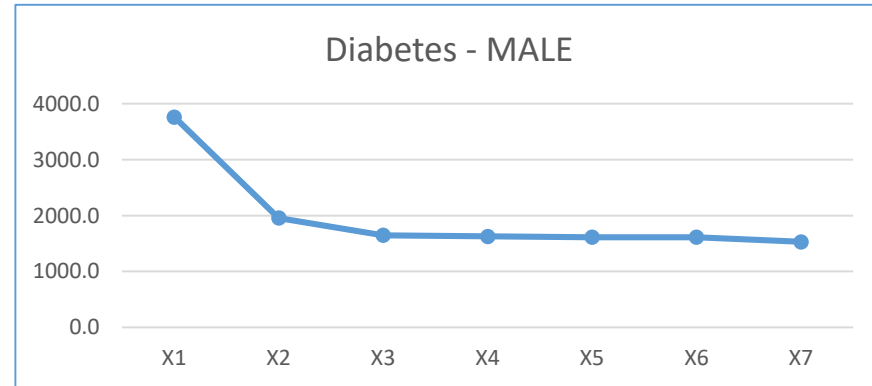
CHD - ALL DATA - FEMALE	
AGE	0.0416
RATIO	1.9684
Diabetes (yes)	0.6009
UA	0.1188
HCHOL_drug (yes) x TG	0.0053
DBP	0.0108
HDL	-0.0042
BMI	0.0176
C	0.72
$\chi^2$	14.34
$S_0(10)$	0.83



# Diabetes - MALE

## 1993-1996年營養調查建立模型

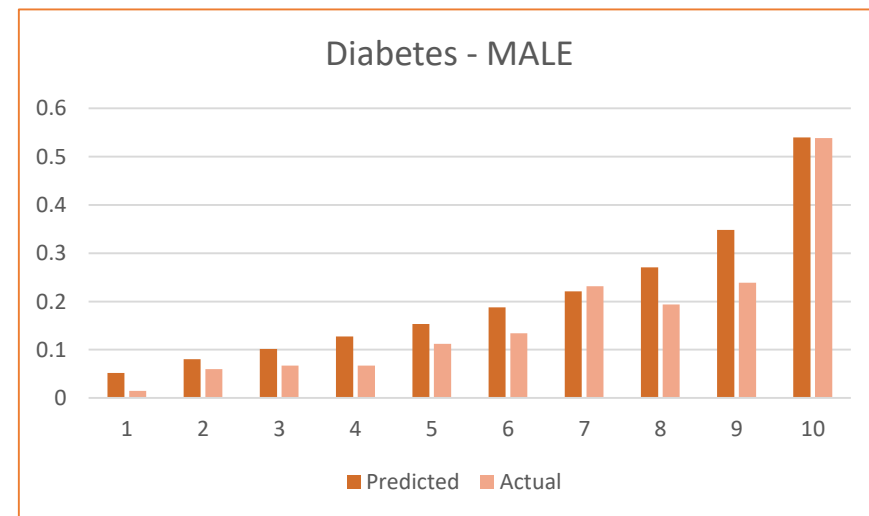
代號	變數組合	C	AIC
X1	AGE	0.594	3762.1
X2	AGE+BMI	0.691	1956.6
X3	AGE+BMI+GLU	0.703	1646.1
X4	AGE+BMI+GLU+TG	0.717	1626.2
X5	AGE+BMI+GLU+TG+CHOL	0.721	1612.3
X6	AGE+BMI+GLU+TG+CHOL+UA	0.723	1612.2
X7	AGE+BMI+GLU+TG+CHOL+UA+Smoke	0.724	1528.8



Diabetes - MALE	
C	0.72
$\chi^2$	22.80
AIC	1612.2
$S_0(10)$	0.79

## 2002年三高資料驗證結果

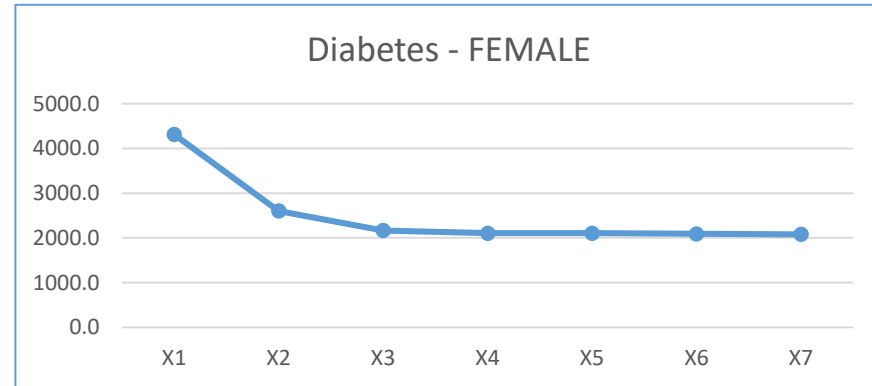
Diabetes - MALE	
AGE	0.0355
BMI	0.1229
GLU	0.0320
TG	0.0021
CHOL	0.0015
UA	0.0753
C	0.75
$\chi^2$	20.67
$S_0(10)$	0.83



# Diabetes - FEMALE

## 1993-1996年營養調查建立模型

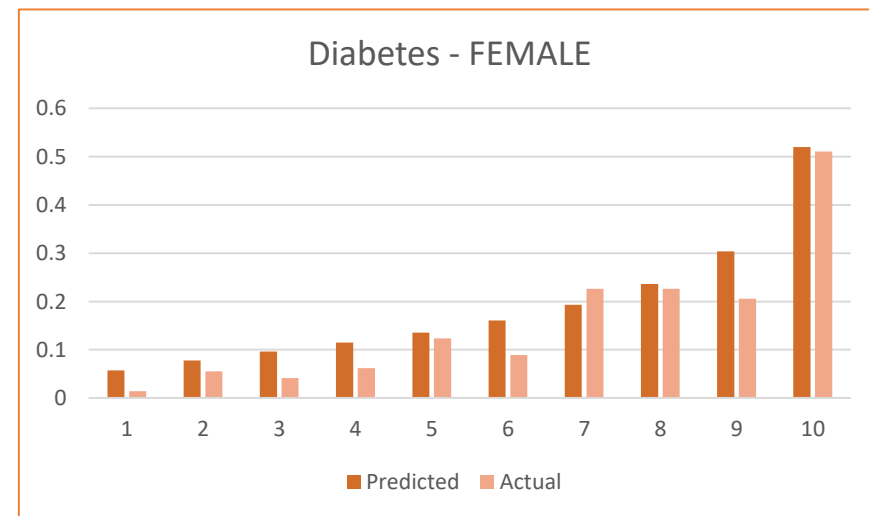
代號	變數組合	C	AIC
X1	AGE	0.607	4313.9
X2	AGE+Waist	0.707	2601.7
X3	AGE+Waist+GLU	0.724	2165.9
X4	AGE+Waist+GLU+TG	0.737	2106.1
X5	AGE+Waist+GLU+TG+UA	0.743	2105.8
X6	AGE+Waist+GLU+TG+UA+BMI	0.746	2091.6
X7	AGE+Waist+GLU+TG+UA+BMI+CHOL	0.747	2081.2



Diabetes - FEMALE	
C	0.75
$\chi^2$	27.40
AIC	2091.6
$S_0(10)$	0.76

## 2002年三高資料驗證結果

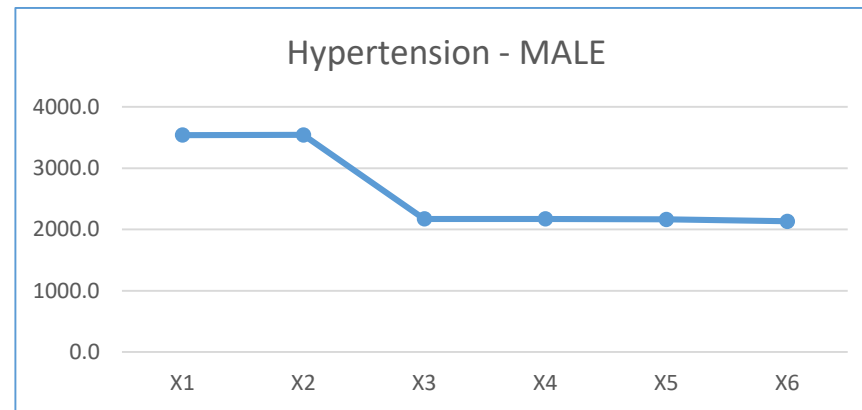
Diabetes - FEMALE	
AGE	0.0198
Waist	0.0247
GLU	0.0322
TG	0.0021
UA	0.0552
BMI	0.0553
C	0.75
$\chi^2$	24.41
$S_0(10)$	0.84



# Hypertension - MALE

## 1993-1996年營養調查建立模型

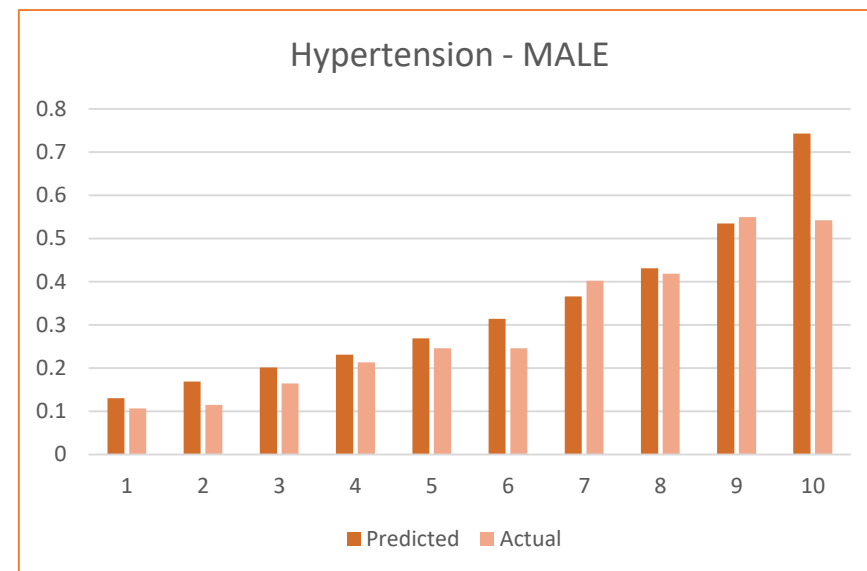
代號	變數組合	C	AIC
X1	AGE	0.657	3540.7
X2	AGE+SBP	0.682	3541.4
X3	AGE+SBP+HDL	0.690	2172.0
X4	AGE+SBP+HDL+UA	0.695	2170.6
X5	AGE+SBP+HDL+UA+Diab	0.698	2163.6
X6	AGE+SBP+HDL+UA+Diab+LDL	0.698	2133.3



Diabetes - MALE	
C	0.70
$\chi^2$	5.13
AIC	2163.6
$S_0(10)$	0.65

## 2002年三高資料驗證結果

Diabetes - MALE	
AGE	0.0525
SBP	0.0218
HDL	-0.0054
UA	0.0995
Diabetes (yes)	0.8006
C	0.70
$\chi^2$	12.76
$S_0(10)$	0.69

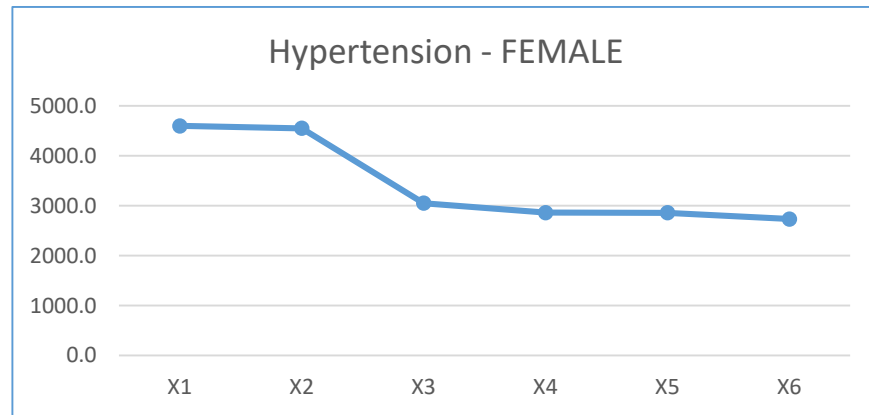




# Hypertension - FEMALE

## 1993-1996年營養調查建立模型

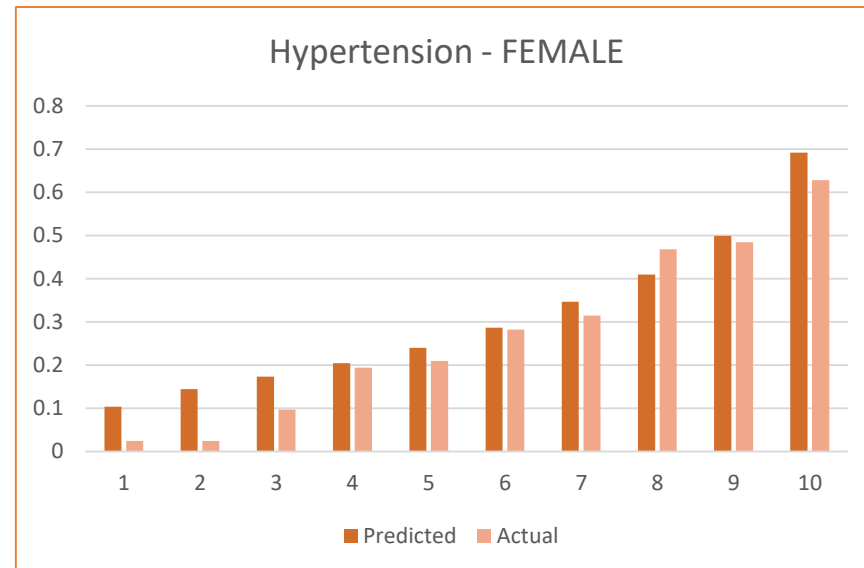
代號	變數組合	C	AIC
X1	AGE	0.644	4597.6
X2	AGE+SBP	0.697	4550.9
X3	AGE+SBP+BMI	0.718	3049.9
X4	AGE+SBP+BMI+UA	0.725	2860.1
X5	AGE+SBP+BMI+UA+Diab	0.730	2858.1
X6	AGE+SBP+BMI+UA+Diab+TG	0.731	2732.2



Diabetes - FEMALE	
C	0.73
$\chi^2$	6.15
AIC	2858.1
$S_0(10)$	0.60

## 2002年三高資料驗證結果

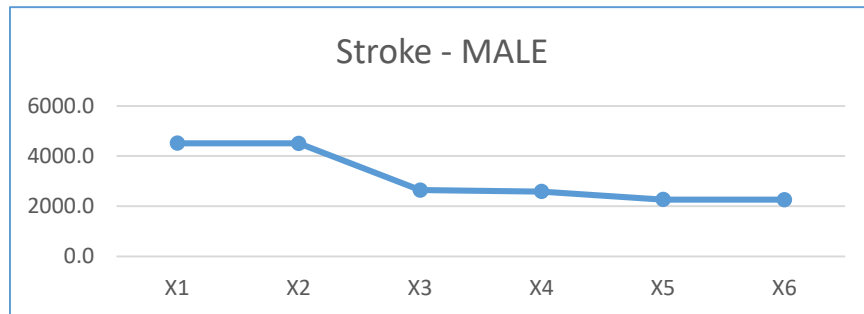
Diabetes - FEMALE	
AGE	0.0342
SBP	0.0284
BMI	0.0645
UA	0.1568
Diabetes (yes)	0.4563
C	0.75
$\chi^2$	26.90
$S_0(10)$	0.72



# Stroke - MALE

## 1993-1996年營養調查建立模型

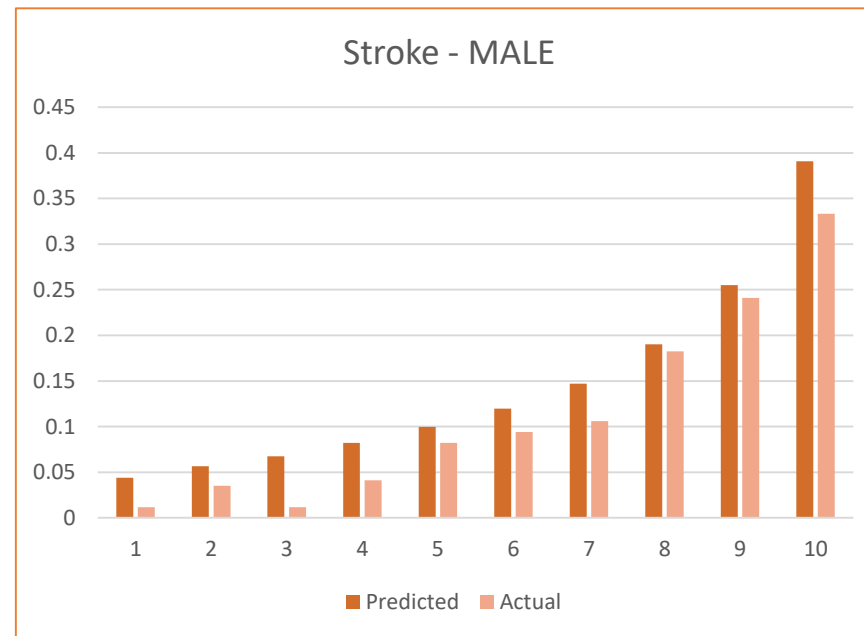
代號	變數組合	C	AIC
X1	AGE	0.697	4510.8
X2	AGE+SBP	0.738	4509.7
X3	AGE+SBP+HDL	0.742	2641.9
X4	AGE+SBP+HDL+LDL	0.745	2586.8
X5	AGE+SBP+HDL+LDL+GLU	0.747	2263.1
X6	AGE+SBP+HDL+LDL+GLU+DBP	0.748	2259.9



Stroke - MALE			
AGE	0.0622	AGE	0.0598
SBP	0.0174	SBP	0.0163
HDL	-0.0107	HDL	-0.0040
LDL	-0.0036	GLU	0.0027
GLU	0.0020		
C	0.75	C	0.74
$\chi^2$	13.16	$\chi^2$	12.51
AIC	2263.1	AIC	2285.1
$S_0(10)$	0.76	$S_0(10)$	0.76

## 2002年三高資料驗證結果

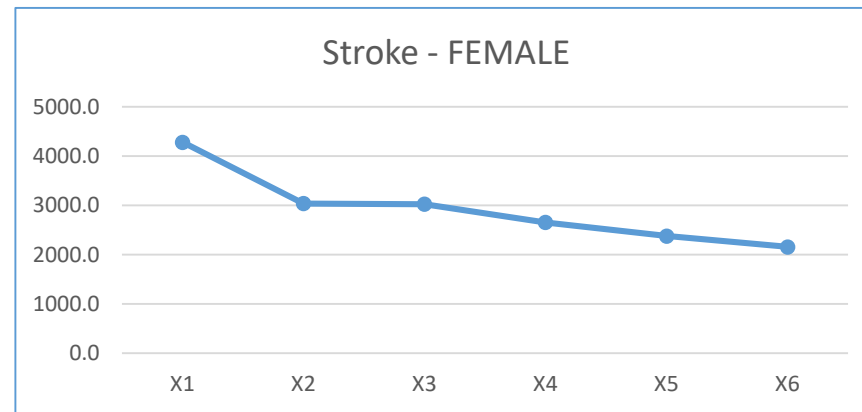
Stroke - MALE	
AGE	0.0598
SBP	0.0163
HDL	-0.0040
GLU	0.0027
C	0.76
$\chi^2$	21.70
$S_0(10)$	0.88



# Stroke - FEMALE

## 1993-1996年營養調查建立模型

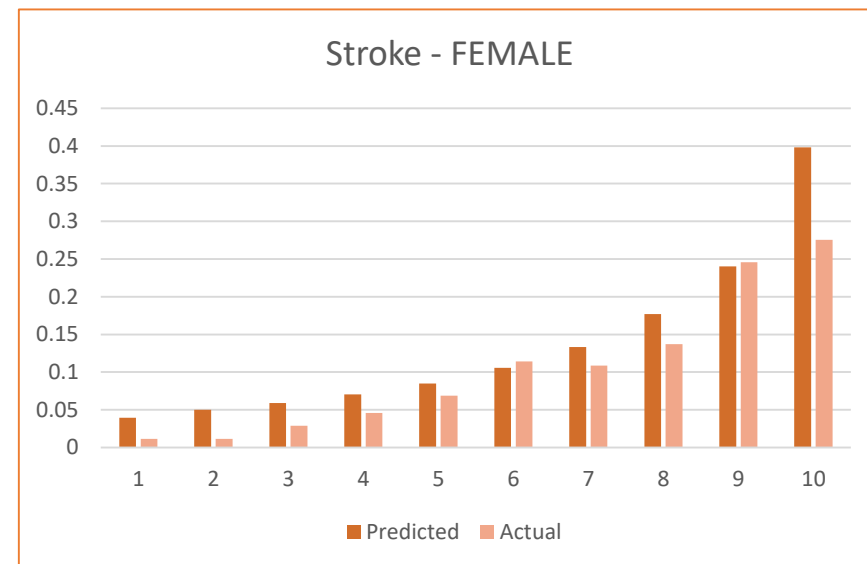
代號	變數組合	C	AIC
X1	AGE	0.678	4282.5
X2	AGE+RATIO	0.707	3038.8
X3	AGE+RATIO+hbp	0.719	3026.3
X4	AGE+RATIO+hbp+smoke	0.725	2656.6
X5	AGE+RATIO+hbp+smoke+CHOL/HDL	0.729	2381.4
X6	AGE+RATIO+hbp+smoke+CHOL/HDL+GLU	0.730	2159.9



Stroke - FEMALE	
C	0.73
$\chi^2$	17.13
AIC	2382.8
$S_0(10)$	0.78

## 2002年三高資料驗證結果

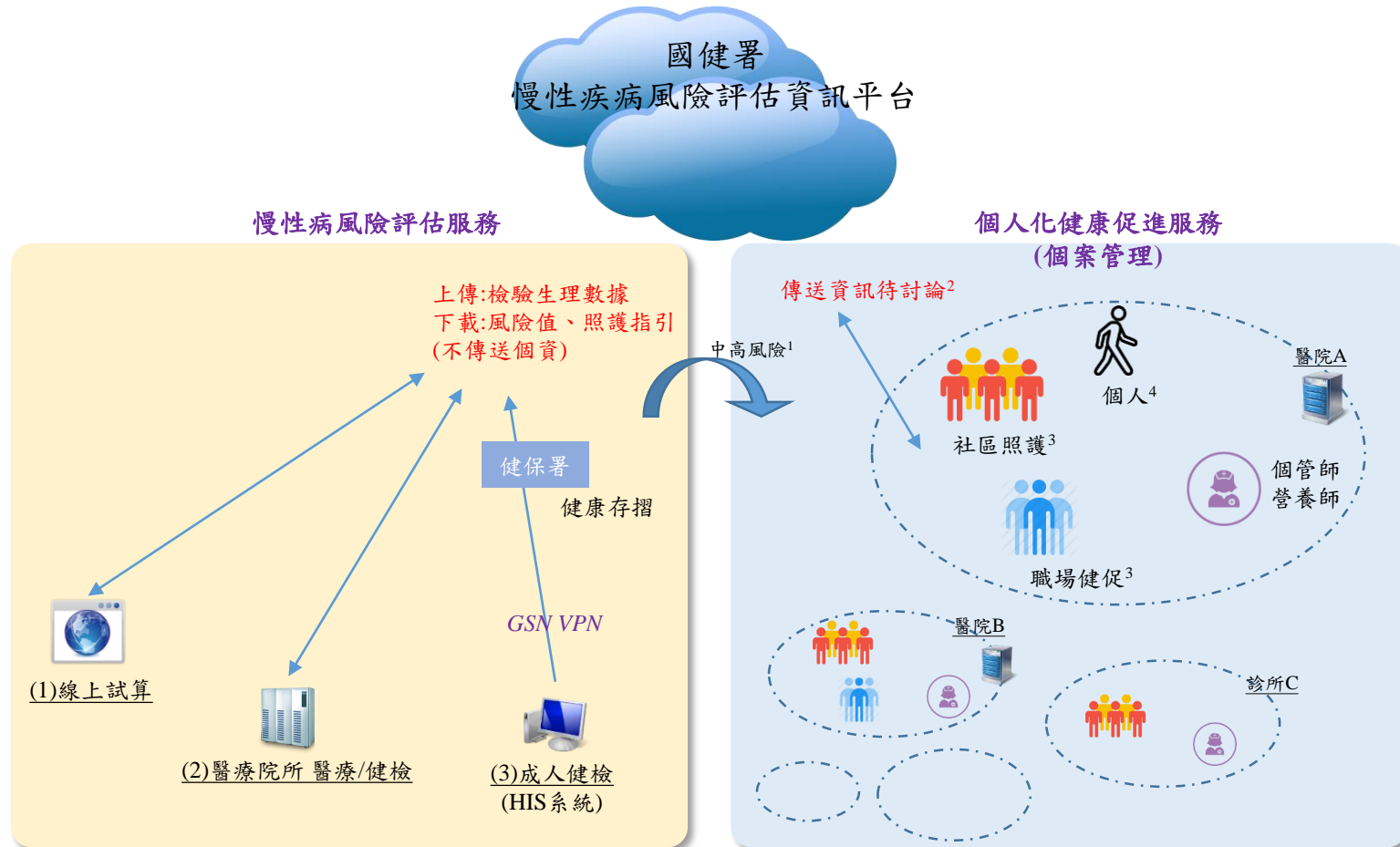
Stroke - FEMALE	
AGE	0.0525
RATIO	2.6456
CHOL/HDL	0.1429
Hypertension(yes)	0.5186
Smoke(yes)	0.6959
C	0.75
$\chi^2$	22.74
$S_0(10)$	0.89



# Risk Prediction Platform

Application to Three Different Types of Hospitals.

# 國健署慢性疾病風險評估資訊平台



註1: 高風險者進入醫療體系

註2: FY107 考量IRB, 照護資訊留在醫院內。

註3: FY107規劃以社區照護為場域, 兩家醫院參與服務。

註4: 潛在客戶為健檢VIP。

# 醫學中心（台北榮總）

醫學計算機

自動抓取病歷資料 1

序號	國衛院疾病風險評估-心臟病
1	gender 原始數值：2018-06-06時gender=M <input type="radio"/> Female <input checked="" type="radio"/> Male
2	Age 原始數值：2018-06-06時AGE=2 2 years
3	高密度膽固醇: hdlc 原始數值：無 mg/dl
4	收縮壓: sbp[限男性] 原始數值：2018-06-01時sbp=95.000 95.000 mm/Hg
5	腰圍: waist[限男性] 原始數值：無 cm

醫學計算機

儲存紀錄瀏覽 1

搜尋

儲存紀錄 重新計算

日期	時間	結果值	選擇
2018-06-06	14:43:12	risk: 1.94% populationAvg: 18.68% multipleDiff: 0.1	<input type="button" value="選擇"/>
2018-06-06	14:43:24	risk: 2.76% populationAvg: 30.57% multipleDiff: 0.09	<input type="button" value="選擇"/>
2018-06-06	14:43:41	risk: 5.35% populationAvg: 30.57% multipleDiff: 0.18	<input type="button" value="選擇"/>
2018-06-06	14:43:48	risk: 9.37% populationAvg: 30.57% multipleDiff: 0.31	<input type="button" value="選擇"/>

序號	國衛院疾病風險評估-糖尿病
1	gender 原始數值：2018-06-06時gender=M <input type="radio"/> Female <input checked="" type="radio"/> Male

They only need our formula to incorporate into their system.



# 區域醫院(為恭醫院含社區關懷)

## 社區健康小站(\*17)



- 為恭醫護人員或志工使用APP或筆電將數據直接填寫到系統。
- 初期選擇幾個站來推行量測自動化。(量測設備→藍牙→APP→伺服器)
- 現場即時檢視歷次記錄(限醫護人員)，協助衛教之進行。
- 為恭可從系統匯出量測記錄Excel，再分享給關懷據點。



異常追蹤



健管師

## 整合性篩檢服務



- 當場填寫表格，回院後手動填寫到HIS系統。
- 檢驗數據會直接進入到HIS系統



匯出



成健資料檔

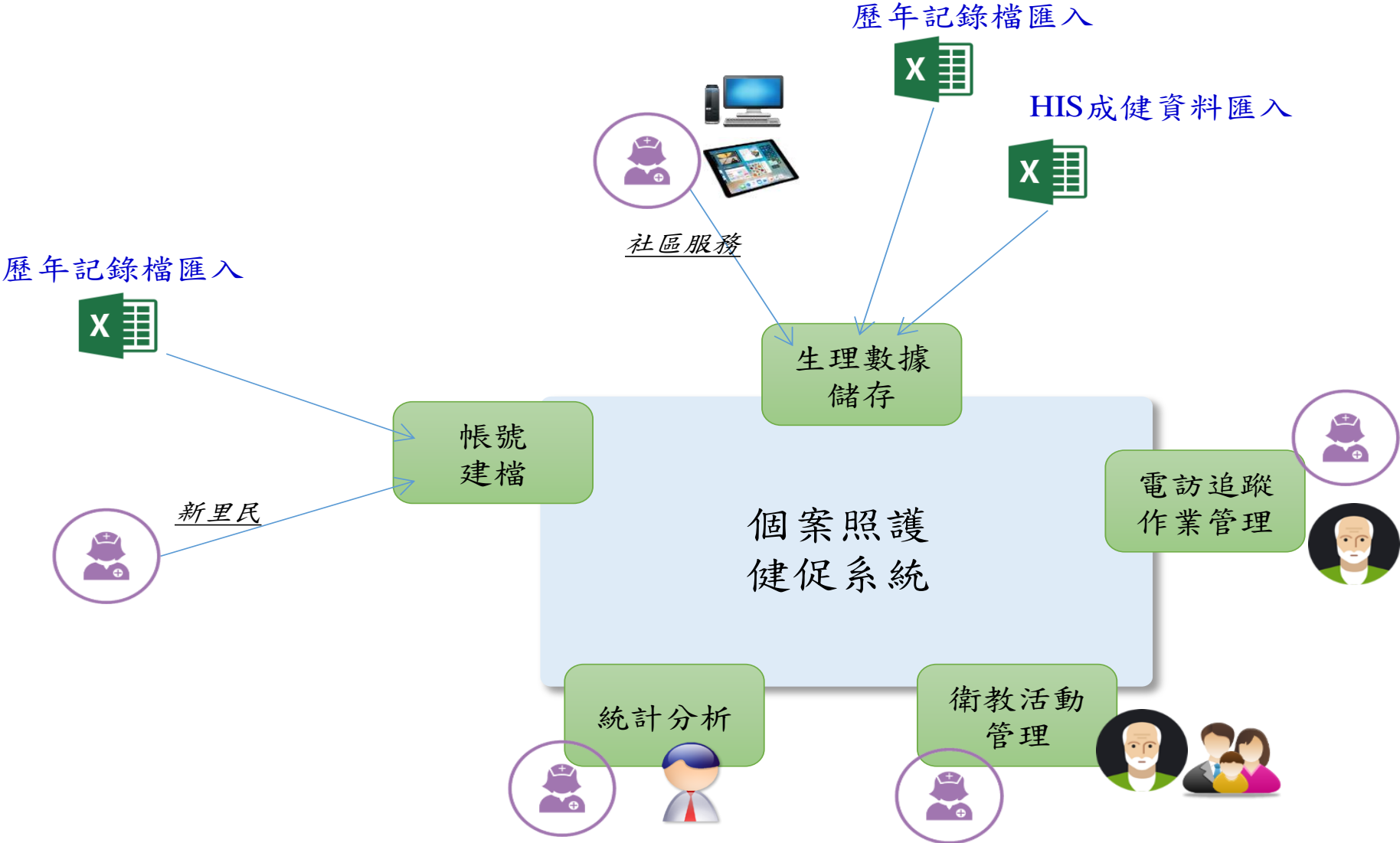
匯入

- 數據自動歸戶。
- 自動篩選出數值異動者，自動安排負責個管師。
- 每日提醒應電訪名單。
- 對象之歷次數據表列、趨勢圖(可挑選來源:全部、成健、小站)
- 電訪追蹤內容填寫。
- 追蹤成效統計。
- 個管課同仁直接登入系統檢視數據。(視權限)

註1: 考量系統複雜性，本階段暫不與HIS直接進行整合。(會與為恭管理層討論)

註2: APP推播服務(服務通知、衛教新知、...)需考量APP的使用率，尚待與計畫主持人討論。

# 社區個案管理系統



# 民眾自我計算網頁

- <https://dev2.health200.tw/nhri/index.jsp>

衛生福利部國民健康署  
Health Promotion Administration, Ministry of Health and Welfare  
智慧健康醫院-慢性疾病風險評估資訊平台

首頁 / 慢性疾病風險試算

心臟病(CHD) 糖尿病(Diabetes) 高血壓(Hypertension) 中風(Stroke) 一次所有疾病

**1** 提供您個人健康數據，評估疾病風險  
(提醒:本試算並不適用於患有心臟病的病人)

性別:  女  男

(請耐心填入以下所有欄位，才能準確進行風險評估)

年齡:

高密度膽固醇(mg/dl):

腰圍(公分):

收縮壓(mm/Hg):

 您的風險 11.41%

 同族群的風險 11.49%

您10年發生 心臟病(CHD) 的風險值=11.41%

國人男性40歲有 心臟病(CHD) 的平均風險值=11.49%

您的風險為同族群(性別/年齡相同)的=0.99倍

依照WHO分法，您的風險值11.41%是屬於中風險。

It is evolving...

Thanks for your listening!