STUDY DESCRIPTION AND METHODS
研究设计与方法

INTRODUCTION: Geographic variation across China

The 2,400 counties that comprise rural China, with an average population of a few hundred thousand per county, differ greatly from each other in the ways the local populations live and in the main diseases by which they die. Many of these differences in lifestyle and disease rates have persisted for centuries. Even though in recent decades there has been a nationwide reduction in death from infectious disease (particularly in childhood), there is still great heterogeneity among counties in childhood mortality rates, as well as in the age-standardised mortality rates from the main chronic diseases of middle age.

This geographic study describes the variation across 69 mainly rural Chinese counties (figure 1) in mortality, blood biochemistry, diet and lifestyle. The chief comparisons are among counties, not among individuals. Hence, each county is characterised by the average values for various factors among those living there. Mortality rates are based on whole counties (or, for very large counties, on substantial portions of them), but average values for biochemistry, diet and lifestyle are generally based on special surveys in just two randomly-chosen rural villages per county, with particular emphasis on adults aged 35-64. Major components of the study in mainland China were replicated in 16 areas of Taiwan, which range from urban to rural in character.

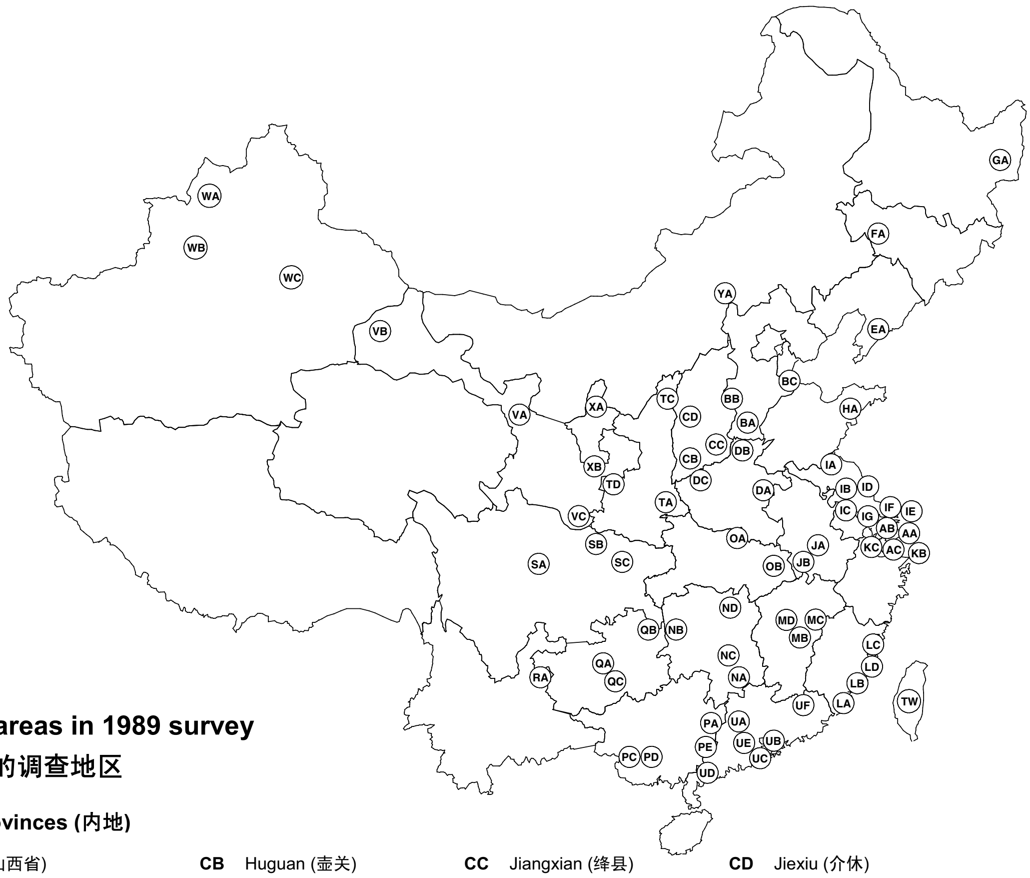
The chief purpose of the study is to describe the wide range of differences among different counties in lifestyles and disease-specific mortality rates, rather than to analyse these differences in search of direct evidence of causes. A few of the geographic correlations of particular factors with particular diseases do yield good evidence of causality (e.g., schistosomiasis rates in different counties are correlated with intestinal cancer mortality rates, because in endemic areas chronic infection of the wall of the large intestine with *S. japonicum* greatly increases the incidence of colorectal cancer, which is otherwise low), but the main value of this study is descriptive: the extraordinary range of mortality rates and of lifestyles across different Chinese counties deserves to be more widely known.

导言：中国各地的地区差异

中国大陆农村有 2400 个县，每个县平均有几十万人口。在这些县之间，人们的生活方式和主要疾病死亡率有很大的差异，其中许多差异已持续了数百年。最近几十年，尽管传染性疾病的死亡率在全国（特别是儿童中）均呈下降趋势，但不同县之间的儿童死亡率仍有很大区别；同样，中年人年龄标准化后的主要慢性疾病死亡率在不同县之间也不相同。

本次地区性研究描述了中国大陆的 69 个农村县（图 1）在死亡率、血液生化指标、膳食以及生活方式上的不同。主要的比较以每个县为基础，而不是个体间的比较；因此，每个县的各种特征均以其居民的均值来表示。除特别大的县是部分人口外，县死亡率是全县的数据。但是，生化指标、膳食及生活方式的均值是基于在每个县随机抽取的两个村进行的专门调查，调查对象主要是 35-64 岁的成年人。一些在大陆进行的主要调查内容，在台湾的 16 个城市和农村地区进行了重复调查。

本研究的主要目的是描述不同县之间在生活方式和各种疾病死亡率上的巨大差异，而不是分析这些差异来寻找造成这些差异的直接证据。一些特殊的因素与一些特殊的疾病之间的地区性相关确实提供了因果关系的良好证据（例如，不同县之间的血吸虫病患病率与肠癌死亡率之间的关系，是由于血吸虫病流行地区人群大肠壁长期感染日本血吸虫而增加了大肠癌的患病率，否则将会很低），但本研究的主要价值是描述信息，让读者更广泛地了解不同调查县之间在死亡率分布以及生活方式上的巨大不同。



Survey areas in 1989 survey
1989 年的调查地区

Inland Provinces (内地)

C	Shanxi (山西省)	**CB**	Huguan (壶关)	**CC**	Jiangxian (绛县)	**CD**	Jiexiu (介休)		
D	Henan (河南省)	**DA**	Shangshui (商水)	**DB**	Linxian (林县)	**DC**	Songxian (嵩县)		
F	Jilin (吉林省)	**FA**	Changling (长岭)						
G	Heilongjiang (黑龙江省)	**GA**	Baoqing (宝清)						
J	Anhui (安徽省)	**JA**	Zongyang (枞阳)	**JB**	Qianshan (潜山)				
M	Jiangxi (江西省)	**MB**	Lean (乐安)	**MC**	Nancheng (南城)	**MD**	Xiajiang (峡江)		
N	Hunan (湖南省)	**NA**	Linwu (临武)	**NB**	Mayang (麻阳)	**NC**	Qiyang (祁阳)	**ND**	Yuanjiang (沅江)
O	Hubei (湖北省)	**OA**	Zaoyang (枣阳)	**OB**	Echeng (鄂城)				
Q	Guizhou (贵州省)	**QA**	Qingzhen (清镇)	**QB**	Yinjiang (印江)	**QC**	Huishui (惠水)		
R	Yunnan (云南省)	**RA**	Xuanwei (宣威)						
S	Sichuan (四川省)	**SA**	Wenjiang (温江)	**SB**	Cangxi (苍溪)	**SC**	Quxian (渠县)		
T	Shaanxi (陕西省)	**TA**	Shanyang (山阳)	**TC**	Jiaxian (佳县)	**TD**	Longxian (陇县)		
V	Gansu (甘肃省)	**VA**	Tianzhu (天祝)	**VB**	Dunhuang (敦煌)	**VC**	Wudu (武都)		
W	Xinjiang (新疆自治区)	**WA**	Tuoli (托里)	**WB**	Xinyuan (新源)	**WC**	Tulufan (吐鲁番)		
X	Ningxia (宁夏自治区)	**XA**	Yongning (永宁)	**XB**	Longde (隆德)				
Y	Neimongol (内蒙古自治区)	**YA**	Xianghuangqi (镶黄旗)						

Coastal Provinces (沿海)

A	Shanghai (上海市)	**AA**	Shanghai (上海)	**AB**	Qingpu (青浦)	**AC**	Songjiang (松江)		
B	Hebei (河北省)	**BA**	Cixian (磁县)	**BB**	Jingxing (井陉)	**BC**	Huanghua (黄骅)		
E	Liaoning (辽宁省)	**EA**	Xiuyan (岫岩)						
H	Shandong (山东省)	**HA**	Laoshan (崂山)						
I	Jiangsu (江苏省)	**IA**	Shuyang (沭阳)	**IB**	Huaian (淮安)	**IC**	Yangzhong (阳中)	**ID**	Jianhu (建湖)
		IE	Qidong (启东)	**IF**	Haimen (海门)	**IG**	Taixing (泰兴)		
K	Zhejiang (浙江省)	**KB**	Daishan (岱山)	**KC**	Jiashan (嘉善)				
L	Fujian (福建省)	**LA**	Zhangpu (漳浦)	**LB**	Nanan (南安)	**LC**	Changle (长乐)	**LD**	Huian (惠安)
P	Guangxi (广西自治区)	**PA**	Cangwu (苍悟)	**PC**	Chongzuo (崇左)	**PD**	Fusui (扶绥)	**PE**	Rongxian (容县)
U	Guangdong (广东省)	**UA**	Sihui (四会)	**UB**	Panyu (番禺)	**UC**	Zhongshan (中山)	**UD**	Wuchuan (吴川)
		UE	Shunde (顺德)	**UF**	Wuhua (五华)				

TW Taiwan (台湾)

ZA Taipei City, Kaohsiung City (台北, 高雄市) **ZB** Taichung City, Tainan City (台中, 台南市) **ZC** Chungho City, Fengshan City (中和, 凤山市)
ZD Miaoli County (苗栗县) **ZE** Hsinchu County (新竹县) **ZF** Chiai, Tainan County (嘉义, 台南县) **ZG** Penghu County (彭湖县)
ZH Nantou, Hualien County (南投, 花莲县) **ZI** Kaohsiung, Taitung County (高雄, 台东县) **ZJ** Pingtung County (屏东县)
ZK Taipei County (台北县), Ilan County (宜兰县) **ZL** Changhua, Pingtung County (彰化, 屏东县) **ZM** Taitung County (台东县)
ZN Ilan County (宜兰县) **ZO** Changhua County (彰化县) **ZP** Tainan County(台南县)

Figure 1: Location of 69 mainland study counties, and of Taiwan. The first letter denotes the province, the second identifies the study area. In 1989 there were 69 study areas in mainland China, 65 of which were also included in a 1983 survey, and 16 in the island of Taiwan (marked TW). Note: The municipality of Shanghai [province A] included some rural counties, one of which [AA] has since been absorbed into the city of Shanghai, and part of Sichuan [province S] is now the municipality of Chongqing.

图 1：69 个大陆调查县和台湾调查点的地理位置及名称。第一个字母代表省、第二个字母代表调查点。1989 年在大陆共调查 69 个县，其中的 65 个县曾在 1983 年进行过调查；台湾有 16 个调查点（标记为 TW）。注："直辖市"上海[A]包括了一些农村县，其中的[AA]已被合并到上海市；四川[S]的一部分为现在的直辖市重庆。

As an example of these geographic differences in disease, age-standardised mortality rates (male versus female) from oesophagus cancer, stomach cancer, liver cancer, chronic lung disease, ischaemic heart disease and stroke in the 69 study counties are shown in figure 2, along with the corresponding rates in the United Kingdom (UK). Together, these six diseases account for more than half of all Chinese deaths in middle age (which, throughout this monograph, is defined as ages 35 to 69). For each disease, there is more than ten-fold variation among the counties, and these differences are not chiefly genetic. Although some important causes are known (for example, within each county, high blood pressure greatly increases the risk of death from stroke and heart disease; and chronic hepatitis B greatly increases the risk of death from liver cancer), little of the heterogeneity among counties in mortality from particular diseases can be explained by heterogeneity in the prevalences of the known causes of those diseases. Thus, for none of these six diseases are the main reasons for wide geographic variation properly understood, and wherever any of these diseases is relatively common, there must be some major avoidable cause, or causes, still awaiting discovery.

作为疾病地区性分布具有巨大差异的一个例子，图 2 比较了 69 个研究县的男女食管癌、胃癌、肝癌、慢性肺部疾病、缺血性心脏病及中风的年龄标准化死亡率的不同，同时提供了英国相应疾病的死亡率。上述六种疾病引起的死亡占中国中年人群（在这本专著中，定义为 35-69 岁）死亡总数的一半以上。对于每一种疾病，在不同县中有十倍以上的变化，而遗传并不是这些差异的主要决定因素。尽管一些重要的病因已经清楚（例如：在每一个县中，高血压会大大增加死于中风及心脏病的危险；慢性乙型肝炎大大增加死于肝癌的危险性），但是不同县之间的某些疾病死亡率的不同并不能用这些疾病已知病因的流行差异来解释。因此，对造成这六种疾病死亡率如此巨大地理差异的主要原因还没有完全的了解；在任何地方，只要这些疾病是比较常见的，肯定有一些可避免的主要原因有待发现。

Each of these six diseases can be caused by smoking, but, for each of them, the wide geographic variation in mortality rates is not chiefly due to geographic variation in tobacco use: in rural China, few women smoke, and the prevalence of smoking among men does not vary greatly among counties. Chronic lung disease, for example (figure 2d), is the main cause of death in many parts of rural China, but the reasons for this are not properly understood. The generally higher rates among males than among females are chiefly due to differences in tobacco use, and the very high rate for women in one county (Xuanwei, labelled “R”) is due to smoky coal fires in houses without chimneys. Neither tobacco nor coal smoke, however, can plausibly account for most of the ten-fold variation among county rates, nor for the much higher average rates in rural China than in the UK. In contrast, ischaemic heart disease (IHD; which also shows ten-fold variation between one part of China and another) is, in every county, much less common than in the UK. Dietary factors might well account for much of this—average fat intake in rural China (18% of dietary calories) was less than half that in the UK, and average plasma cholesterol was only about two-thirds that in the UK (figure 3). Among the study counties, however, the variation in IHD mortality is not significantly correlated with the variation in fat intake, possibly because fat intake is correlated about as strongly with HDL cholesterol (which cardioprotective particles carry) as it is with non-HDL cholesterol.

这六种疾病均可由吸烟引起，但每种病死亡率的巨大地区性差别，并不主要是由于烟草使用的地区性差别而造成的，因为在中国农村女性吸烟的很少，而男性的吸烟率在不同县之间又没有明显不同。如慢性肺部疾病（图 2d）是中国许多农村地区的主要死因，但原因并不十分清楚。男性死亡率总体上高于女性的主要原因是由于烟草消费的不同。而在宣威县（R）女性慢性肺部疾病死亡率很高，其原因是由于在室内使用烟煤而没有烟囱。然而，不管是烟草还是烟煤，都不能完全合理地解释各县之间患病率的十倍以上的差别，也不能解释大陆农村平均患病率大大高于英国的结果。相反，每个县的缺血性心脏病（IHD，在中国不同县之间也有十倍以上的差别）都比英国要低。膳食可能是这些不同的主要影响因素。大陆农村人群膳食脂肪的摄入（占膳食总能量的 18%）较英国人低一半多，同时大陆农民的血胆固醇水平是英国人的三分之二（图 3）。然而，在中国的调查县中，缺血性心脏病死亡率的变化与脂肪的摄入却没有显著相关，可能是脂肪摄入与 HDL 胆固醇 (由对心脏有保护性作用的粒子所带) 和非 HDL 胆固醇相关的强度相同。

STUDY COMPONENTS

研究内容

Two surveys of mainland county mortality rates (1973-75 and 1986-88)

- County mortality rates during the three-year period 1973-75, subdivided into a limited number of specific causes (or groups of causes), were taken from a previous nationwide study.
- County mortality rates during the three-year period 1986-88, subdivided into many specific causes, were derived from our individual review and ICD-9 coding of 300,000 deaths. Our parallel survey of 800,000 urban deaths in 24 cities during 1986-88, conducted mainly for other purposes (Liu et al., 1998), is used in this monograph chiefly to compare rural and urban cause-specific mortality rates in mainland China. In the Annex, from page 803, cause-specific mortality rates by sex and 5-year age groups are given for urban China (24 cities), rural China (67 counties) and all China (weighted average, 0.3 urban + 0.7 rural).

两次大陆县死亡率调查 (1973-75， 1986-88 年)

- 1973-75 年三年的调查县死亡率，只分为有限的疾病类别（或几种类别的组合），资料来源于先前的一次全国性调查。
- 1986-88 年三年的调查县死亡率，分为多种具体死因，资料来源于我们对 300,000 例死亡进行的个体回顾调查和 ICD-9 编码。我们主要为其它目的于 1986-88 年在 24 个城市同时进行的 800,000 例城市人口死亡调查(刘等，1998)，在本专著中主要用于比较大陆农村与城市的死亡专率。从 803 页起的附录给出中国城(24 市)乡(67 县)及全国(加权平均，0.3 城镇 + 0.7 农村)性别和五岁年龄组的死亡专率。

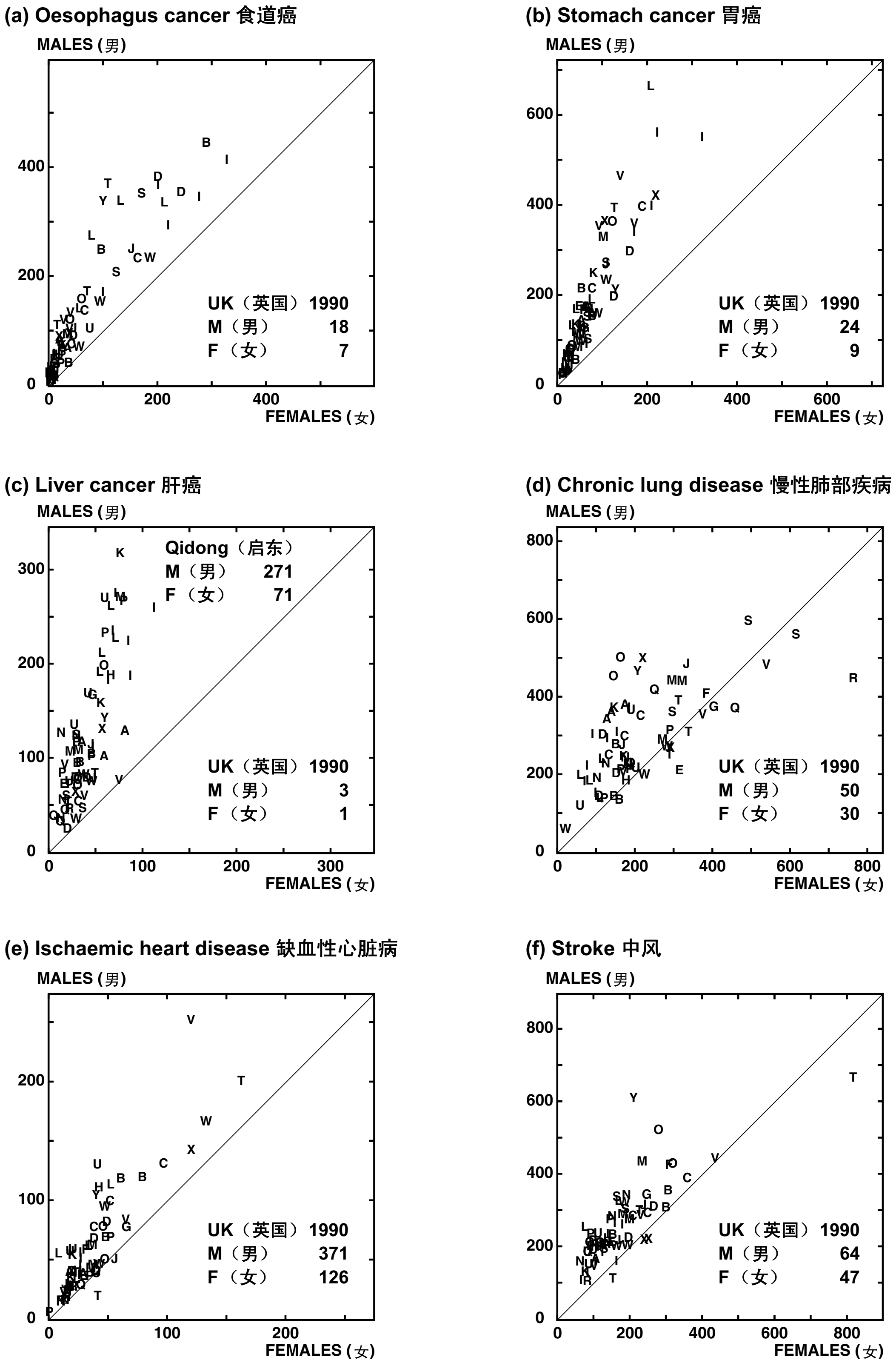


Figure 2: Standardised mortality rates from six major chronic diseases in 69 different counties in rural China, showing wide variation, and hence much avoidability. The mortality rate is the mean of the 7 age-specific annual rates per 100,000 at ages 35-39, 40-44,…,65-69. Hence, a rate of 300 would mean that a 35-year-old would (in the absence of other causes of death) have about a 10% risk of death from this particular cause at ages 35-69; a rate of 600 would correspond to about a 20% risk of death at ages 35-69; and a rate of 30 to a 1% risk.

图 2：中国农村 69 个不同县的六种主要慢性疾病的标准化死亡率有很大差异，因此这些慢性疾病在很大程度上是可以避免的。所表示的死亡率是 35-39，40-44.，… 65-69 岁等 7 个年龄组的年死亡率（1/100,000）的平均值。因此，死亡率为 300/100,000 意味着一个年龄为 35 岁的人（在不考虑其它死因的情况下），在 35-69 岁时死于某种疾病的风险为 10%；同理，若死亡率为 600/100,000，意指在 35-69 岁时死于某种疾病的风险为 20%；若死亡率为 30/100,000，那么风险则为 1%。

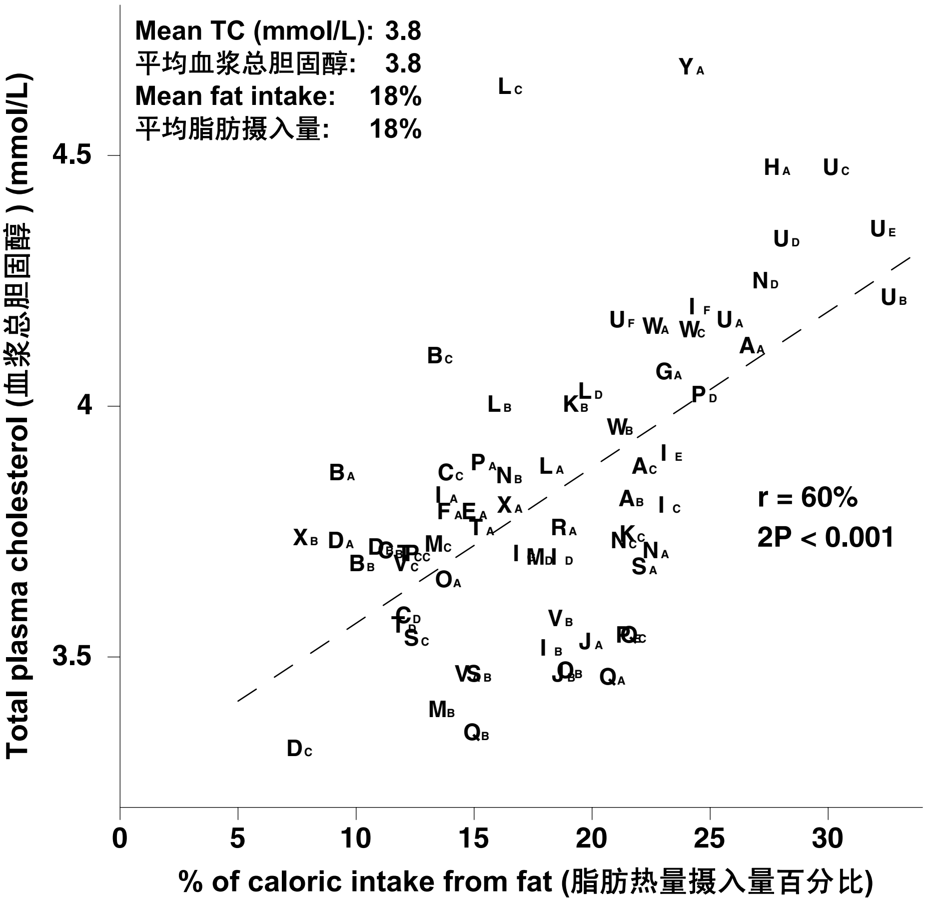


Figure 3: Total dietary fat intake versus total plasma cholesterol (TC): mean values among adults in 69 rural Chinese counties in 1989. Fat intake as a percentage of total dietary calories averaged 18% in these counties, which is less than half the percentage typically seen in UK adults, and total plasma cholesterol averaged 3.8 mmol/L (148 mg/dL), which is only about two-thirds that in the UK and three-quarters that now seen in rural China (Gu et al, 2005). But, there is in these 69 counties a similarly strong positive geographic correlation of total dietary fat intake with the total plasma cholesterol, with the plasma cholesterol in low-density lipoprotein particles (LDL cholesterol), which are hazardous, and with the plasma cholesterol in high-density lipoprotein particles (HDL cholesterol), at least some of which are cardioprotective.

图 3：膳食总脂肪摄入量与血浆总胆固醇(TC)：1989 年 69 个大陆农村县成年人的平均值。这些县成年人的膳食脂肪摄入量占膳食总能量的比例平均为 18%， 比英国成年人低一半；他们的血浆总胆固醇平均为 3.8 毫摩尔/升（148 毫克/分升），仅相当于英国人的三分之二，和四分之三（在现代中国农村）（顾等，2005）。但是在所有的 69 个县中，调查对象总的膳食脂肪的摄入量与血浆总胆固醇、对健康有害的低密度脂蛋白粒子中的血浆胆固醇（LDL 胆固醇）、和对心脏至少有部分保护作用的高密度脂蛋白粒子中的血浆胆固醇（HDL 胆固醇）均有非常强的地区性正相关。

Two surveys of mainland county biochemistry, diet and lifestyle (1983 and 1989)

- In 1983, a survey of biochemistry, diet and lifestyle was undertaken in 65 of the 69 counties.
- In 1989, a more detailed survey was undertaken in all 69 of the counties, involving
  - analyses of samples from adults aged 35 to 64 of plasma, of red blood cells, and, from men only, of urine;
  - a three-day weighed household dietary survey, used to estimate average daily intakes of a wide variety of foods and nutrients per “reference man”;
  - questionnaires (including some physical measurements) about dietary, lifestyle, anthropometric, social and economic factors, representing either the individuals being interviewed, their families, or their communities; and
  - geographic characteristics of the county.

两次大陆县生化指标、膳食以及生活方式调查（1983，1989 年）

- 1983 年，在 69 个县中的 65 个县进行了生化、膳食及生活方式调查。
- 1989 年，在 69 个县进行了更详细的调查，包括：
  - 对 35-64 岁成年人的血浆及红细胞样品分析，对男性尿样分析；
  - 三日家庭称重膳食调查，用于估计标准成年男子每日各种食物及营养素的摄入量；
  - 对调查的个人及其家庭以及所在社区的膳食、生活方式、社会及经济指标（包括一些体格测量指标）的询问调查；
  - 调查县的地理特征。

Reliability re-survey in selected mainland counties (1993)

To help assess the reliability of the methods used in the 1989 survey, a repeat survey using those same methods was carried out in 1993. Thirteen counties in mainland China that represent a good north-south mix and a range of affluence levels were included (counties AC, BA, CB, CC, FA, HA, KB, LC, ND, QA, AC, RA and TD). In each, the re-survey was carried out at the same time of year as the 1989 survey, to avoid seasonal differences. After a refresher training course, the same 1989 personnel (where available) conducted the re-survey, during which they had no access to the 1989 values.

The following elements of the 1989 survey were included in the reliability re-survey:

- a subset of questions from the individual-level questionnaire
- pulmonary function (using the same equipment and methods)
- blood pressure (using the same equipment and methods)
- household dietary survey
- blood sample (sodium ascorbate was used as a preservative in 1993, although ascorbic acid had been used in 1989)
- 12-hour urine collection (males only)

Overall, 70% of the 1989 participants in these 13 counties were re-interviewed in 1993. Replacements, of the same gender and age, were recruited for the other 30% because the aim was to study the reproducibility of aggregate means, rather than the reproducibility of individual values.

所选部分大陆县可信性重复调查（1993 年）

为评价 1989 年调查方法的可信性， 1993 年采用相同方法进行了重复调查。在大陆重复调查的 13 个县较好地代表了南北方及经济水平的不同（这些县的编码为 AC、BA、CB、CC、FA、HA、KB、LC、ND、QA、AC、RA 和 TD）。为避免季节性差异，每个县重复调查的时间与 1989 年相同，调查员也与 1989 年相同（在可能情况下），并经过重新培训。重复调查期间，调查员并不掌握 1989 年调查数据。

下面这些 1989 年曾调查过的项目被列入 1993 年的可信性调查：

- 个人问卷中的部分问题
- 肺功能测定（用相同的仪器和方法）
- 血压测量（用相同的仪器和方法）
- 家庭膳食调查
- 血样收集（尽管 1989 年使用的保存剂为抗坏血酸，1993 年用的是抗坏血酸钠盐）
- 12 小时尿样（男性）

在 13 个县中，1993 年重复调查了 70%的 1989 年的调查对象。鉴于重复调查的目的是评价人群均值而不是个体值的可重复性，因此按照同性别和同年龄的原则，新补充了另外 30%调查人群。

Taiwan: survey of mortality (1986-88) and of biochemistry, diet and lifestyle (1989)

To compare mainland China with Taiwan, 16 areas in Taiwan were selected for study. Mortality rates during 1986-88 were calculated from review of death certificates, and a survey of biochemistry, diet and lifestyle similar to that in mainland China was undertaken in 1989. The three-day weighed household dietary survey was not conducted in Taiwan.

台湾：死亡率调查（1986-88 年）和生化指标、膳食以及生活方式调查（1989 年）

为了比较大陆与台湾的不同，在台湾选择了 16 个地区进行调查。1986-88 年的死亡率来源于对死亡证明的回顾调查，在 1989 年进行了与大陆类似的生化指标、膳食及生活方式调查。在台湾没有进行家庭三日称重膳食调查。

METHODS

Selection of study sites and participants in mainland China

Selection of study sites in mainland China

In the early 1980s, 69 counties were randomly chosen from the total of about 2400 largely rural counties in China to represent the full range of mortality rates (in the previous 1973-75 nationwide survey) for seven major types of cancer: nasopharynx, oesophagus, stomach, liver, lung, colorectal and leukaemia. These counties are distributed throughout China and are, in aggregate, reasonably representative of rural mainland China as a whole.

Mortality rates for these counties during 1973-75 (from the nationwide survey) and 1986-88 (from our own survey) were determined retrospectively. Surveys of the characteristics of cluster-randomised samples of the local populations were carried out in 1983 (only 65 of the counties), in 1989 (all 69 counties) and in 1993 (13 of the counties). The 1989 survey was more detailed than the previous one, and the 1993 survey duplicated its methods to assess their reliability.

方法

大陆研究现场及研究对象的选择

大陆研究现场的选择

在二十世纪八十年代初，从中国大陆 2400 个大部分是农村的县中随机抽取了 69 个县，以代表鼻咽癌、食管癌、胃癌、肝癌、肺癌、大肠癌及白血病七种主要癌症的全部死亡率范围（在早前 1973-75 年全国性调查中）。这些抽取的县分布在整个大陆，在总体上很好地代表了全部农村地区。

这些县的死亡率是通过回顾 1973-75 年的全国性调查和 1986-88 年我们自己的调查来决定的。采用分层随机整群抽样方法对抽样人群的特征进行了调查，分别在 1983 年(只有 65 个县)，1989 年(全部 69 个县)和 1993 年(13 个县)。1989 年的调查较 1983 年的更为详尽，而 1993 年的调查则重复使用 1989 年的方法来评价这些方法的可靠性。

Within each county, two smaller administrative areas, “xiangs”, were randomly selected, and within each xiang, either one village or two adjacent villages (depending on their size) were then randomly selected as the actual sites of the interviews and other data collection. All survey sites had to be within four hours travel time from the county laboratory, resulting in the replacement of six (4%) of the xiangs.

在每个调查县内随机抽取 2 个乡，根据村子的大小，在每个乡随机抽取 1 个村或 2 个相邻的村，对抽到的调查村进行询问调查并收集其它信息。抽样要求能在 4 小时内从调查县实验室到达调查乡；因此，第一次抽样后有 6 个乡被更换（占总数的 4%）。

The average results for the two-xiang pairs were used to estimate the average values for each county. The 69 pairwise differences between two xiangs in each county helped to assess how reliably the pairwise averages were likely to represent entire counties: if the values in one xiang are closely correlated with those in the other, then their pairwise average is likely to be reliably informative.

以两个乡调查结果的平均值代表其所在的县。用 69 个县中每个县的两个乡之间的差别对其代表性进行可信性评价。如果一个乡的值与另一个乡密切相关，则说明两者的平均值能提供可信的信息。

The same xiangs that were studied in 1983 were studied again in 1989, but administrative reorganizations in China during the 1980s led to changes in nomenclature, which are reflected in different terms used in the monograph on the 1983 study (Chen et al., 1990) and in this monograph. The current “xiang” was, in 1983, called a “commune”, which was both a collective farm and a unit of rural government, and the commune was made up of “production brigades”—for the most part natural villages—that are now referred to as “villages”.

1989 年与 1983 年的调查是在相同的乡进行的，但在八十年代中国大陆对行政区划进行了新的命名；因此，1983 年（陈君石等，1990）的专著与本书采用了不同的行政单位名称。本次调查的“乡”在 1983 年称作“公社”。“乡”既是农村集体的总称，也是一级农村政府。“公社”则是由“生产大队”即（大多数为自然村）组成的，过去的“生产大队”现在称作“村”。

Selection of study participants in each xiang

每个乡调查对象的选择

Within each study site, 50 households (in 1983) or 60 households (in 1989) were randomly selected from an official registry of residences. One individual per household (involving roughly equal numbers of males and females) aged 35-64 (in approximately equal numbers for age groups 35-44, 45-54, and 55-64) was randomly selected, and these individuals and their households were the focus of data gathering. If the selected individual was absent or, less commonly, declined to participate (<1% declined), an individual in a neighbouring household was selected and asked to participate. Half the households were also asked to participate in a detailed 3-day dietary survey. The 1989 survey attempted to reinterview the 1983 study participants, replacing those who were either no longer available or 65 or older in 1989, and adding 10 individuals and households per village by random selection of new participants. A similar random sampling scheme was used in each of the four new counties first surveyed in 1989 to identify 60 study participants, age 35-64.

在每个调查点，从正式居民登记册中随机抽取 50（1983 年）或 60（1989 年）户调查家庭，从每个家庭中随机抽取一名年龄在 35-64 岁的个体（男女数量大约相等，三个年龄组 35-44，45-54，55-64 岁的人数大约相等）。这些被抽到的个人及其所在家庭为信息收集的主要对象。如果被抽到的调查对象不在家，或（在少数情况下）拒绝参加（拒绝率<1%），则从其邻居中选取一名作为补充。对一半的家庭进行了三日详细的膳食调查。1989 年试图重复调查了所有 1983 年的被调查对象，替换了那些已经无法找到或年龄已经大于或等于 65 岁的人，并且每村随机补充了 10 名新的调查对象和家庭。对于 1989 年第一次参加调查的四个县，采取了同样的抽样方法，在每个县确定了 60 名年龄在 35-64 岁的调查对象。

Each individual in the study was assigned a unique identifier, denoting province, county, xiang (as xiang I or xiang II), gender, and sequential number. For instance, participant ‘DBIIM24’ is the 24th male interviewed in xiang II of county B (Linxian) of province D (Henan). This identifier was used for both questionnaire data and biological samples.

每个调查对象都有一个唯一的编码，表示调查对象所在的省、县、乡(一乡或二乡)、性别及序号。例如编码为 DBIIM24 的调查对象，即是 D 省(河南)、B 县(林县)、第二乡的第 24 名男性调查对象。所有的问卷和生物样品均采用一致的编码。

In 1989, 8307 individuals were interviewed, data were gathered from 7888 households, and the dietary survey was completed for 4140 households across the 69 counties.

1989 年在 69 个县询问调查了 8307 名个人，采集了 7888 户家庭的有关数据，完成了 4140 户家庭的膳食调查。

Selection of study sites and participants in Taiwan

台湾调查点和调查对象的选择

Taiwan was not included in the 1983 study, but the 1989 study included 16 sites in Taiwan, ranging from highly urban to rural (unlike the exclusively rural sites in mainland China). The method used to select the sites was also different from that used in mainland China. In Taiwan, 16 types of area were defined (by 3-digit postal codes):

1983 年的调查没有包括台湾，但 1989 年的调查包括从台湾典型城市到农村（不象大陆那样完全是农村调查点）的 16 个调查点。抽样方法也与大陆的调查有所不同。在台湾，确定了 16 类地区（采用三位邮政编码）：

A Metropolitan cities
B Provincial cities
C County cities
D Hakka area 1
E Hakka area 2
F "Black foot disease" area (where the groundwater is contaminated by arsenic)
G Penghu Islands
H Northern mountainous area
I Central mountainous area
J Southern mountainous area
K Northern coastal area
L Southwestern coastal area
M Eastern coastal area
N Rural towns in Ilan county
O Rural towns in Changhua county
P Rural towns in Tainan county

These 16 types of area were chosen to vary widely in:

- population density and socioeconomic status,
- ethnicity (Hakka, Han and aboriginal Taiwanese),
- crude cancer mortality rates, and
- geographic location.

For each of these 16 types of area (A, B…P) in Taiwan, specific study sites (ZA, ZB…ZP) were chosen. Two towns or districts (depending on the level of urbanization) were selected randomly (with probability proportional to size), and, within each, two villages (or equivalent administrative units) were selected by a similar procedure, for a total of 64 "villages". Thirty-six individuals per village aged 35-64 (evenly divided among the six 5-year age groups and between males and females) were selected, based on household registration information, and invited to participate. The target was to interview at least five of these individuals in each sex and age group, and households were sampled until this was achieved in each village.

Mortality rates (1973-75 and 1986-88)

Mainland China

Mortality rates for 1973-75 were taken from the nationwide survey that had been done during the mid-1970s for other purposes, and mortality rates for 1986-88 were from a special survey carried out in 1989-90 as part of the present study. Many of the causes assigned in the 1973-75 survey are less specific than those assigned in the later survey, although *overall* mortality and, in most counties, mortality rates from the main causes of death are reasonably reliable from both periods. Age-standardised mortality rates for particular age ranges were always calculated as the unweighted average of the component five-year mortality rates (e.g., 35-39, 40-44,…,65-69 for the age range 35-69).

1973-75 Mortality. In the mid-1970s, a nationwide retrospective review was undertaken that sought to classify the causes of all 20 million deaths in mainland China during 1973-75, with particular emphasis on those attributed to certain types of cancer (*Atlas of Mortality from Main Death Causes in China; Atlas of Cancer Mortality in the People's Republic of China*). The Chinese population at the time was about 850 million. About 96% of all

A 直辖市
B 省辖市
C 县辖市
D 客家地区 1
E 客家地区 2
F "乌脚病"地区（该地区地下水被砷污染）
G 澎湖列岛
H 山地乡之北部
I 山地乡之中部
J 山地乡之南部
K 北部沿海地区
L 西南部沿海地区
M 东部沿海地区
N 宜兰县乡镇
O 彰化县乡镇
P 台南县乡镇

这 16 个类型的地区广泛代表以下方面的变化:

- 人口密度及社会经济状况；
- 民族（客家、汉及台湾山地山胞）；
- 癌症粗死亡率；
- 地理位置。

对台湾 16 类地区（A, B…P）的每一类，选定两个特定的调查点（ZA, ZB…ZP）。（根据都市化等级）随机选择两个乡镇或两个区（抽取率与样本大小成比例）。同样，在每个乡镇或区随机选择两个村（或相应的行政单位），使调查村的总数为 64 个。根据户籍资料，对每个村抽取了年龄在 35-64 岁的 36 名个人（按每 5 岁一个年龄组分为六组，男女各半）作为调查对象。调查目标是对每个年龄组，至少调查男女各 5 名，逐一抽取调查家庭直到每个村达到预期的家庭数和人数。

死亡率（1973-75 年和 1986-88 年）

大陆

1973-75 年的死亡率资料来自于 1970 年代为其它目的进行的一项全国性调查，1986-88 年的死亡率来自于作为本项目一部分，于 1989-90 年进行的一项专题调查。尽管两个不同时期的疾病总死亡率以及大多数县的主要疾病死亡率是合理可信的，但第一次调查中的许多死因没有第二次明确。特别年龄段的年龄标准化死亡率均是用每 5 岁一组死亡率的非加权平均（例如：用 35-39，40-44，65-69 岁的平均来计算 35-69 岁年龄段）计算的。

1973-75 年死亡率：1970 年代中期，在中国大陆进行了一项全国性的回顾性调查，目的是对 1973-75 年死亡的所有两千万名死亡对象进行回顾性死因调查，特别是对主要癌症死因进行分类（中国人口主要死因地图集；中华人民共和国恶性肿瘤地图集）。当时中国的人口总数是 8.5 亿。调查覆

deaths were included. In some counties specific causes were to be assigned only to deaths from cancer (grouping together those due to all other causes), but in most counties the non-cancer deaths were grouped into various broad categories, some of which correspond approximately to ICD-9 categories. The present monograph takes from that nationwide review all of the available information on age- and cause-specific mortality rates for the 69 randomly-chosen counties. In all 69 of these counties, overall mortality rates, overall cancer mortality rates, and mortality rates from each of the main types of cancer were available, and in 52 of them the non-cancer deaths during 1973-75 were grouped into various informative categories, e.g., stroke, ischaemic heart disease, other vascular causes, pneumonia, chronic lung disease, etc. (The chief anomaly in the 1973-75 survey is that respiratory heart disease, a common cause of death, was classified as vascular; in this monograph, we reclassify it as part of chronic lung disease.)

盖了 96%的死亡人口。有一些县只调查了死于癌症的具体死因（所有死于其它疾病的死因全部归为其它一组），但大多数县也对非癌症死因进行了确定和大致分类，部分死因类别大致对应于 ICD-9 的分类。本书收录了所有 69 个县按年龄和疾病死亡专率的调查结果，包括所有 69 个县的总死亡率、癌症总死亡率、主要癌症死亡专率。此外，还包括了其中 52 个县 1973-75 年的非癌症死亡原因分类，如中风、缺血性心脏病、其它血管疾病、肺炎、慢性肺部疾病等（1973-75 年调查分类的主要问题是将造成死亡的常见病-肺心病归类为血管疾病，而本书中我们将其归为慢性肺部疾病）。

For the nationwide review of deaths during 1973-75, the National Office of Cancer Control and Research developed survey methods and data forms, and the Ministry of Public Health developed standardized terms for classifying causes of death, which did not use ICD codes. Local survey teams were trained to gather information from a variety of sources, including records and key individuals, on each death within the previous three years. The age and sex distribution of the local population was determined from xiang records and from the Departments of Public Security and of Statistics.

1973-75 年进行的全国性死亡回顾调查的方法和数据表格是由中国肿瘤防治研究办公室设计的，而死因分类是按卫生部规定的标准，没有采用国际死因（ICD）编码。对现场调查队员进行了如何从各种渠道收集信息的培训，包括死亡登记和走访关键人物，调查对象为调查点前三年的死亡个体。调查当地人群的年龄和性别分布信息来自当地乡人口记录、派出所、以及统计部门。

1986-88 Mortality. For each county, the numbers and underlying causes of the deaths in 1986-88 were obtained by a retrospective review undertaken in 1989 specifically for this project. We were unable to get reliable mortality data for two of the 69 counties (both in the southern province of Guangdong). In the other 67 counties, we estimate that about 90% of all deaths were recorded in the sources available to us. Hence, in calculating mortality rates in 1986-88, the estimated numbers at risk are taken as 90% of the population.

1986-88 年死亡率：1986-88 年每个县的死亡人数及具体死因是通过 1989 年专为本课题进行的回顾性调查收集的。69 个县中两个县（均在南方的广东省）的死亡数据不可信而无法利用。我们估计其余 67 个县的资料包括了所要调查的 90%的死亡者；因此，在计算 1986-1988 年的死亡率时，也是按照 90%的人口数进行推算的。

Most counties had populations of a few hundred thousand, but a few were substantially larger or substantially smaller. In the larger counties, deaths from randomly-chosen parts of the county (yielding a population of about 300,000) were used to estimate mortality rates for the whole county. For two northern counties in nomadic areas (Tuoli in Xinjiang Autonomous Region and Xianghuangqi in Neimongol Autonomous Region) that had populations too small for statistical stability, we used the mortality rates for the prefectures to which these counties belong, which comprised six (Xinjiang) and 12 (Neimongol) counties.

调查的大多数县的人口数为几十万，也有几个县的人口数很多或很少。在较大的县，用该县随机抽取的调查点的死亡人数（这些调查点的人口约为三十万）来估计全县的死亡率。在两个北方牧区县（新疆自治区的托里县和内蒙古自治区的镶黄旗），由于人口数不能满足统计学稳定的要求，我们采用了这些县所在地区的死亡率，在新疆包括了 6 个县，内蒙包括 12 个县。

Deaths were identified primarily from village or other administrative records (e.g., Departments of Public Security), at least one of which usually included name, address, gender, age, and cause of death. The information on causes in those records was supplemented by review of medical records, which were still available for most deaths, or by discussion (a few years after the death) with local health workers, community leaders, and family. The information obtained by our field workers was recorded as parts I and II of a standardised death certificate (following WHO ICD-9 recommendations; WHO, 1977). Specific causes were assigned to the vast majority of the deaths, particularly before age 70.

死亡的确认主要根据村或其它行政部门的记录(如，公安部门)，记录内容至少包括姓名、地址、性别、年龄和死因。所记录的死因均通过查阅死者的病历(大多数死者病历仍可得到)，或者(对少数死于几年前的死者)通过与当地医务人员、社区领导以及家人进行的讨论进行了核实和补充。本项目现场调查队员得到的信息记录在标准死亡证明书上的第一和第二部分(根据 WHO ICD-9 的推荐；WHO 1997)。对绝大多数的死亡，特别是年龄在 70 岁以下的死亡，都赋予了具体的死因。

The fieldwork for this study of 300,000 rural deaths and a parallel study, done for other purposes (Liu et al., 1998), of 800,000 urban deaths in 1986-88, involved 500 interviewers. The interviewers usually worked in teams of four, at least one of whom was medically trained. Consistency of the information obtained by these interviewers from family members was checked by repeat

在现场的调查工作者有 500 人，他们负责了本研究中 300,000 例农村居民的死因调查，以及为其它目的而同期进行的 1986-88 年 800,000 例城市居民的死因调查(刘等，1998)。调查队员通常四人一组，其中至少一人经过医学培训。这些队员从

interviews of random households by team leaders. Underlying causes of death in 1986-88 were coded by 100 specially trained clerks in five teams, each under a trained nosologist from the Ministry of Health with previous experience in coding standard death certificates using ICD-9. Some early batches of data sheets were coded by two teams and the differences discussed, leading to the development of consistent coding conventions. Double data entry was followed by extensive computerised checks and queries to correct gaps, duplications, inconsistencies, and implausibilities. After these checks were completed, the proportions recorded as "ill defined" (ICD9 codes 780-799) were, taking the present survey of rural deaths and the parallel survey of urban deaths together (Liu et al., 1998), only 1.0% at ages 0-34, 0.5% at ages 35-69, and 2.7% at ages 70-79.

死者家属所获得信息的可信性由调查队长通过随机入户进行核实。1986-88 年的死因由五个调查队的 100 名受过专门训练的队员进行编码。每个队均有一名来自于卫生部的有 ICD9 死因编码经验的疾病分类专家进行指导。一部分早先得到的资料由两个调查队分别进行编码，并对他们的不同进行了讨论，由此建立了保持编码一致性的规则。资料进行了两次录入并用计算机进行了广泛的检查以纠正疑问、重复、不一致以及不可信数据。完成上述检查后，记录中不明确死因(ICD9 编码 780-799)的比例在本次农村死因以及同期进行的城市死因调查的比例为：年龄 0-34 岁仅占 1%，35-69 岁 0.5%，70-79 岁 2.7% (刘等，1998)。

Population Estimates. In some counties, the official population estimates at ages 0-4 in 1986-88 were, in 1989, substantially too low (perhaps because some of the individuals were too young for the 1984 national census). In view of the sharp increase in the birth rate during the late 1980s, the populations aged 0 and 1-4 in this study would be expected to be about 0.25 and 0.85 times the population aged 5-9. If, therefore, in any particular county, the estimated male or female populations at 0 or at 1-4 were less than this, they were replaced by the above estimate. Taking the study as a whole, this increased the estimated population at ages 0 and 1-4 by 41% and 21%, respectively.

人口估算：在一部分县， 1989 年官方估算的 1986-1988 年年龄在 0-4 岁的人口数太偏低（可能因为 1984 年全国人口普查时一部分人年龄太小）。由于 1980 年后期人口出生率的快速上升，本次研究中 0 岁和 1-4 岁年龄组的人口数估计为 5-9 岁人口的 0.25 和 0.85 倍。因此，在任何一个调查县，如果 0 岁或 1-4 岁的男性或女性估算人口数低于上述推算值的话，则采用上述估算数。就整个调查而言，0 岁组和 1-4 岁组的估算人口分别增加 41%和 21%。

Taiwan

台湾

1986-88 Mortality. For each of the 16 types of area in Taiwan (A, B…P), age-specific mortality rates were computed from the certified causes of death (as ICD-coded by the Department of Health—numerators) and from official population census data (denominators). Death certificates in Taiwan are filled out by a physician, usually from a hospital where the person had been treated, but sometimes from the local public health station.

1986-88 年死亡率： 对于台湾的 16 类调查地区（A, B…P），年龄死亡专率是按死亡鉴定书（卫生署进行的 ICD-编码，分子）和官方人口普查数据（分母）计算的。台湾的死亡证明是由医生填写的，通常是病人接受治疗医院的医生或当地公共卫生站的医生。

Blood samples (plasma and red blood cells)

血样 (血浆和红细胞)

Fasting 10 ml venous blood samples were collected from 8,280 individuals in mainland China in trace-mineral-free heparinized vacutainers, which were placed on ice in light-free vacuum jars. Samples were transported to the county laboratory within about four hours of the last blood draw of the day. Upon arrival at the county laboratory, blood samples were immediately separated into three fractions:

1. 3 ml of packed red blood cells (RBCs), washed three times with saline, haemolyzed with 3 ml preservative buffer, then mixed and frozen.
2. 0.3 ml plasma, with 0.9 ml trichloroacetic acid added as a preservative, then mixed and frozen. (This sample was to be used for ascorbic acid analysis, which could not be done on plasma with added ascorbate.)
3. remaining plasma (usually about 4-5 ml), with 20 mg ascorbate added as a preservative, then mixed and frozen.

对 8,280 名大陆的调查对象，用加有不含微量元素的肝素抗凝剂的真空取血器，采取每个调查对象 10 毫升静脉血，并放在装有冰的闭光真空箱内，样品在当日最后一份血样采集后 4 小时内送调查县的实验室。到达实验室后，血样离心后立即被分成三部分：

1. 取 3 毫升红细胞样品，用生理盐水洗三次，加入 3 毫升缓冲液使之溶血，混匀后冷冻。
2. 取 0.3 毫升血浆，加入 0.9 毫升三氯乙酸保存液，然后混匀并冷冻（该样品用做抗坏血酸分析，故不能加入抗坏血酸盐保存）。
3. 剩余的血浆（通常大约 4－5 毫升），加入 20 毫克抗坏血酸盐保存液，混匀后冷冻。

All fractions were stored temporarily at -15 to -20℃ in the local laboratories, then shipped on dry ice to the Chinese Academy of Preventive Medicine (CAPM) in Beijing, where they were again stored at -20℃. "Pools" were created, which involved mixing individual blood samples of a particular type. The main purpose of these blood samples was to determine the sex-specific mean values of many different factors in each study area, and for many factors this average can be obtained by a single assay of a "pool"

上述三部分血样在当地实验室-15 到-20℃冰箱中保存，然后用干冰保存运至北京的中国预防医学科学院（CAPM）,到后即保存在-20℃冰箱中。个体调查对象的血样在北京按类型制成混合样品。血样混合的主要目的是确定每一地区按性别分布的许多不同指标的均值。这样仅分析混合血样就可以得到相关人群的某个指标的均值。（有一些

of blood that combines samples from all the relevant individuals. (Some measurements, e.g., of various antibodies or tobacco metabolites, had to be done on individual samples to be meaningful.) These pools were prepared (and aliquoted into small portions) in the CAPM laboratories in Beijing. Three types of pools were prepared for each of the three fractions:

1. County pools: Sex- and xiang-specific pools were created for each county (resulting in four pools per county).
2. Twelve sex- and age-specific "superpools" (i.e., six 5-year age groups times two sexes) were created for all 69 counties.
3. What remained of each individual sample was retained, labelled with the individual's unique identifier.

指标，如各种抗体或烟草的代谢物，只有分析个体样才有意义）。混合样品的制备是在北京 CAPM 的实验室完成的（包括分装成小样品）。三部分血样的三种混合样品包括：

1. 调查县的混合样品：包括按性别和按调查乡的混合样品（每个县有 4 个混合样品）。
2. 69 个县按性别和年龄分组的 12 个"超级"混合样品（即 6 个五岁年龄组乘两个性别）。
3. 余下的个体血样继续保存，并贴好个人编码条。

Specific laboratory analyses were carried out in various sites, including Beijing, Taibei, Oxford, London, Tokyo, Ithaca (Cornell University), and other places in the United States. Samples were always shipped between laboratories on dry ice. The pools were shipped to Cornell in 1992 as large samples and then aliquoted into smaller samples, so that small amounts could be thawed for each analysis. In 1996, the samples that remained were sent from Cornell to Oxford and put in long-term liquid nitrogen storage.

血液样品的分析在不同的地方进行，包括北京、台北、牛津、伦敦、东京、依塞加(康奈尔大学)和美国其它地方。样本运往各个实验室的过程中均用干冰保存。混合样品于 1992 年被集中运送到康奈尔大学后被分成小份样品，以便每次分析只需解冻小份样品。1996 年，剩余的样品被送到牛津并放在液氮中长期保存。

Similar procedures were followed for the 2112 samples collected in Taiwan, except that the processing and initial pooling was carried out in Taibei.

除血样处理和最初的混合是在台北进行的，在台湾采集的 2,112 份血样按相同程序进行了处理。

Urine samples

A 12-hour urine collection was to be done in mainland China and Taiwan (from males only) on two separate days, once after a small (500 mg) oral dose of proline and once after the same dose of proline together with enough ascorbate (200 mg) to inhibit virtually all gastric nitrosation of amino acids for as long as the proline was still in the stomach. Samples of the collected urine were frozen at -15 to -20℃ prior to transport on dry ice to Beijing, and aliquots were then sent to the World Health Organisation International Agency for Research on Cancer in Lyon, France, for nitrosamine analyses. The urine was also analysed in Beijing for other factors.

The "ascorbate-inhibitable proline nitrosation", defined as the difference between the urinary N-nitroso-proline excretion in the paired samples, indicates the extent to which the stomach contents could, under normal circumstances, nitrosate other amino acids (which, unlike proline, then yield potentially carcinogenic nitrosamines; Ohshima and Bartsch, 1981; Wu et al., 1993).

尿样

在大陆和台湾，分两天收集了 12 小时尿样(仅对男性)，一次是口服小剂量(500 毫克)脯氨酸后，一次是口服相同剂量脯氨酸和足量的抗坏血酸(200 毫克)后。第二次的目的是当脯氨酸仍在胃中的时候，能有效的阻止全部胃中氨基酸的硝基化。尿样在–15 到–20℃冰箱中冷冻保存，然后用干冰运至北京，分装成小样品送到在法国里昂的世界卫生组织的国际癌症研究机构，进行亚硝胺含量分析。在北京还分析了尿样的其它指标。

"可被抗坏血酸盐抑制的脯氨酸亚硝基化"定义为两次尿样中 N 亚硝基脯氨酸排出量之差，表明在正常状态下，胃内容物能亚硝化其它氨基酸(和脯氨酸不同，会产生潜在的亚硝胺类致癌物；Phshima and Bartsch,1981; Wu et al,1993)的程度。

Diet survey: household three-day weighed food intake

A three-day household dietary survey was carried out in 60 households per county in mainland China (a total of 60 x 69 = 4140 households), split roughly equally between the two study xiangs in that county. These included the same households surveyed in 1983, to the extent possible, with replacements to compensate for attrition due to death or migration.

In each household, all raw and cooked foods available at the beginning of, all foods obtained during, and all foods left over at the end of, the 3-day survey period were weighed and recorded. Foods consumed by the whole household were estimated on the basis of the disappearance of each food during the survey period. Plate wastes and discarded foods were recorded and subtracted from the total household food consumption. The number of people partaking of each meal, and each person's age, gender, occupation, lactation and pregnancy status (for women) and physical activity level were also recorded.

膳食调查: 三日称重家庭食物摄入量

在大陆的每个调查县，都选择 60 户家庭，进行三日家庭膳食调查（共有 60×69＝4140 户）。这 60 户基本上均匀地分布在每个县的两个调查乡中，并尽可能地包括 1983 年被调查的家庭，并补充了由于死亡和移民而减少的家庭数。

在每个调查家庭，对调查开始前所有生熟食物，调查三日内购入的各种食物，以及调查结束时剩余的各种食物都进行称重并记录。全家总的食物消费量是按调查期间消耗的食物量为基础计算的，盘中剩余食物和废弃的食物被从总消费量中扣除。调查同时记录了每次就餐的人数，每个人的年龄、性别、职业、体力活动水平，以及妇女的哺乳和妊娠情况。

Food intakes were standardised, through appropriate conversion factors, to intake per "reference man", defined as a male aged 19-59 years old, weighing 65 kg and undertaking very light physical activity.

食物的摄入是通过适当的转换后，按"每标准人日摄入量"计算的，"标准人"的定义为：男性、年龄19-59 岁、体重 65 公斤、从事极轻体力活动。

Food Composition Data

食物成份数据

The nutrient values assigned to the diet in each xiang combine the amount of each food eaten locally (estimated from the 3-day dietary survey) with "average" nutrient values for each food in China as a whole. This procedure does not take account of local variation in the nutrient content of foods (which, in the case of selenium and certain other trace elements, is substantial).

每个调查乡膳食的营养成分是根据当地每种食物的摄入量（来自三日膳食调查）和那些食物营养成分的全国平均值来计算的。这种计算没考虑地区间食物营养成分的差异（而对硒和某些其它微量元素而言，这种差异是极大的）。

Nutrient values for foods were based on *The Composition of Chinese Foods* (Wang, Parpia, and Wen, 1997), which lists "average" nutrient contents for more than 1300 foods. The tables include 28 general nutrients in 1358 foods, 18 essential and nonessential amino acids in 456 foods, 21 saturated and unsaturated fatty acids in 356 foods, and the cholesterol content of 400 foods.

食物营养成分含量参照了*中国食物成份表*（Wang, Parpia and Wen，1997），该书列出了 1300 多种食物营养素"平均值"，包括 1358 种食物的 28 种一般营养素含量，456 种食物的 18 种必需和非必需氨基酸含量，356 种食物的 21 种饱和与不饱和脂肪酸含量，以及 400 种食物的胆固醇含量。

Questionnaire administration, and summarised questionnaires

询问调查的实施及询问调查表概述

Mainland China

大陆

Local survey teams were trained to administer the questionnaires, make physical measurements, collect blood and urine samples and conduct the dietary survey. Aggregate information about the survey xiangs and villages was also gathered, through interviews with officials at the appropriate administrative levels. Two questionnaires focusing on mothers and children—although somewhat external to the main study design—were also included.

当地调查队经过培训后，进行询问调查、体格测量、血尿样收集以及进行膳食调查。关于调查乡和村的整体信息还通过对有关行政部门进行访问来获得。还进行了两个针对母亲和儿童的询问调查，尽管这项调查与主体研究设计似乎有点偏离。

Each of the six study questionnaires is described briefly below, and the questionnaires themselves are appended (pp787-801) in the original Chinese and in English translation.

对六种调查问卷简要描述如下，中文原始问卷及英文翻译详见附录(787-801 页)。

Questionnaire A: Xiang (formerly Commune) survey

问卷 A：乡（以前的公社）的调查

In each xiang, an official was interviewed to gather information characterising the xiang in 1989 according to:

- Geographical size and location, including proximity to a city and accessibility by road
- Size and makeup of population, including proportions belonging to the various minority groups
- Health care facilities and personnel; private vs. cooperative health care system
- Schools, including numbers of each type
- Major employers and ownership (public vs. private) of businesses
- Communications facilities (post offices, cinemas and other theatres, telegraph offices and public telephones)
- Transportation facilities
- "General statistics", including literacy rates, economic indicators, health and health care indicators
- Xiang government structures, including characteristics of participating citizens
- Numbers and types of markets
- Vaccination coverage of children born in or after 1987.

每个乡对一位行政人员进行访谈，收集 1989 年该乡以下方面的特征信息：

- 地理面积和位置，包括离城市的距离和道路情况。
- 人口数及组成，包括各少数民族人口所占比例
- 医疗设施和人员；私营与合作医疗系统
- 学校，包括各类学校的数量
- 商业机构主要雇主及隶属（国营与私有）
- 通讯设施（邮局、影剧院、电报局与公用电话）
- 交通设施
- 一般统计信息，包括识字率、经济指标、健康与医疗保健指标
- 乡政府结构，包括工作人员特点
- 市场数量和类型
- 1987 年及以后出生儿童的免疫接种覆盖率

Questionnaire B: Village survey

In each village, an official was interviewed to gather information characterising the village in the following respects:

- Size and makeup of population
- Village markets
- Village institutions and facilities
- Post offices
- Cinemas
- Theatres
- Stores for farm equipment
- Banks or lending co-operatives
- Agricultural technical station
- Department stores
- Parks and public gardens
- Sports facilities
- Public telephones
- Places of worship
- Health care institutions and personnel
- Type of health care system(s)
- Selected health indicators (e.g., presence of goitre or cretinism)
- Schools and teachers, including numbers at each educational level
- Indicators of household prosperity (e.g., proportion with radio, television)
- Types and extent of agricultural activities
- Village government
- Household-level business enterprises
- Migration from village
- Changes in characteristics between 1983 and the date of the survey in 1989.

问卷 B： 村的调查

同样，每个调查村也对一位行政人员进行访谈，并了解如下信息：

- 人口数量和组成
- 村的市场
- 村的机构和设施
- 邮局
- 电影院
- 剧院
- 农具店
- 储蓄所或信用社
- 农机站
- 百货商店
- 公园
- 运动设施
- 公用电话
- 宗教活动场所
- 医疗机构和人员
- 医疗保健体系的类别
- 选定的健康指标(如，甲状腺肿或克汀病)
- 学校和教师，包括按教育程度的人数
- 家庭财产指标（如，拥有收音机、电视机家庭的比例）
- 农业活动的类型和范围
- 村委会
- 家庭私有企业
- 村人口流动情况
- 本次调查（1989 年）与 1983 年相比的一些典型变化

Questionnaire C: Household questionnaire

In each survey household, a single respondent was interviewed (most often, the head of the household). Questions were asked about:

- Demographic and occupational information on all household members, and more detailed information about the head of the household (regardless of who was interviewed)
- Water and sanitation facilities for the house
- Use of pesticides and fertilizer
- Household income, including family members working away from home
- Amounts and categories of household expenditures
- Housing and household possessions.

问卷 C：家庭问卷

对每个调查家庭中的一位家庭成员（通常是户主）进行询问，了解以下方面的信息：

- 所有家庭成员的人口特征和职业，以及户主的详细情况（不管询问的是否是户主）
- 家庭饮水和卫生设施
- 农药和化肥使用情况
- 家庭收入，包括家庭成员外出工作的收入
- 家庭开支的数量和种类
- 住房条件和家庭财产

Questionnaire D: Adult questionnaire

One adult (age 35-64) per household (resulting in approximately equal numbers of males and females) was interviewed. Height, weight, blood pressure, and lung function of each participant were measured, the thyroid was examined, and questions were asked about:

问卷 D：成人问卷

对每个调查家庭中一名年龄在 35－64 岁成年人（男女性别比例均衡）进行询问调查，对身高、体重、血压、肺功能进行测量，对甲状腺进行检查，并询问如下信息：

- Age, gender and occupational information
- Educational history
- Smoking and alcohol drinking
- Dietary habits
- Reproductive history (for women)
- Cooking and heating fuels used in childhood and adulthood
- History of major medical conditions.

- 年龄、性别及职业
- 教育史
- 吸烟及饮酒情况
- 膳食习惯
- 生育史（妇女）
- 儿童和成人后家庭烹调及取暖的能源
- 主要就医史

Questionnaire E: Recent pregnancy, infant feeding and vaccination

问卷 E：妇女妊娠、婴儿喂养及疫苗接种情况

All mothers in survey villages who had given birth between January 1, 1987 and the time of the survey in 1989 were invited to bring their children and to answer a series of questions about them. In total, data were collected on 7774 children.

对调查村中所有在 1987 年 1 月 1 日至 1989 年调查日之间出生的孩子及母亲进行询问调查。共收集了 7774 名儿童的资料。

Questions were asked about both the mother and child, including:

问题涉及以下有关母亲及儿童的信息：

- Basic birth information for the child (gender, weight, birth order)
- Mother's occupational history (before, during, and after pregnancy), marital status, reproductive history
- Feeding of baby (including role of breastfeeding)
- Child's health history
- Mother's feeding practices if the child were to become ill
- Child's immunization history

- 儿童出生时的基本信息：性别、出生体重及出生次序
- 母亲职业史（包括妊娠前、中、后）、婚姻状况及生育史
- 婴儿喂养情况（包括母乳喂养的作用）
- 儿童健康史
- 儿童生病时的喂养方法
- 儿童免疫接种史

Questionnaire F: Anthropometry and smoking in primary schools

问卷 F: 小学生体格测量及吸烟情况

In each county, at least 200 students, age 5-15, from 2-4 primary schools were measured and interviewed. In total, data were collected from 15,772 students.

在每个调查县，至少对 200 名年龄在 5－15 岁，来自 2－4 所小学校的学生进行了体格测量和询问调查，共调查了 15,772 名小学生。

Measurements and questions included:

体格测量和询问的内容如下：

- Age and gender
- Weight and height
- Current smoking status.

- 年龄和性别
- 体重和身高
- 目前吸烟状况

Taiwan

台湾

Questionnaire 1: Diet and lifestyle (partially equivalent to mainland China Questionnaire D)

问卷 1：膳食和生活方式（部分内容与大陆问卷 D 等同）

One adult (age 35-64) per household (resulting in approximately equal numbers of males and females) was interviewed. Height, weight, blood pressure, and lung function of each participant were measured, the thyroid was examined, and questions were asked about:

对每个调查家庭中一名年龄在 35－64 岁成年人（男女性别比例均衡）进行询问调查，对身高、体重、血压、肺功能进行测量，对甲状腺进行检查，并询问如下信息：

- Education, use of mass media, religion
- Smoking habits
- Drinking habits
- Food habits
- Cooking and heating
- Previous medical history
- Current medical conditions
- Personal hygiene

- 教育、媒体和宗教
- 吸烟情况
- 饮酒习惯
- 饮食习惯
- 烹调和取暖情况
- 既往疾病史
- 目前健康状况
- 个人卫生状况

- Childbearing and menstruation (females only)

- 妇女生育及月经情况

Questionnaire 2: Lifestyle, health and nutrition (partially equivalent to mainland China Questionnaire C)

问卷 2：生活方式、健康和营养（部分内容与大陆问卷 C 等同）

In each survey household, a single respondent was interviewed (most often, the head of the household). Questions were asked about:

- Head of household information
- Household composition
- Water supply
- Latrines
- Pesticide and fertilizer use
- Housing and household possessions

对每个调查家庭中的一位家庭成员（通常是户主）进行询问，了解以下方面的信息：

- 户主的情况
- 家庭组成
- 供水情况
- 厕所
- 农药和化肥使用情况
- 住房和家庭财产

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ACKNOWLEDGEMENTS

Without the work and co-operation of thousands of people, this study would not have been possible. Most of those who carried out work in the field— conducting interviews, collecting samples, and recording data—are not identified individually. Nor are the individuals and families who participated in the interviews and other aspects of the survey. Preliminary handling and storage of samples and early laboratory analyses involved many more individuals in mainland China and Taiwan. We acknowledge the vital contributions of all these people.

致谢

如果没有成千上万人的劳动与合作，这项研究是不可能的。那些从事现场工作—询问调查，收集样本以及记录数据的大多数工作人员没有单独列出来。同样也没有列出那些参与询问调查和调研的其它方面的个人及家庭。 许多在中国大陆及台湾的人参与了最初的样本处理和贮存以及早期的实验室分析。我们在此对所有这些人所做出的重要贡献表示感谢。

Authors

Junshi CHEN, Richard PETO, Wenharn PAN, Boqi LIU, and T. Colin CAMPBELL—the five principal authors—conceived the study, developed its structure and bear ultimate responsibility for its completion, analysis, and reporting. Major responsibilities were assumed by the eleven other authors from the same home institutions. Their roles are described briefly below.

作者

陈君石，Richard PETO，潘文涵，刘伯齐，和 T. Colin CAMPBELL—五个主要作者—构思了这项研究，发展了其架构并且对这项研究的完成，分析和报告负最终的责任。来自各主要作者研究机构的其他十一位作者也应负主要的责任。他们的职责分工简短地描述如下：

Division of Nutritional Sciences, Cornell University

Banoo PARPIA was project co-ordinator and responsible for the dietary surveys, socio-economic surveys and general data compilation issues and analyses.

Martin ROOT was responsible for specifying specimen handling procedures and analysis, and oversaw many of the laboratory assays.

Patricia A. CASSANO had primary responsibility for lung function testing and for the 1993 reliability re-survey.

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Zulin FENG coordinated the shipment of biological samples to Oxford, Cornell and other laboratories, and was responsible for carrying out some of the assays.

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Junyao LI helped design the study and its individual components.

Yanping WU was responsible for preparing mortality data for all counties in the study.

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Jillian BOREHAM had overall responsibility for data programming and analysis.

Hongchao PAN was responsible for all programming of graphical and numerical presentations, and for much of the Chinese translation and all dual language type-setting.

Linda YOUNGMAN was responsible for a large number of laboratory assays, which included, in some cases, the development or adaptation of methods.

Hellen GELBAND compiled the notes and introductory text in collaboration with the study team.

Zhengming CHEN assisted with study design and planning, and liaised with China for transfer and validation of mortality data.

Other collaborators

Listed below are the many people who provided assistance with specific tasks, including giving guidance and advice, designing questionnaires, conducting specialised laboratory analyses and checking and correcting data.

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武燕萍负责准备本项研究的所有县的死亡数据。

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Jillian BOREHAM 负责总的数据编程和分析。

潘洪潮负责全部图表的编程和绘制，大部分的中文翻译和双语的排版。

Linda YOUNGMAN 负责很多的实验室分析检测，包括在某些情况下拓展和改良分析方法。

Hellen GELBAND 同研究课题组合作编写了全书的注解及导言。

陈铮鸣协助了研究的设计和计划，并且同中国协调死亡数据的传送和核实。

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以下列出的是许多协助过特定工作的人，包括提供指导和建议，设计调查表，进行特殊的室验室分析以及检查和改正数据。

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在中国大陆进行的现场调查由各地的食品卫生监督检验所实施，他们是上海市 (A)，河北省 (B)，山西省 (C)，河南省 (D)，辽宁省 (E)，吉林省 (F)，黑龙江省 (G)，山东省 (H)，江苏省 (I)，安徽省 (J)，浙江省 (K)，福建省 (L)，江西省 (M)，湖南省 (N)，湖北省 (O)，广西自治区 (P)，贵州省 (Q)，云南省 (R)，四川省 (S)，陕西省 (T)，广东省 (U)，甘肃省 (V)，新疆自治区 (W)，宁夏自治区 (X)，内蒙古自治区 (Y)。在台湾进行的现场调查由台北中央研究院生物医学科学研究所实施。

This study was funded by the Chinese Academy of Preventive Medicine (now Chinese Center for Disease Control and Prevention), by the support of the British Heart Foundation, Cancer Research UK and the Medical Research Council to CTSU, by Academia Sinica and National Science Council in Taiwan, by the Tumour Institute of Chinese Academy of Medical Sciences, and by a grant from the US National Institutes of Health to Cornell University.

这项研究得到下列机构的资助，他们是中国预防医学科学院（现在为中国疾病预防控制中心），给予牛津大学临床试验服务中心及流行病研究室资助的英国心脏病基金会，英国癌症研究基金会和英国医学研究委员会，台湾中央研究院和国科会，中国医学科学院肿瘤研究所，以及给予康乃尔大学资助的美国国家卫生研究所。