

Pocket Profile for the CRISPS cohort

Title: Cohort Profile: The Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) and the follow-up studies

Authors: David Tak-wai Lui¹, Chi Ho Lee¹, Yu Cho Woo¹, Carol Ho-yi Fong¹, Annette Wai-kwan Tso¹, Bernard Man-yung Cheung¹, Tai Hing Lam², Edward Janus³, Karen Siu-ling Lam¹

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Corresponding author: Karen Siu-ling Lam [ksllam@hku.hk](mailto:kslam@hku.hk)

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Cohort purpose: CRISPS was a community-based cohort randomly recruited from the Hong Kong Chinese population to determine its prevalence of cardiovascular risk factors in 1995-1996, followed by four reassessments over a median of 20 years, to track the development of incident cardiovascular risk factors and cardiovascular diseases.

Cohort basics: 7730 Chinese individuals had structured telephone interviews. 2900 individuals, the baseline cohort, attended CRISPS-1 and received comprehensive clinical and biochemical assessments in 1995-1996. Follow-up reassessments were performed approximately every five years from CRISPS-2 to CRISPS-5, following the same study protocol. (Figure 1)

Follow-up and attrition: In 2000-2004, 1944 individuals returned for CRISPS-2. In 2005-2008, 1803 individuals returned for CRISPS-3. In 2010-2012, 1618 individuals returned for CRISPS-4. In the latest CRISPS-5, 1428 individuals returned for the follow-up study in 2016-2018. Among the non-attendees, clinical outcomes of additional 1376 individuals, including death data of 439 individuals, were traceable as of CRISPS-5, totalling 2804 individuals (96.7% of the baseline cohort) with clinical outcomes at 20 years valid for analysis.

Design and measures: CRISPS is a longitudinal cohort study. Demographic data, lifestyle factors, and anthropometric, clinical, biochemical and genetic parameters have been collected, as well as DNA and blood samples.

Unique features: CRISPS is the only representative population-based study performed in Hong Kong. More importantly, amongst non-interventional studies in China, it has the longest duration of follow-up, providing a valuable cohort to examine the predictors of cardiovascular risk factors and diseases in Chinese. The completeness of follow-up at a median of 20 years is certainly a remarkable feature. Notably, the diabetes prevalence of 9.8% in Hong Kong in 1995 was strikingly similar to that in Mainland China in 2009, suggesting that the rise in the prevalence of diabetes and possibly its related cardiovascular risk factors in Hong Kong antedated that in China. Data from the CRISPS follow-up studies could provide insight on the increasing cardiovascular risk in Mainland China.

Reasons to be cautious: A proportion of the participants did not attend the follow-up visits due to emigration, death and other reasons. With the ageing of the participants, the follow-up cohorts may also not be fully representative of the general population. Furthermore, results generated from the CRISPS cohort may not be generalizable to other ethnic groups.

Collaboration and data access: The data collected in the CRISPS are not freely available. Interested parties may contact the corresponding author for collaborations.

Funding and competing interests: CRISPS was supported by the University of Hong Kong Committee on Research and Conference Grants; the Hong Kong Research Grants Council; the Hong Kong Society for the Aged; the Hong Kong Health Services Research Fund; the Health Care and Promotion Fund; the Health and Medical Research Fund Grant; the Sun Chieh Yeh Heart Foundation and the Ng Teng Fong Charitable Foundation. The authors declare no conflict of interest.

Author affiliations: ¹Department of Medicine, Queen Mary Hospital, University of Hong Kong, Hong Kong, ²School of Public Health, University of Hong Kong, Hong Kong, and ³Department of Medicine-Western Health, Melbourne Medical School, University of Melbourne

Hong Kong Cardiovascular Risk Factor Prevalence Study **CRISPS**



Figure 1. The timeline of the Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) cohort and its follow-up studies

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Affiliations: ¹Department of Medicine, Queen Mary Hospital, The University of Hong Kong, Hong Kong, ²The School of Public Health, The University of Hong Kong, Hong Kong, ³Department of Medicine-Western Health, Melbourne Medical School, The University of Melbourne, and ⁴General Internal Medicine Unit, Western Health, St Albans, Victoria, Australia

*The members of the Hong Kong Cardiovascular Risk Factor Prevalence Study Group are listed at the end of this paper.

Address Correspondence to:

Professor Karen Siu Ling Lam

Department of Medicine, Queen Mary Hospital, The University of Hong Kong, Hong Kong

Telephone number: +852 2255-4783

Fax number: +852 2816-2863

Email address: ksllam@hku.hk

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Key Features

- I The Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) is a community-based cohort randomly recruited from the Hong Kong population to determine the prevalence of cardiovascular risk factors amongst Hong Kong Chinese in 1995-1996, followed by four reassessments over a median follow-up of 20 years to track the development of incident cardiovascular risk factors and cardiovascular diseases in this cohort.
- I 7730 Chinese individuals had structured telephone interviews. 2900 individuals attended the baseline CRISPS-1 and received comprehensive clinical and biochemical assessments. Follow-up reassessments were performed approximately every five years from CRISPS-2 to CRISPS-5, following the same study protocol.
- I Demographic data, lifestyle factors, and anthropometric, clinical, biochemical and genetic parameters were collected, as well as DNA and blood samples.
- I Collaborations are welcome. Interested parties may contact Prof Karen Lam (the corresponding author).

Keywords: CRISPS, cardiovascular diseases, diabetes mellitus, metabolic syndrome, cohort profile, Chinese

Why was the cohort set up?

Atherosclerotic cardiovascular diseases, especially coronary heart disease (CHD), have for decades been the major cause of mortality in most developed Western countries.¹ In the 1990s, CHD mortality was low in many East Asian regions, including Hong Kong (HK). But in Singapore, a city with similar level of socio-economic development as HK, CHD mortality rate was already increasing.² A rise in coronary heart disease mortality has conventionally been thought to be an inevitable consequence of economic development. Hence, it was postulated that HK could be experiencing a similar rise with its ageing population, rapid socio-economic development, and marked changes in diet and lifestyle. Besides, the difference in the dietary habits between Chinese and the Caucasians might explain the difference in CHD mortality.³ In the 1990s, heart disease was the second commonest cause of mortality after cancer in HK. As a single disease entity, CHD emerged as the biggest killer in HK (3181 deaths in 1992).⁴ Therefore, the Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) was initiated to generate a comprehensive database regarding the prevalence of cardiovascular risk factors in HK Chinese, followed by cohort studies with detailed dietary and biochemical data, to facilitate the development of appropriate population-wide CHD prevention strategies and to monitor their long-term impacts.^{5,6}

Who is in the cohort?

To establish a database of cardiovascular risk factors based on a representative sample of the HK Chinese population, ten age-sex specific groups (25-34, 35-44, 45-54, 55-64, 65-74 years old) were recruited for blood sampling and anthropometric measurements. The World Health Organization (WHO) Monitoring Trends and Determinants in Cardiovascular Disease (MONICA) recommended 200 participants in each of the ten age-sex specific groups to facilitate long-term monitoring of trends of cardiovascular risk factors.⁷ Previous surveys carried out in HK using randomly generated telephone numbers for similar telephone interviews as CRISPS had shown that this method provided an excellent random sample of the population.⁸ In a pilot study using this method, 80% of those who answered the telephone completed the telephone interview and 40% of the interviewees agreed to attend for physical examination and blood tests. Therefore, it was estimated that around 9000 completed telephone interviews would be necessary to obtain 3000 individuals who would attend a comprehensive physical examination and clinical and biochemical assessments. Between 1 December 1994 and 31 October 1996, 21135 random telephone numbers were dialled, where 11970 (57%) were non-residential or otherwise ineligible. 7174 (78%) of the 9165 eligible individuals completed the telephone interview. 2664 (37%) of them agreed to attend physical examination and blood taking. In view of fewer older individuals in the general population and greater difficulties in

recruiting older individuals to attend the session for physical examination and blood taking, a supplementary sample of individuals aged 55–74 years was specifically recruited, where 556 completed telephone interviews and 236 (42.4%) agreed to attend physical examination and blood taking.⁹

7730 Chinese individuals (telephone survey cohort) completed structured telephone interviews for demographic and lifestyle factors. They formed the first HK database for cardiovascular risk factors including details on smoking, drinking, exercise, and socio-economic information such as marital status, education levels, occupation status, and type of housing.

2900 individuals attended for comprehensive physical examination, clinical and biochemical assessments, forming CRISPS-1, the baseline cohort.⁹ Pregnant women and individuals with serious diseases such as cancer or were hospitalized were excluded. The age and sex distributions of the attendees and non-attendees were shown to match those of the general population (Table 1). Smoking status, alcohol intake, exercise participation, marital status, housing type, birthplace, highest educational level attained, occupational status, job nature, self-reported prevalence of hypercholesterolaemia and CHD were comparable between the attendees and non-attendees, except for slightly higher rates of self-reported diabetes (5.1%

vs 3.4%, $p < 0.001$) and hypertension (12.5% vs 10.5%, $p < 0.01$) among non-attendees. Nonetheless, these self-reported diagnoses were not necessarily confirmed. Hence, the non-attendance bias should be small and the baseline cohort CRISPS-1 obtained was a representative population sample.⁵

How often have they been followed-up?

All who participated in CRISPS-1 agreed to be contacted again for follow-up visits. They also gave consent for data linkage to the Clinical Management System (CMS) of the Hong Kong Hospital Authority. All participants from CRISPS-1 were invited to attend the subsequent visits (CRISPS-2 to -5). In 2000-2004, 1944 individuals returned for CRISPS-2 (46.3% men and 53.7% women; mean age: 52 years, range 30–82). In 2005-2008, 1803 individuals returned for CRISPS-3 (46.5% men and 53.5% women; mean age: 56 years, range 35–85). In 2010-2012, 1618 individuals returned for CRISPS-4 (46.2% men and 53.8% women; mean age 59 years, range 39–90). In the latest CRISPS-5, 1428 individuals returned in 2016-2018 (44.3% men and 55.7% women; mean age 62 years, range 43–91), with a median follow-up of 20 years. For those who did not attend the follow-up visit in CRISPS-5, clinical outcomes of interest including cardiovascular events were traced from the CMS using the International Classification of Diseases codes, while death events were retrieved from the Hong Kong Death Registry. Hence,

clinical outcomes of an additional 1376 individuals, including death data on 439, were available as of CRISPS-5, totalling 2804 individuals (96.7% of the baseline cohort) with clinical outcomes at 20 years valid for analysis.

Another wave of CRISPS has been launched. The New Hong Kong Cardiovascular Risk Factor Prevalence Study (N-CRISPS) has commenced in late 2019 with a protocol similar to CRISPS-1, but with the use of a household-based recruitment strategy, and enhanced technologies for assessing life-course exposures and physical activities (further information about N-CRISPS can be found at <http://ncrisps.hku.hk/wp/>). N-CRISPS will be funded by the Health Care and Promotion Fund, Health and Medical Research Fund (HMRF). As there have been major changes in HK in diet, lifestyle, level of health literacy, and the overall standard of medical care over the past 20 years, and with cardiovascular diseases remaining a leading cause of mortality, the N-CRISPS is initiated as a new community-based study to determine the updated sex and age-stratified prevalence of cardiovascular risk factors. The profile of the N-CRISPS will be compared with that of the CRISPS-1 and the overall 7730 individuals who completed the telephone interview, to obtain valuable insights into the major changes in cardiovascular risk factors, to facilitate the development of appropriate population-wide cardiovascular disease prevention strategies.

What has been measured?

Clinical variables

7730 Chinese were randomly selected for telephone interviews, conducted with the questionnaire used in the 1992 Singapore National Health Survey and a validated Chinese version of the WHO Rose-Angina Questionnaire.¹⁰ This method of telephone interview was validated in a morbidity survey in HK.⁸ Information collected included demographic data, perceived general health, lifestyle factors, medical history and family history of CHD, diabetes, hypertension and stroke.¹⁰

2900 individuals agreed to attend physical examination and blood tests. Anthropometric parameters, including body height and weight, waist and hip circumferences, and blood pressure (BP), were measured using standardized techniques.⁹ Waist circumference (WC) was measured half-way between the xiphisternum and the umbilicus,¹¹ which highly correlated with the WHO recommendation of WC measurement half-way between the lower rib margin and iliac crest.¹² Also, 1010 of the 2900 participants in CRISPS-1 completed the dietary survey with a validated Food Frequency Questionnaire.⁶

Biochemical variables

All participants had blood taking after an overnight fast for 12 hours before their visit. Biochemical parameters including fasting glucose (FG), insulin, lipid profile and fibrinogen were measured, and a 75g oral glucose tolerance test (OGTT) was performed in all except those taking anti-diabetic medications. The laboratory used standard methods which met the requirements of international quality control programmes.⁵ Plasma and serum samples were stored in aliquots at -70°C for biomarker measurements. A sub-cohort of 1010 participants involved in the dietary survey in CRISPS-1 had urinary sodium, potassium and creatinine levels measured.⁶

Genetic studies

DNA samples of 1938 individuals in CRISPS-2 were available for genotyping and were analysed in relation to the development of cardiovascular risk factors.

Carotid intima-media thickness (IMT) measurements

296 and 502 individuals attending CRISPS-2 and CRISPS-3 respectively had IMT measurements

at the common carotid arteries using high-resolution B-mode ultrasound (ATL HDI 3000 and 5000 ultrasound system; Advanced Technology Laboratories) to assess carotid atherosclerosis.¹³

Follow-up measurements

In the follow-up visits, participants were comprehensively reassessed, as in CRISPS-1. Body fat was analysed with the TBF-410 Tanita Body Composition Analyzer (Tanita Corp., Tokyo, Japan).

In 1997, a sub-cohort of 322 individuals with impaired glucose tolerance (IGT, defined by the WHO 1998 criteria) and 322 sex- and age-matched individuals with normal glucose tolerance from CRISPS-1 participated in a reassessment to examine the natural history of IGT in Chinese, and hence had additional data at year 2 including 75g OGTT results, anthropometric and BP measurements.¹⁴

Table 2 summarizes the variables captured in the baseline and follow-up studies.

What has it found? Key findings and publications

Over the past 20 years, CRISPS has contributed to over 100 international peer-reviewed publications. These include cross-sectional and prospective studies on the epidemiology of cardiovascular risk factors and diseases in HK, their prediction and potential preventive strategies, and genetic and mechanistic studies on cardiovascular risk factors and diseases. We have identified the key risk factors of diabetes, hypertension, dyslipidaemia, CHD and stroke in HK Chinese and demonstrated how central obesity predisposes to cancer development. These findings have guided public health policies on the prevention and control of these major health problems in our community, especially in the context of population ageing. The CRISPS database also allows investigations of novel genetic and protein biomarkers to enhance the identification of individuals at increased cardiovascular risks. The list of publications from CRISPS can be found at <http://ncrisps.hku.hk/wp/index.php/crisps-publications/>. The baseline characteristics of the participants, aged 25-74 years, in CRISPS are summarized in Table 3.

Epidemiology of cardiovascular risk factors in HK

In CRISPS-1, 9.8% of individuals had diabetes, an unexpectedly high prevalence for a relatively non-obese population. Another 14% had IGT and 10% had hypertension (defined by systolic BP ≥ 160 mmHg, diastolic BP ≥ 95 mmHg, or on anti-hypertensive). 46% of men and 41% of

women had total cholesterol of ≥ 5.2 mmol/L. Overweight and obesity were also prevalent, with 58% of men and 49% of women having body mass index (BMI) > 23.5 kg/m².⁵ The clustering of these risk factors was demonstrated by a high prevalence of the metabolic syndrome, present in 14-21% of the individuals depending on the criteria adopted.¹⁵

Cardiovascular risk factors: associated parameters and predictors

We have demonstrated that anthropometric parameters reflecting central obesity appears to contribute to a greater extent, compared with overall adiposity, to the development of cardiovascular risks.¹² Regarding biochemical parameters, OGTT retained its value in improving the detection rate of individuals at risk of diabetes, compared to FG alone.¹⁶ In fact, isolated IGT correlated with cardiovascular risk factors,¹⁷ and among normoglycaemic individuals, 2-hour post-load glucose levels were independently associated with cardiovascular risk factors.¹⁸ The metabolic syndrome was associated with incident hypertension, incident diabetes,¹⁹ increased carotid IMT,²⁰ and increased all-cause and vascular disease mortality.²¹

Using the CRISPS cohort we demonstrated, among Chinese, the application of the Framingham cardiovascular risk equation in cardiovascular risk calculation,²² the usefulness

of the diabetes risk test recommended by the American Diabetes Association in identifying individuals at risk of diabetes (AUROC of 0.725 at a cut-off of 5), and more recently, the utility of a validated “Non-invasive Diabetes Score”, comprising age, BMI, and hypertension, to triage individuals to proceed with diabetes testing if deemed high risk.²³

We also demonstrated the links between dietary habits and cardiovascular risk development. For instance, dietary antioxidant intake (vitamin A, C and E) was shown to be independently and inversely associated with incident adverse cardiovascular outcomes on 22 years of follow-up.²⁴

Biomarkers for prediction of cardiovascular risk factors, cardiovascular diseases and cancer in Chinese

CRISPS data have been applied to evaluate the clinical relevance of biomarkers of cardiometabolic disorders including adipokines, mostly identified from our preclinical studies. Circulating levels of adipocyte fatty acid-binding protein (AFABP) correlated with carotid atherosclerosis in women, independently predicted the development of metabolic syndrome and cardiovascular diseases, and were associated with early mortality from ischaemic stroke.²⁵ Hypoadiponectinaemia was reported for the first time to predict incident hypertension and

the progression of carotid atherosclerosis.¹³ Circulating levels of fibroblast growth factor 21 (FGF21) were independently associated with carotid atherosclerosis.²⁶ Circulating AFABP, FGF21 and adiponectin levels all predicted incident diabetes on long-term follow-up, independent of obesity and glycaemic indices. Among them, FGF21 appeared to have a superior predictive value.²⁷ Plasma C-reactive protein (CRP) levels independently predicted the risk of glycaemic progression among individuals with IGT,¹⁴ as well as incident hypertension.²⁸ Measurements of circulating adipokines, such as adiponectin, were shown to have a potential role in improving diabetes risk prediction when incorporated into clinical risk prediction models.²⁹

Furthermore, circulating levels of interleukin-6 and soluble TNF-alpha receptor 2 independently predicted incident cancers. WC, but not BMI, was an independent predictor of incident cancers, supporting an increased risk of cancer mediated by the chronic low-grade inflammation associated with central obesity.³⁰

Genetics of cardiovascular risk factors and cardiovascular diseases

CRISPS database allows investigations of genetics in relation to cardiovascular risk factors, in part by contributing subjects without CHD as controls. With exome-wide association analysis,

variants in three novel loci associated with blood lipid levels in Chinese were identified.³¹ Furthermore, exome-chip meta-analysis identified novel loci and East Asian-specific coding variants contributing to lipid levels and CHD.³² The finding of an Asian-specific missense variant in *PAX4* associated with type 2 diabetes in Chinese from exome-chip association analysis supported the role of *PAX4* in the pathogenesis of type 2 diabetes.³³ Seven of the 13 obesity-related genetic variants identified from genome-wide association studies in the Caucasians were shown to impact on the development of obesity in Chinese. Among them, the strongest associations with obesity were observed in the *FTO*, *GNPDA2*, and melanocortin-4 receptor genes.³⁴

CRISPS data demonstrating clinical relevance of novel findings from animal studies on diabetes and obesity

CRISPS data were used to demonstrate the clinical relevance of novel findings from animal studies on diabetes and obesity, such as the role of angiopoietin-like protein 4 (ANGPTL4) and adiponectin. ANGPTL4, a circulating protein predominantly expressed in adipose tissue and the liver, potently decreased blood glucose in mouse models. In human subjects, circulating ANGPTL4 levels inversely correlated with glucose levels and HOMA-IR, and ANGPTL4 levels were lower in diabetic patients compared to healthy individuals, suggesting that reduced

ANGPTL4 could be a causative factor for type 2 diabetes.³⁵ Adiponectin was found to alleviate fatty liver diseases in the mice, and among obese humans from CRISPS, an independent inverse relationship was found between serum adiponectin and alanine aminotransferase levels, suggesting the potential clinical relevance of adiponectin in fatty liver diseases.³⁶

What are the main strengths and weaknesses?

CRISPS is the only representative population-based study performed in HK. Notably, this is a unique, genetically homogenous, urbanized Chinese population. More importantly, with a median follow-up of 20 years since 1995-96, it has the longest duration of follow-up amongst non-interventional studies conducted in China, providing a valuable cohort to examine the predictors of cardiovascular risk factors and diseases in Chinese, especially for those living in urbanised areas. The prevalence of diabetes of 9.8% observed in CRISPS-1 in 1995-96 antedated the diabetes epidemic in Mainland China where the prevalence in 1995 was 2%, but leaping to 5.5% in 2001 and 9.7% in 2009,³⁷ in parallel with the rapid socioeconomic growth and urbanization in the Mainland, which would impact also on other cardiovascular risk factors. Data from the CRISPS follow-up studies could provide insight into the rising cardiovascular risk in China.

Inevitably, a proportion of the participants were lost to follow up due to various reasons, including emigration and death. Nevertheless, the number of participants who attended CRISPS-5 still represented half of the original cohort. Moreover, data of the participants were linked to the CMS and the Hong Kong Death Registry, allowing us to trace the outcome data of those lost to follow up. However, due to ageing of the participants in CRISPS-1, the follow-up cohorts may not be fully representative of the general population.

Ethics approval

Ethical approval had been obtained from the Institutional Review Board of the University of Hong Kong/Hospital Authority, Hong Kong West Cluster (approval numbers: EC 849-96; UW 05-296 T/959; UW 08-297; UW 16-048).

Funding support

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Promotion Fund, Health and Medical Research Fund (HMRF), RGC, the Sun Chieh Yeh Heart Foundation and the Ng Teng Fong Charitable Foundation.

Data availability

The data collected in the CRISPS are not freely available. Nonetheless, collaborations are welcome. Interested parties may contact Prof Karen Lam (the corresponding author) for further information.

Conflict of interest

None declared.

Members of the Hong Kong Cardiovascular Risk Factor Prevalence Study Group

The members of the Hong Kong Cardiovascular Risk Factor Prevalence Study Group are: ED Janus (Study Group Chairman; University of Hong Kong), CS Cockram (Chinese University of Hong Kong), R Fielding (University of Hong Kong), AJ Hedley (University of Hong Kong), P Ho (Department of Health), KSL Lam (University of Hong Kong), TH Lam (University of Hong Kong),

CP Lau (University of Hong Kong), M Lo (Health Promotion Resource Centre, Hong Kong), SC Lo (Hospital Authority, Hong Kong), PL Ma (Department of Health, Hong Kong), JRL Masarei (University of Hong Kong), YT Tai (University of Hong Kong), SP Wong (Queen Elizabeth Hospital, Hong Kong) and JLF Woo (Chinese University of Hong Kong).

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Table 1. Age and sex distribution of the Hong Kong population (in the 1996 By-census) in comparison with the phone interviewees and the Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) cohort*

Age Groups	Male			Female		
	Hong Kong population (n=2203000)	Phone Interviewees (n=3774)	CRISPS (n=1412)	Hong Kong population (n=2213324)	Phone Interviewees (n=3956)	CRISPS (n=1488)
20-24	224497 (10.2%)	10 (0.3%)	10 (0.7%)	227013 (10.3%)	5 (0.0%)	5 (0.0%)
25-29	246460 (11.2%)	377 (10.0%)	122 (8.6%)	285524 (12.9%)	382 (9.7%)	107 (7.2%)
30-34	309601 (14.1%)	483 (12.8%)	194 (13.7%)	344901 (15.1%)	520 (13.1%)	203 (13.6%)
35-39	325821 (14.8%)	485 (12.9%)	208 (14.7%)	328394 (14.8%)	548 (13.9%)	250 (16.8%)
40-44	264490 (12.0%)	500 (13.2%)	187 (13.2%)	258046 (11.7%)	562 (14.2%)	253 (17.0%)
45-49	225998 (10.3%)	399 (10.6%)	174 (12.3%)	203042 (9.2%)	420 (10.6%)	187 (12.6%)
50-54	139142 (6.3%)	320 (8.5%)	103 (7.3%)	113762 (5.1%)	270 (6.8%)	115 (7.7%)
55-59	137722 (6.3%)	276 (7.3%)	120 (8.5%)	118566 (5.4%)	241 (6.1%)	117 (7.9%)
60-64	135297 (6.1%)	338 (9.0%)	129 (9.1%)	124725 (5.6%)	312 (7.9%)	96 (6.5%)
65-69	113554 (5.2%)	325 (8.6%)	105 (7.4%)	116383 (5.3%)	353 (8.9%)	99 (6.7%)
70-74	80418 (3.7%)	258 (6.8%)	57 (4.0%)	92968 (4.2%)	342 (8.6%)	55 (3.7%)
75-79		2 (0.1%)	2 (0.1%)		1 (0.0%)	1 (0.1%)
80-84		1 (0.0%)	1 (0.1%)			

* Adapted from The Hong Kong Cardiovascular Risk Factor Prevalence Study, 1995-1996 (Janus ED, ed.), 1997, Queen Mary Hospital, Hong Kong (ISBN 962-8310-03-8) with written permission from the copyright owner

Table 2. Summary of parameters measured in the Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS) cohort

Phase	Measurements
Baseline (CRISPS-1)	Questionnaire: demographics, perceived general health, smoking, drinking, physical activities, personal and family history of cardiovascular diseases, dietary survey Anthropometric data: body height, body weight, waist circumference, hip circumference Blood pressure Biochemical parameters: fasting glucose, insulin, lipid profile, fibrinogen, 75g oral glucose tolerance test
Follow-up (since CRISPS-2)	Same measurements as in baseline (CRISPS-1) Bioelectrical impedance Electrocardiogram Carotid intima-media thickness Plasma and serum samples (for biomarkers and genetics)

Table 3. Baseline characteristics of the participants (*aged 25-74 years*) in telephone interview and the Hong Kong Cardiovascular Risk Factor Prevalence Study (CRISPS)*

Participants of the Telephone Interview					
	Total Number	Men		Women	
		Total Number	Number (%)	Total Number	Number (%)
Marital status	7711	3761		3950	
Never married			619 (16.5)		453 (11.5)
Married			3007 (80.0)		3131 (79.2)
Divorced / separated			58 (1.5)		58 (1.5)
Widowed			62 (1.6)		284 (7.2)
Not stated			15 (0.4)		24 (0.6)
Type of housing	7711	3761		3950	
Public			1482 (39.4)		1562 (39.5)
Home ownership			305 (8.1)		371 (9.4)
Private (whole)			1580 (42.0)		1681 (42.5)
Private (shared)			146 (3.9)		99 (2.5)
Temporary / squatter			80 (2.1)		52 (1.3)
Quarters or other			139 (3.7)		134 (3.4)
Not stated			29 (0.8)		51 (1.3)
Highest level of education attained	7711	3761		3950	
No formal			229 (6.1)		758 (19.2)
Primary			1014 (27.0)		1103 (27.9)
Secondary – form 1-3			594 (15.8)		493 (12.5)

Secondary – form 4-5			1217 (32.3)		1136 (28.7)
Matriculation			142 (3.8)		121 (3.1)
College or above			542 (14.4)		319 (8.1)
Not stated			23 (0.6)		20 (0.5)
Job nature (for those with job)	4807	3056		1751	
Professional, clerks			949 (31.1)		877 (50.1)
Services workers			677 (22.1)		531 (30.3)
Labourers			1345 (44.0)		310 (17.7)
Other			46 (1.5)		4 (0.2)
Not stated			39 (1.3)		29 (1.7)
Smoking behaviour	7711	3761		3950	
Non-smokers			1883 (50.1)		3707 (93.8)
Ex-smokers			507 (13.5)		67 (1.7)
Current smokers			1358 (36.1)		165 (4.2)
Not stated			13 (0.3)		11 (0.3)
Alcohol consumption	7711	3761		3950	
None			1837 (48.8)		3348 (84.7)
Yes			1917 (51.0)		587 (14.9)
Not stated			7 (0.2)		15 (0.4)
Exercise within the last one month	7711	3761		3950	
None			2153 (57.2)		2415 (61.1)
Yes			1589 (42.3)		1520 (38.5)
Not stated			19 (0.5)		15 (0.4)
CRISPS Attendees					

	Total Number	Men			Women		
		Number	Mean	SEM	Number	Mean	SEM
Height (cm)	2876	1399	165	0.17	1477	153	0.15
Weight (kg)	2876	1399	66.3	0.28	1477	56.2	0.24
Body mass index (kg/m ²)	2876	1399	24.3	0.09	1477	23.9	0.10
Waist circumference (cm)	2879	1398	83.1	0.26	1481	75.3	0.24
Hip circumference (cm)	2879	1398	94.3	0.17	1481	93.5	0.18
Waist-to-hip ratio	2879	1398	0.88	0.002	1481	0.81	0.002
Cholesterol (mmol/L)	2875	1397	5.1	0.027	1478	5.0	0.027
Triglyceride (mmol/L)	2874	1396	1.4	0.025	1478	1.1	0.022
HDL cholesterol (mmol/L)	2874	1396	1.15	0.008	1478	1.35	0.008
LDL cholesterol (mmol/L)	2839	1374	3.3	0.022	1465	3.2	0.024
Fasting glucose (mmol/L)	2878	1398	5.5	0.036	1480	5.3	0.037
2-hour glucose (mmol/L)	2676	1316	6.7	0.092	1360	6.9	0.079
Systolic blood pressure (mmHg)	2881	1399	121	0.5	1482	117	0.6
Diastolic blood pressure (mmHg)	2881	1399	77	0.3	1482	73	0.3
Fibrinogen (g/L)	2764	1359	2.48	0.016	1405	2.62	0.015

Abbreviation: SEM, standard error of mean

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