THE LANCET
Public Health

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Xia C, Basu P, Kramer BS, et al. Cancer screening in China: a steep road from evidence to implementation. *Lancet Public Health* 2023; published online Nov 21. https://doi.org/10.1016/S2468-2667(23)00186-X.

Supplementary Appendix

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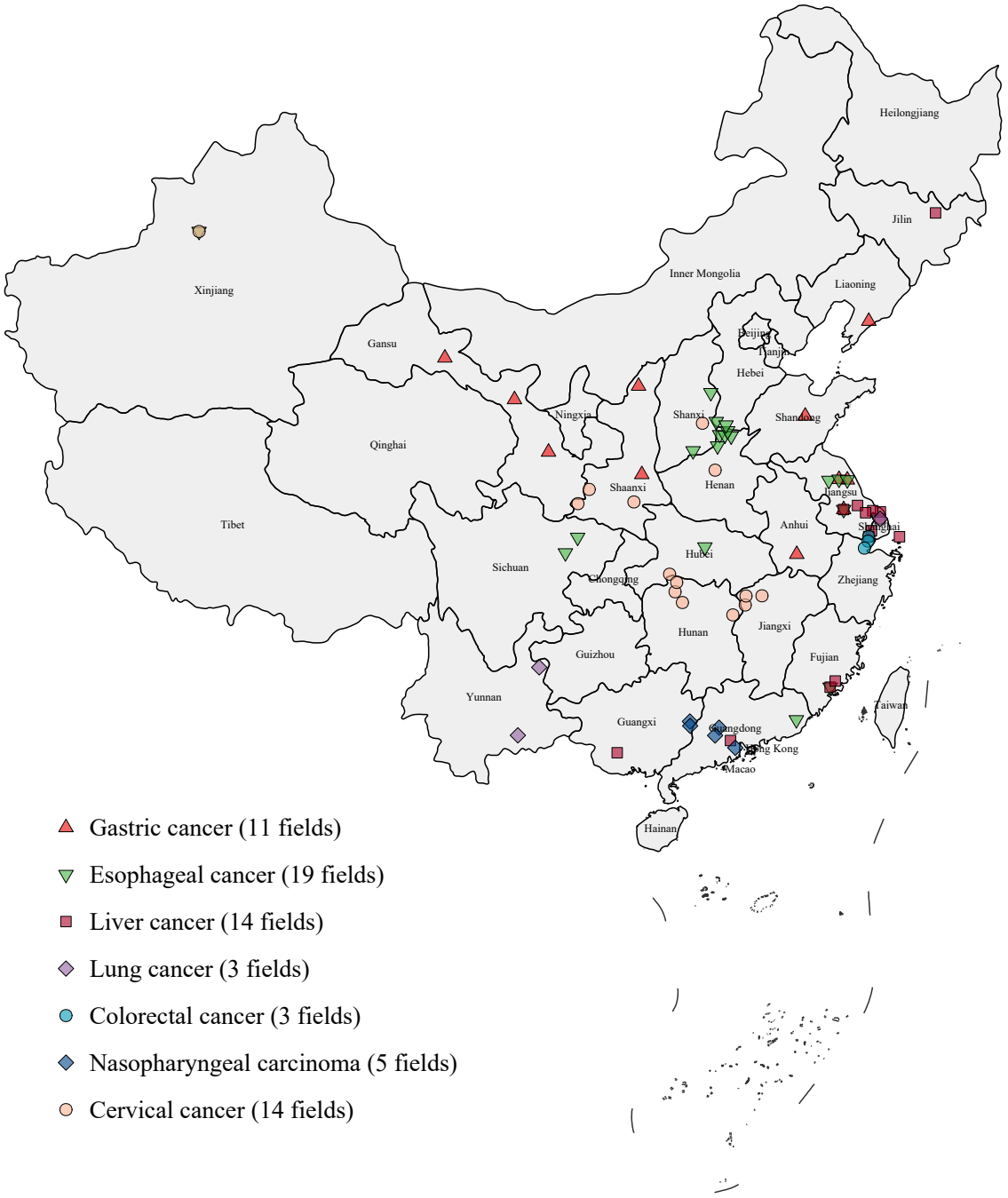

Figure S1: Location of High Incidence Fields for cancer prevention in China in 1970s to 1990s[1,2]

Table S1: High Incidence Fields for cancer prevention in China in 1970s to 1990s[1,2]

Cancer types	High Incidence Fields
Gastric cancer (11 fields)	Anqing, Dingxi, Jianhu, Jiuquan, Linqu, Weinan, Wuwei, Yancheng, Yangzhong, Yulin, Zhuanghe
Esophageal cancer (19 fields)	Anyang, Cangxi, Cixian, Hebi, Huai'an, Huixian, Jianhu, Jieyang, Linxian, Shexian, Tangyin, Tongan, Xinyuan, Yancheng, Yangcheng, Yangquan, Yangzhong, Yanting, Zhongxiang
Liver cancer (14 fields)	Chongming, Dunhua, Fusui, Haimen, Jiashan, Nan'an, Nantong, Qidong, Qingpu, Rugao, Shengsi, Shunde, Tongan, Yangzhong
Lung cancer (3 fields)	Chongming, Gejiu, Xuanwei
Colorectal cancer (3 fields)	Haining, Jiashan, Jiaxing
Nasopharyngeal carcinoma (5 fields)	Cangwu, Sihui, Wuzhou, Zhaoqing, Zhongshan
Cervical cancer (14 fields)	Cili, Fengxian, Jing'an, Liuyang, Lueyang, Shimen, Taoyuan, Tonghui, Wufeng, Xiangyuan, Xinmi, Xinyuan, Xiushui, Zhen'an

Table S2: Cancer screening programmes funded by local government in China*

Province	Programme	Cities or counties covered	Target cancer sites	Initiation year
Tianjin	Colorectal Cancer Screening Programme[3-6]	All 16 districts in Tianjin Municipality	Colorectum	2012
Tianjin	Joint Screening Programmes for Common Cancers[7,8]	Seven districts in Tianjin Municipality: Heping, Nankai, Hexi, Hedong, Hebei, Hongqiao, and Jizhou	Lung, breast, stomach, and liver	2017
Liaoning	Livelihood Programme for Colorectal Cancer Screening[9]	Eight cities: Shenyang, Fushun, Benxi, Dandong, Yingkou, Panjin, Liaoyang, and Tieling	Colorectum	2021
Shanghai	Community-Based Colorectal Cancer Screening Programme[10,11]	All districts and counties in Shanghai Municipality	Colorectum	2012
Jiangsu	Colorectal Cancer Screening Programme[12]	10 regions in Jiangsu Province: Jintan District of Changzhou City, Kunshan City of Suzhou, Rudong County of Nantong, Ganyu District and Guanyun County of Lianyungang, Xuyi County of Huai'an, Yandu District of Yancheng, Baoying County of Yangzhou, Jiangyan District and Xinghua City of Taizhou	Colorectum	2020
Jiangsu	Comprehensive Cancer Screening Programme[13,14]	25 cities and counties in Jiangsu Province	Lung, liver, stomach, esophagus, and colorectum	2019
Jiangsu	Livelihood Project for Colorectal Cancer Screening[15,16]	Hanjiang District of Yangzhou City	Colorectum	2021
Zhejiang	Colorectal Cancer Screening Program[17,18]	All 90 districts and counties in Zhejiang Province	Colorectum	2020
Zhejiang	Gastric Cancer Screening Programme among low-income population[19,20]	Taizhou City	Stomach	2019
Zhejiang	Lung Cancer Screening Programme[21]	Wenling City of Taizhou	Lung	2019
Zhejiang	Gastric Cancer Screening Programme among low-income population[22]	Lishui City	Stomach	2019
Zhejiang	Lung Cancer Screening Programme[23]	Lishui City	Lung	2023
Zhejiang	Colorectal Cancer Screening Programme among urban and rural residents[24,25]	Lanxi City of Jinhua	Colorectum	2018
Zhejiang	Gastrointestinal Cancer Screening Programme[26]	Yongkang City of Jinhua	Esophagus, stomach, and colorectum	2019
Zhejiang	Gastrointestinal Cancer Screening Programme[27,28]	Fenghua District of Ningbo City	Esophagus, stomach, and colorectum	2023
Shandong	Five Cancer Screening Programme upon employee medical insurance[29,30]	Jinan City	Lung, esophagus, stomach, colon, and rectum	2019
Shandong	Colorectal Cancer Screening Programme among local residents[31]	Weifang City	Colorectum	2021
Shandong	Gastric Cancer Screening Programme among rural residents[32]	Weihai City	Stomach	2021
Shandong	Common Cancer Screening Programme upon employee medical insurance[33]	Binzhou City	Lung, esophagus, stomach, colon, and rectum	2020
Hubei	Free Screening Programme for Colorectal Cancer[34]	Wuhan City	Colorectum	2021
Hubei	Free Screening Programme for Lung Cancer[35]	Six cities: Yichang, Enshi, Huangshi, Ezhou, Jingzhou, and Huanggang	Lung	2023
Hunan	Lung Cancer Screening Programme[36,37]	Seven cities: Zhuzhou, Hengyang, Shaoyang, Changde, Chenzhou, Loudi, and Huaihua	Lung	2021
Hunan	Colorectal Cancer Screening Programme[38,39]	14 cities and municipalities in Hunan Province	Colorectum	2022
Guangdong	Colorectal Cancer Screening Programme in community population[40-42]	Guangzhou City	Colorectum	2015
Guangdong	Pilot Screening Programme for High-Risk Populations of Lung Cancer[43]	Yuexiu District of Guangzhou City	Lung	2017
Guangdong	Colorectal Cancer Screening Programme in community population[44,45]	Shenzhen City	Colorectum	2020
Guangxi	Nasopharyngeal Carcinoma and Liver Cancer Screening Programme[46,47]	22 counties, cities, and districts: six urban areas of Nanning City, three urban areas of Guigang, Jiangzhou District of Chongzuo, and counties of Fushui, Binyang, Long'an, Hepu, Guiping, Pingnan, Tianyang, Tiandong, Cangwu, Cenxi, Bobai, and Luchuan	Nasopharynx and liver	2013

* Local government sponsored cervical cancer and breast cancer screening programmes were not included, because these programmes are considered as the components of the nationwide Cervical Cancer and Breast Cancer Screening Programmes for Women.

Table S3: Key advances on cancer screening tests in China

Study	Study design	Key outcomes
Lung cancer		
Li et al (2022)[48]	Real-world study; cohort study	One-off low-dose CT screening reduces mortality from lung cancer and all-cause
Dai et al (2019)[49] and Qin et al (2022)[50]	Cohort study	Polygenic risk scores (PRS) and mosaic chromosomal alterations can identify subpopulations at high risk of lung cancer
Jin et al (2001)[51] and Fan et al (2009)[52]	Cohort study	Sputum atypia is an effective method for lung cancer screening among occupational high-risk population
Liver cancer		
Zeng et al (2023)[53]	Cohort study	Annually alpha-fetoprotein (AFP) test combined with ultrasound improves survival of individuals with HBsAg seropositivity
Wu et al (2016)[54]	Cohort study	Shorter ultrasound screening intervals are associated with reduced overall mortality in hepatocellular carcinoma (HCC) patients in a dose-dependent manner
Zhang et al (2004)[55]	RCT	AFP test and ultrasound examination every 6 months reduce HCC mortality by 37%
Zhu et al (1981)[56]	Real-world study; diagnostic study	AFP test is an effective method for liver cancer screening
Colorectal cancer		
Chen et al (2022)[57]	RCT	Risk-adapted approach is a feasible and cost-favourable strategy for colorectal screening
Wang et al (2019)[58] and Wang et al (2021)[59]	RCT	Computer-aided detection system increase adenomas detection rates during colonoscopy
Zheng et al (2003)[60]	RCT	Fecal occult blood test reduce mortality form rectal cancer but not reduce mortality form colon cancer
Esophageal and gastric cancer		
Chen et al (2021)[61]	Real-world study; cohort study	One-time endoscopic screening reduces upper gastrointestinal cancer incidence and mortality in high-risk areas
Jin et al (2020)[62]	Cohort study	Polygenic risk scores (PRS) can identify Chinese individuals at high risk of gastric cancer
Luo et al (2019)[63]	Case-control study; diagnostic study	Artificial intelligence system achieved high diagnostic accuracy in detecting upper gastrointestinal cancer lesions
Wei et al (2015)[64]	Community-based cluster non-randomised controlled trial	One-time endoscopic screening reduces mortality from esophageal cancer in high-risk areas
Liu et al (1994)[65] and Dawsey et al (1994)[66]	Cohort study	Esophageal balloon cytology can identify individuals at increased risk of esophagus cancer or gastric cancer
Breast cancer		
Shen et al (2015)[67]	RCT	Ultrasound is superior to mammography for breast cancer screening in high-risk Chinese women
Thomas et al (1997)[68] and Thomas et al (2002)[69]	RCT	Intensive instruction in breast self-examination did not reduce mortality from breast cancer
Cervical cancer		
Zhang et al (2021)[70]	RCT	High-risk HPV testing is an effective primary screening method in primary health care centres
Pan et al (2013)[71]	Pool of diagnostic studies	Liquid-based cytology (LBC) can effectively detect cervical intraepithelial neoplasia (CIN) grade 2 or worse
Zhao et al (2012)[72]	Pool of diagnostic studies	Self-sample HPV testing favourably with LBC and superior to visual inspection with acetic acid
Zhao et al (2010)[73]	Pool of diagnostic studies	HPV DNA testing is highly sensitive and moderately specific to detect CIN grade 3 or worse
Qiao et al (2008)[74]	Diagnostic study	A low-cost, less time-consuming, and low-tech alternative HPV DNA test (i.e., careHPV) was developed for cervical cancer screening in low-resource settings
Nasopharyngeal carcinoma (NPC)		
He et al (2022)[75]	Case-control study; diagnostic study	Polygenic risk scores (PRS) with the Epstein-Barr virus (EBV) test improves NPC risk stratification
Ji et al (2019)[76]	Cluster RCT	Serum IgA antibodies against EBV can identify high-risk population of NPC
Chan et al (2017)[77]	Cohort study	Plasma EBV DNA is an effective method to detect early NPC and improves progression-free survival of NPC patients
Huang et al (1997)[78] and Deng et al (2005)[79]	Cohort study	A screening strategy based on EBV serological tests was established for NPC

AFP=Alpha-Fetoprotein. CIN=Cervical Intraepithelial Neoplasia. CT=Computed Tomography. EBV=Epstein-Barr Virus. FIT=Fecal Immunochemical Test. LBC=Liquid-Based Cytology. NPC=Nasopharyngeal Carcinoma. HBsAg=Hepatitis B surface Antigen. HCC=Hepatocellular Carcinoma. HPV=Human Papillomavirus. PRS=Polygenic Risk Scores. RCT=Randomised Controlled Trial.

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