全球健康学杂志

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全球健康—预防医学教育和科研的机会与挑战

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摘　要：从发表的科研论文可以看出，全球健康已经进入加速发展阶段。为了促进全球健康的讨论来推动全球健康学的发展，本文首先描述了全球健康的发展趋势，然后从多个层次，从理论上探讨了全球健康的概念、思想来源，全球健康发展的内外在推动力以及全球健康目前面临的挑战和历史机遇。全球健康首先是一种思想，指导我们自然地从全球的角度来思考和解决与疾病健康有关的问题。全球健康是一门新兴学科，可以称之为全球健康学（Global Health Sciences）。只有让全球健康成为一门学问，才有利于开展相关的科学研究，来认识解决全球健康应该面对的两大问题，一是受大范围或全球危险因素影响的疾病问题，二是对全球有重大影响的健康疾病问题。全球健康必须成为一个专业，才能够聚集人才，开展教学科研和人才培养。全球健康学必须要有自己的方法学体系。总体而言，培养全球健康方面的人才，应该适当地压缩有关生物医学方面的方法，加强对研究宏观的环境、文化、社会和心理行为方面的问题的方法和技术的学习。全球健康的人才培养，发达国家走的是一条从上到下的实用主义道路，而中国走的是一条从下至上的未来导向模式。全球健康的发展，为中国培养自己的全球健康人才和开展相关研究提供了机遇。中国可以通过引进来和走出去的方式来培养人才和发展全球健康。当前迅速增加的留学生，为开展全球健康提供一个机会。由于全球健康作为一门学科还处于初级阶段，很多观点还不是很清晰。本文的许多提法，只是一种探讨，完全属于个人的观点。发表的目的是想抛砖引玉，引起同仁们的兴趣，参与讨论，来推动全球健康在学科建设、教学和科研方面的健康发展。

关键词：全球健康；全球健康学；方法论

1　全球健康的发展

进入 21 世纪以来最令人瞩目的，对医学科学和实践，尤其是预防医学和公共卫生具有重大影响的事件之一，就是全球健康。文献检索发现，"全球健康"这一概念最早出现在 1944 年的一篇关于热带病和外国输入性疾病的文章里[1]。在世界卫生组织成立之前，一些专家学者在 1945 年前后陆续发表了几篇论文，讨论公共卫生的全球视野[2-5]。自世界卫生组织成立，直到 1995 年之后，全球健康作为一门科学的话题才开始在医疗卫生界引起广泛注意。从最

具有代表性的英文文献库 MEDLINE 中，以"全球健康"作为论文题目的主题词检索发现，到本文完成时为止，在该库所有收录的文献中有 4000 多篇论文的题目包含"全球健康"这个词。把这些论文按照发表的年份绘制成图 1。从图中可以看出，发表的论文数目在 1990 年以前一直徘徊在较低水平；1990－2005 年间逐步增长；自 2005 后每年发表的论文数量，以明显加速度趋势增加。仅仅 2012 年一年发表的论文，就超过了过去几十年发表的论文的总和。除了论文总量增加以外，许多具有很大影响力的同行评议学术刊物，如英国的 Lancet《柳叶刀》，美国的 JAMA《美国医学会杂志》和 AJE《美国流行病学

杂志》等都纷纷开辟全球健康专辑、专栏,刊登从全球范围内征集的文稿。最新的一项针对美国全国能够授予医学博士的所有医学院校调查结果显示,在参加调查的 133 所学院中,有 32 所(24%)开办了正规的全球健康课程教育[6]。
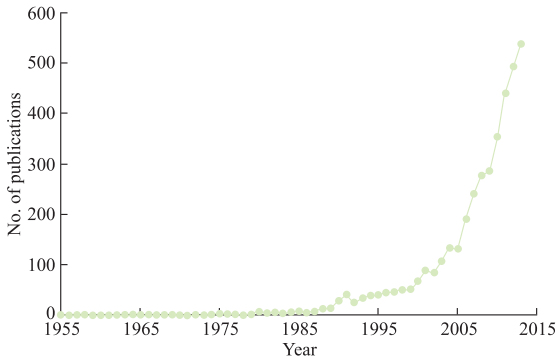
Figure 1　Explosive Growth in Publications in Pub Med with Global Health as the Phrase in Title

　　是什么力量推动了全球健康的发展,从而形成这样的发展轨迹? 全球健康发展是偶然的还是有其内在和外在的驱动力量? 如何理解全球健康的含义? 全球健康的思想从哪里来? 全球健康为我们今天的医疗卫生事业发展提供了什么样的机遇和挑战? 而我们又应该作哪些准备来把握这些机遇,迎接这些挑战? 要回答这些问题中的任何一个,都是一个挑战。本文的内容是基于作者本人对相关文献的学习,加上自己的理解,纯属个人的观点。由于全球健康作为一门学科还处于初级阶段,本文的许多提法和观点都只是初步的,还有待继续提炼。在这里先借《全球健康学》杂志这一平台发表出来,期望起到抛砖引玉的作用,引起广大同仁的兴趣,参与讨论,推动全球健康在学科建设、教学和科研方面的全面发展。

2　什么是全球健康

　　全球健康一词的英文为"Global Health"。英文的"health"一字,中文既可以翻译为"卫生",也可以翻译为健康。在上世纪八十年代研究社会医学时,作者与自己的导师,著名的社会医学家梁浩材教授曾经讨论过该英文是否应该翻译成健康还是卫生的问题,以及不同的翻译对公共卫生科研、教学和服务的影响。譬如,联合国的机构有世界卫生组织;国

家行政机构有卫生部、卫生厅、卫生局;卫生事业单位有卫生防疫站,卫生院、卫生所,以及卫生工作人员;医学教育有公共卫生学院、公共卫生专业等等。事实上,与卫生一词相对应的英文应该是"Hygiene",而与健康一词相对应的应该是"Health"。显然,卫生是达到健康的手段,因此用全球健康而不是全球卫生作为 Global Health 的中文翻译,避免了歧义,体现了目标导向的思想,是十分可取的。

　　为了推动全球健康事业的发展,首先必须清楚全球健康的含义。第一,只有科学地、全面地、准确地理解了全球健康的含义,我们才能够把握全球健康的发展方向,使之能够形成自己的独特个性(identity),发展成为一门独立的科学。第二,只有科学地、全面地、准确地理解了全球健康的含义,我们才能够把全球健康与其他类似的概念区分开来,比如世界卫生组织、公共卫生、国际保健等等。第三,只有科学地、全面地、准确地理解了全球健康的含义,我们才知道如何采取行动,动员一切资源,包括人力、财力和物力,来推动全球健康的发展;把有限的资源用在关键的问题上,更有效地发展全球健康。第四,只有科学地、全面地、准确地理解了全球健康的含义,我们才能够引导和跟上全球健康的发展趋势,让医疗卫生的教学、科研和服务跟上全球步伐,促进医疗卫生事业发展,造福人类。

　　纵观医疗卫生发展和人类健康演进的历史,综合国内外不少学者的研究,笔者认为,全球健康的含义大概可以从三个层次来理解。第一,全球健康首先是一种指导思想,它引领我们从全球的角度,来更有效地思考人群的健康疾病问题。第二,全球健康是一门新兴学科,亟待发展。如果全球健康仅仅停留在思想层面,是没有多大意义的。要让全球健康像其他医疗卫生学科,如环境医学、工业卫生、家庭医学、儿童卫生等那样发挥作用,就必须开展大量的科学研究,建构起理论框架,制定出研究标准,确立好方法体系,积累大量科学数据,使之发展成为一门科学。第三,全球健康必须是一门专业。要想让全球健康成为一门具有实质意义的科学,就必须让它成为一门专业,来吸引全球范围的人才,参与全球健康的研究。同时把研究成果通过多种方式,包括短期学习培训正规教育,转化为高水平能够从事全球健康教学、科研和服务的人力资源。下面将从这三个层面来讨论什么是全球健康。

　　第一,全球健首先是一种指导思想。无论是谁,

只要一提到全球健康这个词的时候，就会自然而然地把健康和全球连在一起。作为医疗卫生专业人员，全球健康要求我们必须从全球的角度出发，来思考健康疾病问题，包括所有的与健康疾病相关的科研、教学和实践。譬如，开展病因学研究（Etiological study）来认识疾病和健康危险行为的原因时，就必须采用全球和跨文化的视野；研究传染病必须考虑病原体可以通过自然（如气流）和人为（如飞机、火车）渠道传播；要认识健康危险行为，就不可以忽视不利于健康的价值观点、文化传统和生活方式的多渠道传播，包括经典的（如印刷品和人员交流）和现代的途径（如现代社会多媒体）。在进行干预性研究（Intervention studies）来开发更有效的治疗、预防和健康促进的措施和手段时，必须考虑通过多种途径，如交流、合作、购买、转让等，利用世界各国的有利条件和借鉴最领先的研究成果。在设计、计划和管理医疗卫生实践活动时，也要有全球化的思想和理念。以全球健康的思想为指导时，计划决策者就会很自然地考虑要让医疗卫生研究的成果在满足本地人民的需求的同时，也要考虑世界其它国家和地区的需要。譬如我们已经做到了而且还在做的，用青蒿素帮助广大的非洲地区来控制疟疾；欧美发达国家把在本国内证明有效的治疗艾滋病的药物治疗和行为预防措施，贡献给世界上受艾滋病影响最严重的国家和地区。

第二，全球健康应该成为医学科学的一个分支，可以称为全球健康学（Global Health Sciences）。如果仅仅只是有思想，全球健康至多不过是一种装点门面的的漂亮说辞，或者成为人们茶余饭后闲谈中的调味剂。要让全球健康学的思想为促进人类健康发挥作用，就必须开展大量的科学研究和勇敢的探索。全球健康学是一门全新的学问，没有任何可以直接借鉴的东西。就是欧美国家许多著名大学和研究机构，也都是各行其是，自搞一套。因此我们必须依靠自己，通过自己的努力，包括交流合作，来推动全球健康学的发展，使之逐步成长为一门成熟的学科。像其它任何学科的发展历程一样，我们必须通过研究探索，逐步建立起全球健康的理论框架和思想体系；逐步地明确全球健康学的目标、任务和要解决的主要问题；逐步地制定出相关的指标体系和判断标准，来衡量全球健康的发展。还有非常重要的一点，就是我们必须通过研究探索，建立起支撑全球健康学发展的特有的方法学体系，帮助我们能够在

全球健康的思想的指导下，来分析、研究、评价和解决人类所面临的重大健康疾病问题。如何认识全球健康作为一门学科分支，国内外学者在这方面都花了很大气力[7-10]，虽然还没有找到一个公认的学科定义，但总体而言倾向于从两个层面来理解全球健康学。在第一个层面，大家一致认为全球健康学的主要任务就是要研究解决那些受跨文化（cross-cultures）跨国界（cross-nations）跨地域（cross-regions）因素影响的健康疾病问题，和那些在全球范围内普遍流行，或者对全球有重大影响的疾病问题。虽然不同的研究列举了不同的疾病健康问题，最典型有重大传染病，如艾滋病、SARS、流行性感冒。其次是与行为和现代生活方式密切相关的问题，如毒品使用、网络成瘾、营养过度、跨文化压力、抑郁自杀等等。再次是与健康水平不断改善，寿命不断延长有关的老年健康问题。这些观点为发展全球健康学提供了重要参考。在第二个层面，全球健康学必须建立起自己的方法体系，让我们能够从全球范围，从全新的角度来研究、认识、理解和解决这些棘手的健康疾病问题。因此跨学科（trans-disciplinary）的知识（如跨文化心理学，社会流行病学）、技术和方法（如地球信息系统，空间流行病学）就称为发展全球健康学的首选。武汉大学全球健康专业的课程设置，是在这方面非常有意义的探索。

第三，全球健康学必须是一门专业（specialized discipline）。全球健康无论是作为指导思想还是作为医学科学的分支，更多的是偏于理论方面的东西。要让全球健康学从理论向实践转化，同时又经受现实的检验，就必须建立全球健康专业。有了专业就等于有了基础，学校才能建立相应的全球健康教育和科研机构，开办相应的人才培养项目，吸引人才，汇聚资源，开展科学研究。再通过短期培训和长期正规教育，把研究成果转化成为治疗疾病、预防疾病、促进健康的行动。全球健康专业在许多发达国家都已经成立。中国在武汉大学于 2011 年率先成立了全球健康专业，2013 年已经招收了第一届全球健康本科生，2014 年准备招收硕士研究生。国内其他高校，如北京大学、复旦大学等也先后成立了全球健康研究所，从事相关的科研、教学和学术交流。2013 年亚太公共卫生年会以全球健康为主题，吸引了亚太地区 60 多个国家近 600 名专家学者。学术会议交流的许多内容，都与全球健康专业密切相关。包括对全球有重大影响的疾病的病因学和干预研

究,全球专业学生的招生、培养方案、学生毕业后的去向等等。

3 全球健康的思想来源

全球健康的思想并非是某一个或几个人突然心血来潮提出的,它的出现有着一定的历史渊源。全球健康至少有以下四个思想来源:第一个来源是广大的科学工作者,包括工作在国际战线的医疗卫生工作人员,和开展公共卫生和国际保健的教学和科研的专家学者;第二个重要的思想来源就是世界卫生组织;第三个思想来源包括世界各国参与国际合作项目的政府机构和医疗卫生服务机构;第四个思想来源就是大专院校和专业研究机构。

笔者认为,全球健康最早的也是最丰富的思想来源,就是广大的、活跃在国际战线的,或者积极参与国际保健活动的广大医疗卫生工作者。白求恩的故事就是一个我们人所共知的典型例子。白求恩在中国抗日战争时期来中国为伤病员服务,为解决当时八路军新四军伤病员救治问题发挥了重要作用。目前活跃在世界范围内的多种非政府的医疗预防求助组织(如眼科、外科),是全球健康的现代实践。通过这些实践,让我们看到了从全球角度来认识和解决健康和疾病问题的长处和优势。与此同时,也看到了从事全球健康的巨大挑战。

全球健康的第二个重要的思想来源是世界卫生组织。世界卫生组织成立于 1948 年 4 月 7 日。作为联合国的一个重要机构,它是针对那些对全球有重大影响,必须通过国际合作来解决的重大传染病而成立的。自成立之日起,世界卫生组织在动员社会资源,推广计划免疫,控制和消灭重大烈性传染病方面发挥了重大作用。同时,世界卫生组织的成功,让人们更进一步看到了从全球角度来认识和解决基本健康问题的巨大希望。世界卫生组织前总干事 Kickbusch 早在 2002 年就系统讨论过全球健康的定义[9]。尽管世界卫生组织是联合国的一个机构而不是一门学科和大学里的一个专业,但是世界卫生组织的实践为全球健康提供了重要的思想来源,包括如何从跨国家,跨地区,乃至全球范围内思考疾病健康问题,制定规划决策,编制预算项目,通过与不同国家地区、不同行业的人员和不同专业的人员合作,开展科学研究,制定并实施综合性措施,来预防和控制对全球有重大影响的传染病。目前世界卫生

组织也开始包括慢性非传染性疾病和行为健康等问题,包括生殖健康、生长发育、老年化、营养和食品安全,职业卫生和毒品滥用。具体可以参见世界卫生组织的网站和相关文献。

全球健康的第三个思想来源,就是世界各国开展的大量医疗卫生国际合作项目,包括由世界卫生组织和世界银行主持的项目。世界上绝大多数国家政府的医疗卫生部门,都曾经或正在主持或参加国际合作项目,包括向不同的国家和地区提供医疗卫生研究和服务;或接受别的国家、非政府组织,以及世界性机构,如联合国、世界卫生组织、世界银行等方面的援助项目等等。类似于世界卫生组织,这些实践活动也为全球健康提供了丰富的思想源泉和素材。为了进一步发展全球健康学,有必要充分利用国际医疗合作的丰富资源,全力发展国际卫生项目合作,提升全球健康水平。

全球健康的最后一个来源是各个医疗卫生教育科研机构,涵盖了医学、药学、临床、预防、护理等等领域。如果说前面所讨论的三个来源为全球健康提供的是丰富的原始素材的话,要把这些素材加工成全球健康的思想体系、方法系统和科学体系,主要还是依靠这些活跃在在学术机构,以科学研究为职业的科学家们。前面列举的有关全球健康的论文,除了小部分,绝大多数都是由医学院校和研究所的专家学者们发表的。

4 发展全球健康的内在和外在动力

光有思想来源,并不意味着全球健康就一定能够快速发展。既然全球健康的思想早就有了,为什么直到今天才突然热络起来?是什么力量推动了全球健康的发展?分析了解全球健康发展的时代背景和推动力,有助于我们这些对全球健康有兴趣的人,坚定全球健康的研究方向;同时,也让我们能够主动地、充分地利用各种有利条件,因势就导,发展全球健康事业。正如世界范围内经济发展的不平衡推动了经济全球化一样,在笔者看来健康发展的高度不平衡是全球健康快速发展的内在推动力,而当今的科学技术的现代化和经济的全球化为全球健康提供了外在动力。

4.1 人口学转变体现的健康不平衡发展

如何评估健康发展的平衡状况,本身就是一个全球健康应该研究的课题。从医学科学的角度看,

全球健康发展不平衡，主要可以通过两个转变理论模式来进行科学衡量和评估，一个是人口学转变（Demographic transition），再一个就是流行病学转变（Epidemiological transition）。人口学转变模式是由著名人口学家汤普森（Warrant Thompson）1970 年提出，用来描述世界范围内各国人口出生、死亡和人口规模的一个理论模式。后来人们把这一模式进行了扩展。最新的模式如图 2 所示。按照人口学转变模式，一个国家或地区的人口发展可以分为五个阶段，分别是(1)高出生、高死亡、稳定小规模人口阶段；(2)高出生，死亡快速下降、人口前期扩张阶段；(3)出生率、死亡率同时下降、人口后期扩张阶段；(4)低出生、低死亡、稳定大规模人口阶段；(5)出生率低于死亡率，人口规模下降阶段。大量研究表明，如果一个国家或地区的人口转变处于第一、二期时，总体人口的健康水平是堪忧的；如果人口学转变进入到第四期，则总体人口的健康状况就达到一个较高的水平。

表 1 是根据 2008－2012 世界银行的数据，列出的一些典型的，分别处于不同人口学转变阶段的国家，供参考。进入 21 世纪，虽然没有国家还处于人口学转变的第一阶段，但是，从第二阶段到第五阶段的人群健康水平的差异是巨大的。譬如刚果民主共和国在 2008－2011 年间每千人口的出生率为44.22，死亡率为 16.35，出生时的期望寿命为 48.68岁。中国处于第四阶段，每千人口出生率为 12.03，死亡率为 7.10，出生时期望寿命为 74.81 岁。第五阶段的国家主要包括欧洲和日本，典型的特征之一，

就是出生率低于死亡率。这种通过人口学转变体现出来的健康发展高度失衡，可以看作是全球健康发展的内在驱动力。

4.2　流行病学转变体现的健康不平衡发展

与人口学转变模式相关，却更能够直接反映疾病健康状况的，是流行病学转变理论。该理论模式是由著名的流行病学家奥姆兰（Omran）于 1971 年提出的。其理论基础是源于对人类死亡模式的观察。根据奥姆兰的理论，一个人群的健康水平，可以通过主要归因于低社会发展水平的传染性疾病和主要归因于生活方式和行为的慢性退行性非传染性疾病的二者的比例构成（见图 3）。在观察分析了人类历史上疾病死亡与社会形态之间的关系之后，奥姆兰提出了死亡模式转变的三个阶段。最早的称为瘟疫和旱灾时代，相当于一万年前的新石器时代，人类从以狩猎生活为主向农耕社会转变，人口密度增加，传染病逐步成为健康的主要威胁，人均期望寿命通常在 30 岁上下以较大幅度被动，死亡率决定人口状
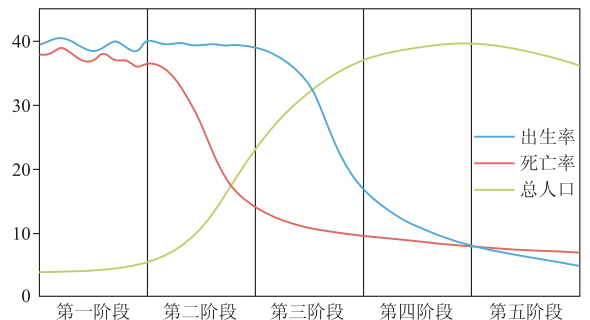
图 2　汤普森人口学转变模式－扩展模式

表 1　一些典型的处于不同人口学转变阶段的国家

人口学转变	典型的国家地区，出生率（B，‰），死亡率（D，‰），期望寿命（LE，岁）
第一阶段	柬埔寨（Cambodia）（1980：B＝44，D＝42，LE＝30）
第二阶段	赞比亚（Zambia）（B＝43.28，D＝12.77，LE＝53.77）；　刚果民主共和国（Congo, Dem. Rep.）（B＝44.22，D＝16.35，LE＝48.86）；　坦桑尼亚（Tanzania）（B＝40.82，D＝9.86，LE＝58.63）；　马里（Mali）（B＝47.80，D＝14.21，53.55）；　尼日利亚（Nigeria）（B＝41.98，D＝14.24，LE＝51.04）
第三阶段	孟加拉国（Bangladesh）（B＝21.14，D＝5.95，LE＝69.29）；　尼泊尔（Nepal）（B＝23.63，D＝7.02，LE＝66.87）；密克罗尼西亚（Micronesia, Fed. Sts.）（B＝23.92，D＝6.26，LE＝68.56）；　不丹（Bhutan）（B＝20.72，D＝6.73，LE＝66.73）；　印度（India）（B＝21.45，D＝7.99，LE＝65.54）
第四阶段	美国（United States）（B＝13.45，D＝8.17，LE＝78.30）；　中国（China）（B＝12.03，D＝7.10，LE＝74.81）；英国（United Kingdom）（B＝12.9，D＝9.08，LE＝80.20）；　希腊（Greece）（B＝10.13，D＝9.65，LE＝80.31）；古巴（Cuba）（B＝10.04，D＝7.42，LE＝78.62）
第五阶段	德国（Germany）（B＝8.20，D＝10.40，LE＝80.08）；　意大利（Italy）（B＝9.35，D＝9.73，LE＝81.65）；　日本（Japan）（B＝8.50，D＝9.40，LE＝82.74）；　葡萄牙（Portugal）（B＝9.48，D＝9.83，LE＝79.25）；　克罗地亚（Croatia）（B＝9.80，D＝11.75，LE＝76.36）

资料来源：根据 2008－2012 世界银行数据整理。出生率、死亡率和期望寿命通过 2008－2011 年的数据求平均值得到。由于世界银行数据在 2008－2012 年期间没有处于第一阶段的国家，为了介绍这一模式，我们世行数据库中选取 1980 年柬埔寨的数据。

况。第二阶段称为大规模传染病下降阶段,这一阶段伴随经济、技术、文化、社会和医疗卫生的快速发展和现代化。传染性疾病的死亡率不断下降;而慢性非传染性疾病死亡率不断攀升。此阶段人均期望寿命由 30 岁左右上升到 50 岁左右。第三阶段为退行性和人造疾病时代。传染病死亡所占比例很少,代之以大量退行性疾病和与我们人类自己的行为和生活方式密切相关的疾病。期望寿命由 50 岁左右上升到 70 岁以上,主要由出生率决定人口规模。
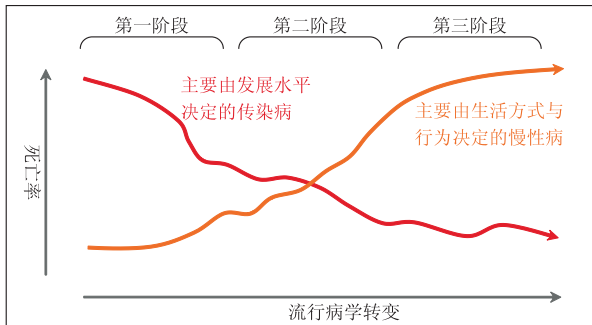
图 3 奥姆兰的流行病学转变模式

奥姆兰的流行病学转变模式在公共卫生领域最广泛的应用,就是根据死亡统计数据,先把传染病死亡分为一类,然后把慢性非传染性性疾病分为另外一类。然后把这两类疾病的死亡率的时间趋势放在一起进行对比。由于传染病,包括结核病、痢疾、肝炎等等往往与资源缺乏,经济技术落后相关联;而慢性非传染性疾病如高血压、冠心病、自杀、老年退行性疾病,往往是现代社会相关联。根据奥姆兰的模式,如果一个国家或地区的死亡模式由传染病高于慢性病转到慢性病高于传染病,就表明,该国家或地区的人口健康状况完成了流行病学转变(图 3)。根据奥姆兰的流行病学转变模式和 2008－2012 世界银行的数据,我们列举了一些处于不同转变阶段的国家和地区,来说明人口健康水平在世界范围内高度不平衡的事实。目前欧美发达国家都步入到了流行病转变的第三阶段;许多非洲国家和一些东南亚国家仍然处于流行病学转变第一阶段的后期;而大量发展中国家都处于第二阶段或者介于第二和第三阶段之间。中国在上世纪七十年代就完成了由第二阶段向地三阶段的转变。在笔者看来,这种全球范围内健康发展的高度不平衡,是全球健康发展的重要内在推动力。

4.3 科学技术发展与经济全球化

如果说人口学转变和流行病学转变是全球健康发展的内在动力的话,科学技术发展与经济全球化则是全球健康发展的外部动力。医学科学技术的发展,提供了新途径、新手段、新技术以便更有效地应对健康方面的挑战。现代信息、通信和传播,让我们足不出户也能够了解世界范围内的健康状况,包括健康水平和健康在国家与国家之间,地区与地区之间的差异;能够了解什么地方有什么技术和方法来应对自己和当地面临的健康问题。现代的交通运输手段,让我们在一两天之内,几乎能够到达世界上的任何国家,亲临其境地考察情况。剩下的就是如何把收集到的资料和我们的想法变成实际行动,其中通过系统途径,譬如全球健康,来完成这一任务就是最好的方法之一。因为仅仅靠少数人的、非组织的、自发的行动,并不能有效地、系统地、科学地、和客观地把握不同国家和地区之间健康发展的差异;也不能有效地把不同国家和地区的医疗卫生技术资源整合起来,实现优化配置,为提高人类的健康水平服务。所以,必须有一套科学的方法,开展系统的科学研究,进行大量的科学实验,从而探索到有效的途径以提升全球健康水平。这些正是全球健康的目的和所要完成的任务。

如果说科学技术的进步推动了全球健康思想的形成和发展的话,这种发展在很大程度上还要归功于经济全球化。因为经济全球化首先推动了科学技术的发展,包括医疗卫生科学技术、信息通讯技术和交通运输技术。其次经济全球化促进了世界范围内的人才流动,让人们不仅能够通过先进的科学技术了解到发生在世界各地的情况,而且还能够亲临其境,切身感受不同地区的差异。同时全球健康也从经济全球化的过程中获得了思想和启发。如果说经济全球化的目的是为了优化资源配置,提高经济发展效率;那么全球健康也可以看作为是一种研究探讨在全球范围内如何优化配置有限的卫生资源,为人类健康服务。

5 全球健康提供的挑战和机遇

5.1 人才培养的挑战与机遇

作为一门新兴的学科,全球健康首先需要培养人才,而培养人才的前提是必须要有教师队伍、教科书和教学实验基地。而所有的这一切对任何国家的任何学校都是严峻的挑战。在这三大挑战中,教师队伍的建立和培养是重中之重。如果有了专家教

授,自然就可以招收学生,编写教材,开设课程,开发教学基地,培养急需的合格人才。由于是一个新兴学科,全球健康专业人才的缺乏是一个普遍现象,不仅仅只限于发展中国家,也不仅仅只是限于中国。为解决人才短缺的问题,欧美许多国家采取的是一种从上到下的培训策略。首先,通过多种方式,包括自己学习、开办学习班、举行学术讲座等等,吸引那些对全球健康有兴趣的人参加培训,造就一批发展全球健康的"种子选手"。有了这些种子选手后,再通过全球健康博士后和全球健康证书等更灵活的培养方式,来培养从事并且能够胜任全球健康科研和教学的师资队伍,编写教材,开发试验基地等等。当有了一定的教学条件之后,才开始进行正规的研究生和本科生教育。欧美等许多发达国家有很多发展中国家所不具备的条件来发展全球健康。譬如这些国家多年来在世界各国都有合作项目,而在绝大多数合作项目中,都有大学和研究机构的参与。通过国际合作,不仅培养了大量实际工作中所需要的专业人才,也丰富了大学和科研机构的知识结构和人才队伍。因此,比较容易从现有的人才队伍中,通过自愿和单位扶植性政策(如更多的机会升职和获得科研资助)等方式,建立一支从事全球健康教育和科研的师资队伍。通过这种方式发展起来的全球健康,在招收学生和学生毕业后的去向方面,都有一定的优势。当然这种方式也有其内在的缺点。譬如西方国家开展的国际合作往往受国家经济和政治的影响,因而缺乏稳定性,从而导致全球健康的发展也相应受到影响。

　　目前,全球健康在中国走的是一条从基础到上层的路子。一开始就招收本科生,然后再发展到研究生。笔者认为,这是一种面向未来的发展模式。因为目前对全球健康人才的需求还不是很高,但是随着国家实力的快速提高,对全球健康方面的人才的需求,在可以预见的将来一定会快速增加。选择从本科开始,就可以为将来培养大量高水平高质量的人才打下良好的基础。但是这种发展模式在短期内面临两个巨大的挑战。第一个挑战就是缺乏能够来开展研究,编写教材,开设课程,和培养学生的师资人才作为"种子选手";第二个挑战就是培养出来的学生的去向。从目前国家发展趋势来看,第二个挑战即使目前存在,也不会持续太久,关键在于第一个挑战。只有有了一支优秀的师资队伍,全球健康作为一门学科和专业才能够得到健康发展。如果有

了一支强有力的师资队伍,就不愁培养出来的学生没有好的去向。由于中国是一个快速发展的国家,采用未来导向的发展模式有其合理的一面。但是这一模式决定了全球健康在中国的成长必须依赖国家的直接投入,用两条腿走路的办法,来建立自己的全球健康的领军和担纲人才。第一是立足国内,国内有庞大的教学科研队伍,也有不少从事国际合作项目的政府和实业机构,只要措施得当,就一定可以在较短时间内造就一支良好的队伍。第二是从国外引进,包括人才和知识引进两个方面。由于全球健康是一个新兴领域,因此知识引进应该比人才引进更重要,因为到目前为止,还没有哪一个国家哪一所大学的全球健康专业得到了广泛的认可。

　　笔者认为,选拔全球健康人才,包括师资队伍和本科生研究生,有两点是必须认真考虑的。第一点,也是最重要的一点,就是要真正地喜欢全球健康。如果不是真正地喜欢,只是好奇或者说是名称好听,这样的人即使是进来了,也很难有所成就。只有真正喜欢的人,才能够理解和认识全球健康的许多不成熟和有待发展的方面;才能够为全球健康的发展尽心尽力而不是一遇到困难和问题就怨天尤人。第二点就是要具有很强的开拓精神、创新精神和持久的毅力,在全球健康的创立阶段"很听话"好好先生,是不适合从事全球健康专业教学和科研的领军人才的。同时,全球健康是一门全新的学科,需要假以时日才能发展成熟。作为老师,在事业成长方面会需要更多的时间。譬如在全球健康建立博士项目之前,就不可能有博导。由于是新学科,一些专为全球健康出版的学术刊物连影响因子都还没有建立起来,更谈不上由 SCI 或 SSCI 收录(一般一本杂志要通过 5～10 年才能申请),也影响个人的发展。全球健康没有现成的路可走,只有具有创新精神和锲而不舍的特质人才,才能够真正举起全球健康的旗帜,带领一支团队持久奋斗,并且最终建立起让同行和社会让可的,符合时代需要的全球健康科学,培养大量合格全球健康人才。

　　尽管全球健康人才培养在许多国家,包括中国都面临许多挑战,但是全球健康在世界范围的发展,也为人才培养提供了很多难得的机遇。中国经济实力的提高,有能力输送一些人到国外学习取经。尽管全球健康总体而言还处于发展阶段,但是在发达国家已经有人搞了很多年了,课程也开了,教科书也写了,学生也招收了,因此有很多可以供我们学习和

借鉴的地方。出来送出去,还可以请进来。通过邀请其他国家在全球健康方面有造诣的专家学者来中国开展学术交流,不乏为一种快速、经济有效的途径。邀请国外的专家学者有时候只要一封邀请函就可以。欧美一些好的大学或者那些比较有成就的教授,都有出国教学的意愿和自己的资助方式,只要有人邀请,很多都会乐意接受。如果能够提供往返机票,几乎就没有问题了。受邀出国演讲,是西方大学考核知名度和学术成就的内容之一,很多人都有意愿去做。最后一点,也是大家都认为很有发展前途的人才培养方式,就是远程教育(Tele-education)。比如美国的全球健康大学(网址:http://www.uniteforsight.org/global-health-university/);美国国立卫生研究院的全球健康 e-学习资料(网址:http://www.fic.nih.gov/Global/Pages/training-resources.aspx)等等。这为发展全球健康,培养全球健康专业人才,提供了非常有效的途径,是十分难得的机会。

5.2 科学研究的挑战与机遇

实现全球健康的目标和任务,除了前面讨论的人才培养问题之外,再一点就是要开展系统的科学研究。笔者认为,开展全球健康研究目前面临三大挑战:第一、缺乏统一的思想体系,第二、没有确定的方法学体系,三、缺乏成熟的学术交流平台。几乎每个人都觉得全球健康非常重要,可是却不能够明确说出来全球健康是什么。只要有机会,每个人都想为全球健康做点什么,可是都不知道如何着手,从哪里着手。用"全球健康"上网一搜,五花八门,什么都有,可就是没有一个统一说法。这虽然是一个巨大的挑战,但是却也是一个重要机遇。所有发表的文章,包括本文的目的之一,就是想通过讨论交流,逐步建立起全球健康的思想体系,方法学体系;明确全球健康的目标和任务,通过集思广益来推动全球健康的发展。因此,每一个有志于全球健康的人,都可以在学习他人研究成果的基础上,通过独立思考,系统研究的基础上,对全球健康提出自己的观点、看法和思路。然后在通过多种形式(如非正式个人交流、学术会议,期刊杂志等)的交流合作,形成共识。在不断明了全球健康的含义、目标、任务、方法等等理论性研究的同时开展大量实证研究,来验证、丰富和发展全球健康的理论性研究,相辅相成。

在全球健康研究面临的三大挑战中,研究的方法学体系尤为重要。在本文的第二节中,笔者讨论

了全球健康的指导思想,目标和任务。但是如何从全球的范围来思考全球健康问题,包括受全球因素影响的或者对有重大影响的健康疾病问题,需要我们掌握相应的公共卫生技术和方法,来评估什么样的健康疾病问题会对全球产生重大影响;分析研究跨国家跨地区危险因素与健康和疾病的之间的关系;设计针对性的干预措施,来减少危险,提高健康水平。我们必须发展现有的公共卫生研究技术和方法,适当压缩用于微观领域的生物学技术和方法,增加宏观领域的方法。比如应该加大力度学习《医学社会学》、《人类学》、《社会医学》、《行为医学》、《跨文化心理学》、《社会流行病学》、《空间流行病学》和《空间统计学》等等。只有运用这些方法,才能够帮助我们从全球的角度来理解掌握人类社会、文化、公共卫生和医学科学的发展历史;来评估某一健康疾病的全球影响或者研究跨国家跨地区因素与健康疾病的关系;从而能够在研究的基础上,从全球的角度出发,设计和建立相应的公共卫生措施来预防疾病,促进健康。

缺乏成熟的学术交流平台是也是开展全球健康研究的一个挑战。许多成熟的学科都有自己的专业学会,非常成熟的已经建立起了自己的影响力的专业期刊。而全球健康就缺乏这方面的条件。尽管前面谈到了,很多学术刊物,比如英国《柳叶刀》和美国的《美国医学会杂志》对全球健康这一主题十分感兴趣,全球健康毕竟不是他们关心的主题。而一些刚刚创刊不仅的杂志,知名度非常有限,目前以全球健康挂名的杂志主要有:(1)Global Health Action(网站:http://www.globalhealthaction.net/index.php/gha),影响因子 IF = 2.062,由 SCI & SSCI 收录;(2) Global Public Health (网站:http://www.psypress.com/journals/details/1744-1692/),影响因子 IF = 1.594;(3)Journal of Epidemiology and Global Health(网站:http://www.elsevier.com/journals/journal-of-epidemiology-and-global-health/2210-6006),由 Elsevier 出版;(3)Global Health Promotion(网站:http://www.sagepub.com/journals/Journal201894),影响因子 IF = 0.729;(4)The Journal of Global Health(网站:http://www.gh-journal.org),有美国哥伦比亚大学的大学生主办;(5)Global Journal of Health Science(网站:http://ccsenet.org/journal/index.php/gjhs),open access.最后就是本刊,《全球健康学杂志》。从这些新的专

门期刊以及自 1995 年以来与全球健康有关的科研论文的加速度增长可以看出,全球健康的学术交流平台正在形成,与全球健康有关的科学研究,正在步入快车道。虽然面临不少挑战,开展与全球健康相关的科学研究,前途光明。

5.3　国际留学生和全球健康研究

　　快速增加的国际留学生为中国开展全球健康研究提供了一个难得的机遇[11]。根据国家教育部的官方统计,中国的留学生总数在 1978 年改革开放开始的时候只有 1236 名。之一数字到 2011 年上升到 29 万,而仅仅过了两年之后到 2012 又上升到 32 万。统计结果显示,在中国学习的留学生几乎来自于世界各地所有的国家。尽管他们的目的是来学习中国的知识和技术,了解认识中国,可是他们也携带着非常丰富的有关自己国家的信息,包括医疗卫生体制,历史文化、风俗习惯、疾病健康等等;而他们本人的健康疾病状况也是他们自己国家人民健康的一个重要侧面。有了这样一个特别人群,就能够让我们在家里不不走出国门,就可以开展与全球健康有关的科学研究。最近我们刚刚完成的一项留学生的健康行为调查表示,国外留学生在中国学习和生活期间,普遍感受到不同程度的文化同化心理压力。这种心理压力要明显高于留学生们在欧美等发达国家的压力。感受到心理压力最大的是非洲裔留学生,其次是亚裔的;感受压力最小的是来自欧美等发达国家的留学生,同时我们也发现,留学生感受到的文化同化压力与其抑郁状况存在十分紧密的联系[12,13]。这一发现让我们有必要重新思考文化同化压力的问题。很可能文化差异对文化同化压力产生的影响还要小于社会经济条件作用。很明显,相对亚洲国家而言,中国与欧美国家之间的文化差异应该大得多,为什么来自于欧美国家的留学生感受到的文化同化压力反而比来自于亚洲国家的留学生的要小呢? 最可能的解释就是,来自于欧美国家的留学生可能有比较好的经济条件。

　　我们的研究仅仅只是一个侧面。通过留学生,我们还可以研究很多其他具有全球健康意义的课题。比如通过留学生和中国本地学生的对比,可以让我们了解不同国家的人群有关健康疾病的知识、观点、态度和生活习惯等等;认识不同国家的常见健康行为问题,如艾滋病危险行为,抽烟、酗酒、吸毒行为的流行水平和影响因素;认识许多具有全球健康意义的疾病问题,包括代谢综合征、肥胖、高血压、心

脏病等,以及危险因素;还可以研究求医行为,对医疗卫生服务的期望等等。可以说能够开展研究很多很多,这里只是列出一些例子,供参考。

小结

　　从理论上讨论了全球健康的含义,全球健康发展的内外在推动力,进一步介绍了发展全球健康的挑战和机遇,包括人才培养、科学研究等等。

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Global Health—Opportunities and Challenges for Education and Research in Preventive Medicine

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Abstract：Evidence from the published studies in the literature implies that global health is entering into a rapid development stage. To stimulate more discussions around the topic of global health for the development of Global Health Science，this study first outlined the overall trend in global health development. It then moved to the discussion，in theory and from multi-levels，of the concepts，origin of the thought，internal and external driving forces of global health，and current challenges to and historical opportunities for global health. Global health is first a guiding principle，leading us to consider and solve health related problems with a global perspective. Global health is also a new branch of science，and it can be termed as Global Health Sciences. Only when global health becomes a branch of sciences，it will pave the way for searchers to tackle two global health problems in two categories：The first category consists of health problems that are influenced by factors with a very large or a global scope；and the second category consists of health problems that are of global impacts. We must make global health sciences as an academic discipline to attract faculties and students for institutionalized teaching，research and training. Global health sciences must have its unique methodological system. With regarding to teaching in methodologies for global health，training for biomedical methods in general can be reduced so that more time can be used to teach methods and techniques related to macro environment，culture，society，psychology，and behaviors. With regarding to global health education programs，developed countries take a practice-oriented top-down approach while China takes a future-oriented bottom-up approach. The rapid and worldwide development of global health provides a window of opportunities for global health education and research in China. We suggest two strategies for China to develop global health and to improve global health education：inviting experts from other countries to come to China and sending Chinese out to other countries. The rapidly growing number of international students in China creates an opportunity to conduct global health researches without going abroad. Due to the fact that global health as an academic discipline is still in its early developmental stage，lots of the concepts and definitions are evolving. Many concepts and ideas presented in this paper are simply personal thoughts and perspective as an exploration. The purpose is to intrigue peer researchers′ participation in the discussion and to promote the development of global health in establishment of global health as an academic discipline to advance preventive medicine education and research.

Key words：Global health；global health sciences；methodology

对我国全球健康本科专业人才培养的思考 *

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摘　要：随着全球化的加速发展,健康问题全球化和健康不平等已成为世界各国共同面临的挑战。传统预防医学专业培养的人才已不能完全满足全球健康实践的需求,亟需全球健康专业人才,但目前全球健康本科教育在全球处于起步阶段,尚无成熟模式。武汉大学公共卫生学院,多次组织国内外专家研讨会,形成中国政府和学者对"全球健康"概念理解,在此基础上对我国全球健康本科专业的人才培养目标、知识结构、能力结构和专业精神进行了探讨。

关键词：全球健康；本科；能力；人才培养

进入新千年以来,国际人员流动、商贸往来日益频繁,新(再)发传染病在世界范围暴发和流行的危险性加剧,心脑血管疾病和恶性肿瘤等非传染性疾病在全球的发病率不断升高,人类健康问题已成为人类的重大挑战[1-2]。"全球健康(Global Health)"学科应运而生,为了应对全球健康问题,美国、瑞典、英国等发达国家的著名大学纷纷开设全球健康专业,全球健康的人才培养也成为医学教育领域的热点问题。

经国家教育部批准,武汉大学于2012年招收了我国首批全球健康专业本科学生,然而,由于全球健康学科发展时间相对较短,目前学术界对全球健康尚未形成公认的概念[3-4],国内外不同学校制定的全球健康人才培养方案不尽相同[5]。为了更好制定满足中国卫生外交战略需要、具有中国特色的全球健康专业人才培养方案,武汉大学多次组织中国政府相关部门专家、国内外学者,重点讨论"全球健康"概念的内涵、外延,并形成中国学者的共识："全球健康是致力于改善全人类的健康水平,实现全球人人公平享有健康的一个兼具研究和实践的新兴交叉领域。其关注的是具有全球意义的健康问题及其决定因素,以及解决方案和全球治理,需要在国家、地区和全球层面超越国界和政府,动员并协调各方力量采取有效行动予以应对。其领域的特点是融合人群为基础的预防医学和个体水平为对象的临床医学,运用卫生领域各学科的理论与方法,以及卫生领域学科之外的政治、外交、社会、经济等多学科的研究方法与实践经验,倡导跨学科参与和合作"。本文根据中国学者对于全球健康概念的理解共识,结合国外文献综述[5],就我国全球健康专业本科人才的培养目标、知识结构、能力结构和专业精神,提出一管之见,供同道们批评指正。

1　全球健康本科专业培养目标的思考

根据全球健康的学科概念,全球健康本科专业人才的培养目标可概括为：培养具有多学科知识结构,能够从全球视角识别全球主要健康问题及其影响因素,制定符合国际规则的全球健康治理策略、行动计划和具体措施,具备跨文化、跨国界团队工作精神,善于沟通、协作,致力于改善全人类的健康公平性、提高全人类健康水平的复合型人才。

全球健康专业人才培养的核心要素包括：具备临床、预防和管理学基本理论和基本知识；善于从全球化视角分析、识别和解决全球主要健康问题；追求全球人人公平享有健康；能够从事全球健康研究、教学和实践实务工作。全球健康实践实务工作岗位是其主要就业方向，包括国家卫生相关行政机关、大型事业单位国际交流合作部门（如，国家疾病预防控制中心等），中国卫生援外项目机构，国际组织驻中国分支机构（如，联合国儿童基金会驻华代表处等），各类与健康相关的国际组织、私营基金会等非国家行为体组织，等等。

2　全球健康专业本科生应具备的专业素养

美国公共卫生协会（APHA）认为全球健康专业本科生应具备进行全球健康实践所需的，在理论和循证基础上总结出的独特知识和技能[6]。参考我国医学生培养标准[7]和美国全球健康专业的知识和能力结构[8-12]，根据我们对全球健康专业人才培养目标与职业定位，全球健康专业本科生应具备的知识结构结构、能力结构和专业精神包括：

2.1　知识结构

全球健康解决其学科问题的手段，除传统的临床医学和预防医学外，将更多地借鉴卫生领域之外的多学科方法。因此，全球健康专业人才属于复合型，应具备多学科理论和知识。具体要求应为：熟悉临床医学、预防医学和管理学基本理论；掌握全球社会健康状况及全球健康学的目标、任务、内容、方法和全球主要健康问题及其治理的原理、策略和措施（包括全球疾病分布与疾病负担、全球卫生政策与卫生系统、全球健康治理、全球健康研究方法、国际卫生项目管理、全球老年健康、全球妇幼健康、全球精神健康、全球环境健康、全球新发传染病等）；了解与健康相关的伦理学、文化人类学、国际政治与经济学、国际法学等基础知识。

2.2　能力结构

全球健康关注的重点是全球化带来的健康问题，以及超越国界和政府，需要全球各方力量共同采取行动治理的健康问题。因此，全球健康专业人才应具备从全球化视角，发现、分析和解决跨越国界的全球主要公共卫生问题。参照美国疾病预防控制中心等机构提出的公共卫生专业人员的核心能力分类表述，全球健康专业人才应具备预防医学基本技能，社区实践技能，分析和评价技能，财务规划和管理的能力，协调动员与合作共事能力，领导和系统思维的能力等基本技能外，更应具备多种语言文字的交流能力，多元文化的理解能力，全球健康政策开发或全球健康项目计划能力等特别能力。

2.3　专业精神

全球健康学致力于改善全人类的健康水平，实现全球人人公平享有健康。因此，全球健康专业人才应该具备锲而不舍的职业信念，以促进健康公平、最大限度地改善全球人类健康水平为己任。具体体现为："大爱"精神，全球健康学科宗旨是实现人人享有健康，不论其种族、贫富和宗教信仰，只有"大爱"才能真正包容、理解多元文化；"全球化的意识"，承认全人类的共同利益和共同的价值判断，以人人平等享有健康为价值取向，既要善于学习和借鉴其它国家的经验，又要积极与国际社会合作，熟悉国际惯例和规则，与所有国家共享中国的经验；"多学科视角"，善于从管理学、社会学和经济学等多个学科的视角思考和解决健康问题，从而凝聚各种力量，综合运用多种方法改善全人类健康水平。

3　讨论

从本专业人才应具备的知识结构、能力结构及专业精神是基于中国学者对于全球健康概念的理解总结出来，但上述结果与国际上开设全球健康学本科专业的学校有很多相似之处。

在知识结构方面，"复合型"和"多学科"是全球健康的重要特点，需要在人才培养方面奠定较为宽泛的学科基础，熟悉和掌握医学、社会学、经济学和法学等多学科的相关知识。为开阔视野，拓宽基础，美国多所学校的全球健康学本科生选修课涉及学科门类相当广泛。如南加州大学的选修课分为国际关系、卫生政策、全球健康相关主题 3 个模块，涉及生物学、物理学、社会学、流行病学、政治学、人类学、行为科学等多领域；亚利桑那州立大学必修课较少，包括全球健康概论、社会公正、研究方法和实践课程，选修课分为贫穷与社会公正，健康与生物学，文化、社会与健康、人类学相关课程。由此可见，在本科生中开设多学科的课程确实是全球健康人才培养的基

本共识。

在能力结构方面,我们强调"从全球化视角,发现、分析和解决跨越国界的全球主要公共卫生问题",美国的乔治华盛顿大学、纽约大学和康奈尔大学也同样强调"了解全球主要疾病负担是开展全球健康实践的基础",要求学生生能够运用医学、社会学和经济学等多学科的理论,结合不同的研究方法评估不同国家和地区,尤其是资源匮乏地区人民的健康情况及相关因素[8-11],美国肯特州立大学要求学生具备识别特定领域的关键健康问题的能力,乔治城大学则要求学生能够评估和分析全球健康相关的研究和发现,运用循证的思维方式分析全球健康不平等性的影响因素。因此,虽然各学校在人才培养方面存在差异,但均认为"从全球化视角,发现、分析和解决跨越国界的全球主要公共卫生问题。"是本专业的核心能力要求。

在专业精神方面,国外院校更加重视健康的公平性,认为健康权属于基本人权,消除健康不公平性,最大限度提高人类健康水平,是全球健康的学科伦理基础。如肯特州立大学强调在"中低收入国家和资源匮乏地区"开展健康促进,提高"弱势人群"的健康水平。乔治城大学要求学生"识别服务水平低下地区弱势群体的主要健康问题",并"分析全球健康不平等性产生的广泛因素"。此外,"具备多种语言文字的交流能力以及多元文化的理解能力"对于工作的开展同样非常必要。Battat 等人的研究显示,"能够与不同的人群交流,在不同文化和医疗体系下展开工作"[12]是全球健康专业人才必备的核心能力之一。因此,只有"具备锲而不舍的职业信念,以促进健康公平、最大限度地改善全球人类健康水平为己任",才能促进不同国家的政府及非政府组织协同合作,解决共同面临的健康挑战。

基于对全球健康人才培养目标的理解,全球健康学专业的人才培养将显著区别于传统的临床医学、卫生管理和预防医学。临床医学培养合格的临床医生,卫生管理专业培养卫生事业的管理者,而预防医学则培养疾病预防控制专业人员,而全球健康学专业培养的是具有全球化视野,善于运用国际经验解决复杂健康问题的专业人员。这就要求该专业的学生需要具备一定的临床医学、卫生管理和预防医学的相关背景知识,又能从全球化视角认识全球健康的挑战、全球应对策略、支持体系及行动等。

4　小结

全球健康是一个崭新的领域,全球健康学是一门年轻的科学。全球健康的人才培养问题还面临着许多挑战,如何在实践中进一步凝练中国特色的"全球健康"定义,完善顶层设计;如何将多学科知识进行交叉整合,如何编写教材和培养师资,如何开展全球健康实践都是值得思考的重要问题。因此,我们必须在实践的过程中不断总结和改进人才培养方案,最终培养出既顺应时代发展,又符合社会需求的全球健康本科专业人才。

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Exploration on Training of Global Health Undergraduates in China

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Abstract：The growing of international communication and trading has altered the globalization of health issues and health inequality into a common challenge that all the nations are confronted with. China has been actively participating in global health practice，yet a crucial problem is that the traditional preventive medicine education can no longer prepare the health workforce for the emerging global health demands，where global health professionals are badly needed. Currently，the global health education for undergraduates are still in its infant stage，and there exists little mature education and training model to follow. The School of Public Health of Wuhan University has organized several seminars with both international and domestic experts，and explored the training objective as well as the knowledge，competence structure and professional spirits for undergraduate professionals，based on the understanding of the global health by both the Chinese government and experts in this area.

Key words：Global Health；undergraduate；competency；education

全球健康学中与疾病相关的研究领域及常用指标

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摘　要：全球健康问题是指跨越国家边界和政府的、需动用全球性力量解决的卫生问题，这些问题的解决很多情况下是需要多国家、多学科和多部门合作。目前全球已有上百所机构致力于全球健康领域的研究。其中与疾病相关的内容包括了慢性非传染性疾病、新发再发传染病、健康不平等、环境因素与健康、妇幼健康、出生缺陷以及全球疾病负担等等，本文就目前全球健康研究中涉及的这部分领域研究进行综述，以期了解全球健康学中的研究现状。

关键词：全球健康；研究领域；指标

全球健康又称"全球卫生"（Global Health），是指跨越国家边界和政府的、需动用全球性的力量来解决的卫生问题，这些问题的解决需要多国家、多学科和多部门的共同完成。据文献报道，目前全球有 70 所大学建立了全球健康研究中心，在 71 所大学中开设了全球健康课程，250 多所大学致力于这一领域的实践活动[1]，主要的研究领域很广泛，如全球健康政策、全球健康治理、全球健康与经济、全球健康与伦理等等，其中涉及卫生、医疗的内容包括了健康不平等、慢性非传染性疾病、新发与再发传染病、环境因素与健康、妇幼卫生以及全球疾病负担等等。目前这些领域中，全球范围内已经开展了广泛的多国多部门和多学科的国际合作的项目。

全球健康研究中通常从全球角度对健康问题重新进行审视和观察，提出在宏观范围内解决这一问题的策略和措施。因全球健康领域广泛，本文仅从全球健康角度对国内外主要涉及的与疾病、健康密切相关的领域进行综述，以期了解全球健康学研究中涉及的疾病、健康领域的研究现状。

1　慢性非传染性疾病防治

1.1　慢性非传染性疾病防治的全球研究

慢性非传染性疾病一直是近年来全球面临的严重公共卫生问题，研究报道在 2008 年全球死亡总数中 63％源于慢性疾病，包括心脑血管病、癌症、慢性呼吸系统疾病和糖尿病[2,3]，而慢性病死亡人数中，有 80％在中、低收入国家。世界卫生组织预测到 2030 年每年死于非传染性疾病的人数将增加至 5500 万人。目前慢性疾病的公认的行为危险因素有烟草使用、不健康饮食、缺乏身体活动和有害酒精的使用[4]。

大量研究表明，在全球范围内对慢性防治开展通力合作后，有效的干预措施对于人群的防治有良好的效果。如果这些被证明有效的防治措施能够有效实施，则慢性病的疾病负担将会大大降低。在 2011 年召开的联合国慢病峰会上，各国专家达成了慢性病防控需要政府主导、多部门配合、全社会支持的共识[5]，之后，世界卫生组织和相关国际组织制定的行动计划及对策相继出台，如由世界卫生组织编制的《预防控制非传染性疾病全球行动计划（2013—

2020)》。

1.2 慢性非传染性疾病的全球研究指标

在 2011 年联合国慢病峰会上，通过的《全球非传染性疾病预防和控制综合监测框架(含指标)和自愿性目标(2013－2025)》，在监测框架指标中主要包括了 3 方面指标。即：(1)死亡率和发病率指标：主要针对 30～70 岁人群，计算心血管疾病、癌症、糖尿病和慢性呼吸系统疾病的死亡概率以及各类癌症的发病率；(2)危险因素暴露指标：主要监测有害酒精的使用、蔬菜和水果摄入、身体活动、盐/钠摄入、饱和脂肪酸的摄入、血糖升高/糖尿病、血压升高、体重超重和肥胖、总胆固醇升高和烟草使用等；(3)国家系统应对指标：包括心血管疾病药物的预防和咨询、慢性病的基本药物和技术、宫颈癌筛查、接种人类乳头状瘤病毒疫苗(HPV)和乙肝疫苗、姑息治疗、在食品供应中不使用部分氢化植物油(PHVO)政策和减少对儿童的食品营销政策的制定等[4]。

2 新发传染病和再发传染病防治

2.1 新发、再发传染病的全球研究

新发传染病(emerging infectious diseases，EID)是指"新的、刚出现的或呈现抗药性的传染病，其在人群中的发生在过去 20 年中不断增加或者有迹象表明在将来其发病有增加的可能性"[6]。各种新发传染病在世界各地不断出现，这些新发传染病具有传染性强、传播速度快、流行范围广、病死率高、且不易控制、难以预测和防范等特点。

全球化加剧了传染病的全球传播，传染病的全球化又迫使国际社会开展密切的国际卫生合作。传染病全球治理，是指个人和各种机构(包括国际组织、政府)共同参与传染病的综合治理，强调多元主体以多种方式共同治理传染病问题。目前各国专家正在试图建立更好的全球卫生治理机制，包括发展问题的解决，治理结构的多维化及世界卫生组织主导[7]。

目前，全球新发传染病的种类多达 40 余种，此外，生物武器的使用和生物恐怖事件的时有发生，加重了新发传染病对人类的威胁。一些新发传染病已在中国出现并造成流行，例如艾滋病、SARS、禽流感、莱姆病、登革热、埃立克体病等。随着国际交往、贸易和旅游的发展，一些疾病存在传入我国的可能，

如埃博拉、西尼罗、尼帕等[6]。

为了应对全球化对公共卫生的严峻挑战，国际社会对现代传染病防控国际合作机制进行了发展与完善，包括转移世界卫生组织的工作重点，扩张其职能，改变以消灭单一传染病为目标的工作方针，逐渐将工作重点与核心职能集中到促进公共健康的全球卫生合作方面；修改 TRIPS(Agreement On Trade-related Aspects of Intellectual Property Right)协议，明确专利药品强制许可的条件与具体规则，协调国际贸易与公共健康的矛盾；修订《国际卫生条例》，强化主权国家在防治传染病中的国际合作义务[7]。目前，传染病的全球治理框架已初步建成，并在防治 SARS、禽流感、艾滋病和 H1N1 甲型流感等事件中发挥了重大作用[7]。尽管传染病的全球治理机制已初步形成，但在面对各种新发传染病带来的非传统性安全威胁还存在着一些不足。由于自然灾害频发，气候变暖、环境污染、生态破坏、食品安全、抗生素滥用、人口老龄化、城市扩张等大大增加了传染病发生与传播风险，使情况更为复杂[8-10]。

2000 年，为了应对全球范围的传染病传播和暴发，建立了全球范围的传染病暴发和应急处置网络(Global Out break Alert and Response Network，GOARN)。世界卫生组织在 2005 年发表的国际卫生条例中增加了关于加强传染病监测能力条款。国际新发传染病监测项目(International Society for Infectious Disease，Program for monitoring Emerging Disease，ProMED-mail)[11]通过邮件的方式报告传染病暴发，可以对人间传染病、动物间传染病、植物及农作物疾病以及人畜共患病等多个领域疾病暴发状况进行监测，超过 150 个国家应用。加拿大公共卫生署建立的全球公共健康信息网(Global Public Health Intelligence Network，GPHIN)是"早期预报预警系统"，主要追踪和监测传染病疫情暴发、食物中毒、生物恐怖事件、化学品泄露、自然灾害、医疗和放射性物质等公共安全问题，搜集全球疾病暴发和相关公共健康事件，并以 6 种语言发布[12-14]。

2.2 新发、再发传染病全球研究主要指标

新发、再发传染病防治主要通过密切监测加以防范，建立传染病监测网络，进行连续系统收集与分析。目前对新发、再发传染病主要的监测指标包括：

(1)聚集性异常症状病例、严重异常临床表现/

事件等,以便及时进行传染病的预警。

(2)发病人数、发生地点、死亡人数、时间和地区分布等指标。

(3)新发、再发传染病的时空分布,以及分布与周围环境的关系。

(4)建立新发现病原微生物资源库以保存与共享,包括对新发病原菌的收集、管理、教学、研究,以便进行病原学诊断或提供病原线索,提高对新发传染病的认知。

2.3 应对新发再发传染病的现场防控装备指标

与传染病防控密切相关的是技术设备的准备。这些技术设备包括:现场采集设备、实验室检测技术设备、疫情实时监测电子系统、疫情的实时分析和时空定位及可视化分析系统。

在全球应对疫情中,可疑病原体的检测试剂和检测方法很关键,研制敏感的未知病原体的基因检测技术能在分离不到病原体时提供病原体的证据;建立系统的和标准化的病原微生物分子分型技术、方法和资料库能够揭示系列分离菌株间的流行病学关系,进行传染源和传播途径分析。

3　健康公平性研究

3.1　健康公平性的全球研究

健康公平是人类共同追求的目标,长期以来健康公平问题一直是卫生改革和发展关注的重点,并已成为国际卫生政策的主要方向[15]。在全球健康学研究中,健康的公平性是其主要的研究内容。公平(Equity)意味着人们的需要人人幸福安康的机会相等。卫生保健的公平性主要体现在卫生保健服务的筹资与提供。卫生筹资公平性是指根据每个社会公民的支付能力筹措卫生保健经费。卫生服务提供的公平可分为:健康平等、卫生服务利用平等和受诊机会平等。健康不公平是指社会经济地位(socioeconomic status,SES)不同的个体之间健康问题流行率或发生率的差异,监测不公平性的强度对卫生政策干预效果评估至关重要,推荐使用集中指数(concentration index)作为健康公平性测量指标[16]。

目前国内外开展的健康公平性评价研究中对健康指标测量时,主要为死亡率、失能率、无残疾期望寿命(disability-free life expectancy)、健康期望寿命(healthylife expectancy)、疾病别发病率、自感健康(self-ratedhealth,perceived health,self-assessed health)、两周患病率、慢性病患病率等[16]。自感健康指标在国外被广泛应用于健康公平性的衡量,而国内健康公平性研究通常选用两周患病率和慢性病患病率作为评价指标。在国家卫生服务调查中,自感健康状况主要基于被调查者本人的主观判断,慢性病患病率强调以医生的明确诊断为依据,两周患病率则介于二者之间。社会层组的划分依据主要为收入、教育和职业,最理想的社会阶层划分当属融合了收入、教育、声望、权力等因素的职业身份[17]。

3.2　健康公平性评价的研究指标

3.2.1　极差法

极差法通常用比较社会经济分组最上层和最下层的差距,经济分组按照国际惯例首先按全体人群的人均收入排序,再根据收入的高低把人群分为五个阶层,其中第一层最贫穷,第五层最富裕。能直接比较经济最好和经济最差阶层健康差距,但忽略了对中间各阶层的健康水平。

3.2.2　洛伦兹曲线和基尼系数(the lorenz curve and Gini coefficient)

洛伦兹曲线是由统计学家洛伦兹提出的描述社会收入分配状况的曲线,它由累计人口在总人口中所占百分比与这部分人口收入占总收入中的百分比共同表达(图 1),图中 45°对角线称为“绝对平等线”,“洛伦兹曲线”是实际收入曲线,即向下弯曲的曲线,弯曲度越大表示收入分配不均越严重[18]。基尼系数是根据洛伦兹曲线提出的判断收入分配平均程度的指标,为洛伦兹曲线与对角线之间面积与对角线下直角三角形面积的比值。这两个指标在卫生服务领域现被广泛用来作为评价资源配置公平以及健康公平方面的研究。
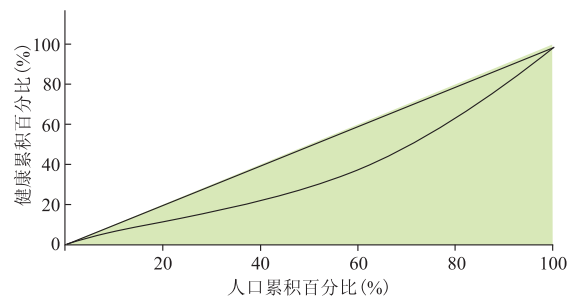
图 1　洛伦兹曲线示意图

3.2.3 不相似指数法

不相似指数（index of dissimilarity, ID），是各个不同阶层反映健康状况的某变量的比重和其对应的人口比重的离差和的 1/2，用来判断各个阶层健康水平是否有差异的指标[19]。不相似指数介于 0 和 1 之间，越接近于 0，说明各个阶层人群的健康水平差异越小，越接近于 1 表示各个阶层的健康水平相差越大。

3.2.4 集中指数法

集中指数（the concentration index, CI），考察与社会经济状况相联系的某变量不公平程度，即动态反映经济收入对该变量影响的指标[19]。CI＝0 表示某变量绝对公平，如该变量是反映健康水平的变量，说明健康完全公平。CI 为负值，表示健康趋向于经济状况较差的人群中，CI 为正值，表示健康趋向于经济状况较好的人群中。

4　人口健康相关研究

4.1　人口预测的全球研究

目前的人口预测主要是根据已有数据、研究方法和模型对各空间层次进行预测。首先对一般参数进行认定，如：人群的生育率、死亡率、迁移率、育龄妇女最低生育年龄和生育率峰值年龄等，之后应用合理的模型对人口的自然变动态势及及其社会经济属性进行一系列的分析，如：人口的出生、死亡、迁移、人口的性别比、人口的负担比、人口的年龄结构、人口的城市化、学龄人口、劳动力人口、家庭户结构等等。从空间层次可以分为全球、区域、城乡、社区等[20]。

4.2　妇幼健康的全球研究

1992 年成立了全球妇女健康委员会，1995 年《北京行动纲领》提出"社会性别主流化"的策略，要求各成员国将其运用于包括妇女健康政策在内的公共政策的实施和改革中。1998 年世界卫生组织提出"健康公平性"主题，将性别、种族和贫穷列为议题。1999 年世界卫生组织成立"妇女健康部"（WMH），2002 年通过"性别健康政策"，成立"性别暨妇女健康部"（GWH），要求 WHO 所有的计划和方案都需要考量"性别议题"，并将性别平等与对妇女的增权（empower）列为重点目标，以促进各国认识和关注文化与生理对妇女健康的影响[21]。

社会性别比较是近年来评价社会福利和社会保障政策的视角，为纠正传统的社会政策只重经济结果本身而忽视社会关系的形成过程做出了努力。性别差异政策是指决策人认识到两性的差异，把传统男女观念带入到决策中去，产生了"强化两性差别"的社会政策。2007 年第 62 届联合国大会把"到 2015 年实现人人享有生殖健康"正式列入了千年发展目标，此后生殖健康问题，尤其是青少年生殖健康研究成为全球健康研究领域中的一个重点内容[22]。

4.3　出生缺陷的全球研究

出生缺陷是导致婴儿和儿童死亡的首位原因，2006 年美国发布的"全球出生缺陷报告"中估计全球每年新增加出生缺陷人数超过 800 万，90% 发生在中低收入国家。2006 年美国研究报告推算的全世界 2001 年最主要的严重出生缺陷为：先天性心脏病、神经管缺陷、Hb 病、唐氏综合征、葡萄糖 262 磷酸脱氢酶缺乏症（G6PD）[23]。近年国外出生缺陷监测集中在：（1）出生缺陷监测体系标准化的研究，如 2004 年欧洲和美国通过研究推出的《出生缺陷监测指南》。（2）发展新的监测和分析技术手段，将多学科技术应用到监测中，如出生缺陷时空分布、疾病成因分析及疾病干预的医疗资源配置等，地理信息系统技术可以很好地揭示疾病与环境的空间关系，并对出生缺陷干预的地理可达度的公平性进行分析。（3）出生缺陷监测同卫生干预、临床诊治、经济负担等领域合作开展交叉学科研究。（4）采用数理模型等技术开展了出生缺陷监测预警方法学研究，建立基线和预警的流行病学数学模型[23]。

出生缺陷通常采用发生率来反映发生频率。全世界出生缺陷发生率最高的国家是苏旦，为 820/万，最低为法国，为 39.7/万。2006 年美国研究报告推算我国的发生率为 511/万（不包括由于单纯环境遗传因素所致的出生缺陷），从主要先天畸形的顺位变化来看，我国主要先天畸形的种类逐渐向发达国家接近[24]。

5　环境与健康关系

5.1　环境与全球健康研究

以全球变暖和环境污染为主要表征的全球环境变化正深刻影响着人类健康，该领域的研究对防范环境风险、控制和预防疾病传播、促进医疗十分重

要。全球环境变化以其复杂性、不确定性为科学、公众和政策制订者带来了新的挑战。全球环境变化、城市化与健康风险，城市环境变化与健康指标体系，健康风险的早期预警系统，脆弱人群（如老年人）的健康保障，环境风险意识，贫困等都是环境与健康的研究主题。世界卫生组织认为，将环境危害造成的医疗支出进行量化处理可帮助各国政府选择适当的干预措施，只要国家及社区采取预防性措施，推动生活用水处理和储存安全化，以及实行有利于发展与健康的能源政策，都能够大幅减少因环境因素导致的疾病[25,26]。

5.2　环境与全球健康研究指标：健康危险度评价

健康危险度的评价能够描述特定环境危险度，评价相对准确性较高，这源于它使用了大量的流行病学资料，从动物到人的危险度外推降低了不确定因素；此外，发育和生殖毒性的危险度评价方法给决策者提供了敏感的健康效应指标[27]。

6　疾病负担的研究

6.1　疾病负担的全球研究

疾病负担（burden of disease，BOD）是疾病、伤残和过早死亡给患者、家庭带来的损失以及用于疾病防治消耗的资源。疾病负担指标指导政府、社会在卫生均衡性方面发挥作用。决策者、卫生经济专家、临床工作者和公共卫生工作者关注和研究疾病负担的目的主要是用于解决卫生资源配置的可得性和均衡性，卫生保健政策制度适用性和可及性，以及评估防治技术的成本、效果、效益和效用。

疾病负担作为评估人群健康的宏观指标，从最初的单一指标评价，扩展到目前全球范围内对疾病和伤害、多种危险因素，按年龄、性别、地区分别测算的综合评估健康的指标，最令人瞩目的研究就是全球疾病负担（global Burden of Disease，GBD）研究。这项研究从 1991 始，由世界银行与世界卫生组织资助[28]。该研究将全球划分为 8 个地区，疾病和伤残划分成三大类，对全球 107 种疾病和损伤共 483 种结果的疾病负担进行研究，比较不同地区、不同疾病间的疾病负担。研究结果最早于 1997 年发表在《柳叶刀》杂志。早期结果表明，疾病负担主要集中在发展中国家，而对疾病负担的投入主要集中在发达国家。发达国家的疾病负担以慢性非传染性疾病为主，而发展中国家面临传染性疾病和慢性非传染性疾病的双重考验。随后其研究结果每隔一段时间进行更新。目前最新结果为 2010 年的研究结果，已于 2012 年 12 月发布，其中有关中国的结果也于 2013 年发表在《柳叶刀》杂志[29]。

在 2010 年的 GBD 研究结果中，明确指出：世界范围内，许多国家在预防儿童疾病和延长公民寿命方面取得了非凡的进步，其结果是疾病负担越来越多地表现为由于疾病造成的残疾而不是死亡。精神及心理疾病、疼痛和伤害在妨碍人群健康，肥胖和高血糖正在取代营养缺乏成为主要的人群健康危险因素[28,30]。

6.2　疾病负担研究的常用指标

疾病负担研究指标包括流行病学负担和经济负担。流行病学负担包括发病率和患病率、死亡率、门诊和住院率、健康调整寿命年（HALE）、伤残调整寿命年（DALY）及危险因素归因的疾病负担、与健康有关的生存质量（HR-QOL）、潜在减寿年数（PYLL）等[31]。经济负担包括医疗保健直接支付的费用和病伤给社会经济产生的损失。

小结：本文对全球健康学中与慢性非传染性疾病、新发再发传染病、健康不平等、环境因素与健康、妇幼健康、出生缺陷以及全球疾病负担等有关的研究现状和常用指标进行了综述，为了解全球健康的研究领域提供参考。

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Global Health: Health Problems's Research Fields and Commonly Used Indicators

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Abstract: The global health problems refer that those need to solve across national borders and the government, and using the global force. Solving these problems, in many cases is needed by multidisciplinary and joint efforts of many departments. In the world, there are hundreds of agency dedicated to these fields of global health. Involved the fields, included chronic non-communicable diseases, Emerging infectious diseases and infectious diseases, the health inequality, environmental factors and health, women's and children's health and the global burden of disease, birth defects, etc.. In this paper, the fields of global health researches were reviewed, in order to understand, main research contents in the global health studies.

Key words: Global health; research field; indicators

全球健康信息平台的框架构建及应用

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摘　要：全球化正对人类健康产生深远影响,加剧了全球公共卫生的问题,使之变得越来越复杂化和多样化,许多问题已变为跨国界,跨部门,跨学科并需要动员全球各种力量采取行动来解决的全球健康问题。利用互联网可以更好的监测和了解全球健康相关信息。本文重点介绍了构建全球健康信息平台的框架,数据来源及应用,该信息平台功能包括:分析和发布全球健康各主要研究领域的理论和技术进展并实时监控涉及全球健康领域的突发事件、重大疫情和热点话题。构建该平台的目的旨在建立一个中英文跨语言的全球健康领域的信息平台,希望有助于学术界及时了解全球健康各领域的研究动态和技术进展,有助于全面准确地获取全球健康的动态,为我国应对全球疾病风险、制定合适的卫生政策和积极参与全球健康事务提供决策依据。

关键词：全球健康；信息平台；基本框架；应用

1　前言

大数据时代的来临为内容分析提供了更多的数据和资源,同时由于数据的复杂性也提出了强有力的挑战[1-2]。特定领域的内容分析是针对某领域收集互联网有关数据并进行深度挖掘,从而服务于各种内容的需求[3,4]。

当今世界,全球化正对人类健康产生深远影响,加剧了全球公共卫生的问题,使之变得越来越复杂化和多样化。全球健康（Global Health）是跨越国家和政府边界的健康问题,是一切把提高全球范围内人口的健康和实现全球范围的卫生公平性列为优先事项的学习、研究和实践需要动员那些对健康起决定作用的全球各种力量采取行动来来解决的卫生问题[5,6]。无论是传统意义上的传染性疾病,还与生活方式相关的慢性非传染性疾病;无论是因自然和人为因素导致的重大突发性事件并由此引起的健康问题,还是涉及许多国家的全球性议题,如气候变化、人口增长、环境污染、食品安全等等,都涉及疾病预防与控制、环境保护、持续性发展和全球安全等国家核心利益,是反映国家形象和综合实力的重要因素,而相关信息的搜集能为我们及时发现问题,正确处理问题和政策制定提供依据。

传统上,全球健康的信息获取依赖世界卫生组织的官方通报。而当今世界已经步入信息时代,互联网已经成为全球信息扩散最快最全的方式。因此,利用互联网的力量,可以更好的监测和了解全球健康相关信息。近年来搜索引擎已成为全球健康信息获取的主要手段。但该手段基于关键词匹配技术,面临搜索不全、结果不准、索引延迟和无法自动发现热点话题等问题。其发展趋势是依靠全球健康领域的知识本体提高信息获取的查全率、查准率和时效性,利用计算机学习技术自动发现全球健康的热点话题和突发事件。

针对目前对全球健康信息的重大需求,本文设计了全球健康信息平台,构建该平台的目的旨在建立一个中英文跨语言的全球健康领域的信息平台,

融合与全球健康研究相关的各类学术性互联网信息源,分析和发布全球健康各主要研究领域的理论和技术进展,获取全球健康的相关信息;同时也建立一个全球健康领域的舆情平台,其功能是实时监控涉及全球健康领域的突发事件、重大疫情和热点话题。

2　全球健康信息平台框架构建

全球健康信息平台框架主要分为数据搜集,数据分析和数据呈现三个功能模块,系统主要框架如图1。

图 1 所示,首先利用爬虫技术分别从公共卫生专题类网站和学术数据库网站中爬取公共卫生和全球健康相关的新闻和文章信息,搜集完信息之后用自然语言处理技术对信息进行过滤、整理、抽取、存储等一系列操作,将自然语言变成结构化语言并存储在数据库中,最后将分类信息在前台网站中展示,方便用户浏览。下面根据框架图详细介绍平台的实现方法。
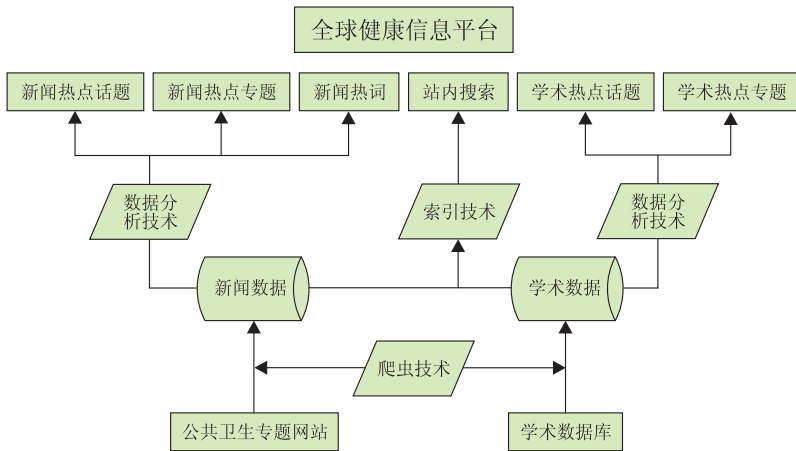
图 1　全球健康信息平台系统的主要框架

2.1　数据搜集

平台的数据来源主要分为新闻和学术,新闻信息是通过搜集国内外知名公共卫生网站信息,网站由公共卫生学院,全球健康研究中心的老师和同学收集和指定,将这些网站统一称为来源网站,通过新闻爬虫技术爬取网站中新闻信息,储存在数据库中,方便下一步的数据分析。同样,学术信息是通过学术网站爬虫技术从数据库中爬取公共卫生信息,数据库暂时包括英文的 Medline,中文的万方和维普。因为获取的学术信息只包括论文标题、论文作者、论文摘要、发表期刊、发表日期等一些概要信息,这些信息是开源的,即通过任何可以上网的电脑都可以用浏览器获取,所以不涉及侵权行为。

数据搜集的关键技术是爬虫设计,根据新闻网站和数据库网站的不同架构,来设计相应的爬虫以满足数据搜集的需求。爬虫设计是信息获取的关键技术。首先,爬虫必须具有稳定性,要克服网站崩溃,延时访问,网络状况不佳等因素,一些网站会有一些防爬机制设定,绕过这些壁垒也是爬虫设计的关键所在。同时,根据新闻网站和学术数据库网站的设计结构不同,爬虫设计也分为新闻爬虫和学术爬虫,爬虫架构如图 2 所示。爬虫架构是先用程序模拟浏览器想服务器发送获取网页请求,服务器会发送网页 HTML 文档到本地缓存,程序提取 HT-ML 文档,从中获取新闻数据,将数据存入本地数据库,最后将数据放入前台网站方便用户浏览。
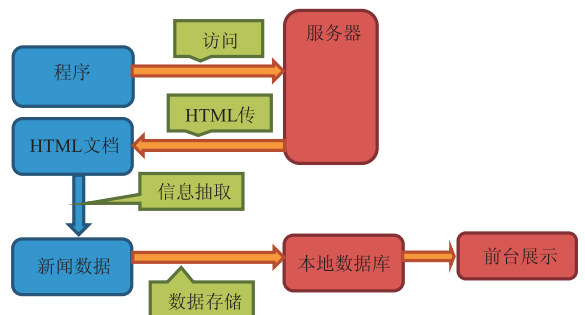
图 2　全球健康信息平台爬虫构架

2.2　数据分析

平台的数据分析是运用计算机学科中的自然语

言处理技术,将新闻,学术论文这种自然性质的语言,通过数据分析、数据整理、关键字提取、数据整合等一系列处理,最终得到结构化的语言,这些结构化的语言是研究者需要的信息,研究者可以通过提取出的结构化信息对新闻和学术有更深的了解。例如可以通过最近一个月的新闻分析出,网上热议的疾病类型,最新传染病或者某些大型疾病的治疗方法等。此外,平台还能搜集最新全球健康最新期刊会议及学术文章。方便研究者进行学术研究。

2.3　数据呈现

　　数据呈现方式是通过网站的形式呈现,即在前台设计一个全球健康信息平台网站,将收集、整理、过滤、分析后的数据呈现在网站上,方便用户浏览。网站采用 B/S 设计模式。前台采用 JSP 技术编写,加入 struts2.0 框架技术,界面用 DIV＋CSS 布局,用 javascript 完成网页操作逻辑功能实现,用 jquery 实现异步数据传输。应用(java)服务器采用的是

tomcat,后台数据存储采用 mysql,并用 hibernate 进行数据持久化。

3　全球健康信息平台的应用

3.1　平台现状

　　全球健康信息平台目前按主要功能分为新闻、教育、科研、热点专题、国际合作、本地搜索、简报这七个部分。在主页上,分别有这七大板块的子链接,见图 3。通过鼠标点击便可以轻松进入这些板块。信息平台板块仍在构建中,必要时增加新的板块。

3.2　主要功能

3.2.1　新闻板块

　　全球健康的新闻板块主要是在从互联网上搜集跟公共卫生,公共健康等相关的舆情和新闻,让访问者能更实时了解最新,最热的公共健康新闻(图 4)。

图 3　全球健康信息平台 7 大板块

图 4　中英文新闻板块效果图

　　新闻分中文和英文两部分,分别介绍国内外的公共健康动态,在新闻的列表中,会有几样重要信

息:新闻标题可以让访问者很直观的了解新闻;新闻发布时间可以让用户知道新闻的实效性,对于新闻

的真实性,用户可以通过来源网站来鉴别,政府性消息当然会比地方性网站更具有真实性,但是地方性网站会比政府性网站更敏感,充分利用这两来源类型的网站消息可以让用户对消息有更深刻的理解。光有标题信息很难满足用户的信息获取的要求,所以通过点击标题,可以直接获取新闻所在原网址,用户便可以从那里获取完整信息。但是互联网的不稳定性使得新闻所在原网页时常会出现失去链接的情况,所以新闻板块在爬取信息的同时,保存了网页快照,如果出现了点击新闻标题获取不了新闻内容情况,点击快照同样可以浏览新闻全文。新闻快照有利有弊,快照保存的爬取新闻发布时的内容,如果新闻

在之后变化了,快照无法更新,只能获取最新快照来浏览最新新闻。所以同时保留新闻原网页和网页快照既能解决新闻链接消失都能解决新闻更新的问题。

在新闻左边有时间筛选选项。网站的全球健康信息是每天更新的。所以如果用户需要了解某时间段的全球健康信息新闻,可以通过时间筛选来获取。

在新闻板块中,中间部分是关键词云图,云图是从最近一段时间发生的相关新闻中提取的热词组成。热词的提取运用了计算机的自然语言处理方法从最近获取的所有全球健康新闻中自动生成的,具有很强的实时性和相关性。云图可以让用户大致了解最近全球健康相关的新闻热词。效果图见图 5。

图 5　全球健康新闻板块关键词云图

新闻板块不仅有关键词云图,还有关键词索引数(新闻板块的下方),与云图不同,关键词索引树是图中词语的分层结构,可以让用户更清楚热词之间的关联(图 6)。图中的中医药词语与甘肃省中医药管理局相关,用户知道最近中医药的新闻是跟甘肃省中医药管理局相关联的。

图 6　全球健康新闻板块关键词索引树

英文的结构及操作与中文相似,只是英文信息获取来源是国外网站,这里不再赘述。

3.2.2　教育板块

教育板块的主要内容是介绍全球各大高校关于全球健康教育相关的专业课程,教育机构和科学基金等。它为大学、机构、教材、培训与课程等 4 个子板块。下面具体介绍各子板块内容,同样通过鼠标点击可以打开各子板块。

大学子板块展示的是国内外高校关于全球健康专业开设的专业或者培训计划。目前国内只有北京大学、复旦大学、武汉大学三所高校开设了全球健康相关的专业,而国外华盛顿大学和耶鲁大学等大学都开设了相关的专业级培训课程。在计划名称这一分栏中,罗列了这些培训计划的名称并附上了链接,用户可以通过点击链接直接访问相关的官网。

机构子板块展示全球关于全球健康的所有相关

机构以及官网网址。由于目前机构不多,平台采用列表展示,随着机构的增多,平台会调整为区域分类展示以方便用户更好的浏览和访问。

　　教材子子板块中展示的是全球健康和公共卫生专业相关的各式教科书。用户可以点击浏览以知道全球健康所需要的专业教材。

　　培训与课程子板块中,展示全球所有关于全球健康的官方机构开设的培训课程名称,所属国家,所属机构以及链接,用户可以通过链接访问培训课程的官网以便学习该课程。

3.2.3　科研板块

　　科研板块主要从学术方面详细介绍全球的公共卫生的研究状况。通过内容不同分为:机构、项目、期刊、会议、数据库和文章这六大板块(图 7)。每个子板块都在科研板块中有标签,通过鼠标点击可以直接进入任意子板块。

　　机构子板块介绍了与全球健康相关的重要的机构,包括政府组织和非政府组织。可以通过链接直接访问其官方网站。

　　项目子板块介绍全世界基于公共卫生相关的项目申报动态。这些动态也是平台在全球健康相关领域网站上获取的消息:包括国家重点基础研究发展计划－973 计划等。

　　期刊子板块展示了与全球健康相关的期刊和杂志,并附上期刊类型和影响因子,方便全球健康研究者获取他们想要的信息(图 8)。

图 7　全球健康信息平台科研子板块效果图

序号	期刊名称	期刊类型	影响因子
1	中华预防医学杂志	——	——
2	卫生研究	——	——
3	中国公共卫生	——	——
4	中华疾病控制杂志	——	——
5	环境卫生学杂志	——	——
6	环境与职业医学	——	——
7	现代预防医学	——	——
8	AIDS	SCI/SCIE	6.407
9	Vaccine	SCI/SCIE	3.492
10	NUTRITION RESEARCH REVIEWS	SCI/SCIE	5.5

图 8　全球健康信息平台期刊子板块效果图

　　会议子板块列出近年来国内外召开的关于全球健康相关会议的会议名称,会议召开时间,会议地点等信息。并附上会议的官方网站方便用户访问。通过此板块,用户可以了解与全球健康相关的国际会议以及国际学术动态,方便研究型用户的学习和研究(图 9)。用户可以通过点击会议名称访问会议的

官方网站;

　　数据库子板将全球健康相关的国内外各大数据库全面的罗列出来,包括中国生物医学服务系统,中国生物医学文献数据库等国内的知名数据库网站和PubMed,BIOSIS Previews 等国外全球健康相关数据库。用户可以根据自己的喜好访问这些数据库,

随着平台深入发展,平台会将各大数据库的信息进行整合,分析,提取,一并展示给用户。

文章子板块是平台采用自主研发的爬虫系统对数据库中的医学论文和杂志中的文章进行搜集和整理,并把和全球健康相关的文章列出来,在如何定义和计算于全球健康的相关度时,平台采用了自然语言处理的关键词相关匹配算法,使得文章最大限度满足用户需求。为方便作者浏览,该子版块展示的内容有:标题名、期刊名、作者、发布时间、来源数据库等属性,并可以通过标题直接查看论文相关信息。该子板块分中英文两版,中文和英文只有来源数据库的不同。中文论文目前的来源数据库有万方和维普,英文数据是 Medline,随着平台的建设,来源的

增多,数据库会扩展到更多。

3.2.4 热点专题板块

热点专题是以专题为中心展示文章和新闻。根据公共卫生图书的编撰,平台讲专题定义为 7 大专题,分别是:疾病、环境、食品安全、社会与健康、人口与健康、公共事业管理、卫生经济。

这些专题都与公共卫生和全球健康息息相关。每个专题下又分文若干子专题,这些子专题都是公共卫生学者最关注的专题。点开专题后可以查看到相关专题的文章信息,包括,文章或者随时间分布,随地域分布,随来源分布等。以乙型肝炎为例,图10 是关于乙型肝炎专题中各新闻和学术文章的专题信息。通过专题走势图可以发现随着时间发展,网

图 9 全球健康信息平台会议子板块效果图

图 10 全球健康信息平台以"乙型肝炎"专题为例的子板块效果图

络上关于乙型肝炎的新闻和舆情越来越多。说明乙型肝炎在网络上的话题越来越热门; 通过媒体来源分布图可以看出不仅中国媒体, 美国媒体也同样有很多关于该病的新闻和舆情。通过专题来源分布图可以看出该信息的新闻、学术、媒体之间的组成分布。除了这些分布图, 专题来列出具有代表的一些文章标题及内容列表。还有该专题下的关键词标签云 (参考新闻板块的标签云)。

除此之外, 随着平台发展, 用户可以通过自己定义专题来了解该专题的新闻以及信息分布。

3.2.5　国际合作

因为全球健康是一个很宏观的概念, 需要多方面部门通力合作, 所以国际合作板块介绍那些与全球健康相关的组织, 机构和项目。国际合作板块下又有机构, 法律, 项目和援外, 这四大主题的子板块 (图 11)。机构罗列了与卫生相关的组织和机构。法律这介绍与全球公共卫生相关联的国际法律法规。项目则是介绍正在开展的公共卫生项目和基金。而援外展示的是中国对世界其他国家的公共卫生事业的资助。

图 11　全球健康信息平台国际合作板块效果图

3.2.6　本地搜索

平台还开设了本地搜索模块, 方便用户通过关键字或者关键字组合, 对信息平台所有新闻信息, 学术信息进行搜索, 进一步满足用户获取信息的需求。其中简单搜索是单关键字搜索, 高级搜索是多关键字复合逻辑搜索。

3.2.7　简报

最后板块是简报板块。一方面平台将定期通过人为的收集, 汇编与全球健康相关的简报供用户阅读。平台自带简报上传功能, 只需要将简报制作好, 通过文件上传的形式, 便可以将简报展示出来。同时也有文件上传功能, 后台管理人员可以将资源放入平台中, 供需要的用户进行下载。此外, 武汉大学公共卫生学院主办的《全球健康学杂志》也将在简报板块中刊出, 供相关科研人员阅览。

4　总结

总之, 该平台将一方面通过对国内外涉及全球健康的知名中、英文信息源 (包括新闻网站和论坛) 的智能化数据采集、处理和分析, 实时发布各类与全球健康有关的舆情、突发事件、疫情和热点话题; 另一方面, 将通过对权威文献库、学术网站、世界著名高校网站和全球健康相关的官方网站的最新文献的搜索、统计和分析, 实时掌握各类研究进展、国际合作、卫生政策动态及实施结果等; 此外, 该平台还能根据用户需求定制各类专题。该平台将可为卫生决策机关提供舆情简报, 为学术期刊杂志提供信息来源, 为本领域研究人员提供最新学术进展。随着信息平台的信息源进一步的完善, 希望本平台将有助于学术界及时了解全球健康各领域的研究动态和技术进展, 有助于全面准确地获取全球健康的突发事件、热点话题和前沿技术, 为我国应对全球疾病风险、制定合适的卫生政策和积极参与全球健康事务提供决策依据。

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Framework Construction and Application for Global Health Information Platform

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Abstract：Globalization has a profound impact on human health. Global public health problems，exacerbated by globalization，are becoming more and more complicated and diversified，which may be across national boundaries，departments and disciplines. In order to solve global health problems，it is necessary to mobilize all forces around the world to take action. At present，internet provides a better means to monitor and understand global health related information. In this paper，framework and application of our global health information platform are introduced. The functions of information platform mainly include two aspects：to analyze and disseminate theoretical and technological progress of global health main research fields；and real-time monitor emergencies，epidemic situation and hot topics related to the field of global health. The aim is to establish a Chinese-English bilingual information platform in the global health field. The platform would help academic researchers understand and master global health progress in time；acquire information of global health comprehensively，accurately and dynamically；and eventually help deal with the risk of global diseases，formulate appropriate health policies and actively participate in the global health affairs in the future.

Key words：Global health；information platform；basic framework；application

我国长期护理政策的发展与影响分析 *

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摘　要：本文回顾了 2000 年以来我国的老年护理相关政策，评述了政策发展的思路；利用中国老年健康长寿纵向调查等统计数据从护理服务能力建设、老年人护理机构转移、老年人护理需求满足度等方面评估了护理政策发展的影响；为建立老龄社会长期护理模式提供了建议。这些建议包括：政府发挥主导作用外，尚需公众支持；整合资金，提供更多的综合服务；培训护理人员，确保老年人长期护理的服务质量。

关键词：护理政策发展；护理服务利用；长期护理模式

1　引言

中国正面临前所未有的老年长期护理挑战[1]，老龄人口急剧增长背景下的老年护理问题受到世界瞩目，主要现实是尚未建全长期护理服务体系和社会保障体系，不能应对老年人口日益增长的长期护理需求[2]。根据 2012 年世界人口预测报告，2050 年我国 65 岁以上的老年人口数将是现在的 3 倍，达到 3.3 亿（约占总人口的三分之一），其中包括 1 亿 80 岁以上的高龄老人[3]。我国人口老龄化、高龄化正以史无前例的规模推进，已经导致巨大的老年长期护理需求。研究表明，2010 年我国需要长期护理的老人超过 1500 万[4]，到 2050 年这一数字将增至 2500～4500 万[5]。一方面是老年护理需求的高增长，一方面是家庭和社会的老年护理服务能力不足：中国的独生子女政策直接削减了家庭规模，依赖子女提供老年照顾的传统模式受到冲击；经济改革伴随的人口迁移进一步弱化了家庭非正式护理的功能，弱势（高龄、失能、失智、空巢、留守）老人的护理问题堪忧。如何满足老年人的护理需求，平衡家庭、

文化、社会经济发展之间的矛盾，成为我国长期护理政策需要考虑的重要问题。

本文通过回顾 2000 年以来我国的老年护理相关政策，评估政策发展对个人护理服务需求和利用的影响，为建立老龄社会长期护理模式提供建议。

2　我国老年护理相关政策的发展

由于意识到老年长期护理问题的紧迫性，中国政府自 2000 年以来连续出台了多项政策和法规，保护老年人被照顾的权益，保障老年人的护理需求。根据这些政策对老年长期护理服务的凸显程度，可以分为几个阶段。第一阶段，意识形成阶段（2000－2005）。国家大力推动社区服务建设，但社区的护理服务覆盖人群和功能非常有限；老年护理服务高度从属于社会救助服务，对象主要是五保、"三无"（无劳动能力、无生活来源、无赡养人和扶养人，或者其赡养人和扶养人确无赡养或扶养能力）等传统弱势人群。2000 年 8 月中共中央、国务院发布的《关于加强老龄工作的决定》[6]，成为后面十几年老龄政策的纲领性文件。《关于加强老龄工作的决定》要求加

强社区建设,依托社区发展包括生活照料和护理在内的多种老年服务。随后民政部连续出台了《关于在全国推进城市社区建设的意见》[7] 和《"社区老年福利服务星光计划"实施方案》[8],推进社区服务工作。2001 年 8 月国务院《中国老龄事业发展"十五"计划纲要》[9] 提出了在 2001-2005 年间大力发展社区老年照料服务的措施,包括在社区建立综合性、多功能的服务站,依托社区老年服务设施,采取上门服务、定点服务等形式,开展看护照料、精神慰藉、家务帮助等服务项目。2001 年至 2004 年间,"星光计划"总投资达 134 亿元人民币,建成"星光老年之家" 3.2 万个,涵盖老年人入户服务、紧急援助、日间照料、保健康复和文体娱乐等多种功能,受益老年人超过 3000 万[10]。

第二阶段,意识深化阶段(2006-2010)。政府深刻认识到我国老龄人口高龄化、空巢化的严峻现实,逐步重视高龄、失能、空巢老人的护理问题;鉴于家庭养老功能弱化这一事实,推动社区护理功能建设,鼓励兴办具备医疗护理功能的社会养老机构,构建老年人社会福利服务体系,促进老年人社会福利由补缺型向适度普惠型转变。2006 年 2 月国务院办公厅转发全国老龄委办公室和发展改革委等部门《关于加快发展养老服务业意见的通知》[11] 决定大力发展社会养老服务机构,支持兴办老年护理、临终关怀性质的医疗机构,鼓励医疗机构开展老年护理、临终关怀服务,按规定给予政策扶持。2006 年 5 月《关于加强和改进社区服务工作的意见》[12] 要求推进社区社会保障服务,在具备条件的地方开展老年护理服务。2006 年 8 月《中国老龄事业发展"十一五"规划(2006-2010)》[13] 强调了老年人口的高增速和农村老龄问题,要求以高龄老人和空巢老人的生活照料需求为出发点,在鼓励家庭成员为老年人提供服务的同时,加快建立以居家养老为基础、社区服务为依托、机构养老为补充的老年人社会福利服务体系。2006 年,中国老龄事业发展基金会在国家各部委的支持下在全国范围内开始实施"爱心护理工程"老年服务设施建设项目,主要面向生活不能自理的高龄老人,试图用老年福利社区化概念实现老年人居家养老、生活照顾、护理关怀等一站式服务功能。截至 2010 年底,该项目建成"爱心护理院"300 多家,覆盖了全国 31 个省市的 100 多个大中城市,提供床位 10 万张[14]。

第三阶段,启动推进阶段(2011-)。随着社会养老保障和医疗保障覆盖面的扩大,社会各界老年护理意识的增强,中央和部门政府明显加大了老年护理政策的力度,形成建立长期护理服务体系的理念。2011 年 9 月《中国老龄事业发展"十二五"规划(2011-2015)》[15] 提出要优先发展护理康复服务,加强老年护理院和康复医疗机构建设,兴办具有长期医疗护理、康复促进、临终关怀等功能的养老机构。卫生部在对全国护理院调研的基础上,修订并发布了《护理院基本标准(2011 版)》,在《中国护理事业发展规划纲要(2011-2015 年)》[16] 中指出"十二五"时期卫生事业发展的主要任务之一是探索建立"以机构为支撑、居家为基础、社区为依托"的长期护理服务体系。2012 年 12 月《中华人民共和国老年人权益法》从法律角度保障了老年人的护理需求,要求地方政府对生活长期不能自理、经济困难的老年人,根据其失能程度等情况给予护理补贴;政府投资兴办的养老机构,应当优先保障经济困难的孤寡、失能、高龄等老年人的服务需求。2013 年 2 月《中国老龄事业发展报告(2013)》[17] 提议建立长期护理保险制度,加大对商业长期护理保险的政策支持力度以促进其快速发展。2013 年 9 月《国务院关于加快发展养老服务业的若干意见》[18] 认为我国以居家为基础、社区为依托、机构为支撑的养老服务体系已经初步建立;提出到 2020 年全面建成服务体系更加健全的养老体系,包括生活照料、医疗护理、精神慰藉等在内养老服务覆盖所有居家老年人;规定公办养老机构应发挥托底作用,重点为"三无"老人、低收入老人、经济困难的失能半失能老人提供无偿或低收费的供养、护理服务。

从"十五"到"十二五",国家政策层面的老年长期护理战略逐步清晰,明确了家庭、社区和机构在老年护理服务体系中的定位。从居家传统、赡养法制、家庭建设等方面强调家庭的基础功能;从城乡社区网点覆盖和护理服务功能建设等方面加强社区对居家护理的依托作用;通过明确公立护理机构的托底功能,保障最弱势人群的护理需求;通过加强医院长期医疗护理功能和兴办社会护理机构保障超出家庭社区服务功能的护理服务需求。

3　长期护理服务供给与利用的发展

3.2　社区和机构护理服务能力的变化

根据国家对社区的定位,它是居家老人获得护理服务的重要载体。图 1 显示了 2000－2012 年间我国社区服务机构的发展状况。2000－2012 年间,社区服务机构的数量和覆盖率呈上升趋势,社区服务中心的数量稳步增长,其中,2006 年的机构调整使得社区服务机构的数量明显下降。截至 2012 年底,我国社区服务机构的数量达到 20 万个,社区服务机构覆盖率达到 29.5%(其中,城市达到 75.2%),社区服务中心达到 1.6 万个[19]。在发展的初始阶段,社区为老年人提供的护理服务非常有限[20]。到 2012 年,社区为老年人提供的服务内容已经得到较大的扩展,从提供日间照料等基本生活服务扩展到包括医疗护理、康复训练等专业性较强的领域。尽管如此,社区护理服务仍然存在着很大的提升空间,特别是在农村地区。

老年护理机构是老年人的集中供养场所,包括养老院、老年护理院、老年福利院等多种形式。图 2 显示了 2000－2012 年我国老年养老机构的发展状况。
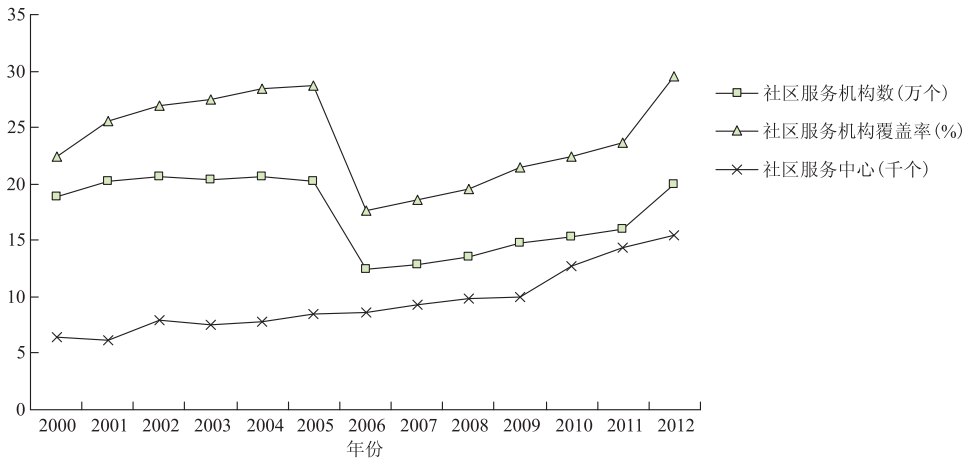
图 1　我国社区服务机构发展状况(2000－2012)

资料来源:《中国民政统计年鉴》(2013);社区服务设施覆盖率＝(社区服务中心＋社区服务站＋其它社区服务设施)/村居委会
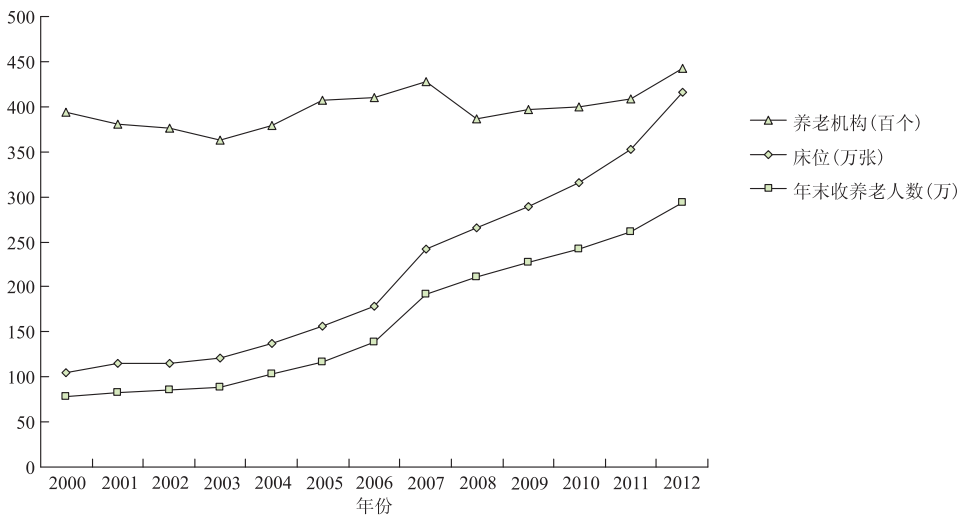
图 2　我国养老机构发展状况(2000－2012)

资料来源:《中国民政统计年鉴》(2013)

不难看出，2000 以来我国养老机构的数量、床位数和年末收养老人数均呈上升趋势；床位数增速高于养老机构数增速。养老机构数量和规模的增长与老年人上升的机构护理需求相适应[21]。Feng et al.(2011)的研究显示，在南京、天津和北京等大城市，大约 60%的养老机构建立于 2000 年之后[22]。截至 2012 年底，我国养老机构的数量达到 4.4 万个，床位 416.5 万张，年末收养老人 293.6 万人[19]。每千名老人拥有床位数从 2000 年的 8.0 张增长到 2012 年的 21.5 张[19]。

综合来看，我国老年护理服务硬件建设在护理相关政策的指导和支持下取得了显著的进步，形成了向上的长期趋势。但是，与我国老龄社会的现实需求存在着很大的差异。比如，老年护理机构的服务质量不高，床位不足，私立机构入住费用偏高等。截至 2012 年底，我国养老机构收养的老人只占老人总数的 2.1%[19]，远低于西方国家的 5%～7%。同时，长期护理发展的城乡差异成为制约老年人获得公平护理服务的重要因素。

3.2 老年人机构转移率的变化

随着老年护理机构数和床位数的增加，老年人从社区向机构转移的转移率呈现上升趋势。Peng & Wu（2013）利用中国老年健康长寿纵向调查（CLHLS）2002、2005、2008 和 2011 年的数据测算了我国老年人的机构转移率[23]。在每一个转移区间（2002－2005，2005－2008，2008－2011），对生存的老人，跟踪其居住转移；对死亡的老人，询问老人死亡前的居住转移。将这两种形式的转移进行累加，得到总的转移频数。利用调整的分城乡－性别－年龄权重计算相连两次调查间社区老年人的加权机构转移率。表 1 显示，机构转移率从 2002－2005 年间的 0.5%上升为 2008－2011 年间的 0.8%。

表 1 基于 CLHLS 调查的社区老人的机构转移率（2002－2011）

调查区间	基期	报告期					总转移
		删失	生存	生存并转移	死亡	死亡前转移	
	N	N（%）	N（%）	N（%）	N（%）	N（%）	N（%）
2002－2005	15609	1854（13.0）	7831（75.1）	57（0.4）	5384（11.9）	30（1.1）	87（0.5）
2005－2008	14935	2808（19.2）	7274（70.1）	47（0.3）	4853（10.8）	—	—
2008－2011	15809	2505（14.5）	8006（74.7）	86（0.6）	5298（2.2）	48（2.2）	134（0.8）

注：CLHLS，中国老年健康长寿纵向调查；频数是未加权数据，百分比是加权数据，用以反映整个人群的情况；由于 2005－2008 年调查未提供死亡老人的机构转移情况，他们的机构转移率空缺。

上升的护理机构转移率说明有越来越多的老人选择护理机构作为一种居住方式，特别是处于高死亡风险的老人，这一发现与预期相符。老年人入住机构不仅仅是个人的决定，通常跟家庭无力提供护理服务有关[21]。上升的护理机构转移率一方面反映了老年人对机构护理服务利用地增加，另一方面也映射出社会和家庭对老年护理态度地转变。护理机构要适应这种变化，满足老年人的护理需求，不仅要增加床位数，而且亟需提高护理服务质量。

3.3 老年人长期护理需求满足度的变化

发展长期护理服务的重要目的之一是满足老年人的长期护理需求。护理需求得不到满足对老年人卫生服务利用和生命质量产生不利影响。例如，老年人对所获得的护理服务不满意、更严重的失能、更多门诊和住院需求、增加的机构转移和死亡风险等。

由于我国机构和社区护理服务能力的增强，满足老年人护理需求的模式在最近十年可能发生改变。

Peng，Wu & Ling（2014）以潜在最多长期护理需求的 80 岁及以上高龄老人为研究对象，利用中国老年健康长寿纵向调查（CLHLS）2005 和 2008 年的数据，分析两次调查之间老年人自评护理需求满足度（包括完全满足、基本满足和不能满足）的变化，提供了护理需求满足度变化的经验证据[2]。考虑到居住在社区和养老机构的老人获取护理服务的显著不同，仅研究社区居住的老人。

在 2005 年 CLHLS 调查的 10298 位居住在社区的 80 岁及以上高龄老人中，需要日常生活帮助的有 3538 人，其中，3497 人得到了某种程度的帮助。2008 年的调查的样本量为 11720，需要日常生活帮助的有 3408 人，其中，3371 人得到了某种程度的帮

助。删除掉回答项有缺失的样本后,2005 年和 2008 年的有效样本量分别为 3457 和 3347 人,其中 446 人在两次调查中被跟踪访问。利用调整的分城乡—性别—年龄权重计算 2005 年和 2008 年高龄老人长期护理需求满足度的百分比构成。考虑两次调查间的重叠样本[24],估计百分比差异的方差,计算 Z 统计量,得出 P 值。

表 2 列出了 2005 年和 2008 年我国高龄老人长期护理需求满足度的百分比构成及变化[2]11。不难看出,大多数高龄老人自评其护理需求满足度"基本满足",其次是"完全满足",自评为"不能满足"的比重很少。例如,2005 年分别有 39.5%、56.3%和 4.2%的人评价自己的护理需求满足度是完全满足、基本满足和不能满足。从 2005 年到 2008 年,城市老人自评为"基本满足"的百分比显著下降 8.7 个百分点(P=0.040),没有发现"不能满足"百分比的变化;城乡老人自评护理需求为不完全满足的比重均有所下降,但仍然超过 50%。不论是 2005 年还是 2008 年,农村老人自评为不完全满足的百分比为均高于城市老人的。

表 2　我国高龄老人长期护理需求满足度百分比构成及变化(2005－2008)

| | 2005 | | | 2008 | | | 变化 | | | |
| | 完全满足 | 基本满足 | 不满足 | 完全满足 | 基本满足 | 不满足 | 基本满足 | | 不满足 | |
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	百分点	P 值	百分点	P 值
农村	576(36.3)	995(58.1)	82(5.6)	787(40.1)	994(56.3)	49(3.6)	−1.8	0.687	−2.0	0.156
城市	830(42.8)	925(54.4)	49(2.8)	700(49.8)	779(45.7)	38(4.5)	−8.7	0.040	1.7	0.202
汇总	1406(39.5)	1920(56.3)	131(4.2)	1487(45.3)	1773(50.6)	87(4.1)	−5.7	0.192	−0.1	0.943

自评护理需求满足度与老年人过去获取护理服务的经验有关。基于我国社区和机构护理服务的改进、老年人比过去更容易获得护理知识和信息、政府为老年人特别颁发高龄津贴,我国高龄老人在获取护理服务中的体验是可能得到提升的。尽管高龄老人的自评护理需求满足度有所提升,但自评护理需求为不完全满足的比重仍然超过 50%,且存在城乡差异。

4　建立老龄社会长期护理模式的建议

随着政策支持力度的加大,护理服务供给的增加,老年人对护理服务的利用也增加了,但是我国的长期护理服务仍然处于供不应求的状况。西方国家的研究一致表明,长期护理服务供不应求将导致老年人健康状况恶化,例如挤占急诊室,过度住院,发病率和死亡率增加。此外,我国长期护理服务供不应求也导致针对老年人的虐待和忽视率的增加。当前,为了给老年人提供更好的社会经济资源和健康护理,除进行养老保险和医疗保险改革外,更为迫切的是建立健全长期护理政策和制度。中国和其他国家都面临的挑战是,如何利用有限的资源,保障弱势老年群体的尊严和自主权。要实现这一目标,必须建立新的护理模式。本文主要探讨城市老年护理制度的发展。农村老年长期护理还处在萌芽阶段,面临更多挑战。城市老年长期护理制度的发展可以为将来农村有关制度的建构和发展提供经验。

4.1　政府发挥主导作用外,尚需公众支持

与许多发展中国家不同,在中国发展长期护理制度的初期,政府(而不是宗教和慈善组织)一直在支持贫困老年人获得机构照料服务方面发挥主导作用。虽然家庭有足够支付能力的非五保老人可以在私营养老机构获得长期护理服务,许多贫困或残疾的非五保老人,在需要长期护理服务时,希望获得机构照料但缺乏支付能力。因此,有必要加大政府投入力度,支持所有需要长期护理服务的老年人获得社区和机构的照料服务。政府还需为老年人提供健康护理需求评估(例如,进行标准化的健康测试),作为分配公共资金的主要标准,以满足弱势老年群体的长期护理需求。

在今后的改革进程中,政府将可能在设计、建立和完善机构护理制度的战略和政策方面继续发挥主

导作用。然而,其他国家的经验和教训表明,政府应该制定政策,创造良好的外部环境,以鼓励私营部门和非营利组织建立机构护理设施。当前,相关私营机构在中国开始涌现,并积极寻求营利模式。2011年,在北京等七个城市建立的养老机构中,大部分为私营性质[22]。国家鼓励兴办私营民办养老服务机构政策的陆续出台,还吸引了一些中低端酒店通过转型为养老院来获取商机[25]。然而,目前政府主办的社会福利机构和私营、非政府主办的福利机构之间存在不平等竞争。主要区别在于大多数政府主办的社会福利机构必须接受五保老人。未来的完善之策是向其他经验较为丰富的国家学习,公共资金直接向每名符合资格条件的老人(如五保和低收入老人)发放,机构可以间接地通过为这些老年人提供服务而获得资金收入。唯有如此,才能在长期护理服务领域建立一个更加合理的市场竞争机制。

当前,政府对机构照料的资金投入主要集中于入住社会福利机构的老年人,重点用于支持五保老人。对于广大的非五保老人,当其年老体弱需要照料时,传统的家庭支持面临越来越多的挑战(例如孝顺价值观发生变迁、人口结构变化、社会流动性增加、贫富差距加剧等)。因此,有必要加大政府投入力度,以支持贫困老年人和其他弱势老年人的机构照料。2003年以来,上海已经为贫困老年人建立了以社区为基础的长期护理服务机制,尽管资金投入有限,支持范围较小[20],毕竟已经做出有益的尝试。随着中国经济的持续增长,国家将有更多的公共资金投入机构照料服务领域,为非五保弱势老年群体获得长期护理服务提供资金支持。当然,根据中国东、中、西部或各省经济发展水平不同,各地区可以提供与当地经济相适应的资金和服务支持力度。

4.2 整合资金,提供更多的综合服务

无论对于发达国家还是发展中国家,长期护理与医疗保健系统的整合都是一个根本性的问题[26]。中国也不例外。民政部在为老年人提供照料服务方面发挥着重要作用,卫生部则负责为长期失能老年人提供医疗服务。然而,这两者在中国目前尚存在脱节问题。

在其他国家,如美国,州政府和联邦政府共同资助的医疗补助计划是政府在长期照护方面最大的一笔资金投入,其专门为低收入群体设计。联邦政府资助的医疗保险计划则主要用于支付医疗费用,包括急性病症的门诊费用和住院费用。

由于老年人长期护理需求的日益增长以及相关机构照料成本的日益增加,政策制定者制定了以家庭和社区为基础的服务计划(HCBS),重点关注非正式照顾者。早在20世纪80年代,长期护理方面最大的融资项目—医疗补助计划开始允许其中部分资金投向HCBS计划,并且所投资金稳步增长;到2006年,其达到该医疗补助计划中长期护理方面总支出的40%[27]。同时,美国实施一些示范项目,以不断探索长期护理服务的新方法。其中,老人服务的全包式(PACE)是最突出和最成功的方法之一。根据PACE计划,55岁及以上、经州政府认定需要入住护理院的老年人一经报名录取,就能够在社区或PACE服务区获得服务,过上有保障的生活。

PACE提供的医疗保险和医疗补助计划覆盖范围内的所有长期照护服务,包括开处方药、医疗服务、交通协助、家庭护理、检查和医院探访等。PACE起源于旧金山华埠健康服务中心开发的"On Lok"护理模式。这种模式极大地降低了住护理院的比率,节省了长期护理成本,并提高了护理质量,更重要的是,其帮助老年人在家独立居住。2011年,PACE这种基于社区的综合护理模式在29个州得到普及[28]。

在吸收其他国家经验和教训的基础上,中国最重要的是要发展家庭和社区为基础的长期护理。建立一些示范项目,扩大社区卫生服务中心的功能,为体弱老年人提供在家中医疗和家居照顾服务。卫生部和民政部可以同时为这些项目提供财政支持,对低收入老人提供补助。

在中国,国家层面已经开始探讨如何整合资金,为本国医疗保险制度覆盖范围内的城镇居民提供更多的综合服务。一些研究者建议,建立多层次、多功能的长期护理设施,为不同程度失能的老年人提供服务(包括医疗服务和社会服务)。综上所述,许多方面如融资、行政管理、服务传递,包括门槛设立、评估和服务提供等,都可进行整合。对上述一个或多个项目的整合能提高长期护理服务的有效性,确保服务的连续性,提高服务质量,加强服务效果。

4.3 培训护理人员,确保老年人长期护理的服务质量

缺乏技术熟练的护理人才是绝大多数老年长期照料机构拒绝接纳失能、半失能老人和痴呆症患者的最主要原因之一[29]。政府官员,专家和机构管理

者已经认识到,必须引入内容涵盖更广泛、适合不同水平护理人员的培训课程体系。随着国内逐步发展的长期护理制度,促使护理人员接受充分的、基于照料内容的培训显得至关重要。唯有如此,才能确保老年人长期护理的服务质量。然而,培训也应与当地受照料者的需求层面相适应。受照料者的护理需要将影响护理人员的培训目标。一般来说,受照料者失能程度越高,疾病越多,护理人员需要接受更多的培训,对护理人员的技能要求也越高。当前,在发达的城市地区,可能更加需要注重培训护士和护工。例如,老年人及其家庭对建立专门的长期护理设施(以提供特殊服务如老年痴呆症的护理)的需求日益增长,然而,老年痴呆症的特殊监护病房有限,应当建立更多的特殊病房,培训更多训练有素的护理人员,以满足这些老人及其家庭的需求。同时,许多外来务工人员也需接受语言技巧培训,以更好地与当地受照料者沟通,尤其是学会与有听力、语言或认知功能障碍的老年人沟通。培训也能使护理人员学会尊重受照料者,与被照料者形成更好的关系,并在他们的日常交往中更加积极主动地进行沟通。

中国政府提出社会建设的目标之一是"使全体人民学有所教、劳有所得、病有所医、老有所养、住有所居",其中,"老有所养"目标,尚需整合多方力量,关注多层次需求;是社会建设中的重大工程。建立多层次、多功能的长期护理设施,为不同程度失能的老年人提供服务(包括医疗服务和社会服务)。对一个或多个项目的整合能提高长期护理服务的有效性,确保服务的连续性,提高服务质量,加强服务效果。

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Long-term Care Policy in China：15 Years of Development and Its Implications

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Abstract：This paper reviewed the policies related to long-term care in China since 2000. Using the Chinese Longitudinal Healthy Longevity Survey，this paper assessed the impact of the policy development on elder care services abilities，institutionalization of the elderly，and unmet needs of Long-term care. This paper also provided policy recommendations to help strengthen Chinese long-term care system development. Those suggestions included government's role in designing，developing，and establishing strategies and policies，integration of long-term care with the acute health care system，and workforce training.

Key words：Long-term care policy development；elder care service utilization；Chinese long-term care models

Caretakers' Perceptions of Air Quality and Its Effects on Their Children in Nanchang，China

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Abstract：Background：China is undergoing rapid modernization and industrialization with air quality becoming a major concern and Air Quality Index（AQI）ratings in the hazardous range across the country. Children are particularly vulnerable to poor air quality. Little research has occurred to assess parental concerns regarding effects of poor air quality on their children's health. **Methods：**A self-reported survey of 721 caretakers of children between ages 2－10 was conducted in Nanchang，China. SPSS version 20 was used during data analysis. **Results：**Most of the respondents agreed that air quality affected their child's health. Those with less than a high school education found less association between air quality and child's health. Caretakers with knowledge of the AQI and had children with asthma，allergies，bronchitis，and wheezing were more likely to associate air quality with poor child's health. Caretakers with higher income levels，were willing to relocate to a different city，and had a child who had asthma，allergies，bronchitis，and wheezing were all significant predictors of willingness to pay to improve air quality. **Conclusion：**This is the first study that shows a quantitative connection between caretaker's attitudes and perceptions towards air quality in Nanchang，China but also illustrates a need for further research.

Key words：Air Pollution；China；environmental Illness

1　Introduction

Air pollution has been shown through several large epidemiologic studies to negatively affect morbidity and mortality.[1,2] In 2002，air pollution accounted for more than half a million deaths and 3.1 million lost years of healthy life in developing Asian countries.[1] Sustained exposure to air pollution in parts of China has reduced life expectancies by 5.52 years.[3] In China，air pollution has been rapidly increasing in recent years with the rapid economic growth. The development of new factories，cars and coal-fired power plants has led to high levels of particulate matter.[1]

As a result of the federal Clean Air Act，the United States' Environmental Protection Agency（EPA）calculates the Air Quality Index（AQI）to assess the level of particulate matter（PM）in the air. The AQI includes five major air pollutants：

ground-level ozone，particle pollution（also known as particulate matter），carbon monoxide，sulfur dioxide，and nitrogen oxide.[4] Particulate matter （PM）is defined by the EPA as a complex mixture of extremely small particles and liquid droplets.[5] PM is classified based on their diameter and health risks and vary based on the diameter of PM. PM smaller than 2.5 micrometers in diameter（$PM_{2.5}$） affects the lungs and heart and is emitted from power plants，factories，and cars. Exposure to sulfur dioxide，nitrogen dioxide，and particulate matter are all associated with adverse health outcomes.[1,6,7]

The AQI is a scale from 0－500，with scores below 100 indicating clean air and scores above 150 indicating unhealthy air quality. For scores between 100－150，sensitive groups including children should take precautions. Although an AQI of 500 was supposed to be the maximum AQI level， the US Embassy in Beijing reported an unprecedented AQI of 755 in January 2012.[8] The Chinese Ministry of Environmental Protection reported that only three of 74 cities met acceptable air quality standards during the first six months of 2013.[9] Main sources of pollutants included coal，motor vehicles，industrial，construction and transportation dust.[10]

Respiratory diseases are mostly chronic diseases that worsen with increasing exposure. With China's air quality projected to worsen，China's youth will be disproportionally affected by the poor air quality. Children are a high-risk population because of their developing physical growth and lung function and because they spend more time outdoors than adults.[2,11] Air pollution has been shown to be associated with respiratory conditions in children[2,12] and can also lead to hospital admitted asthma cases due to PM[13]. Other studies show exposure to PM is associated with low birth weight.[14,15]

Nanchang is the capital of the Jiangxi province with a population over five million as of 2010. Jiangxi is one of the poorest provinces in China. In 2011，a Jiangxi resident's average monthly salary of 2,838 Yuan was second lowest out of 22 provinces. However，Jiangxi is currently experiencing economic growth due to industrialization. Its 17.1% growth rate of its resident's average salary is the largest of the 22 provinces.[16] Nanchang's air quality has been shown to be ranked as low as 57th out of 74 major cities and as high as 31st.[17]

The objective of this study is to examine caregiver's current attitudes and perceptions of air pollution's effects on their child and to establish a baseline for future studies. Such information is necessary and important because we were unable to find any studies published in Chinese or English on this topic. Saksena[18] reported in 2011 that communities are now insisting on having more involvement in making decisions that affect their health and homes. Health behavior change is founded on first understanding the knowledge and attitudes of the targeted population.[19] Better understanding of public opinion towards this important public health topic will enable public health officials to enact better strategies to improve the air quality through policy change and education.

2   Methods

2.1   Data Sources

A cross-sectional survey between May to June 2013 was conducted at four sites：two primary prevention clinics（Center for Disease Control sites）， the only Children's Hospital in Jiangxi Province， and a kindergarten. Members of the investigating team had existing relationships with the four sites that serve the majority of the Nanchang population who live in two of the nine major districts. The Institutional Review Board of Human Studies Program at the University of Hawaii at Mānoa approved the study. Local institution protocols at Nanchang University were also followed.

2.2   Survey

As this was the first study of its kind，a 25-item questionnaire was devised that focused on at-

titudes and perceptions on air quality and air pollution. A majority of the questions utilized a four or five point Likert scale. Questions included: demographic characteristics, general perceptions of air quality, perceptions of the effect of air pollution on children's health, knowledge of air quality, and personal and political action towards air pollution. Utilizing a face-to-face interview style, each survey took on average eight to ten minutes to complete.

2.3　Inclusion Criteria

Jiangxi residents aged 18 years or older who were the parents or caregivers of a child between two and ten years old were eligible. Interviewers underwent an extensive training session prior to survey collection and participated in a debriefing meeting after the first day of survey collection to better improve interviewing protocols. Interviewers approached every possible participant who had a child that appeared to be older than two years old. Those who qualified were asked if they were willing to participate. If they consented, the face-to-face questionnaire was administered. Additionally, 40 surveys were sent home with the East Lake Kindergarten students because in person administration was not feasible.

2.4　Data Analysis

Data was analyzed using SPSS 20 (SPSS Inc, Chicago, IL). Frequency data was assessed to determine the basic perceptions of participants towards air quality and pollution. In particular, we focused on two outcome variables: whether or not respondents would pay more in fees to improve air quality and to what extent they thought air quality affected their child's health.

These independent and dependent variables were chosen based on the knowledge, attitude, and practices (KAP) behavioral survey model.[19] The questions in this model can reveal characteristic traits of a person's knowledge, attitude, and practices towards social, religious, and traditional factors. Such factors are often the source of misconceptions that can perpetuate the presence of a specific problem. Lacking knowledge of a problem is a barrier to change. Using these variables, we are able to measure caretaker's current attitudes and to set a baseline for further research.

Gender, income level, caretaker's age and highest education are basic independent variables included in most regression models. The other independent variables are respiratory complex one, respiratory complex two, their knowledge of air quality index (AQI) and how frequently it was checked, perception of what is the most important problem towards child's health, and if they would move from Nanchang due to air quality impacting their child's health.

Using Principle Component Analysis, we factored upper respiratory infection and coughing into chronic respiratory symptoms and asthma, allergies, bronchitis, and wheezing into chronic non-respiratory symptoms. Significant level was set at $\alpha = 0.05$.

Multivariate analysis involved a binary logistic regression model and an ordinal logistic regression model. The binary logistic regression tested whether the independent variables significantly predicted whether respondents would pay more in fees to improve air quality. The binary logistic regression independent variables were gender, income level, caretaker's age, observing a connection between child's health and air pollution, chronic respiratory symptoms, chronic non-respiratory symptoms, willingness to move cities, knowledge of AQI, and education level. Caretaker's age was coded as ≤50 years old and >50 years old.

The ordinal logistic regression determined if the independent variables were significant predictors of caretakers determining to what extent air quality affected their child's health. Gender, living in the city, income level, education level, knowledge of AQI, chronic respiratory symptoms, chronic non-respiratory symptoms, and most important problem towards child health were the independent variables for the ordinal logistic regression.

3 Results

Of the 805 eligible participants who were approached，721 completed the survey（89.5%）. Most（71.6%）of the participants were female. The caretaker's age ranged from 20 years of age to 76 years，and the majority（81.8%）were under 50 years of age（Table 1）.

Table 1　Demographics of respondents（n=721）

Characteristic	% of sample
Female	71.6%
Highest Education	
＜Elementary School	1.4%
Elementary School	6.8%
Middle School	18.6%
High School	34.1%
College	36.5%
Post-Graduate	2.6%
Place of Residence	
Countryside	16.0%
City	84.0%
Income Level（Yuan）	
≤10,000	6.5%
10,000 to 29,999	24.0%
30,000 to 59,999	31.1%
60,000 to 99,999	23.4%
≥100,000	15.0%
	Median
Caretaker's Age（Year）	35
Child's Age（Year）	4

Participants were asked to select what they believed were the top three contributors to air pollution in the city. Motor vehicles were the most selected cause of air pollution（89%）with an increase in use of air conditioners selected the second most often（35.6%）. Waste burning，construction of city and residential developments，industrial facilities，and cigarette smoke were selected by around one third of all respondents. Power plants were the least selected cause of air pollution（3.1%）.

Of respondents，78.5% were willing to pay more in fees to improve air quality. A vast majority of respondents（96.1%）felt that air quality affected their child's health with 57.1% of respondents seeing a strong effect. 28% thought air quality somewhat affected their child's health and 11% saw a little effect. Only 3.9% of respondents did not see air quality affecting their child's health.

Of the 10 independent variables in the binary logistic regression，caretaker's income level，child having chronic non-respiratory symptoms，and caretaker's willingness to move to a different city were significant predictors of the caretaker's willingness to pay more in fees to improve air pollution. The remaining 7 variables were not significant predictors（Table 2）.

Many of the independent variables in the ordinal regression were significant predictors of seeing an affect of air quality on their child's health during the univariate analysis. Observing a connection between child's health and air pollution was not an independent variable in this regression model because of a moderately high correlation（r=0.57）. However，once all nine were combined in the final model，only chronic non-respiratory symptoms，those with less than a high school education，and those that knew what the AQI and checked it frequently significantly predicted to what extent caretaker's thought air quality affected their child's health（Table 3）.

4 Discussion

Overall，it is clear that most residents of Nanchang believed that poor air quality significantly affected their child's health. Over 97% of caretakers observed a connection between their child's health and air pollution and over 96% also of caretakers felt air quality affects their child's health. Given the high response rate and the locations of data collection，the sample seems to be fairly representative of the population of parents and caregivers in Nanchang and the immediate surrounding countryside. Females are typically the primary child caretakers for most families,[20] which explains the distribution of

female to male caretakers in our study.

Table 2　Caretakers' characteristics associating air quality negatively affecting their child's health

Variable	Adjusted OR with 95% C.I.
Respiratory Complex Two	1.11 (0.97, 1.29)
Respiratory Complex One	1.24 (1.03, 1.48)
Location of Residence	
Countryside	1.01 (0.66, 1.54)
City	1
Gender	
Male	0.91 (0.65, 1.25)
Female	1
Income Level	
<10,000 Yuan	0.90 (0.45, 1.81)
10,000 to 29,999 Yuan	0.65 (0.39, 1.05)
30,000 to 59,999 Yuan	0.92 (0.57, 1.47)
60,000 to 99,999 Yuan	0.65 (0.40, 1.06)
≥ 100,000 Yuan	1
Perceived Most Important Problem	
Air Pollution	1.61 (0.90, 2.88)
Water Pollution	1.21 (0.50, 2.88)
Food Safety	1.11 (0.64, 1.95)
Drug Safety	1
Education Level	
< High School	0.58 (0.38, 0.89)
High School	0.77 (0.54, 1.10)
> High School	1
Knowledge of AQI & How often they check it	
Knows AQI and checks it frequently	2.21 (1.29, 3.74)
Knows AQI and checks it infrequently	1.43 (0.96, 2.15)
Knows AQI but does not check it	1.29 (0.81, 2.07)
Does not know AQI	1

Table 3　Caretakers' characteristics associated with willingness to pay more in fees to improve air pollution

Variable	Adjusted OR with 95% C.I.
Gender	1.32 (0.89, 1.97)
Income Level	1.2 (1.01, 1.41)
Caretaker's Age	1.1 (0.67, 1.87)
Have you observed a connection between your child's health and air pollution?	0.85 (0.68, 1.06)
Chronic Respiratory Symptoms	0.90 (0.75, 1.07)
Chronic Non-Respiratory Symptoms	1.26 (1.001, 1.59)
Willingness to move to a different city	1.63 (1.02, 2.63)
Knowledge of Air Quality Index	1.12 (0.94, 1.34)
Education level	1.05 (0.80, 1.38)
Living in the city	1.11 (0.64, 1.92)

However，it is not enough for caretakers to understand that air pollution negatively affects their child's health. It is also important for caretakers to know the major contributors towards air pollution in order for health behavior change to occur. We asked caretakers what they perceived to be the largest contributor of air pollution and only 3.1% selected power plants. China's biggest source of energy comes from coal，which accounts for about 75 percent of its energy.[21] But each coal-fueled power plant produces close to 775 GigaWatts and can be blamed for releasing about half of China's deadly PM.[22]

Power plants also release chemicals such as sulfur dioxide and nitrogen oxide into the air as well as particulate matter.[23] As a result of continued economic growth in China due to industrialization，the use of coal-fueled power plants will continue to increase. Navarro writes that China adds a new large coal power plant to its existing number every week.[21]

In contrast to the 3.1% of caretakers who selected power plants，89% of caretakers perceived motor vehicles as the major source of air pollution. As of 2009，car ownership in China has increased by 25 times and is responsible for 51.4 million tons of air pollution.[24] A study done by Badyda et al.[25] in 2013 showed people living in high automobile traffic areas are four times more often to show symptoms of bronchial obstruction. Car emitted $PM_{2.5}$ caused significant increases in respiratory inflammatory responses[26] and nitrogen dioxide emitted from automobiles may increase the risk of insulin resistance.[27]

An explanation for such a large discrepancy between caretakers' perceptions of motor vehicles versus power plants as the largest contributor of air pollution is the concept of point source pollu-

tion. Point source pollution refers to pollution originating at any discrete source.[28] Power plants are known to be a main point source for air pollution.[29] A study by Yao and colleagues[30] in 2006 also shows that high levels of PM concentrations were found downwind of a power plant. Their findings show that power plants can also be non-point sources for air pollution. In Nanchang，power plants are typically located outside city limits and are not visible by residents on a daily basis. This may explain the finding that respondents were less likely to perceive power plants as a source of air pollution.

We set out to understand how caretakers currently feel about the relationship between their child's health and air quality and to establish a baseline for future research. These survey results can be useful to Nanchang public health officials in their approaches to improve the air quality in Nanchang though educating specific populations identified in our analysis.

While awareness of a problem is a key component towards initiating public health change，willingness to take action is an important next step. Of the caretakers surveyed，78.5% of them were willing to pay more in fees to improve the air quality. Furthermore，98% of caretakers consider improving the environment is the responsibility of every citizen. This not only shows caretakers' awareness of air quality，caretakers' are also ready to take action.

However，not every caretaker surveyed found air pollution to be a problem towards his or her child's health. Further analysis from the ordinal logistic regression identified specific caretaker populations with whom to focus education efforts. Caretakers with less than a high school education were at lower odds of thinking air quality affected their child's health. Caretakers who knew what the AQI was and checked it frequently had higher odds of seeing air quality as having an effect on their child's health.

Initial education efforts led by Nanchang pub-

lic health officials can focus on caretakers with less than a high school education to awareness of the effects of air quality on children's health. In addition，public health officials can now improve caretaker's access to the daily AQI readings，increasing the odds of a caretaker associating air quality with their child's health. Improving the air pollution problem will require public health intervention at multiple levels. This study can help to further this public health change at the individual and household levels and also potentially affect policy level change.

5　Limitations

This study has several limitations. It was limited to only four sites in Nanchang and two of those sites were vaccination and wellness sites. Therefore，parents who were not bringing in their children for vaccines were not included in the study. Because all the sites were in Nanchang City，those who lived in rural areas outside the city were less likely to visit one of the four sites and participate. Also，men were under represented in this study. Although social desirability is often an issue in self report studies，the high level of concern about air quality indicates that it was of minimal concern in this study.

Acknowledgements

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第1卷第2期
2014年10月

全球健康学杂志
Global Health Journal

Vol. 1 No. 2
Oct. 2014

Factors Affecting Feeding Frequency in Animals

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Abstract：The worldwide increase of the obese population has become a topic of global health and a concern of public health. As eating/feeding contributes to the maintenance of body weight，it becomes urgent to understand effects of feeding behaviors on the control of body weight. One component of feeding behaviors is the frequency at which meals are consumed during a day. Whether feeding more or less frequently benefits body weight control or metabolic outcome of a subject is still an open question. Animals have been used extensively in feeding behavior studies along with other physiological topics. The controlled conditions in animal studies allow the identification of potential behavioral and physiological factors that can promote or decrease feeding frequency. Additionally，through the administration of natural and synthetic compounds，researchers have been able to measure how the feeding frequency of animals is affected in certain brain regions or molecular pathways. The aim of this article is to review animal studies that reported factors positively or negatively affecting feeding/eating frequency. Due to the large number of publications regarding animal feeding behaviors，we mainly summarized the studies that focused on eating/feeding frequency in rodents. We believe that a better understanding of how feeding frequency of animals responds to various manipulations will allow us to translate results in animal studies to interventions in humans. In so doing，the obesity epidemic as a global health problem can be curtailed.

Key words：Body weight；feeding frequency；eating behaviors；diet compositions；hormones；obesity

1 Introduction

With the rising prevalence of obesity，it becomes more and more urgent to understand factors affecting eating behaviors in order to prevent these detrimental outcomes. Both internal and external factors affect feeding behaviors. Behaviors such as timing of meal consumption，duration，and frequency can all influence physiological processes of metabolism [1]. It has been shown that increasing the length of time between meals seems to promote

brain and overall health of mice via changes in expression levels of genes beneficial for neuronal survival，synaptic plasticity，and neurogenesis as reviewed elsewhere[2,3]. Dietary restriction through either caloric restriction or intermittent fasting can have a positive impact on cellular stress responses leading to increased production of proteins involved in protection against neurodegeneration，oxidative stress，and obesity，thus not only prolonging life，but also increasing the quality of life[2]. The frequency of food intake may eventually affect metabolic outcomes，such as alteration of body compo-

sition and development of metabolic diseases. Therefore，knowing what factors could positively or negatively alter feeding frequency is of utmost importance.

Animal studies have shown a wide range of factors that could possibly influence the frequency of food intake. These factors range from environmental conditions（i. e. temperature）to dietary components or drug usage. A variety of these conditions have been studied in animal models for decades. It becomes possible to review their roles in the regulation of feeding frequency in animals，which have been primarily rodents. Therefore，this review will focus mainly on studies conducted in rodents，and on the physiologic，genetic，environmental，and behavioral factors that primarily influence feeding frequency. In this article，feeding frequency，eating frequency，and meal frequency are used interchangeably.

2　Environmental conditions & manipulation of dietary composition

The environment can play an important role in the regulation of feeding frequency as shown in Table 1. The manipulation of the environment allows the examination of environmental factors that impact feeding frequency. In female rats，the increased food intake in cold is due to the increase of meal frequency rather than a change in meal size[4]. One way to access the feeding behavior is to determine the costs and benefits in laboratory environments that offer multiple behavioral options and then obtain animals' allocation of time and effort to each option. Studies performed in rats using a procurement bar as well as activity wheels found that feeding bout frequency declines with the increase of feed cost (effort to get food)[5]. In female

Table 1　Environmental Conditions & Dietary Composition

Manipulation	Animals	Intervention	Testing Duration	Mechanisms	Conclusion	Ref.
Access to activity wheel（during ovarian cycle）	Long Evans Rats	Wahmann running wheel Diet：ground rat chow	4 days	Locomotor activity increases during ovarian cycle Hormonal regulation of satiety	↓ FF	6
High procurement cost	SD Rats	Activity wheel Diet：ground Purina Laboratory chow ad libitum	38 days total	Anticipation	↓ FF	7
High procurement cost	SD Rats	Procurement bar Diet：45mg pellets （rodent chow formula）	40 days	Anticipation	↓ FF	8
Hypercaloric diet during lactation	Wistar Rats	Lactating rats：hypercaloric foods Offspring：rodent chow diet	1 hour (12 x 5 min bouts)	Alterations in dopamine metabolism	↑ FF	12
Switching diets（Cafeteria-fed → chow-fed）	Lister-hooded Rats	Chow Diet Cafeteria Diet	78 days total	Palatability for chow diet decreases following cafeteria diet	↓ FF	13

FF：Feeding Frequency；Ref：references；up arrow：increase；down arrow：decrease.

rats with access to running wheel，their meal frequency decreases in the dark with the rise of meal size[6]. If feed cost is too high，rats can adjust eating frequency，meal size，and daily food intake to accommodate the changes[7,8]. A more in-depth perspective on the effects of meal pattern behaviors in relation to food cost has been reviewed elsewhere[9].

Manipulation of the dietary composition may lead to changes in feeding behavior and impact disease development. Chronic hyperinsulinemia caused by increased frequency of carbohydrate intake has been considered the driving force for insulin resistance and development of obesity. However，a reduction in the frequency of carbohydrate intake without a decrease in the recommended 55－60％ daily caloric intake has been proposed to attenuate the problems in human subjects[10].

Dietary composition has long-term impacts on feeding frequency in rats. It has been shown that chronic food restriction with low dietary fat can cause overeating when a high-fat diet（HFD）was provided to rats，and the animals fed a fat-free diet（FFD）had the same body composition as the ones fed a low-fat diet（LFD，16％ energy from fat）[11]. Interestingly，when lactating Wistar rats were fed a hypercaloric cafeteria diet，male adult offsprings had increase in eating frequency accompanied with shorter eating bouts at 12-15 weeks of age while female rats had both a higher number of feeding bouts and longer feeding times[12]. When rats fed a cafeteria diet were switched to consume a chow diet，their meal frequency dropped in the first four weeks[13]. It is possible that this decrease in meal frequency was due to a reduction in palatability for the chow diet that replaced the more desirable cafeteria diet. The underlying molecular mechanism of this long-term effect deserves to be investigated further.

3 Brain regions and hormones affecting feeding frequency

The brain regions and neural circuits responsible for feeding have been gradually revealed over time as shown in Table 2. It is reasonable to believe that neuronal signals play the most important role in satiety and feeding behavior. Many original studies have focused on the control of feeding behavior by neural circuitry and this will continue to be the case due to the obvious connection of feeding behavior and increasing prevalence of obesity[14,15].

It has been shown that lesions in the ventromedial and lateral hypothalamus regions have been associated with increase or decrease food intake behaviors，respectively[16]. Damage to the medial hypothalamus in CD rats led to a hyperphagic effect characterized primarily by increased feeding frequency along with an increase in meal size[17]. Interestingly，when a 20-second delay of food pellet release was implemented，there was little change in total food intake by the rats due to decreases in meal size while increasing meal frequency[17]. Anterior hepatic vagotomy presumably disrupts a hepatic caloric sensory mechanism diminishes inhibitory vagal effects on food intake with total parental nutrition，and causes change of feed behaviors such as increase of meal frequency in rats[18].

Feeding frequency is a result of coordinative interactions of peptide hormones that can stimulate and inhibit it. Ghrelin，a hormone stimulating food intake，increased meal frequency in rats when it was delivered to the ventral，but not dorsal subregion of the hippocampus for 2 hours[19]. This increase in feeding frequency with ghrelin was attributed to the activation of the phosphoinositide 3-kinase signaling pathway when rats consumed a normal chow diet，but the consumption of a HFD blocked

Table 2　Brain Regions and Hormones

Factor	Animals	Treatment (dose)	Delivery Method	Mechanisms	Region of Action	Conclusion	Ref
Damage to Medial Hypothalamus (MH)	CD Rats	T101 food pellets (45mg/pellet)	Diet: ad libitum (pellet dispenser) Surgery: encephalotomy procedur	Disruption of typical satiety signaling	MH	↑ FF	17
Hepatic vagotomy	Fischer 344 Rats	Post-vagotomy: TPN solution	3ml/h of fixed caloric distribution of glucose: fat:amino acids＝50 : 30 : 20	Disruption of hepatic caloric sensory feedback loop	Hepatogastric omentum	↑ FF	18
Ghrelin	SD Rats	Ghrelin (0, 7.5, 15, 75, 150, and 750 pmol/kg)	Dorsal and ventral hippocampus ICV infusion	Activation of PI3K signaling pathway	Ventral hippocampus	↑ FF	19
Ghrelin	SD Rats	Ghrelin (150 pmol/ kg/min)	IV infusion	Disruption of GLP-1 and PPY signaling	Gastrointestinal vagal sensory nerves/hypothalamus	↑ FF	20
Glucagon-like peptide-1	SD Rats	GLP-1 (0-30μg)	ICV infusion	Decreases orosensory positive feedback mechanisms driving feeding/licking	Hypothalamus/ hippocampus	↓ FF	21
Adrenaline	Wistar Rats	Adrenaline (6, 20, and 60 nmol)	Injection via cannula into median raphe nucleus (MRN)	MRN neurons/adrenergic receptors	MRN	↑ FF	22
Leptin	Wistar Rats	Leptin (0, 0.3, 1, 3, 6.25μg/kg body weight)	ICV injection	Binds to leptin receptor leading to activation and possible synergism with other feeding-induced negative feedback signals	Brain (arcuate, dorsal and ventral hypothalamus)	↓ FF	24
Nesfatin-1	C57Bl/6 Mice	Nesfatin-1$_{30-59}$ (0.1, 0.3, 0.9 nmol/ mouse)	ICV injection	Upregulates expression of anorexigenic brain peptides	Brain, hypothalamus	↓ FF	27
Cyclic Estradiol	Long Evans Rats	17β-estradiol-3-benzoate (2μg)	Intrascapular subcutaneous injection	Potentiating effects of CCK	Hypothalamic-pituitary-gonadal (HPG) axis	↑ FF	28.29
Cholecystokinin (CCK)	Long Evans Rats	CCK octapeptide (CCK-8, 1.1μg/ meal)	IP infusion	Prolonged infusion leading to prolonged gastric emptying	Pancreas (acinar cells)CNS (CCK receptors)	↑ FF	31
Kisspeptin-10	C57BL/6 Mice	Kisspeptin-10 (0.3, 1, and 3 μg)	ICV injection	Inhibition of NPY/ MCH signaling; Recruitment of POMC-derived α-MSH	Lateral brain ventricle/hypothalamus	↓ FF	32
Melatonin	Wistar Rats	Melatonin (1mg/kg body weight)	Supplemented to drinking water	Can lead to alterations in leptin and ghrelin signaling	Hypothalamus	↑ FF	35
Urocortin 2 (Ucn 2)	C57BL/6 Mice	Ucn 2 (10 μg/kg body weight)	IP injection	Activation of gastric vagal afferent fibers	Brain	↑ FF	36

FF: Feeding Frequency; Ref: references; up arrow: increase; down arrow: decrease.

this activation[19]. In contrast to the action of ghrelin, glucagon-like peptide-1 (GLP-1), and peptide YY (PYY) are both hormones known to inhibit food intake. An infusion of ghrelin (150 pmol/kg/min) in Sprague Dawley (SD) rats attenuated the inhibition of food intake caused by GLP-1 and PYY and enhanced food intake by 28% primarily through increasing feeding frequency[20]. An intracerebroventricular (ICV) infusion of GLP-1 into rats led to a 50% reduction in sham-fed intake associated with a decrease in feeding frequency[21]. Injection of adrenaline, but not noradrenaline, at 60 nmol/0.2 μl directly into the median raphe nucleus of freely feeding Wistar rats caused induction of feeding frequency in the 30-minute experiment[22].

Leptin is a hormone mainly derived from adipose tissue and is widely known for its role in the regulation of energy balance[23]. When a drinking-inclusive, empirical meal definition, and fenfluramine group was used as the satiation control, it has been shown that leptin (ICV, 1μg) reduces food intake through the reduction of meal frequency on nocturnal feeding[24,25]. As the control, fenfluramine (subcutaneous, 5 and 10mg/kg) does it through reduction of meal size.

Nesfatin identified from hypothalamus is a protein that controls appetite[26]. In one study, a group of researchers investigated which portion of the 82 amino acid Nesfatin controls its effects on feeding. After the ICV administration of nesfatin-1$_{1-29}$, nesfatin-1$_{30-59}$, or nesfatin-1$_{60-82}$, nesfatin-1$_{30-59}$ (0.3 nmol/mouse) was the one that decreased meal frequency[27].

Rats with the ovariectomy altered feeding patterns such as hyperphagia characterized by an increase in meal size, and a decrease in meal frequency[28]. Treatment of such rats with cyclic estradiol resulted in normalization of the altered patterns including reduced meal size and food intake with an increase in meal frequency[28]. The action of cyclic estradiol in ovariectomized rats is at least partially attributed to potentiating the satiety effects of cholecystokinin (CCK)[29]. CCK, is one of the most studied satiety hormones that plays a role in suppressing human feeding[30]. A study utilizing male Long Evans rats found that the infusion of 1.1 mg/meal of the octapeptide of CCK (CCK-8) led to a 44% reduction in average meal size while daily meal number increased by 162%[31]. This shift in feeding pattern could be attributed to the prolonged infusion of CCK-8 leading to prolonged gastric emptying.

Due to the wide distribution of the kisspeptin gene in regions of the brain associated with food intake control, kisspeptin has been postulated as an important regulator of food intake. Administration of kisspeptin-10 (1μg/mouse) into the brain ventricle of mice with 17-hour depletion of food resulted in reduction of meal frequency for 24 hours[32]. However, central administration of kisspeptin at similar doses failed to change feeding behavior in rats, showing the effects could be specific to species[33,34].

When the gut-derived hormone melatonin was included in drinking water, it increased the dark phase meal frequency of normal rats, but not that of streptozotocin-induced diabetic rats, which was already induced by diabetes[35]. Intraperitoneal (IP) injection of urocortin 2 (Ucn 2, 10μg/kg body weight) increased meal frequency of mice in the 4-hour observation period after an over-night fasting, and did not affect meal frequency of mice fed ad libitum in the dark phase[36].

4　Natural and synthetic compounds

As shown in Table 3, natural and synthetic compounds also affect feeding frequency. With the increasing prevalence of obesity and obesity-related disorders, a significant number of pharmaceutical compounds have been used experimentally to regulate

Table 3　Natural and Synthetic Compounds

Factor	Animals	Treatment (dose)	Delivery Method	Mechanisms	Region of Action	Conclusion	Ref
D9-Tetrahydro-cannabinol	Zucker Rats	D9-Tetrahydrocan-nabinol (1, 4, or 8 mg/kg body weight)	IP injection	Suppression in satiety signaling	Hypothalamus	↑ FF	37
AM251	Ob/ob Mice C57Bl/6 Mice	AM251 (1, 3, or 10 mg/kg body weight)	Oral gavage	CB1R antagonists may activate dopamine signaling to stimulate locomotor activity	Brain	↓ FF	38
Cannabinoids	Topeka Guinea Pigs	CB1 receptor agonist WIN 55，212-2 (1 mg/kg)，antagonist AM251 (3 mg/kg) or their cremophore/ethanol/saline vehicle (1：1：18；1 ml/kg)	Injection	Proopiomelanocortin (POMC) neurons	Hypothalamic arcuate nucleus	↑ FF	39
Amylin Receptor Antagonist (AC187)	SD Rats	AC187 (60-2，000 pmol/kg/min)，either alone or coadministered with amylin (2.5 or 5pmol/kg/min)	AC187 and amylin-intravenous infusion Liquid diet-intragastric infusion	Prevention of amylin binding to its receptor	To be determined	↑ FF	41
Nalmefene	Zucker Rats	Nalmefene (1mg/kg body weight)	Subcutaneous injection	Opposes actions of opioids	Hypothalamus	↑ FF	43
Bombesin	SD Rats	Bombesin (0.1-4.0 mg)	ICV injection	To be determined (paraventricular structures with bombesin receptors?)	Lateral cerebral ventricle	↓ FF	45
2-buten-4-olide (2-DTA synthetic derivative)	Wistar Rats	2-buten-4-olide (30-100mg/kg body weight)	IP injection	Activation/stimulation of VMH glucoreceptors；Suppression of LHA neuron actions	Brain and cerebrospinal fluid	↓ FF	47
Lithium Chloride (LiCl)	Long Evans Rats	LiCl-150 mM (1.9 mg/meal/rat)	Meal-contingent infusion	Creates aversions (taste)	Taste buds	↓ FF	48
Pancreatic lipase inhibitor (Ro 20－0083)；Hepatic fatty acid synthesis inhibitor (Ro 22－0654)	Zucker Rats	Ro 20－0083 (774 mg/100 g diet) Ro 22－0654 (322 mg/100 g diet)	Diet admixtures	Inhibition of pancreatic lipase and hepatic fatty acid synthesis enyzmes	Liver and intestines	↓ FF	49
Olanzapine	Wistar Rats	Olanzapine (1，2.75，or 7.5 mg/kg/day)	Implanted osmotic minipump Orally (drinking water－7.5 mg/kg/day only)	Thermoregulation，locomotor activity	Hypothalamus	↓ FF	51
Simmondsin	Wistar Rats	Simmondsin (0.15%，0.25%，or 0.5%)	Saccharin solution with various amounts of simmondsin	Conditioned taste aversions (CTA)	Vagal nerve	↓ FF	53

FF：Feeding Frequency；Ref：references；up arrow：increase；down arrow：decrease.

feeding behaviors. When Δ9-tetrahydrocannabinol，the principal cannabinoid of the cannabis plants，was injected at 4mg/kg，it transiently（3 hours）increased meal frequency in male Zucker lean（ZL）and fatty（ZF）rats[37]. AM251，a cannabinoid receptor type 1（CB1）antagonist，reduced feeding frequency in ob/ob and agouti yellow obese mice[38]. The effect of the CB1 receptor on meal frequency is short. CB1 agonist（WIN 55，212-2）alone induced meal frequency in the second hour after administration，and suppressed meal frequency between 3 to 6 hours，whereas its antagonist（AM251）reduced meal frequency in the first hour only[39]. The combination of agonist and antagonist neutralized each other's effects[39].

Amylin，a hormone secreted by the pancreas along with insulin during feeding，has been shown to suppress food intake[40]. An amylin receptor antagonist，AC187，induced meal frequency within 3 hours after administration[41]. Following the administration of amylin which suppressed meal intake in Sprague Dawley rats by 50％ as well as meal size and frequency，infusion of AC187 led to an attenuation of these responses[41]. Since amylin can cross the blood-brain barrier，this compound most likely affects meal frequency by acting within the brain[42]，but AC187 has only been postulated to act within the brain as the exact site of action has yet to be determined.

When nalmefene，an opioid antagonist，was administrated daily subcutaneously at 1mg/kg for 7 days，it increased meal frequency in ZF rats[43]. This increase in meal frequency was coupled with a decrease in meal size as well as daily food intake. The dopamine D_2 agonist N-0437 significantly reduced food intake in rodents without altering the duration or frequency of feeding[44]. These studies demonstrate the impact of opioids as well as opioid antagonists on the regulation of feeding behaviors including feeding frequency in rodent models.

Bombesin，a tetradecapeptide，inhibits food and fluid intake when administrated in the lateral cerebral ventricle of rats[45]. Litorin，a bombesin-like nonapeptide，was also found to dose-dependently decrease food intake in Wistar rats after parenteral injection，but feeding frequency was not significantly altered[46]. Intragastrical administration of 2-buten-4-olide，a synthetic derivative of 2-deoxytetronic acid，reduced meal frequency in rats[47].

Lithium chloride（LiCl）infusion（1.9 and 3.8mg/meal/rat）dose-dependently reduced feeding frequency in rats[48]. This reduction in frequency with LiCl can most likely be attributed to the taste aversion created when LiCl is blended into food. Ro 22-0654，an inhibitor of hepatic fatty acid synthesis，and Ro 22-0083，an inhibitor of human pancreatic lipase，significantly reduced meal frequency in both ZL and ZF rats whereas inhibitors of carbohydrate metabolism did not have the same effect[49]. The use of olanzapine，an atypical antipsychotic drug，has been associated with weight gain in patients[50]. In rats，administration of olanzapine via an osmotic minipump for 9 days dose-dependently（1 to 7.5mg/kg body weight）reduced meal frequency as well as locomotor activity with the increase of average meal size[51].

Simmondsin，a glycoside extracted from jojoba seeds，can reduce food intake and body weight gain in rats[52]. Simmondsin has been suggested to be the primary component of jojoba meal that leads to its appetite reducing effects[52]. Rats with prior experience with 0.5％ simmondsin，but not the ones without prior experience，fed normal food supplemented with 0.5％ simmondsin had reduced meal frequency in the light phase，but not the dark phase of feeding cycle[53].

5　Factors associated with cancer and inflammatory conditions

　　Disease conditions such as cancer or pathogen exposure usually have negative outcomes on feeding behavior. For example，mice with the methylcholanthrene-induced sarcoma MCG-101 displayed a reduction in meals consumed per day，demonstrating the effects of tumor bearing on eating frequency[54]. Using inhibitors that directly target cyclooxygenase-1 and-2，the anorexia induced by MCG-101 tumors has been thought to be driven by cyclooxygenase-1，but not cyclooxygenase-2[54].

　　Bacterial lipopolysaccharides（LPS）derived from the cell walls of dead and disintegrating gram-negative bacteria activate Toll-like receptor 4 on cell membrane and have anorexia effects in animal models[55]. LPS infusion via hepatic portal vein（$100\mu g/kg$ body weight）decreased meal frequency along with reduction of food intake，without affecting meal size or duration[56]. LPS infusion has also been shown to decrease feeding frequency without altering fluid intake suggesting that LPS is not altering the desire for consumption [57]. It should be noted that even though peripherally infused LPS decreases meal frequency，centrally infused LPS has been shown to alter meal size and duration，therefore，the infusion site in which LPS is administered determines the mechanisms in which LPS alters feeding[58]. It has been observed that the mRNA level of interleukin-1βcan be induced by LPS and leptin in the hypothalamus[59]. ICV administration of interleukin-1β decreased nighttime（4.0ng/rat）and increased daytime（1 to 4.0ng/rat）meal frequency in male Wistar rats[60].

　　Muramyl dipeptide（1.5mg/kg body weight），one of the major components of cell wall of gram-positive bacteria，reduced meal frequency of adult rats at 3－6 hours of a 24-hour experimental period when administered through IP injection[61]. This reduction in feeding frequency most likely did not stem from presumed taste aversion，but instead from the bacterial infection causing sickness.

6　Genetic knockout studies

　　The genes responsible for the feeding frequency have been studied in mice after they are deleted from mouse genome. Mice with conditional deletion of brain-derived neurotrophic factor in smooth muscle cells have elevated meal frequency accompanied by increases of food intake and development of obesity[62]. This seems to be due to the disruption of communication between the gastric intestinal afferents and the brain，thus decreasing the feeling of satiety.

　　The physiological functions of prostaglandin E2 are mediated by E prostanoid receptor subtypes 1 to 4（EP1-4R）[63]. Mice with EP3R deletion showed the increase of feeding during the light cycle with the development of obesity[64]. Mice with deletion of cholecystokinin type 1 receptor（CCK1R）have lower meal frequency than their wild type controls regardless of the dietary fat content，demonstrating the role of CCK in the regulation of feeding behavior[65]. However，HFD consumption prolonged meal time in both wild-type and CCK1R knockout mice compared to those mice consuming a LFD，indicating that CCK may play a role in meal frequency whereas fat content may have a greater role in regulating meal duration[65].

7　Conclusion

　　As we have summarized here，both controllable and uncontrollable factors can affect feeding frequency. With satiety/feeding regulation signals derived from different regions within the body such

as the hypothalamus，gastric intestinal tract，and oral cavity，multiple complex interactions occur to influence many facets of feeding behaviors. Leptin，ghrelin，insulin，glucagon，amylin，and other hormonal factors play an active role in regulating feeding behavior，but the exact mechanisms of how all these hormones coordinately influence feeding frequency still needs to be examined. Rodent model systems have been an invaluable tool to identify mechanisms controlling feeding frequency. They have provided vital information of translatability to human feeding frequency investigation. As part of the problem of obesity treatment is to control feeding behaviors，additional studies of factors summarized in this review are warranted. They certainly will help us to control the epidemic of obesity and other metabolic diseases.

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第1卷第2期
2014年10月

全球健康学杂志
Global Health Journal

Vol. 1 No. 2
Oct. 2014

Brief Review of Smoking Cessation Training for Medical Students Worldwide: A New Initiative of Experiential Learning for Tobacco Control in Hong Kong

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Abstract: We briefly reviewed the literature regarding medical students' knowledge of tobacco use, tobacco control advocacy and smoking cessation intervention, and found an alarming deficiency worldwide. Medical students, especially those from developing countries, usually could not identify their responsibilities as future physicians to advocate for strong tobacco control policies, and advise patients routinely to quit smoking. Many medical schools failed to implement a tobacco control and smoking cessation curriculum, with one-third or even fewer medical students reporting that they had received specific training on tobacco cessation. We described the teaching program for tobacco control advocacy and smoking cessation for medical students in the University of Hong Kong, shared our experiences and made recommendations on future tobacco control and cessation training for medical students.

Key words: Tobacco control; brief review; smoling cessation training

Introduction

The tobacco epidemic is one of the biggest public health threats in the world. Each year, tobacco use kills nearly 6 million people worldwide, with more than 5 million of these deaths resulting from direct tobacco use and more than 600,000 deaths from secondhand smoke exposure[1]. Nearly 80% of tobacco-related deaths occur in low-and middle-income countries, where the burden of tobacco-related illness and death is heaviest and rapidly expanding[1,2]. The World Health Organization (WHO) estimates that unless urgent action is taken, over 8 million people will die from tobacco use annually by the year 2030[1].

Physicians play a critical role in reducing tobacco use by encouraging nonsmoking patients not to use any tobacco products and advising smoking patients to quit[3]. Physician's advice is associated with increased likelihood of quitting[3-6]. Even brief advice is associated with a substantial increase in patients' smoking cessation rates[7-11]. After receiving such advice to quit smoking, patients were more likely to report trying to quit, quitting for at least 24 hours, making more quit attempts, and having more successful quitting outcomes compared with those who received no such advice[12-14]. Physician's advice to quit smoking not only motivates smokers to quit but also increases their quitting confidence[8,15]. Introducing tobacco control advocacy and brief cessation intervention or coun-

seling skill training in medical education is an important first step in encouraging medical professionals to engage in tobacco cessation counseling.

However, physicians often miss the opportunities to advise patients to quit smoking. Data from the 1995 US National Ambulatory Medical Care Survey showed that smoking counseling by physicians represented only 21% of smokers' visits[16]. Training on tobacco control and cessation techniques is scarce or often lacking in the medical curriculum, particularly in developing countries[17]. A 1995 international study of 493 medical schools in 93 countries found large variation in tobacco use and cessation counseling teaching and learning in the medical curriculum (88% of medical schools covered the topic of tobacco-related diseases at some level, 12% did not address the issue of tobacco use in their curriculum, only 11% of medical schools had specific tobacco-related teaching modules, and 58% reported incorporating tobacco use and cessation teaching within other teaching content)[17]. There was a paucity of research on teaching of tobacco control advocacy. Also among schools with a tobacco cessation curriculum, it is not clear whether tobacco control advocacy is included as part of the training program. Many medical students are smokers themselves and lack the motivation to advise patients to quit smoking. Two studies of Chinese medical students found that 38% male students in Wuhan were smokers (smoking on at least one day in the past 180 days)[18], and 27% of male students Hainan smoked in the past 30 days[19].

Alarmed by the prevalence of and attitudes towards smoking in young doctors and medical students[20,21], in 1994, a 3-hour seminar on tobacco or health was introduced to second year (preclinical) medical students. The seminar achieved significant improvements in the student's knowledge of, attitudes towards tobacco control and agreement with the role of the doctor in providing stop-smoking advice[22]. The success of this and

the deepening of involvement of academic staff in tobacco control in Hong Kong led to the design of the new tobacco control curriculum in the 1997 New Medical Curriculum. With over 30 years of tobacco control efforts, Hong Kong now has the lowest smoking prevalence (10.7% daily smokers in 2012) in the developed world[23].

This paper briefly reviews the literature regarding (1) medical students' knowledge of tobacco use, tobacco control and smoking cessation intervention; and (2) their attitudes toward tobacco control policies. The teaching program for tobacco control advocacy and smoking cessation for medical students in the Li Ka Shing Faculty of Medicine of the University of Hong Kong 1997 New Medical Curriculum is then described.

1 Knowledge of tobacco use and smoking cessation counseling

The paucity of medical students' knowledge of tobacco use was clearly identified in the late 1980s[24,25]. Worldwide, medical students generally underestimate the causal relationship between tobacco use and chronic diseases such as coronary heart disease, cancers (e.g., lung, bladder), neonatal mortality, and other clinical outcomes[24-30]. Although knowledge of and skill acquisition in tobacco control and smoking cessation interventions has been widely recommended for inclusion in medical curricula and as an accepted educational outcome competency in many medical schools, such educational aims are often neglected. Worldwide, few students in the healthcare professions (dentistry, medicine, nursing, and pharmacy) receive formal training in tobacco use cessation interventions[31,32]. Prior studies reported a deficiency in knowledge of tobacco control or tobacco cessation training among medical students in New York, Europe, and Asia[24,25,28,33]. Many students recognize the 'duty-of-care' for a health professional to provide smoking cessation counseling and intend to

provide smoking cessation and counseling advice for patients[24,25,28,29,34,35]. Some students constrain smoking cessation counseling to patients with smoking related diseases or on patient request whereas others intend to counsel patients irrespective of their symptoms or diagnosis[24-26,29,36,37]. Most medical students agree that healthcare professionals should acquire specific smoking cessation counseling skills[29,35,36]. A 2011 study of college students at Sun Yat-sen University in China（the largest comprehensive university in Guangdong province）found that more than one-third of medical students did not know the harm of tobacco use.[30]

2　Attitudes toward tobacco control policies

Medical students demonstrate moderate or strong support for tobacco control policies：smoking ban in public venues（74% in Europe，85% in Asia，90% in Hong Kong，100% in Australia），health warning labels on cigarette packages（67% in Europe，70% in Asia，99% in Australia），tobacco sale restriction to children（64% in Europe，85% in Asia，90% in Hong Kong，99% in Australia），tobacco advertising ban（54% in Europe，58% in Asia，86% in Hong Kong，93% in Australia），and price increase in tobacco products（36% in Europe，44% in Asia，94% in Australia）[24,25,35]. However，reports of tobacco control policy advocating practice are lacking.

3　Medical curriculum on tobacco use in the University of Hong Kong

Tobacco control and smoking cessation was included in the formal undergraduate medical student curriculum at the University of Hong Kong since 1994[22]. Following implementation of the new medical curriculum in 1997，tobacco control and smoking cessation teaching and learning

was systematically and more fully integrated in the curriculum from MBBS Year 1－4 through clinical scenarios in problem based learning（PBL：small group teaching，student led and supported by a teacher；Year 1－2；PBL cases are rotated，that is the same PBL case is not used in sequential years. A number of PBL cases with specific smoking related learning objectives are available for use in Years 1－2.）cases and tutorials；problem based public health advocacy projects（10－25 students working on a community based project；Year 3）in which students advocate for community level initiatives on tobacco control（or other health topics）；in clinical bed side teaching（i. e.，Tuberculosis Clerkship：small group teaching at the bed side and Smoking Cessation Skills Counseling：small group teaching with a smoking cessation counselor；Year 4）；as well as more traditional whole class sessions（lectures；Year 3）. Examples of the MBBS 5-year smoking-related learning objectives by year and teaching activity are shown in Table 1. The Log book，completed by each student，provides the tutor an opportunity to assess the achievement of tobacco control and smoking cessation learning objectives（see Figure 1 as an example）. Through formative and summative assessments（see Box 1 for example examination questions），tobacco use and smoking counseling knowledge，and skill acquisition and application are formally examined.

Thematically，the tobacco control and smoking cessation sub-curriculum covers the epidemiology and burden of tobacco induced diseases and benefits of smoking cessation，WHO Framework Convention on Tobacco Control and MPOWER strategies[38]，critical appraisal of local tobacco control measures，identification and management of smoking behaviors，communication of risk to individual patients，public health advocacy for tobacco control，smoking cessation counseling skill acquisition，and the role of medical students and physicians，government and non-governmental organizations in tobacco control efforts.

Table 1　Examples of the MBBS 5-year curriculum smoking-related learning objectives at the University of Hong Kong

Year	Activity	Learning objectives
MBBS 1	PBL case	• Explain to COPD patients why it is important to quit smoking • Describe the community importance of smoking-related illness and identify the groups at risk • Analyze public health approaches to reducing smoking-related illnesses • Demonstrate the role of doctors in helping patients quit smoking • Describe the epidemiology (pattern, risk factors, and causes) of lung cancer in Hong Kong • Evaluate the tobacco control measures and Government proposals • Recognize the medico-legal issues of litigation for damages by an employee against the employer
MBBS 2	PBL case	• Discuss the role of doctors in ant-smoking education and movement in society • Discuss the risk of cancer in relation to smoking
MBBS 3	TB bedside & chest clinic Problem based public health	• Use smoking cesation to help patients to quit smoking and limit burden of tobacco on morbidity and mortality of TB • Summarize the impact of tobacco and alcohol on public health • Evaluate the tobacco control measures • Advocate for further actions against tobacco in Hong Kong
MBBS 4	Smoking cessation skills course	• Describe the adverse effects of active and passive smoking • Assess the different stages of readiness to quit in a smoker • Assess the level of nicotine addiction in a smoker • Measure carbon monoxide in end-expired breath in a smoker • Compare and contrast the different treatment methods available for tobacco dependency • Describe the "5A's" and the "5R's" approach to help smokers stop smoking and explain their use in routine medical practice • Produce a decisional balance worksheet to help smokers make the decision of smoking cessation • Describe the concept of contemplation ladder and the different strategies that could be employed to help smokers in different stages, to achieve optimal results in smoking cessation • Evaluate information and evidence on methods for the treatment of tobacco dependency • Practice counseling for smoking cessation among patients who smoke

Figure 1　An example of log book completed by medical student at the University of Hong Kong

Box 1　Formative assessment of tobacco use and smoking cessation learning outcomes

Question 1

　Give three commonly known unavoidable risk factors and seven commonly known avoidable risk factors for coronary heart disease. Note that you have to specify whether increased or decreased level of the risk factor is related to high risk of the disease. (10 marks)

Question 2

　　a)　List twelve common risk factors for coronary heart disease (CHD), stating clearly the direction of the relationship (for example: increasing x is associated with increasing risk of CHD; smoking is associated with CHD) (6 marks)

　　b)　Explain briefly (i) primary prevention, and (ii) secondary prevention of diseases. (2 marks)

　　c)　List four major methods of primary prevention of CHD by the control of smoking. (2 marks)

Question 3

　Your Chief of Service (COS) has requested of your specialist training that you acquire and apply the evidence of smoking cessation treatment for decreasing the risk to your middle-age patient of having a myocardial infarction.

　　a)　List two examples of primary research evidence and two examples of secondary research evidence that would be relevant for treatment decision making. (2 marks)

　　b)　Identify and discuss four difficulties in applying the results of primary research evidence in clinical practice. (4 marks)

　　c)　List and discuss four factors to be considered when applying evidence to this patient. (4 marks)

Question 4

　Albert, a 15-year-old male, recently had an annual general health check up at the student health centre. Since he is a smoker, he was advised to quit smoking. During the discussion, Albert expressed his reluctance to follow the advice given as he had tried to quit several times and had failed. Albert also worries that his peers will reject him if he stops smoking.

　This scenario illustrates which two factors stopping Albert to change his behaviour. Briefly describe how these factors affects individual's behaviour change. (4 marks for naming the two factors; 6 marks for the brief description)

Within any one PBL case scenario in Year 1—2 (with an individual patient clinical presentation of symptoms potentially associated with tobacco use; e.g., a nonsmoking female restaurant worker exposed to passive smoking and diagnosed with lung cancer), students will be asked to consider the impact of tobacco control from a societal (legal, ethical, burden of illness), occupational, patient, or professional perspective (including how and where to advise patients to seek smoking cessation support) (Table 1). For example, the learning objectives include: 1) evaluate the tobacco control measures and government proposals; 2) advocate (based on clear evidence), as the doctor's role, for public health policy on tobacco control. In the Tuberculosis Clerkship Year 3, the paper case PBL is brought to life. Students learn to take a smoking and tobacco use history on real TB patients at the bed side and have the opportunity to gain first-hand experience of the negative health impact of tobacco use on patients and their families. Local research findings, particularly on the increased risk of TB disease and mortality from smoking and passive smoking in Hong Kong are emphasized.

The contents of the one hour whole class session (lecture; Year 3) include the epidemiological impact of active and passive smoking on health, disease and economic burden at international, national, and local level with local research findings, the effectiveness of tobacco control measures (including WHO Framework Convention on Tobacco Control and MPOWER strategies), tobacco industry strategies to obstruct tobacco control policies, physicians' role to ask smoking history and to at least briefly advise patients to quit and refer to existing smoking cessation services and the impact of the Quitline, the negative outcomes when no cessation counseling is provided, the benefits of quitting smoking and available clinical treatments (different types of medication) for smoking cessation. Successful experiences of tobacco control advocacy by medical students were illustrated with newspaper clippings (derived from the seniors of the current class of students). Before the session, students complete a one-page questionnaire (Appendix A) on the mortality risk of smoking (i.e. at

least one out of two smokers will be killed by smoking），their experience of exposure to second-hand smoke，and their attitudes towards more stringent tobacco control measures in Hong Kong. The objective of the questionnaire was to motivate students to reflect on what they know and think about the tobacco control measures and advocacy and to motivate and help them to consider choosing a tobacco control project for 'public health based public health'.

Training medical students as public health advocates for tobacco control in 'problem based public health' is a challenging，engaging，and experiential activity where students choose，design，prepare and implement an advocacy campaign in the community. Through the design and display of pamphlets and posters，signature campaigns and setting up counters for public education at busy pedestrian areas，mass rally，health talks at school and in the community，letters to newspapers，government officials and legislators，much of which has been reported in pro-fessional journals，Faculty Newsletters，conferences and through the lay（print，radio and TV）press，students have made important contributions to raising awareness of the public and stakeholders，and particularly to the enactment of smokefree legislation in Hong Kong（Figure 2）.

The undergraduate medical tobacco control curriculum culminates with the smoking cessation counseling skills program in Year-4 where students are trained in the 5A's（ask，advise，assess，assist and arrange）（see Table 1 for the specific learning objectives）. The smoking cessation skills program includes a one hour PBL case，visit to a smoking cessation clinic，smoking cessation information kit and a smoking cessation skills counseling practice session. At the end of the skills programs students are expected to be able to describe the adverse effects of active and passive smoking，assess smokers' stages of readiness to quit，assess the level of nicotine addiction and measure the carbon monoxide in end-expired breath in a smoker and assess
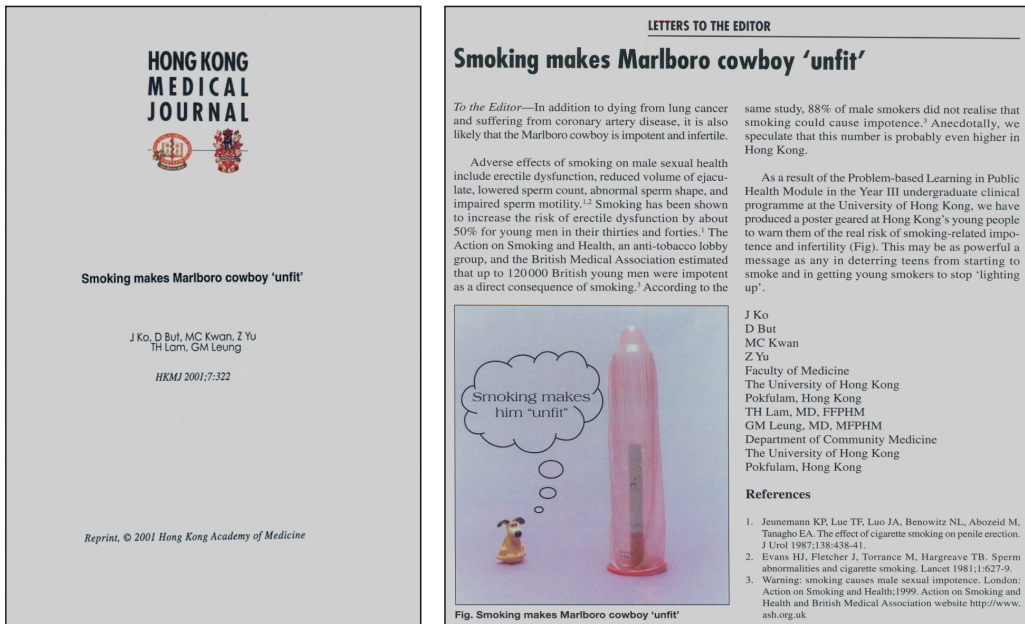

Figure 2A   A journal article entitled "Smoking makes Marlboro cowboy 'unfit'" described the poster designed by the Year-3 medical students at the University of Hong Kong as a result of their 2001 problem-based tobacco control advocacy project. The poster targets the Hong Kong young people to educate them about the risk of smoking-related impotence and infertility.

反吸煙策略

致 編輯先生：

今年二月末聯合國第一條具法律約束力的公共衛生多邊條約《煙草控制框架公約》正式生效。最近香港立法會及坊間各界亦就《吸煙（公眾衛生）條例》作出修訂，把全面禁煙的範圍擴大至食肆、酒吧和卡拉 OK 有不少討論。我們身為醫生，可算是未來的醫療工作者，希望表達我們關於反吸煙的立場，期望得貴報刊登，以提升公眾關注。

醫學界早已證實吸煙危害健康。研究指出高達五成的吸煙者會死於吸煙引致的疾病；二手煙對非吸煙者健康的禍害比空氣污染更嚴重。我們認為，有效的控煙策略應包括三步：首先是停止任何形式的煙草產品宣傳，防止有人（尤其是青少年）因誤導而患上煙癮，以杜絕煙草市場的擴展；其次是鼓勵吸煙者戒煙；最後是保護非吸煙者免受二手煙之禍害。

食肆全面禁煙的政策勢在必行，然而亦只是整個策略的其中一部份。政府的反吸煙政策一向比較於最後的一步，亦可說是處於一個被動的、治標不治本的位置。一個有遠見，有決心要為市民健康著想政府，應該有一個比較全面的藍圖去實施反吸煙此，就著各方面，我們有些建議，可作討論和參考

就著減少未來煙民的數量，政府應加強戒煙面宣傳，並加強吸煙者戒煙的配套。宣傳的方面了吸煙的害處，也可多鼓勵煙民戒煙。一些正面息，例如戒煙為了家人著想，戒煙者需要親友給持，戒煙不是想像中的辛苦，戒煙永不會太遲等是可行的宣傳口號。香港現有的一些戒煙服務，院管理局的十間「無煙新天地」，和香港吸煙與健員會籌劃的香港戒煙健康中心，數目有限，宣足。戒煙輔導服務雖是免費，但戒煙療法（如尼補充療法）的收費對煙民卻構成某程度的負擔。醫療界方面，對於協助戒煙人士的意識亦普遍低。這些問題政府應投放更多的資源解決。

香港政府亦可收緊甚至取消可攜帶免稅煙免，減少免稅煙的數量，間接提高吸煙的負擔，有助煙民消除這惡習。

建立無煙的社會，對市民健康來說是百利害。早前香港大學發表了有關吸煙和二手煙所引重社會負擔的研究，竟引來些指導術界與政府「的指摘，實在是令人感慨。作為醫學界的一員，在此再次喚起大眾對反吸煙問題的正視，為民點綿力！

——一群香港大學醫科三年級

Figure 2B　A letter entitled "Tobacco Control Measures" published by the Apple Daily in 2005. The letter written by the Year-3 medical students at the University of Hong Kong was a result of their 2005 problem-based tobacco control advocacy project. The letter called for tobacco advertising restrictions, and government support for tobacco cessation treatment and programs.

單車遊行促禁煙

【本報訊】約五十名香港大學醫科學生，昨日發起支持立法禁煙單車遊行（圖）。各人在單車上掛起反吸煙的旗幟及標語，由沙田公園遊行至大埔元洲仔公園，學生又沿途向市民派發傳單，宣揚吸二手煙損害健康的訊息。行動發起人、港大醫學院三年級學生胡暉表示，對政府延遲執行室內全面禁煙的時間表感到失望，但理解政府需平衡各界利益，「愈快推行愈好，愈遲執行，愈多人受二手煙禍害」。

此外，民主黨向八百一十名市民進行的調查發現，九成受訪者認為政府應修例，擴大禁煙範圍至室外所有公共地方；七成人同意在公眾地方排隊也應禁止吸煙。
王子俊攝

單車遊行反吸煙

●香港大學醫學院約五十名三年級學生，昨日從沙田騎單車到大埔，支持當局立法全面禁煙，全程約三小時。學生在單車插上吸煙危害健康的標語和旗幟，宣揚反吸煙訊息，沿途派傳單。有學生表示，對政府分階段禁煙感失望，不過明白當局要平衡各方利益，希望盡快通過和推行有關法例。　（孫冰玉攝）

Figure 2C　An article entitled "Bicycle Parade for Tobacco Control" published on the Apple Daily (left) and the Oriental Daily (right) in 2006. The article described the 2006 tobacco control advocacy project planned and conducted by the MBBS Year-3 students at the University of Hong Kong to support for tobacco control legislation in Hong Kong.

Figure 2D　An article entitled "Call for An Increase in Tobacco Tax—Year-3 Medical Students of the University of Hong Kong" published on the Life Style (top) and the Sing Pao (bottom) in 2008. The article described the 2008 tobacco control advocacy project planned and conducted by the MBBS Year-3 students at the University of Hong Kong to petition for a law increasing tobacco tax in Hong Kong.

Figure 2E　An article entitled "Parade of 500 Students from the University of Hong Kong to Support for Tobacco Tax Increase" published by the Apple Daily in 2009 (top)，and a picture showing the parade (bottom). The article described a mass rally planned and conducted on March 22，2009 by more than 500 students of the University of Hong Kong from 3 healthcare professions (medicine，nursing，and traditional Chinese medicine) to petition for a law increasing tobacco tax in Hong Kong.

Figure 2F　An article entitled "Strengthen Tobacco Control Legislation" published on the Sing Tao Daily (top) and an article entitled "Medical Students Call for Stronger Tobacco Control Legislation" published on the Apple Daily (bottom) in 2010. The articles described a signature campaign planned and conducted by medical students of the University of Hong Kong to call for stronger tobacco control legislation.

Figure 2G　An article entitled "Medical Students Call for A Ban on Displays of Tobacco Products at Points of Sale" published on the Standard (left) and a picture showing the signature campaign on the Sky Post (right) in 2011. The article described a signature campaign planned and conducted by Year-3 medical students of the University of Hong Kong to petition for a law banning the display of tobacco products at points of sale.

Figure 2　Problem-based public health advocacy projects with different formats：tobacco control in communities

the applicability of various tobacco dependency treatment methods. The effectiveness of the overall tobacco use and smoking cessation training program in changing attitudes and behaviors in medical students and other healthcare professionals has been demonstrated in our previous research[22,39] and in our assessment on the content what the students had learnt as reported in students' log books.

4　Discussion

Globally，an alarming deficiency is persistently found in medical students' knowledge of tobacco-related diseases and nicotine addiction treatment and their lack of involvement in tobacco control advocacy. Many medical schools have failed to implement a tobacco control and smoking cessation curriculum，and students often report that they are not adequately prepared to perform cessation counseling，even in developed countries. For the countries reviewed，only about one-third of medical students reported that they had received specific training on tobacco cessation，and the number is even lower in developing countries. The worst is the lack of any experiential learning for medical students to choose，organize and implement public health advocacy projects to be conducted in the community. Public health is often taught with theory and knowledge but no practice. To reduce tobacco use，medical schools must incorporate training in tobacco use，tobacco control policies，and cessation techniques (brief advice at least) as part of medical students' education. A systematic evaluation for the training program should be included in tobacco education.

Medical students usually pay little attention to the role of a doctor in providing preventive advice to patients. Many students，especially those from developing countries，think that it is not the physicians' responsibility to advise patients to quit smoking. Even in developed countries，many medical students claimed that they would offer tobacco cessation counseling only if the patients had smok-

ing-related diseases[26,29]. Heavy smokers are more likely to obtain cessation advice or information from physicians than light or intermittent smokers[13,40]. Light and intermittent smokers are excluded from most smoking cessation clinical trials, and are less likely to seek or receive cessation treatment than heavier smokers[41-45]. Tobacco cessation training for medical students must emphasize the role of physicians in disease prevention and education, and how physicians' cessation counseling influence smokers' quitting behavior. Furthermore, while medical students support some tobacco control policies, the support in general for the most stringent and effective tobacco control measures (e.g., increasing cigarette tax, warning labels on cigarette packs, smoking ban in public places, tobacco advertisement and sponsorship restrictions) is relatively low. Given the critical role of physicians in tobacco control, it is important to incorporate education about how tobacco control policies change social norms and therefore change individual behaviors in tobacco cessation training. Future training programs may incorporate advocacy for tobacco control policies, legislation, and measures as part of the curriculum.

In conclusion, there is an urgent need for change in medical schools' curriculum and public health teaching and learning on tobacco control needs to be strengthened. The early evidence from the University of Hong Kong program suggests most students learn best in an experiential setting. Incorporating teaching and learning activities in the medical curriculum where students walk-the-talk for tobacco control and smoking cessation training is arguably one of the best change interventions for changing attitudes and thereby behaviors in medical students within the medical school and after graduation. As tobacco control and smoking cessation counseling skills are a key competency for medical graduates, all medical schools should provide explicit tobacco control and smoking cessation teaching and learning. We suggest such programs

if implemented would be instrumental in decreasing the negative impact of tobacco use on patients and their families. Systemic evaluation within the medical school and longer term follow up after graduation is essential to measure the training effectiveness. This paper is a preliminary summary of our experiences for sharing and initiation of more discussion towards more innovative, effective and interesting teaching and learning methods for tobacco control in medical schools and other health professional education institutions, which will be followed by more detailed evaluation in the near future.

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第1卷第2期
2014年10月

全球健康学杂志
Global Health Journal

Vol. 1 No. 2
Oct. 2014

Pre-sarcopenia and Its Relationship with Physical Disability among Rural Elderly in Pahang, Malaysia: A Cross Sectional Study

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Abstract: Background: Aging process is associated with loss of muscle mass and muscle strength. This study aims to determine the association between pre-sarcopenia (low muscle strength and mass) with physical disability among rural elderly in Malaysia.Methods: Using a cross-sectional study design, 547 elderly (aged 60 years and above) from five districts in Pahang were recruited. Hand grip strength was assessed using Jamar hand-grip dynamometer, while muscle mass was estimated using a formula by Lee et al. Physical disability was based on self-reported activity of daily living (ADL) measured using Barthel Index. Descriptive analyses were used to observe baseline characteristics of the elderly population and the trend of reduction of muscle mass and strength according to age group. Logistic regression analyses evaluated the association between muscle mass and strength with physical disability, controlling for confounders such as age, gender and education level.Results: Mean age (standard deviation) of the elderly was 68(± 0.27). Hand-grip strength and skeletal muscle mass decreased with age. Elderly with physical disability were older, shorter, had lower BMI, more co-morbidities, lower hand-grip strength and muscle mass. The odds ratio (OR) of physical disability for muscle strength was 1.69(95% CI: 0.99−2.86) while the age-adjusted and multivariate-adjusted OR were 1.22(95% CI: 0.69−2.15) and 1.08(95% CI: 1.03−1.14) respectively. The OR for muscle mass was 1.47(95% CI: 0.89−2.42) while the age-adjusted and multivariate-adjusted OR were 1.08(95% CI: 0.63−1.84) and 1.38 (95% CI: 0.57−3.33) respectively. Conclusion: Low muscle strength compared to low muscle mass has significant association with physical disability among elderly.

Key words: Muscle strength; muscle mass; muscle quality; functional limitation; physical disability

1　Introduction

Background

Aging results in changes in muscle structure and consequently its function. With aging, multiple processes occur within muscle tissue, such as denervation, changes in the hormonal and inflammatory environment, mitochondrial dysfunction, and also changes in the expression of regulatory

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factors affecting the fate of satellite cells[1]. These combine to produce losses in the bulk properties of muscle tissue. The report by Cruzt-jentoft et al (2010) came out with the definition of sarcopenia as a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death.[1]

In recent years, a number of studies have been conducted to study this relationship. Low muscle strength[2-9] and/or mass[10,11] are found to be positively associated with physical disability in elderly, as reported in these studies. It was generally concluded that sarcopenia is associated with self-reported physical disability in elderly, and this is also associated with poor cognitive function[12] and obesity[8] as conducted in some studies.

This study was conducted in a rural setting since most of the other studies were conducted in Western countries, where ethnicity, height and consequently estimation of the muscle mass was different than that of rural elderly[13]. Their different lifestyle practices and living conditions may also contribute to the difference in muscle mass. Thus, the purposes of this study were to evaluate the association between low muscle strength and mass to physical disability in rural elderly in Malaysia and to identify the most useful indicator of age-related changes in muscle for use in clinical practice.

2　Methods

Muscle mass/muscle strength is a more useful indicator of age-related changes in muscle for use in clinical practice.

2.1　Participants/ Study Population

We retrospectively reviewed the records of 4253 participants of all ages of secondary data provided by the Department of Social and Preventive Medicine, University Malaya. The data was collected from a survey involving households face to face interviews conducted with a standardized questionnaire (Appendix) in the rural area of Pahang. Multi-staged stratified random sampling of households from villages of 5 districts out of 11 districts in Pahang was adopted. They were Bentong, Jerantut, Maran, Raub and Temerloh. However, for our study, we focused only on data regarding elderly which consisted a number of 547 participants and excluded those who were ＜60 years old (n＝3706).

The inclusion criteria for this study were those of the age 60 years old and above and also those who gave their consent for the interview. Exclusion criteria for this study were those aged 59 years old and below, those who were not in the house at the time of interview and those who did not understand the questions asked, such as those who suffered from mental illnesses or were mentally retarded.

2.2　Data Collection

Data included socio-demographic characteristics, medical history, Activity of Daily Living (ADL), Geriatric Depression Scale (GDS), occupational history, anthropometric measurement (height and weight) as well as hand-grip measurement by Jamar hand-grip dynamometer (Model 5030J1 by Lafayette Instrument) (Figure 1) was collected.

Figure 1　Jamar hand-grip dynamometer

Standardized protocols were abided when all measurements were taken[1,2]. Activities of Daily Living (ADL) was measured using Barthel Index[1]. Depression symptoms were evaluated using the GDS-15 score[1,2] while Body Mass Index (BMI) was calculated using the formula of weight (kg) / height^2 (m^2). The hand-grip measurement was repeated three times for both hands each with at least repeated 3 times each for both hands. The best result was taken regardless of hand preference and the readings were recorded in kilogram (kg).

2.3　Variables

2.3.1　Independent variable: muscle mass and muscle strength

A cut-off point of 18.0 kilogram of muscle strength was established as 20% of all subjects had this hand-grip strength. Subjects who scored less than this cut-off value would be labeled as low muscle strength.

For muscle mass, skeletal muscle mass (SMM), which was an estimated value based on equation imported from a study conducted by Lee et al in 2000 was used.

SMM (kg) = Height (m) [0.244 x Body Mass (kg)]+[7.8 x Height (m)]+[6.6 x Gender]−[0.098 x Age]+[Ethnicity−3.3]

where gender: male=1; female=0, ethnicity: Asian=1.4; African−American=1.2; White=0

This formula was proven to be comparable with measurement using dual-energy X-ray absorptiometry (DXA) by Cassiano et. al on. A cut-off point at 22.1 kilogram of skeletal muscle mass was established at the lower 20% of all subjects. Subject with estimated value less than this cut-off value was considered to have low skeletal muscle mass.

2.3.2　Outcome variable

Physical disability was determined via assessing subjects' activities of daily living using Barthel Index[17]. The index consisted of 10 questions with a total score of 100. Participants were classified as physically disabled if they answered yes to any of these questions and non disabled if they answered no to all questions.

2.3.3　Other variables

Variables that were independently associated with exposure and outcome measures were considered as confounding factors (age, height, weight, body mass index, co morbidities, sex, and education level). Co morbidity was classified as the presence of self-stated doctor-diagnosed conditions from a list of eight conditions: hypertension, heart problem, Parkinson's disease, diabetes mellitus, chronic lung diseases, high blood cholesterol, cancer and depression. Presence of stroke and joint pains were categorized as a separate entity. Education level was utilized as a representation of socioeconomic status. Depression was measured using Geriatric Depression Scale (GDS) and a score of more than 5 was considered positive of depressive symptoms[18,19].

2.4　Statistical Analysis

Data entry and statistical analysis was conducted using Statistical Package of Social Science (SPSS) for windows version 16.0. Descriptive analysis was conducted for demographic and baseline characteristics of participants. Differences in the distribution of continuous variables (age, weight, height, body mass index, co morbidities, hand-grip strength and muscle mass) were tested by independent T-tests and analyses of variance while differences in the distribution of categorical variables (gender and education level) were tested using Chi-square test. However, there were 39 missing data regarding activity of daily living measured by Barthel index while for weight, height and body mass index, there were 61 missing data. One-way ANOVA was used to test the differences between age groups of elderly with the independent variables (muscle strength and muscle mass). Only 429

participants went through hand-grip assessment while there were only 518 sufficient data available for the skeletal muscle mass formula. For each outcome variable，separate models of logistic regression were formulated for low muscle strength and low muscle mass. Odd ratios（OR）and 95％ confidence interval（CIs）were reported in the form of crude，age-adjusted and multivariate adjusted after controlling for age，gender and education level.

3　Results

The baseline characteristics of 508 elderly participants in community residential programme from Pahang are presented in Tables 1 and 2. Elderly with physical disability were prone to be older，shorter，lighter，had more co-morbidities，lower hand-grip strength and lower muscle mass. A larger portion of the elderly with physical disability was females. About 63％ of them attended school and they were mainly receiving primary education level（88.5％）.

Table 1　Characteristics of elderly in community residential programme （N = 508） according to physical disability （Continuous）

	mean ± standard deviation	
	physical disability*	
Characteristics	Yes（n＝123）	No（n＝385）
Age	70.30 ± 7.94	67.30 ± 5.63
Height，m‡	1.53± 0.10	1.55 ± 0.09
Weight，kg‡	58.24 ±13.52	60.49 ± 12.40
Body Mass Index，kg/m²	24.88 ± 5.44	25.26 ± 5.94
Comorbidities†	1.99 ± 1.24	1.85 ± 1.039
Hand-grip strength，kg	24.93 ± 13.41	31.74 ± 19.00
Muscle mass，kg	28.25 ± 8.59	29.95 ± 8.03

* Activities of daily living（feeding，bathing，grooming，dressing，bowels，bladder，toilet use，getting from a bed to a chair，mobility and climbing stairs）according to Barthel Index
Comorbidities（hypertension，heart problem，Parkinson's disease，diabetes mellitus，chronic lung disease，high blood cholesterol，cancer，depression）Actual numbers of elderly（N＝486）

The muscle strength and mass of the elderly participants are presented in Tables 3. In table 3 it

is shown that the muscle strength（hand-grip strength）and muscle mass（skeletal lean mass）decreases with increasing age（P＜0.001）.

Table 2　Characteristics of elderly in community residential programme （N＝508） according to physical disability （Categorical）

	physical disability*	
Characteristics	Yes（n＝123）	No（n＝385）
Sex ♯		
Male	57（46.3％）	196（50.9％）
Female	66（53.7％）	189（49.1％）
Attended school ♯		
Yes	78（63.4％）	285（74.2％）
No	45（36.6％）	99（25.8.8％）
Education level ♯		
Primary	69（88.5％）	239（83.9％）
Secondary	7（9.0％）	40（14.0％）
Certificate/Skill	1（1.3％）	3（1.1％）
College/University	1（1.3％）	3（1.1％）

* Activities of daily living（feeding，bathing，grooming，dressing，bowels，bladder，toilet use，getting from a bed to a chair，mobility and climbing stairs）according to Barthel Index
♯ percentage within physical disability

Table 4 shows the relationship between low muscle strength and low muscle mass with physical disability（ADLs-Barthel Index）. There was a stronger association between losses of muscle strength with physical disability compared to muscle mass，but both values were not statistically significant. There was no significant association in muscle strength and muscle mass with disability after adjusted for age. After adjusted for age，gender and education level，muscle strength was significantly associated with disability but the results may not be clinically significant.

4　Discussions

Our results showed that elderly with physical disability were more prone to be older，shorter，lighter，more co-morbidity，had lower hand-grip strength and lower muscle mass. Larger portions of the elderly with physical disabilities were females.

Table 3　Muscle strength of elderly in community residential programme according to age

Age Group	60－69（n=291）	70－79（n=112）	80 and above（n=26）	Overall（N=429）
Muscle strength，kg				
Hand-grip strength	33.26±19.07	25.42±13.31	17.15±9.43	30.24±17.90
Muscle mass，kg				
Skeletal mean mass	31.11±7.76	27.65±7.91	21.10±6.26	29.67±8.13

Table 4　Odd ratio for relationship between low muscle mass and low muscle strength to physical disability

	Odd Ratio（95％ Confidence Interval）		
Factors	Crude	Age adjusted	Model 1*
Muscle strength，kg	1.689	1.215	1.082
	（0.997－2.860）	（0.687－2.148）	（1.028－1.139）
Muscle mass，kg	1.469	1.076	1.377
	（0.890－2.424）	（0.628－1.842）	（0.569－3.333）

* Adjusted for age，gender and education level

63.4％ of them attended school and had primary education level （88.5％）. The elderly tend to be lighter and had lower BMI due to loss of muscle mass which subsequently contributed to loss of muscle strength. But when compared the BMI of our participants，is the BMI was much lower than those from the.

In our study，it shows that muscle strength and muscle mass decreased with increasing age. In fact，throughout the aging process，people show an overall decline in muscle mass，with specific atrophy of type II=2〔ROMAN muscle fibers.[1-4]Decline of muscle mass is considered a 'physiological' feature of aging[1-4] This generalized loss of skeletal muscle has been termed "sarcopenia" and is considered a major factor causing the development of impairments in muscle strength and power for elderly.[12,1]Studies have shown that the loss of muscle strength is much more rapid than the parallel loss of muscle mass，indicating a significant decline in muscle quality.[1] Generally，starting at the age of 45 years，the loss of muscle mass is noticeable.[26]the prevalence increases with age. The prevalence of sarcopenia is 27％ in men and 23％ in

women aged 65 years and above while the prevalence increases to 53％ in men and 31％ in women aged 80 years and above.[1] Our results which showed that muscle strength and muscle mass declined with aging，similar as those of previous studies. The Rochester，Minnesota，study found that the prevalence of sarcopenia was 16％ in men aged 70 to 79 and 34％ in those aged 80 and older.[3] The New Mexico Heath Study reported a prevalence of sarcopenia in older Non-Hispanic white men of 20％ for those aged 70－74，27％ for those aged 75 to 80，and 53％ for those aged 80 and older.

Many factors contributed to sarcopenia.[35,1] These include a loss of α-motor neurons,[1] lower levels of steroid hormones,[1,2] a reduction in dietary protein,[1] and a decreased level of physical activity.[1] Besides that，it is known that muscle strength and muscle mass play a vital role in maintaining daily function，as well as the ability in involving in recreational activities.[1] As in elderly with sarcopenia，the muscle strength[1]，metabolic rate[1] and maximal oxygen consumption （Vo₂ max)[36,43] decreased.Consequently，this physiologic decrement in maximal strength probably causes weakness and a loss of independence in daily living function.[1] For example，recent community-based studies in elderly black and white adults found that high blood levels of interleukin-6 （a protein inflammatory cytokine) were significantly associated with lower muscle mass and lower muscle strength in handgrip and knee extension tasks. With strength impairments，it may lead to the development of disability in elderly. Adults between 75

and 84 years old are less able to perform heavy household work，walk a half mile and climb stairs than adults between 55 and 64 years old in the Framingham Disability Study.[2]

Sarcopenia is used to describe gradual and generalized loss of skeletal muscle mass and strength that occurs with advancing age. The loss of skeletal muscle mass and strength below a critical threshold will lead to some adverse outcomes such as physical disability and functional impairment.[2,3] According to European Working Group on Sarcopenia in Older People（EWGSOP），the diagnosis of sarcopenia required the documentation of criteria 1 plus the documentation of either criteria 2 or 3.[2]

Criteria for Diagnosis of Sarcopenia

1.Low muscle mass

2.Low muscle strength

3.Low physical performance

In our study，we are using muscle mass and muscle strength as our independent variables to determine the best and most accurate measurement of sarcopenia in clinical practice.

The muscle mass is assessed by anthropometric measures. The skeletal muscle mass（SMM），which is an estimated value based on equation imported from a study conducted by Lee et al in 2000 is used. There are 2 prediction models in the study by Lee et al，the second prediction model which includes body weight，height，sex，age，and race is used in our study. These measurements are easily obtained. However，this model has a lower accuracy and is not applicable in obese elderly. [14]

The muscle strength which is assessed by the isometric handgrip strength is strongly related with lower extremity muscle power，knee extension torque and calf cross-sectional muscle area.[2] Low handgrip strength is a clinical marker of poor mobility and a better predictor of clinical outcomes than low muscle mass. Furthermore，handgrip strength is simple，cheaper and can be adminis-

tered rapidly.[4] In practice，there is also a linear relationship between baseline handgrip strength and incident disability for activities of daily living （ADL）.[2]

In our study，pre- sarcopenia（loss of muscle strength and muscle mass）was associated with physical disability in elderly. For crude odds ratio，it was found that the magnitude of association between low muscle strength and physical disability in terms of activities of daily living（ADL）was stronger than the association between low muscle mass and physical disability although both results were insignificant. Noran N. Hairi et al's study showed similar results which were significant. Thus，it is suggested that muscle strength is the better measure associated with physical disability.[4] While for adjusted odds ratio for muscle strength，the result was statistically significant but less likely to be clinically significant. This may be due to the small sample size and the arbitrary cut off point used. While for adjusted odds ratio for muscle mass，the result was statistically not significant. This could be due to the formula from Lee et.al. which was based on unspecified Asian population. Thus，it is unable to determine which is a better indicator of age relate changes in muscles.

Strength and Limitations

The strength of this research is that it is one of the first few researches on sarcopenia that is conducted locally in Malaysia.

The limitation in this research is the small sample size. Sample size should be sufficiently large enough to estimate the prevalence of the conditions of interest with adequate precision. The health condition of the participants may influence their ability to do the handgrip assessment. Participants that had upper limb disability can also limit the result of the study since they are unable to do the assessment. Causality cannot be established as this was a cross sectional study. Some other important variables such as exercise or physical activity

were not measured in this study.

5　Conclusion

Low muscle strength compared to low muscle mass has significant association with physical disability among elderly.

Ethical Considerations

Ethical issue principles including plagiarism，misconduct，data fabrication and/or falsification，double publication and/or submission，redundancy，etc. have been completely observed by the authors.

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广州市居民酒精使用所致相关
恶性肿瘤的疾病负担研究

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摘　要：目的：对 2008 年广州市居民酒精使用所致相关恶性肿瘤(口咽癌，食管癌，结直肠癌，肝癌)疾病负担进行评价。方法：以 2008 年广州市相关恶性肿瘤的发病和死亡资料、广州市饮酒情况现场调查资料为基础，利用伤残调整寿命年(Disability-adjusted life year，DALY)指标和人力资本法，评价 2008 年广州市居民酒精使用所致相关恶性肿瘤的疾病负担。结果：2008 年广州市居民因饮酒所致上述四种恶性肿瘤的疾病负担为 9033.86 个 DALYs，间接经济负担为 3.7 亿元。结论：广州市酒精使用所致上述四种恶性肿瘤而造成的健康损失绝大部分由早死造成，降低人群饮酒率将减少酒精使用所致疾病负担。

关键词：恶性肿瘤；疾病负担；酒精使用

1　前言

　　酒是一种社会性、合法性成瘾物质，我国最早有关酿酒的文字记载是在商朝[1]。酒在现代社交、医疗、烹饪、其他日常生活中，均占有重要地位，随着我国经济的发展，我国饮酒人数不断增加，从 1991－2002 年，我国居民总、男、女性饮酒率分别增长了 17.3％、12.8％和 73.1％[2,3]。另一方面，我国酒的生产与消费均呈现出稳步增长的趋势[4]，人均年饮酒量不断增长。由此引起了一系列与饮酒相关的躯体及心理社会损害[5]。第 32 届世界卫生大会决议中将饮酒列为世界范围的主要公共卫生问题[6]，饮酒及其相关的问题日益受到关注。已有研究表明饮酒与 60 多种国际疾病分类(ICD-10)中所列的疾病及健康状况有关，其中包括慢性病如恶性肿瘤、神经精神系统疾病、心血管疾病、胃肠疾病以及各种有意或无意的伤害[7]。饮酒增加了人们患病的风险，降低了人们的生存质量，同时给人们增加了经济负担。

世界卫生组织全球疾病负担研究报告中指出，在全球范围内，3.8％的死亡及 4.6％的伤残调整寿命年是由于酒精使用引起的[8]。

　　由于酒精使用疾病负担研究方法的成熟，不少发达国家进行了研究[8-10]，但在我国目前鲜有相关研究，本次研究通过了解酒精使用所致恶性肿瘤给广州市居民带来的健康负担和经济负担，为提倡健康的生活方式、控制饮酒提供参考。

2　材料与方法

2.1　材料

2.1.1　广州市居民饮酒状况数据

　　开展广州市居民饮酒状况的现场调查。在大量阅读国内外有关饮酒状况调查相关文献的基础上[1,11-17]，参考专家意见，制定"广州市居民饮酒状况调查问卷"。本文将饮酒者分为曾经饮酒者和年饮酒者，曾经饮酒者是指过去曾经饮酒一次及以上者，年饮酒者指过去一年饮酒一次及以上者，相应的

有曾经饮酒率和年饮酒率。

2.1.2　广州市居民恶性肿瘤流行病学数据

恶性肿瘤死亡资料来源于广州市卫生信息中心 2008 年死因登记监测资料,恶性肿瘤发病资料来源于 2008 年广州市疾病预防控制中心肿瘤登记监测资料。

2.2　方法

2.2.1　饮酒状况现场调查的抽样方法

采用配额抽样的方法抽取被调查者,根据性别(男、女)、年龄(分 3 层,即 28～40 岁、40～60 岁、60 岁以上)、职业(《中华人民共和国职业分类大典》中分的七大类),将调查总体分为 42 层,然后根据广州市第五次人口普查结果中广州市人口分布特征,获得每层需要调查的人数。采用公式 $n = \dfrac{z_a^2 \times pq}{d^2}$[11] 计算得出样本总量,其中 p 为预期饮酒率,$q = 1 - p$,$d = 0.1p$。马冠生等人对我国居民饮酒现状进行分析得出我国居民饮酒率为 21.0%[3],马金香等人 2005 年调查获得的广东省普通人群饮酒率为 18.9%[18],基于此,将广州市普通人群的预期饮酒率定为 20.0%,计算得出所需样本含量为 1537 人,考虑漏查率 10%,总共需调查 1690 人。

2.2.2　饮酒所致相关恶性肿瘤的确定方法

为了确定饮酒与相关癌症的关系,首先查阅国际疾病分类(ICD-10)[19],国际疾病分类中指明酒精使用与相关癌症有因果关系的纳入研究范围;其次大量阅读国外酒精使用疾病负担的研究文献[8,20-22],选择各国都纳入其研究范围的肿瘤;再次,查阅国内文献,若国内有研究综述或大规模流行病学研究显示酒精使用与某种癌症有正的相关性,就纳入研究范围。通过初步判断发现,酒精使用与口咽癌、食管癌、结直肠癌、肝癌存在相关性,纳入研究范围。

2.2.3　统计学方法

使用 Epidata 软件对广州市居民饮酒状况数据进行双录入,对于恶性肿瘤发病数据、死亡数据使用 DisModⅡ进行整理,使用世界卫生组织提供的疾病负担研究工具计算疾病负担,相关参数采用 WHO 推荐值。

使用频数、构成比指标描述样本的人口学特征及 DALYs 的内部构成;使用率的指标描述样本人群的饮酒情况;使用死亡率、YLLs(Years of life lost)、YLDs(Years lived with disability)、DALYs 等指标描述疾病负担,其中 YLL 和 YLD 的通用公式为 $\int_{x=a}^{x=a+L} Dw \times Cxe^{-\beta x} e^{-r(x-r)} dx$,式中,$x$ 为年龄,Dw 为伤残权重系数,C 为年龄权重调节因子,本研究取 0.1658,L 为伤残持续时间或死亡的损失时间,r 为时间贴现率,本研究取 3%,a 为死亡或伤残发生年龄,β 为年龄权重函数参数,本研究取 0.04;$DALYs = YLLs + YLDs$;用公式 $PAF = \dfrac{P(RR-1)}{P(RR-1)+1}$ 计算人群饮酒归因危险度,其中,P 为饮酒率,通过现场调查获得,RR 为相对危险度,其值通过文献检索获得;饮酒所致某恶性肿瘤死亡率 $= PAF \times$ 某癌症死亡率;饮酒归因某恶性肿瘤疾病负担 $= PAF \times$ 某恶性肿瘤疾病负担。

统计推断:使用卡方检验对不同人口学特征人群的饮酒率进行比较。

2.2.4　医学伦理考虑

本研究不涉及对调查对象的干预等内容,因此未申请伦理批件。现场调查时被调查者均签署知情同意书。

3　结果

3.1　样本人口学特征

共回收 1664 份问卷,剔除回答不完全问卷 30 份,年龄在 18 岁以下问卷 6 份,填写不符合逻辑问卷 13 份,剩下符合条件的问卷 1615 份,合格率为 97%。样本的年龄与性别分布见表 1。

表 1　广州市居民饮酒状况调查样本的一般人口学特征

人口学特征		调查人数	构成比(%)
性别	男	772	47.8
	女	843	52.2
年龄(岁)	18～19	97	6.0
	20～29	600	37.2
	30～39	424	26.3
	40～49	338	20.9
	50～59	101	6.3
	60～69	26	1.6
	70 及以上	26	1.6

3.2　广州市居民饮酒情况及酒精使用危险度分析

样本中曾经饮过酒者有 1061 人,过去一年饮过

酒者有 907 人。其中男性曾经饮酒率和年饮酒率均高于女性($\chi^5 = 71.93$, $P < 0.01$; $\chi^5 = 27.18$, $P < 0.01$)。具体饮酒情况见表 2。

通过文献检索，国内已有饮酒与食管癌[23]、结直肠癌[24]、肝癌[25]关系的 Meta 分析，而饮酒与口咽癌的关系采用 Friborg 等人研究饮酒等与相关危险因素的大规模队列研究的研究结果[26]，如表 3。

使用 PAF 的计算公式，将年饮酒率与 RR 代入计算酒精使用对口咽癌、食管癌、结直肠癌及肝癌的人群酒精归因分值。如表 4。

表 2 广州市居民饮酒情况

	曾经饮酒			过去一年饮酒		
	人数	饮酒率(95%CI)%	标化率%	人数	饮酒率(95%CI)%	标化率%
男	588	76.4(73.40—79.40)	76.5	532	68.9(65.63—72.17)	67.1
女	473	56.1(52.75—59.45)	55.3	375	44.5(41.15—47.85)	42.3
合计	1061	65.7(63.38—68.02)	65.4	907	56.2(53.74—58.58)	54.2

表 3 酒精使用所致 RR 值及置信范围

肿瘤名称	RR	95%CI	文献类型	人群
口咽癌	2.30	1.20—4.30	队列研究	新加坡裔华人
食管癌	1.51	1.18—1.30	Meta 分析	中国人
结直肠癌	1.06	0.91—1.24	Meta 分析	中国人
肝癌	1.87	1.36—2.57	Meta 分析	中国人

表 4 酒精使用所致 PAF

肿瘤名称	PAF(合计)%	PAF(女)%	PAF(男)%
口咽癌	42.21	36.67	47.25
食管癌	22.28	20.14	26.01
结直肠癌	3.26	2.60	3.97
肝癌	32.84	27.93	37.48

3.3 2008 年广州市居民四种恶性肿瘤死亡情况

根据广州市 2008 年死因及肿瘤监测数据，广州市监测点 2008 年肿瘤死亡报告 6322 例（男性 3985 例，女性 2337 例），全市肿瘤监测地区粗死亡率为 160.99/10 万（男性 199.49/10 万，女性 121.13/10 万），中国人口标化率为 84.91/10 万。其中，口咽癌、食管癌、结直肠癌、肝癌的死亡 2209 例（酒精所致占 25.84%），占广州市 2008 年恶性肿瘤所致死亡人数的 35%。各病种死亡情况见表 5。

3.4 2008 年广州市居民酒精使用所致相关恶性肿瘤疾病负担情况

3.4.1 健康损失

2008 年人群因各种恶性肿瘤早死及残疾共同损失 90395.05 个 DALYs，平均每千人损失 23.02 个健康寿命年，调整率 13.94/千人。其中，因患口咽癌、食管癌、结直肠癌及肝癌而损失的 DALYs 为 32550.73 个健康寿命年，占全部肿瘤所致健康寿命损失年的 36.01%。因饮酒患口咽癌、食管癌、结直肠癌及肝癌而损失的 DALYs 为 9033.86 个健康寿命年，占因患口咽癌、食管癌、结直肠癌及肝癌而损失的 DALYs 的 27.75%，占因所有恶性肿瘤而损失的 DALYs 的 10.00%。各病种疾病负担情况见表 6，酒精使用所致 DALYs 的构成见表 7。

表 5 广州市部分恶性肿瘤及酒精使用所致部分恶性肿瘤死亡情况

肿瘤部位	死亡例数（例） 死亡率(1/10^5)			酒精使用所致死亡例数（例） 死亡率(1/10^5)		
	男	女	合计	男	女	合计
口咽癌	248（12.42）	93（4.82）	341（8.68）	117（5.87）	34（1.77）	151（3.85）
食管癌	156（7.81）	32（1.64）	188（4.79）	41（2.03）	6（0.33）	47（1.20）
结直肠癌	372（18.62）	314（16.27）	686（17.47）	15（0.74）	8（0.42）	23（0.58）
肝癌	754（37.75）	240（12.44）	994（25.31）	283（14.15）	67（3.47）	350（8.90）
合计	1530（79.30）	679（33.99）	2209（56.25）	456（23.63）	115（5.76）	571（14.54）

表 6　广州市部分恶性肿瘤及酒精使用所致 DALYs,DALY(/千人)及人口调整率(/千人)

肿瘤名称	性别	整体			酒精使用所致		
		DALYs	DALY	调整率	DALYs	DALY	调整率
口咽癌	男	4205.31	2.11	1.31	1987.01	1.00	0.62
	女	1540.95	0.80	0.48	565.07	0.29	0.18
	合计	5746.27	1.46	0.90	2552.08	0.62	0.38
食管癌	男	2276.66	1.14	0.70	592.16	0.30	0.18
	女	395.05	0.20	0.10	79.56	0.04	0.02
	合计	2671.72	0.68	0.40	671.72	0.15	0.09
结直肠癌	男	4501.17	2.25	1.31	178.70	0.09	0.05
	女	4033.12	2.09	1.09	104.86	0.05	0.03
	合计	8534.29	2.17	1.20	283.56	0.07	0.04
肝癌	男	12249.78	6.13	3.86	4591.22	2.30	1.45
	女	3348.67	1.74	0.99	935.28	0.49	0.28
	合计	15598.45	3.97	2.43	5526.50	1.30	0.80
合计		32550.73	8.28	4.93	9033.86	2.14	1.31

表 7　广州市酒精使用所致部分恶性肿瘤 DALYs 的内部构成

肿瘤名称	YLLs	YLDs	YLLs/DALYs(%)	YLDs/DALYs(%)
口咽癌	2423.71	128.37	94.97	5.03
食管癌	638.47	33.25	95.05	4.95
结直肠癌	262.75	20.81	92.66	7.34
肝癌	5032.07	494.43	96.28	3.72
合计	8357.00	676.86	92.50	7.50

3.4.2　经济损失

2008 年广州市死因和肿瘤监测点各种恶性肿瘤导致的间接经济负担为 3190307251 元,相当于 2008 年广州市居民平均每人支出 812.42 元。广州市 2008 年因酒精使用所致间接经济负担为 370121800 元,占广州市恶性肿瘤间接经济负担的 11.60%,平均每千人损失 94300 元。如表 8。

表 8　2008 年广州市酒精使用所致恶性肿瘤的间接经济负担

肿瘤名称	YLL(十万)		YLD(十万)		DALY(十万)	
	间接经济负担	人均经济负担/千人	间接经济负担	人均经济负担/千人	间接经济负担	人均经济负担/千人
口咽癌	993.625	0.253	51.971	0.022	1045.596	0.266
食管癌	262.383	0.067	12.828	0.003	275.211	0.070
结直肠癌	107.470	0.027	8.706	0.002	116.176	0.030
肝癌	2179.717	0.555	84.518	0.020	2264.235	0.577
合计	3543.194	0.902	158.023	0.040	3701.218	0.943

4　讨论

4.1　广州市居民饮酒现状

4.1.1　酒精自古以来就是一种合法的成瘾物质,饮用后能使人产生兴奋、愉快、欢乐的感觉,具有增加人的正性情绪和较强的成瘾倾向。但由于其合法性和在日常生活、社会经济、文化活动中的重要性,在各种社交场合,总是可以看到酒的身影。虽然,酒存在积极的作用,但长期大量饮用会损害人体组织器官,增加死亡率,给社会带来沉重的健康负担,增加卫生医疗费用的支出。另一方面,饮酒会影响人的认知功能及情绪控制能力,造成醉驾、暴力冲突、自伤自杀甚至违法犯罪行为频频发生。这一系列的问题都与酒精使用有关,也引起了全社会的广泛关注。在这样的背景下,开展广州市居民的饮酒状况调查及计算酒精使用所致疾病负担显得很有必要。

4.1.2　此次广州市居民饮酒状况调查共回收问卷 1664 份,其中合格问卷 1615 份,合格率 97%。人群的性别分布方面,回收问卷中男性 772 人,占 47.8%,女性 843 人(52.2%),男性人数略少于女性,这与中国居民饮酒行为现状中男女比例基本一

致（男性 76128 人，占 47.8%；女性 82989 人，占 52.2%），同时与广东省 15 岁以上居民饮酒行为调查中的男女比例大致相同（男性 7958 人，占 45.0%；女性 9744 人，占 55.0%）。调查样本在 60 岁及以上人口组有缺失，因为此次调查主要是进单位调查的方式，而 60 岁以上人群基本已退休。人群的职业分布方面，农、林、牧、渔、水利业人群调查样本量不够，主要是因为调查地点主要限于城市地区，而农、林、牧、渔、水利业人群处于城市边缘地区，调查难度较大。这两方面的不足对饮酒率会有一定的影响。

4.1.3 广州市居民男、女及整体年饮酒率分别为 68.9%、44.5% 和 56.2%，2004 年苏中华等人对我国 5 地区 24992 名社区普通人群调查的到的男性、女性及整体年饮酒率分别为 74.9%、38.8% 和 59.0%[1]。可以看出，广州市男性饮酒率比全国 5 地区低 5 个百分点，女性饮酒率比全国 5 地区高 5.7 个百分点，总体饮酒率比全国 5 地区低 2.8 个百分点。广州市居民饮酒率略低于全国 5 地区，两性饮酒率差距小于全国 5 地区。女性饮酒率高于全国 5 地区，推测与广州市处于沿海地区，经济发达，思想开放，女性就业人员多等因素有关。

4.2 酒精使用所致疾病负担

酒精作为疾病的危险因素之一，世界卫生组织进行的全球健康危险因素研究中，2004 年全球范围内，酒精作为第八大危险因素，2300000 人死亡是由酒精使用引起，占全部死亡的 3.8%，同时，酒精作为第三大危险因素，69000000 个 DALYs 是由酒精使用引起的，占全部损失的 4.5%。酒精作为疾病的危险因素之一，严重威胁着人类的健康，给人类带来极大的健康负担。近年来，随着经济的发展，生活水平的改善，酒精滥用更加严重，酒精使用所致的各种健康问题也接踵而至，酒精使用疾病负担研究作为定量研究酒精对健康危害的方法，能呈现给人们直观的数字，提醒人们酒精带来的损害。

4.2.1 本次研究使用的酒精归因分值是使用世界卫生组织提出的传统的归因分值计算方法得到的，只考虑了饮酒者和非饮酒者，而没有考虑饮酒量的多少，使用世界卫生组织最新提出的比较危险因素分析（CRA）可以更准确地计算 PAF 值[27]，本次研究中口咽癌、食管癌、结直肠癌、肝癌的酒精归因分值分别为 42.21%、22.28%、3.26% 及 32.84%，与全球疾病负担研究中使用比较危险因素分析（CRA）计算出的亚太地区 15～34 岁男性酒精使用 PAF 的结果相比[27]，口咽癌、食管癌、结肠癌、直肠癌、肝癌的酒精归因分值分别为 43.00%、25.90%、4.40%、7.40% 和 13.40%，可以看出，除肝癌外，其他癌症酒精归因危险度大致相同。

4.2.2 2008 年广州市肿瘤监测地区酒精使用所致口咽癌、食管癌、结直肠癌、肝癌死亡例数占 2008 年广州市全部恶性肿瘤死亡的 9.03%。其中，酒精使用所致肝癌死亡最多，占四种恶性肿瘤死亡的 61.30%。本次研究酒精使用所致四种恶性肿瘤死亡占全部恶性肿瘤死亡的比例高于郝亮、王建兵等人的研究结果（占 4.36%），但肝癌死亡所占四种恶性肿瘤死亡的比重低于郝亮、王建兵等人的研究结果 68.80%[28]。敏感性检验得酒精使用所致四种恶性肿瘤死亡占广州市恶性肿瘤全部死亡的 5.19%～9.22%。

4.2.3 2008 年广州市酒精使用所致咽癌、食管癌、结直肠癌和肝癌而损失的 YLLs 为 8357.00，占广州市 2008 年所有恶性肿瘤所致 YLLs 损失年的 9.91%；2008 年广州市酒精使用所致咽癌、食管癌、结直肠癌和肝癌而损失的 YLDs 为 676.86，占 2008 年广州市所有恶性肿瘤所致 YLDs 损失的 11.69%；2008 年广州市酒精使用所致咽癌、食管癌、结直肠癌和肝癌而损失的 DALYs 为 9033.86 个 DALYs，占广州市全部恶性肿瘤所致 DALYs 所致损失的 10.00%。可见酒精的使用对人群健康的致死性和致残性影响都是很大的。

4.2.4 本次研究中，由表 7 可以看出四种恶性肿瘤伤残调整寿命年损失绝大部分是由于早死所致。推测与大部分癌症病人发现的时候已到了癌症晚期，从发现到死亡经历时间短，而且癌症的生存期较短，因此恶性肿瘤所致疾病负担大部分都是由于死亡引起的寿命损失。

4.2.5 使用不同的饮酒率进行敏感性检验发现，饮酒率不同，对酒精使用所致死亡及 DALYs 都有影响，表现为低饮酒率，低酒精使用所致发病、死亡及 DALYs 低，提示，如果能降低人群饮酒率，将减少酒精使用所致疾病负担。

5 结论

1.广州市居民曾经饮酒率为 65.7%，年饮酒率

为 56.2％。男性曾经饮酒率和年饮酒率分别为 76.4％和 68.9％，女性曾经饮酒率和年饮酒率分别为 56.1％和 44.5％，女性饮酒率低于男性。

2.广州市酒精使用所致口咽癌、食管癌、结直肠癌、肝癌而损失的 YLLs、YLDs、DALYs 分别为 8357.00、676.86、9033.86 个健康寿命年，健康损失绝大部分由早死造成。

3.广州市酒精使用所致口咽癌、食管癌、结直肠癌、肝癌而带来的间接经济损失为 3.7 亿元，其中肝癌造成损失最高。

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Research on Burden of Disease of Alcohol-Attributable Malignancy of the Resident in Guangzhou

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Abstract：*Objective*：To estimate the burden of disease（BOD）of 2008 Guangzhou residents alcohol use related malignant neoplasm（oral cavity pharynx cancer，oesophagus cancer，colon and rectum cancer，liver cancer）. *Methods*：DALYs and human capital methods are used to assess BOD of 2008 Guangzhou residents alcohol use related malignant neoplasm，which are based on the data of mortality，incidence and the survey of alcohol use status. *Results*：The BOD caused by the four kinds of malignant neoplasm above are 9033.86 DALYs due to alcohol use，The indirect economic burden of disease（EBOD）of the four kinds of malignant neoplasm attribute to alcohol use is 0.37 billion yuan. *Conclusion*：The BOD of the four kinds of malignant neoplasm attribute to alcohol use is majority because of premature death. Reduce the rate of drinking will reduce the BOD caused by alcohol use.

Key words：Malignant neoplasm；burden of disease；alcohol use

编 者 按

　　本期在创刊号的基础上，根据专家建议，在封面设计、主题安排等方面进行了一定程度的完善和改动。呈以下三个特点：第一，内容更加丰富，比创刊号增加了登刊篇幅；第二，作者来源地更加多元化，除了有美国和国内知名专家的稿件外，增加了马来西亚、香港等国家或地区的稿件；第三，主题更加聚焦，围绕全球健康政策、疾病负担、身心健康等问题展开深入而广泛的研究与探讨。本刊诚挚欢迎国内外专家给本刊多提宝贵意见，惠赐优秀稿件！

　　　　　　　　　　　　　　　　　　　　　　　　　　　《全球健康学杂志》编辑部

Quantitative Estimating the Disease Burden of Adult Cancers and COPD Attributable to Tobacco Smoking in China

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Abstract：Objectives：To estimate the accumulated health hazards attributable to tobacco smoking in China in 2007，through quantifying the disease burden of cancers and chronic obstructive pulmonary disease（COPD) in adults caused by smoking. Methods：Indirect method，based on local epidemiological evidence and national vital registration data，was used to estimate both the tobacco-attributable deaths and disability adjusted life years（DALYs）of cancers and COPD. Results：Tobacco smoking caused about 203 922－234 415 caners and COPD deaths in adults，and the loss of 2. 42－2. 79 million years of healthy life attributable to tobacco smoking in China in 2007. Among middle-aged males，28. 6％ of deaths for cancers and COPD were attributed to tobacco smoking，and 3. 8％ of deaths in females，on significant difference among urban and rural areas. Overall，21. 2％ of deaths for cancers and COPD in middle-aged adults were attributed to tobacco smoking in 2007. Conclusions：The disease burden of cancers and COPD caused by smoking is serious in China even absent in some vital registration data. The serious accumulated hazards foreshows the health outcomes attributable to tobacco smoking are outstanding in China. Measures of controlling the tobacco epidemic are urgently needed.

Key words：Accumulated hazards；DALY；disease burden；tobacco smoking

1 Introduction

As one of the ten leading risk factors that accounting for more than one-third global mortality，tobacco consumption responsible for the fourth cause of global disease burden，and the third of developing countries with low mortality[1]. Comparative risk assessment（CRA）project，undertaken by World Health Organization（WHO），estimated that in 2000，approximately 4. 83 million deaths worldwide were due to smoking，accounting for 12％ of global adult mortality. Of these deaths，2. 41 million were in developing countries[2]. The toll will double in 20 years unless available and effective interventions are urgently and widely adopted[3].As the world's largestproducer and consumer of cigarettes，China bears a substantial proportion of global burden of smoking-related diseases and deaths，it will have catastrophic effects in

the 21st century as most other causes of death are likely to continue to decrease and the effects of tobacco to increase[4]. WHO reported that nearly one million Chinese smokers died from smoking-related diseases in 2000, and two million annually by 2020 if the number of smokers continues to grow at present rates[5].

In the United States the mean daily cigarette consumption per adult were 1, 4 and 10 in 1910, 1930, and 1950, after which it remained fairly constant for a few decades, this similar pattern was repeated in Chinese men 40 years later (in 1952, 1972, and 1992 respectively)[6-8]. Indeed, the daily cigarette consumption per adult in China increased continuously from approximately 13 in 1984 to 16 in 2003[9-13]. From 1984 to 1996, the age of smoking initiation declined approximately 3 years for both men and women[10]. Although the high smoking prevalence especially among males decreased a bit but not stable[9-12]. The sales volume of cigarettes has grown steadily since 1981[10]. Peto et al said that in countries such as the United States or the United Kingdom, where men have been smoking for so long that the male epidemic has approximately reached its maximum level[14]. If the health effect attributable to tobacco of United States reached its highest level in 1984 − 8 when the national data of deaths attributed to smoking were prospectively obtained after decades of lifelong smoking of current smokers[15], and the retrospective proportional mortality study of Liu et al assessed the hazards at an early phase of the growing epidemic of deaths from tobacco in China during 1986 − 8[6]. Meanwhile considering the powerful governmental policies, non-government organization's advocating and multi-sources funded programs on tobacco control carried out basing on the experience of developed countries in recent years, which will undoubtedly weaken the epidemic of smoking in China and shorten the delay between cause and full effect, we boldly assume that we have entered the intermediate stage of epidemic of deaths from tobacco in China.

CRA project has assessed the global disease burden attributable to smoking in 2000, in which mortality statistics from WHO's Global Burden of Disease (GBD) database as well as relative risk from Liu et al were used in the assessment of that in China [2]. However there is lacking of similar systematical studies with local nationwide data. Importantly, over the years some of the conclusions may have changed, as the year of cigarette smoking prolongs and disease or death patterns evolves, the study of re-estimating disease burden attributable to smoking, basing on improved epidemiological evidence and nationwide data, seems to be urgently needed.

In this paper, we applied indirect method, developed by Peto et al[15], to estimate the accumulated hazards of adult (aged 35 − 69 years) cancers and chronic obstructive pulmonary disease (COPD) attributable to smoking by sex in different region (urban-rural) of China in 2007. According with the CRA methodology, we selected both premature mortality and disability adjusted life years (DALYs) as our indicators to assess. The DALYs is a summary measure of population health that combines in a single indicator years of life lost from premature death (YLLs) and years of life lived with disabilities (YLDs)[16]. Local epidemiological evidence and nationwide vital data from China itself were used wherever available.

There are many uncertainty factors that inevitably challenge the reliability of the consequences, despite the representative nationwide epidemiological and vital data, and evidence-based data from WHO were utilized in this paper, we addressed this issue by providing uncertainty analysis reported with the 95％ intervals for expected deaths.

2　Methods

2.1　The calculation of population-attributable fractions (PAF)

In developed countries, cigarette smoking be-

came popular during the first half of the twentieth century，but the main increase in tobacco deaths has been seen during the second half of twentieth century，[7] namely，there is a long delay between cause and full effect，especially cancers and COPD attributed to smoking. It's also reflected in the estimates of risk reversal after smoking cessation in CRA project，which between 5 and 10 years after cessation the risks of COPD and lung cancer were halved[2].Therefore the current smoking prevalence alone is an insufficient indicator of accumulated risk from smoking[2,15,17].Peto et al[15] proposed the smoking impact ratio（SIR），which using excess lung cancer mortality of a population over never-smokers，as a marker for accumulated smoking risk. The SIR is substituted for smoking prevalence in the calculation of PAF of smoking attributable risks for cancers and COPD. The SIR was calculated as follows：

$$SIR = \frac{C_{LC} - N_{LC}}{S_{LC}^{*} - N_{LC}^{*}} \qquad (1)$$

Where C_{LC} is the age-sex-specific lung cancer mortality rate in the study population，N_{LC} is lung cancer mortality rate for never-smokers in the same population，S_{LC}^{*} andN_{LC}^{*} are the lung cancer mortality rates for smokers and never-smokers，respectively，in a reference population. The PAF formula is：

$$PAF = 1 - \frac{1}{1 + P(RR - 1)} \qquad (2)$$

Where PAF is population-attributable fraction within an age-sex-specific population，P is smoking prevalence within an age-sex-specific population，here is replaced with SIR，RR is the relative risk of disease.

2.2   Data sources

In the calculation of SIR，we used the American Cancer Society Cancer Prevention Study phase Ⅱ（CPS-Ⅱ）as the reference population，the S_{LC}^{*} andN_{LC}^{*} are the lung cancer mortality rates for smokers and never-smokers from CPS-Ⅱ respectively[2,15]. The CPS-Ⅱ is a prospective study of

smoking and death in more than one million American aged 30 years and older when they completed a questionnaire in 1982，with the latest follow up in 1998[2].Which was one of the few studies of smoking and cause-specific mortality undertaken when the full effects of the smoking epidemic were apparent，especially for men[18]. In response to the criticism about the lack of empirical evidence for confounding correction，CPS-Ⅱ data was re-examined with adjustment for potential confounders，however，the results showed that the deaths caused by smoking are not substantially altered by adjustment for behavioral and demographic factors associated with smoking[19]，on which lung cancer mortality rates are considered to be robust.

In our study，the region-sex-specific mortality data in 2007 were obtained from the Minister of Health Vital Registration（MOH-VR）system of China[20]，which currently covers 41 urban and 85 rural centers，accounting for roughly 8% of the national population[21-22].

The region-specific lung cancer mortality rate for never-smokers in the study of Liu et al[6] was directly selected as the N_{LC} in the equation 1. The study of Liu et al is a retrospective proportional mortality study of one million deaths who had died during 1986－8 in 24 urban and 74 rural areas of China，with the aim to assess the disease hazards from tobacco in China[6].They concluded that the different non-smoker lung cancer mortality rates in China are largely a result of patterns of household energy use and ventilation conditions in China over the past few years[6,18].Unfortunately，the household use of coal and biomass，not only in rural but in urban，have not yet much changed[23]，so we considered that the lung cancer mortality rate for never-smokers from Liu et al[6] are still suitable for the estimation of disease burden attributable to smoking in 2007.

As the passage of years with continued smoking，the accumulated hazards of cancers and COPD attributed to smoking would certainly increase，

and the *RR* completely from Liu et al in 1986－8 [6] no longer appropriate. Lam et al undertook a large case-control study in 1998，in which 27 507 dead cases（81％ of all registered deaths）and 13 054 live controls aged 35 years and older were included，the past smoking habits of cases were sought from the death registers[24]. Considering the high urbanization in Hong Kong，and the quite low smoking prevalence among females in China，we selected the *RR* among males from Lam et al[24] as the calculation of males. *PAF* in urban region in our study，and the *RR* among females were obtained from Liu et al. By the same proportion of RR among males from Liu et al in urban region[6] to that from Lam et al in whole Hong Kong[24]，we adjusted the *RR* among males in rural region in our study based on the corresponding *RR* from Liu et al[6].Disease outcomes related to tobacco smoking，the age-sex-specific RR of urban and the adjusted age-sex-specific RR of rural，as well as95％ confidence intervals（*CI*）used in our calculation listedin table 1.

Table 1　Disease outcomes related to tobacco smoking and the region-sex-specific RR（95％ *CI*）[a]

Disease outcomes (ICD-10 codes)	Urban		Rural	
	Males (95％ CI) [b]	Females (95％ CI) [c]	Males [d]	Females (95％ CI) [c]
Lung cancer（C33-C34）	4.99（4.00－6.22）	3.24（3.12－3.36）	4.30	1.98（1.74－2.22）
Oesophagus cancer（C15）	7.89（4.49－13.88）	1.65（1.49－1.81）	6.01	1.28（1.10－1.46）
Stomach cancer（C16）	1.72（1.24－2.38）	1.30（1.20－1.40）	1.71	1.13（0.99－1.27）[f]
Liver cancer（C22）	1.56（1.26－1.92）	1.49（1.37－1.61）	1.58	1.12（0.96－1.28）[f]
Pharynx cancer（C10－14）	1.94（1.52－2.48）	1.68（1.54－1.82）	1.82	1.39（1.10－1.68）
Bladder cancer（C67）	1.94（1.52－2.48）	1.68（1.54－1.82）	1.82	1.39（1.10－1.68）
Other cancers（rest of C00-D49）	1.25（1.04－1.51）	1.17（1.11－1.23）	1.38	0.95（0.83－1.07）
Chronic obstructive pulmonary disease（I27-I28，J40-J44）[e]	3.84（2.58－5.26）	2.51（2.41－2.61）	3.45	1.50（1.38－1.62）

ICD-10：International Classification of Diseases and Related Health Conditions，10th. *RR*：Relative Risk. *CI*：Confidence Interval.
[a] The adults aged 35－69 years were involved in this study.
[b] Come from Lam et al[23].
[c] Come from Liu et al[5].
[d] Adjusted by the same proportion of RR among males from Liu et al in urban region [5] to that from Lam et al in whole Hong Kong[23] basing on the *RR* from Liu et al in rural region[5]. The 95％ *CI* of RR were not provided.
[e] Includes pulmonary heart diseases and chronic lower respiratory diseases.
[f] Although the lower confidence interval is less than 1，the deaths of those diseases among rural female were calculated，considering the value is close to 1 and potential underestimation.

The population data were obtained from 2007 national sample survey on population changes. A total of 1.19 million people，accounting for 0.907 per thousand of nation population，were selected with stratified multi-stage systematic Probability Proportion to Size（PPS）cluster sampling methods from 31 provinces，autonomous regions and municipalities of China. The data do not include the population of Hong Kong Special Administrative Region（SAR），Macao SAR，and Taiwan province[25].

2.3　DALYs

The DALYs，YLLs are calculated as follow[16, 22]：

$$DALYs = YLLs + YLDs \qquad (3)$$

$$YLLs = N + L \qquad (4)$$

Where N is the number of deaths due to smoking for given age and sex，L is the standard loss function in years for given age and sex，which in terms of the life expectancy at various ages of China in life tables for WHO member states in 2007[26]. Each death is assigned to one of age groupings for given sex，and the midpoint of the age group is taken as the average age at death for every person in that group. Considering the hard-

ness to accurately obtain the incidence，disability weight and disability duration in the YLDs calculation required，we used the YLDs-to-YLLs ratios method for calculating YLDs[27]，the formula described as below：

$$YLDs = YLLs(YLDs'/YLLs') \qquad (5)$$

Where YLDs' and YLLs' derive from the revised GBD 2002 estimates on WPRO-B（by population，China makes up more 85%）respectively by age，sex and cause groups[28]. To consist with the WHO GBD and CRA project，3% time discounting and non-uniform age weights were used in calculating DALYs. The attributable fraction of morbidity due to smoking was assumed to be the same as mortality for all cancers and COPD[2].

2.4　Uncertainty analysis

Monte Carlo simulation technique，which consists on assigning probability distributions to model variables that involve risk and then generating random numbers based on those distributions，was used to present uncertainty ranges around point estimates reflecting the main sources of uncertainty. The @RISK software version 5 for Excel [29] allows multiple recalculations of a spreadsheet. We defined the RR and the mortality as the input variables，the deaths and DALYs as the output variables. For the input variables we specified a lognorm distribution for the RR and normal distribution for the mortality. For each of the output variables，95% uncertainty intervals were calculated bounded by the 2.5[th] and 97.5[th] percentiles of the 1000 iteration values generated.

3　Results

The quantitative estimates of disease burden attributable to tobacco smoking are summarized in table 2，3 and plotted in figure 1－2. As the indicator of accumulated hazards caused by smoking，the attributable deaths and DALYs of cancers and COPD in adults were calculated by age，region and sex in our study. Tobacco smoking caused an estimated 211 877 deaths in males（94.7%）and 11 877 in females（5.3%），88 691 deaths in urban（39.6%）and 135 063 in rural（60.4%）in China in 2007. Similarly，about 2.6 million（94.4%）DALYs in males and 154 530（5.6%）in females，1.1 million（38.6%）DALYs in urban and 1.7 million（61.4%）in rural were attributable to tobacco smoking. Among males，the tobacco-attributable deaths and DALYs in rural accounted for more than that in urban，and inversely in females（table 2）.

Whether for the cancers，COPD or the combination，the mortality caused by tobacco smoking among rural males far exceeded that among other groups（figure 1）. Totally，of 77.9% tobacco-attributable deaths，60.5% DALYs caused by cancers，and 22.1% and 39.5% caused by COPD respectively，which also means the longer sick state among patients with COPD.

The uncertainty analysis revealed that between 2.42 and 2.79 million adults DALYs of cancers and COPD were attributable to tobacco smoking in China in 2007，among which 0.93 to 1.09，1.40 to 1.77，2.27 to 2.70，and 0.11 to 0.17 million in urban，rural，males and females respectively（table 3）.

Table 2 and figure 1 presented the absolute data of tobacco-attributable deaths，but the situation would change if compared with all the deaths for the same diseases in the same period and same groups. The proportion in figure 5 indicated that the urban males accounted for the most of the deaths，and roughly the same among urban and rural. Among middle aged males the death proportion of cancers and COPD caused by tobacco smoking was 28.6%，and 3.8% among females. Overall，21.2% of deaths for the cancers and COPD in adults aged 35－69 years were attributed to tobacco smoking in China in 2007.

Table 2   Premature deaths and DALYs attributable to tobacco smoking，China，2007

Sex-specific diseases	Urban		Rural		Total	
	Deaths	DALYs	Deaths	DALYs	Deaths	DALYs
Males						
Lung cancer	36 329	325 449	35 034	319 698	71 363	645 147
Oesophagus cancer	16 174	149 888	34 969	304 805	51 143	454 693
Stomach cancer	4 785	44 827	10 922	100 093	15 707	144 920
Liver cancer	7 396	87 463	13 802	169 807	21 198	257 270
Pharynx cancer	996	11 830	1 553	18 725	2 549	30 555
Bladder cancer	400	3 681	394	3 917	794	7 598
Other cancers	1 330	13 824	1 846	21292	3 176	35 116
COPD	14 148	337 993	31 799	690 306	45 947	1 028 299
Total burden of males	81 558	974 955	130 319	1 628 643	211 877	2 603 598
Proportion（%）	38.5	37.4	61.5	62.6	100.0	100.0
Females						
Lung cancer	4 007	44 059	1 783	20 738	5 790	64 797
Oesophagus cancer	231	2 298	458	4 721	689	7 019
Stomach cancer	273	3 326	299	3 388	572	6 714
Liver cancer	525	6 333	265	3 342	790	9 675
Pharynx cancer	94	1 344	82	1 104	176	2 448
Bladder cancer	25	240	21	284	46	524
Other cancers	205	2 651	0	0	205	2 651
COPD	1 773	30 639	1 836	30 063	3 609	60 702
Total burden of females	7 133	90 890	4 744	63 640	11 877	154 530
Proportion（%）	60.1	58.8	39.9	41.2	100.0	100.07
Total burden	88 691	1 065 845	135 063	1 692 283	223 754	2 758 128
Proportion（%）	39.6	38.6	60.4	61.4	100.0	100.0

COPD：Chronic obstructive pulmonary disease. DALYs：Disability adjusted life years.

Table 3   The summary of uncertainty analysis of deaths and DALYs attributable to tobacco smoking，China，2007

|	Urban	Rural	Total
Males			
Deaths	74 500－85 794	116 306－138 760	197 844－217 627
DALYs	870 823－1 027 875	1 360 579－1 709 735	2 273 813－2 696 383
Females			
Deaths	6 224－7 677	4 104－5 296	10 619－12 204
DALYs	70 217－107 128	40 847－92 407	114 660－174 341
Total			
Deaths	80 442－94 022	122 282－141 870	203 922－234 415
DALYs	929 046－1 093 946	1 401 086－1 767 663	2 417 632－2 788 135

DALYs：Disability adjusted life years.
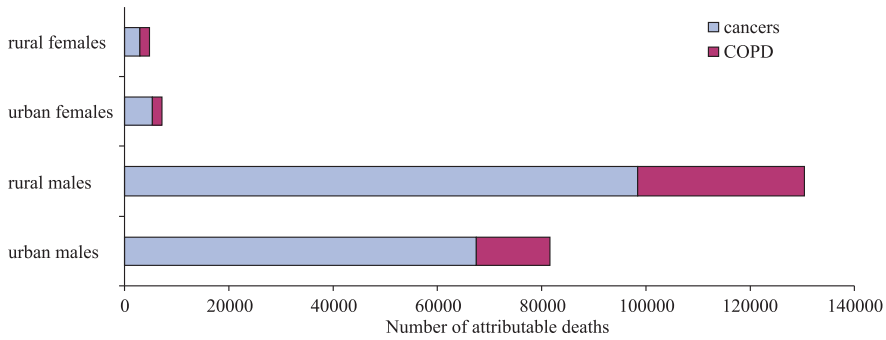
Figure 1　Tobacco-attributable deaths by cancers and COPD for adults aged 35－69 years by region and sex，China，2007
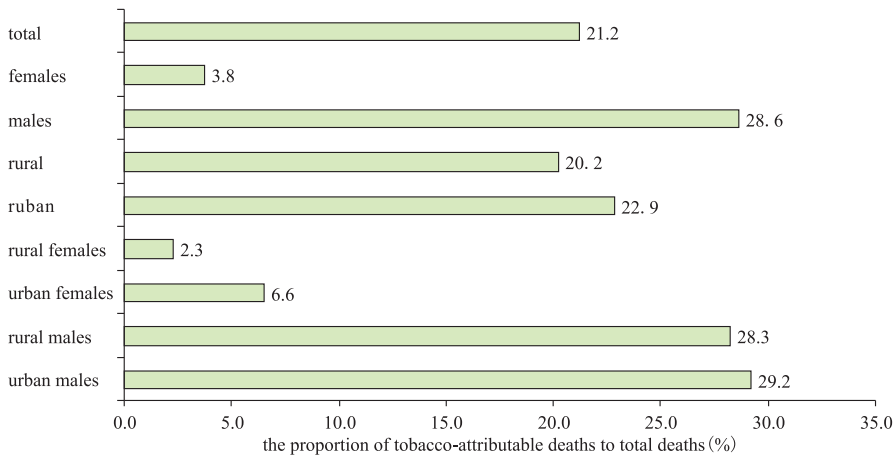

Figure 2　The proportion of tobacco-attributable deaths to total deaths of cancers and COPD in adults aged 35－69 years by region and sex，China，2007

4　Discussion

The updated evidence shows that tobacco smoking are causally related to cancers，cardiovascular diseases，respiratory diseases，reproductive effects，and other effects[30]. In the calculation of CRA project，cancers，COPD，tuberculosis，other respiratory diseases，stroke，ischemic heart disease，other vascular conditions and other medical conditions were included[2]. We selected，in this study，cancers and COPD as the target outcomes to estimate the accumulated hazards attributable to tobacco smoking. Some malignant neoplastics have presenting obvious decline in mortality，while the morbidity and mortality of cancers ecological environment and lifestyle-related shows sustained increasing over the decades in China. Among these，lung and breast cancer registered the highest increase of 465 percent and 96 percent in the past 30 years，respectively[31]. Cancers have become the leading cause of death among Chinese adults[32]，and lung cancer has replaced liver cancer to become the top killer among malignant neoplastics in China[31].A large，population-based survey found that COPD is prevalent in individuals aged 40 years or older in China，the overall prevalence of COPD was 8.2％（men，12.4％；women，5.1％)[33]. Western prospective studies，when the health effects attributable to tobacco reached its peak，

showed that the relative risk of smokers to non-smokers for COPD ranked the 2nd following the lung cancer[2,15,34-35]. COPD is a leading cause of mortality worldwide, and is estimated to be the third most common cause of death by 2020[36]. The steady increase of cancers and COPD in morbidity and mortality foreshows the health outcomes attributable to tobacco smoking are outstanding in China.

The rational selection of RR is very important in the estimation of disease burden attributable to risk factors. There were several case-control studies[6,24] and prospective studies[37-40] based on all death cause in local setting of China. The studies of Yuan et al[39] and Chen et al[40] were carried out in middle-aged men in urban Shanghai, China, and the time of research was during the late 1980s and early 1990s, which closed to that of Liu et al[6]. The sample size in the study of Liaw et al in Taiwan[38] was limited. The study of Niu et al[37] did not provide the available data of relative risk in details, which just listed the rough classification of neoplastic, respiratory and vascular etc. in their paper. Fully considered the sample size and the time of study, as well as the quite low smoking prevalence among females in China, the RR from Liu et al[6] and Lam et al[24] were finally used in our study.

The results of our study suggested that the death proportion of cancers and COPD caused by tobacco smoking, in middle-aged adults, was 28.6% among males, 3.8% among females, 22.9% in urban and 20.2% in rural, respectively, which reflect the distribution characteristics of smoking prevalence over two decades in China[9-12]. Hong Kong has for the past few decades been the urbanized and westernized Chinese city, which cigarette consumption in men reached its stability 20 years later than the United States, 20 years ahead of mainland China[24]. The RR of males from Hong Kong in 1998 used in this study would lead to some overestimation. Comparatively, the disease burden

would be underestimated among females as the RR in 1986－8 in China was used. In total, 21.2% of deaths for cancers and COPD in middle-aged adults were attributed to tobacco smoking, which seems to be more factual after counteraction even non-e-quivalent. In 1955 about 21% of all US male deaths in middle age were attributable to smoking, and increased to 34% by 1975. Among Hong Kong men in 1998 about 33% of the deaths in middle age were attributable to smoking[24]. Epidemiological evidences in mainland China showed that by 1990 smoking caused about 12－13% of Chinese mortality in middle-aged males and 3% of deaths in females[6,37]. In Taiwan, 13.9% of total deaths in men age 40 and older were attributable to cigarette smoking in 1994. Although only cancers and COPD were estimated in our study, we presume the peak period of deaths attributable to tobacco smoking in China, especially in males, will start 10 years late. To substantially limit national tobacco deaths, any measures to make the smokers stop doing so and discourage non-smokers, especially the young people, from starting are desperately needed.

One limitation in our study is the usage of secondhand data. The risks of smoking in relation to disease would undoubtedly increase over time, and updating the risk estimates is needed. We used published literatures of local studies depend on the availability and suitability to estimate the disease burden attributable to tobacco smoking in 2007, the deviation is inevitable. In addition, the indirect method used in our study is obviously crude[15], despite it has well controlled the uncertainty for the instability and insufficiency of smoking prevalence in the calculation of PAF to a certain extent. The mortality data in this study were obtained from the Chinese vital registration system administered by the Ministry of Health which is incomplete and they are not made publicly available at all[41]. For example, only pulmonary heart diseases and chronic lower respiratory diseases were included in the estimate of COPD, oral, larynx, pancreas, breast

and cervical cancer were absent，all which would lead to underestimation. As a result，the absolute value would have been affected，but the impact of proportion and comparison was small. Therefore，we should be careful to extrapolate the results for the apparently precise figures should difficult to be guaranteed.

For the limitations mentioned above，we conducted uncertainty analysis on these estimates to attempt to quantify them. Although the other types of uncertainty are difficult to capture，and the reliability，timeliness and accuracy of data are undoubtedly the most important. China，with 20% of the world's population，smokes 30% of the world's cigarettes. The growing epidemic of premature death from tobacco will be great. Hence，nationwide，reliable and representative epidemiological studies on premature death attributable to smoking at different epidemic stage are strongly recommended. Of course，the continuous accurate monitor of risk behavior of smoking，and vital registration are also urgently needed.

DALY is the integrative index of disease burden assessment WHO recommended，which not only considers the potential years of life lost due to premature death but also the equivalent years of "healthy" life lost due to illness or injury. We used the DALYs to comprehensively estimate the lost of healthy life years caused by tobacco smoking，about 2.76 (2.42－2.79) million DALYs in combination of cancers with COPD were attributable to tobacco smoking in China in 2007. But there are no familiar or comparable studies among other risk factors in China，the DALYs itself can not solve any problems. We suggest in China establishing a professional organization or group with experts in different disciplines，to carry out the research of disease burden attributable to risk factors with uniform comparable methods and all related health outcomes involved. Under the comparative quantification of health risks，the government can better determine the disease control priorities，so that the inexpensive but powerful health intervention will be implemented.

Acknowledgements

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