

## Facilitators and barriers of adopting healthy lifestyle in rural China: a qualitative analysis through social capital perspectives

Yan Zhang<sup>1</sup>, Defu Ma<sup>2</sup>, Renzhe Cui<sup>3</sup>, Esayas Haregot Hilawe<sup>1</sup>, Chifa Chiang<sup>1</sup>, Yoshihisa Hirakawa<sup>1</sup>, Yonghua Hu<sup>2</sup>, Peiyu Wang<sup>2</sup>, Hiroyasu Iso<sup>3</sup> and Atsuko Aoyama<sup>1</sup>

<sup>1</sup>*Department of Public Health and Health Systems, Nagoya University Graduate School of Medicine, Nagoya, Japan*

<sup>2</sup>*School of Public Health, Peking University Health Science Center, Beijing, China*

<sup>3</sup>*Public Health, Graduate School of Medicine, Osaka University, Suita, Japan*

### ABSTRACT

Non-communicable diseases (NCDs) are the major public health concerns in China. However, little has been known yet about the background social factors that influence lifestyles as possible NCD risk factors. This qualitative study aimed to explore facilitators and barriers of adopting healthy lifestyles among residents in a rural community of China. Three age-stratified focus group discussions (FGDs) were conducted in Fangshan district of Beijing in 2013. A FGD guide was designed to elicit the participants' perception and experience regarding their lifestyles. The audio-records were transcribed, and data were qualitatively analyzed through thematic approach. Through social capital framework with bonding, bridging, and linking classifications, we identified the following facilitators and barriers to adopt healthy lifestyles. (1) Facilitators: mutual support from family/friends and motivation to participate in regular exercises (bonding); cooperative relationships with community health workers (bridging); and nationwide high level of healthy lifestyle awareness (linking). (2) Barriers: negative influence from family/friends, insufficient support from family/friends, peer pressure and tolerance towards unhealthy lifestyles (bonding); insufficient support from health professionals (bridging); and inequity in allocation of public resources (linking). This study revealed that bonding, bridging and linking social capital would work as facilitators and barriers to adopt healthy lifestyles among rural residents in China.

**Key Words:** non-communicable diseases (NCDs), social capital, lifestyle, rural China, qualitative analysis

This is an Open Access article distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### INTRODUCTION

Non-communicable diseases (NCDs), such as cardiovascular diseases and diabetes mellitus, are the major public health threats throughout the world. Risks of NCDs are known to increase by adopting unhealthy lifestyles, such as tobacco smoking, diets with too much fat and energy, and physical inactivity.<sup>1, 2)</sup> It was estimated that smoking, dietary factors, physical inactivity,

---

Received: November 17, 2015; accepted: February 16, 2016

Correspondence author: Yan Zhang

Department of Public Health and Health Systems, Nagoya University Graduate School of Medicine, 65 Tsurumai-cho, Showa-ku, Nagoya 466-8550, Japan

TEL: +81-52-744-2128, FAX: +81-52-744-2131, Email: [yanzhang@med.nagoya-u.ac.jp](mailto:yanzhang@med.nagoya-u.ac.jp)

overweight and alcohol use together accounted for more than one quarter of global disability-adjusted life-years (DALYs) in 2010.<sup>3)</sup>

NCDs became major health problems in China, along with economic development and lifestyle changes. NCDs accounted for 80% of the total deaths and 70% of the disease burden, with stroke being the leading cause of deaths.<sup>4)</sup> The prevalence of overweight and obese was reported as 21 % and 2.5 % respectively in 2011,<sup>5)</sup> and obese population in China was estimated to be over 320 million. Prevalence of smoking among adult was 28.1 %, which has made China the world's biggest consumer of tobacco.<sup>6)</sup> Comparing to urban inhabitants, rural dwellers had higher smoking and obesity prevalence.<sup>5-7)</sup>

This qualitative study was designed to investigate the underlying causes of unhealthy lifestyle which induced high prevalence of NCD risk factors among residents in a rural community of China, *i.e.*, Fangshan district in Beijing. A previous quantitative epidemiological report showed the high prevalence of NCD risk factors among the residents in the same area.<sup>8)</sup> For example, the overweight/obesity prevalence was 53.3% among male and 64.7% among female. However, the quantitative epidemiological study alone was unable to identify background social factors which might make people adopt unhealthy lifestyles.

The objective of this qualitative study was to explore facilitators and barriers to adopt unhealthy lifestyles among rural community residents in China. For interpreting the result, we utilized social capital framework with bonding, bridging, and linking classification<sup>9)</sup> to clarify facilitators and barriers to adopt healthy lifestyles.

## METHODS

### *Study area*

This qualitative study was conducted in Fangshan district, Beijing, the same area where the previous cross-sectional epidemiological study was conducted. The findings of the epidemiological study was reported elsewhere.<sup>8)</sup> Fangshan district is located 22 km southwest of the city of Beijing, with hilly areas and farmlands. Within the 14 towns of Fangshan district, Zhoukoudian town was selected for the study because it contains approximately equal proportions of hilly areas and plains, for better representing different lifestyles among those areas.

### *Focus group discussions (FGDs)*

Three focus group discussions (FGDs) were conducted in May, 2013.

Participants of FGDs were purposely recruited through community health workers,<sup>10)</sup> who knew the residents' lifestyles and social backgrounds well. Participants were eligible if they were long-term community residents; over 18 years old; and information-rich about lifestyle related issues. Only those residents who showed the willingness of participation were selected.

A total of 23 residents aged from 33 to 70 years were finally recruited. The participants were divided into three age-stratified groups: group of under 45 year old comprised of 7 participants, group of 46–60 year old comprised of 8 participants, and group of over 60 year old comprised of 8 participants.

The basic socio-demographic information (sex, age, occupation) of participants was obtained before the FGDs. The socio-demographic characteristics of the 23 participants were shown in Table 1. Most of the participants were married.

A FGD guide was designed to cover the common scale of healthy lifestyle adoption, containing 5 main domains: 1) Dietary habits; 2) Regular exercises; 3) Tobacco smoking and alcohol drinking; 4) Health seeking behaviors; 5) Awareness and expectations towards NCD control (Table 2).

This guide provided the moderator with the framework for raising topics, and participants were expected to express their perception and experience of adopting healthy or unhealthy lifestyles.

All the FGDs were conducted in Mandarin Chinese and moderated by D.M. in a meeting room of community health center of Zhoukoudian. Discussions were audio-recorded and key issues raised in the discussions were noted. The FGDs were continued until no new issues were raised, or saturated. Each discussion lasted about 60–90 minutes.

**Table 1** Socio-demographic characteristics of the participants

Age Group	30–45 year-old		46–60 year-old		Over 60 year-old		Total
	(n=7)		(n=8)		(n=8)		
	N	(%)	N	(%)	N	(%)	
<b>Gender</b>							
<i>Male</i>	2	28.6	3	(37.5)	3	(37.5)	8
<i>Female</i>	5	(71.4)	5	(62.5)	5	(62.5)	15
<b>Occupation</b>							
<i>Farmer</i>	5	(71.4)	7	(87.5)	3	(37.5)	15
<i>Non-farmer</i>	2	(28.6)	1	(12.5)	5	(62.5)	8

**Table 2** Guide for FGDs

Domain 1. Dietary habit

1. What kind of food do you and your family usually eat?  
 Probe: What type of foods do you and your family usually eat? How often?  
 Why do you and your family eat such foods?
2. How do you and your family take oil/salt?  
 Probe: How much oil/salt do you and your family consume?  
 Do you think the amount of oil/salt you and your family consume is excessive?  
 If yes, what are the main difficulties for reducing the amount of oil/salt?
3. Do you and your family take snack?  
 Probe: What type of snack do you and your family eat? How often?  
 Why do you and your family eating such snacks?
4. Do you and your family often eat in the restaurant?  
 Probe: How often do you and your family eat in the restaurant?  
 On what kind of occasions do you and your family eating outside?

Domain 2. Regular exercises

1. How do you assess the physical activity level of you and your family, including at home or in the workplace?  
 Probe: What type of physical activities do you and your family like? How often?  
 Is your job physically demanding?
2. Do you and your family have the habit for regular physical activity?  
 Probe: If you and your family are engaging in regular physical activities, what are the main reasons?  
 If you and your family are not engaging in any physical activity, what are the main reasons?

Domain 3. Tobacco smoking and alcohol drinking

1. Do you and your family smoking/drinking alcohol?

Probe: What types of cigarette/alcohol do you consume? How often?

On what kind of occasions do you and your family smoking/drinking?

2. Do you know the health consequences of smoking/drinking alcohol?

Probe: What are the main difficulties of quit smoking/drinking alcohol?

Do you feel any influence/pressure from family or community on your smoking/drinking behavior?

Domain 4. Health seeking behaviors

1. Will you and your family seek medical care when feel sick?

Probe: Where will you and your family seek medical care when feel sick?

What are the main reasons for seek medical care there?

2. Do you and your family take health check up regularly?

Probe: If yes, how often do you and your family go for health check-up? What are the main reasons?

If no, what are the main reasons of not going for health check-up?

Domain 5. Awareness and expectations towards NCD control

1. What do you know about NCDs (hypertension, etc.)?

Probe: What are the symptoms/health consequences of NCDs (hypertension, etc.)?

Do you know the causes of NCDs (hypertension, etc.) and how to prevent?

What are the main information sources of you to acquire health knowledge about NCDs?

2. What do you think about current prevention programs and treatment services of the community/nation level?

Probe: Do you satisfy with those programs and treatment services?

What do you expect in the future program of community/nation level?

### *Data analysis*

The audio-records were transcribed verbatim, and complemented with the handwritten notes. Text data in Chinese were inputted into qualitative analysis software NVivo 10 (QSR International Pty Ltd) and analyzed by thematic approach, which contains the following 5 steps: 1) Familiarization; 2) Generating initial codes; 3) Searching and reviewing themes; 4) Defining and naming themes; 5) Reporting.<sup>11)</sup>

### *Familiarization*

The first author repeatedly read the original Chinese transcript to obtain the whole sense of the FGDs. Non-Chinese speakers read English summary of FGDs translated by D.M.

### *Generating initial codes*

The first author generated the initial codes from the original Chinese transcript. Then those initial codes were translated into English and shared with all the analysts. Other co-researchers reconciled differences and finalized the coding scheme.

In this study, coding process embraced both inductive and deductive approaches. Initial coding was performed by assigning cohesive chunks of text, to broadly explore the facilitators and barriers of adopting healthy lifestyles. During this process, we found that most of the findings of the study were resonating with social capital theory.<sup>9, 12)</sup> Thus, we applied the social capital

framework to investigate the additional codes.

In the present study, social capital was defined as “social connections and the attendant norm and trust”<sup>13)</sup> and classified as bonding, bridging and linking.<sup>9)</sup> Bonding social capital refers to the strong ties with individuals who are homogeneous in social composition, whereas bridging social capital refers to the weak ties with individuals who are heterogeneous in social composition. In this study, we defined bonding as strong ties with family or close friends and bridging as the networks in the community level. Linking social capital was defined as the district, provincial and national level issues, such as the vertical ties with people with the local and central government.

#### *Searching and reviewing themes*

The codes agreed by all co-researchers were clustered into sub-categories and then categories. We defined sub-categories according to the commonality of codes from the perspective of social capital. The sub-categories were sorted and assigned into 3 categories of social capital framework: bonding, bridging and linking.<sup>9)</sup> Divergences occurred during the analysis procedure were resolved by reconciliation on discussion meetings until the thematic system was unanimously agreed.

#### *Defining and naming themes*

Themes were finally created to link the categories and mapping the whole thematic system. Table 3 illustrates the process of themes generated from the transcribed text by showing some examples.

**Table 3** Audit trial example of generating themes from text

FGDs	Group of age 46–60 years	Group of age over 60 years
Text	<i>“I have no choice...we are good friends, especially those who has been so for a long time. If they drink one bottle of alcohol, how can I just drink half?”</i>	<i>“I really hope that...of course you can do some surveys here...I hope that you professionals could give us acceptable and feasible suggestions, to make us healthier. We need more knowledge to change our lifestyles. We all know we should reduce salt and oil, but we still like to put a lot when cooking. We know smoking is harmful, but we still are smoking. We know we can not drink too much, but we still like drinking.”</i>
Codes	I need to drink a lot to keep good relationship with friends.	We have health knowledge but don't know how to do. Only knowledge is not effective enough.
Sub-category	Peer pressure	Insufficient support from health professionals
Category	Bonding social capital	Bridging social capital
Theme	Barriers of healthy lifestyle adoption	

#### *Reporting*

Vivid and compelling examples from participants' conversation in FGDs were selected and presented in the form of quotes, for accurately illustrating our findings.

#### *Ethical consideration*

This study was approved by the Bioethics Review Committee, Nagoya University School

of Medicine, Japan (Approval No. 2012–0103; July 26, 2012). Oral informed consent of each participant was obtained prior to the FGDs. Data were analyzed anonymously and quotes were showed with participant codes instead of the names.

## RESULTS

Findings of the qualitative analysis are shown under 2 themes: (Theme 1) facilitators of the healthy lifestyle adoption; and (Theme 2) the barriers of the healthy lifestyle adoption.

The analysis applied 3 types of social capital: bonding (*i.e.* strong ties with individuals who are homogeneous in social composition, such as with family members and close friends), bridging (*i.e.* weak ties with individuals who are heterogeneous in social composition, such as with health professionals) and linking (*i.e.* vertical ties with the local and central government).

Table 4 summarizes the themes, categories, subcategories emerged, and quotes of the participants' words.

**Table 4** Themes and categories of FGDs

Example codes	Sub-categories	Categories	Themes
<i>My husband takes me to do exercise together.</i>	Mutual support from family/friends	Bonding social capital	Facilitators of healthy lifestyle adoption
<i>Team sports helped me sticking to daily exercise.</i>	Motivation to participate in regular exercise		
<i>Community doctors are very nice. They help us a lot.</i>	Cooperative relationships with community health workers	Bridging social capital	
<i>Most of us know what to do to adopt healthy lifestyle.</i>	High level of awareness about healthy lifestyle nationwide	Linking social capital	
<i>My wife usually cook and put a lot of oil.</i>	Negative influence from family/friends		Barriers of healthy lifestyle adoption
<i>I do anything I want because nobody suggest me to change.</i>	Insufficient support from family/friends	Bonding social capital	
<i>I need to drink a lot to keep good relationship with friends.</i>	Peer pressure		
<i>It is OK for an old man to get fat.</i>	Tolerance towards unhealthy lifestyles		
<i>We have health knowledge but don't know how to do.</i>	Insufficient support from health professionals	Bridging social capital	
<i>No enough doctors in the community health centers.</i>	Inequity in allocation of public resources	Linking social capital	

### *Theme 1: the facilitators of the healthy lifestyle adoption*

#### *Bonding social capital*

##### *(1) Mutual support from family/friends*

Participants described that strong ties within kinship or friendship networks encouraged them to adopt healthy lifestyles. People made efforts to change behaviors influenced by their family members or close friends, actually or potentially, through practical support such as limiting salt intakes, exercising regularly as a group, and sharing knowledge of NCDs.

*“See, if I take exercise, I would like to take my kids and other family members with me. If I cook for my family, I will put less oil and less salt. They all agree.”* (Participant No. 4, male,

under 45 year-old group)

*“Yes, of course I will share (the experience of adopting healthy lifestyles) with my family and friends. It is good that we have to do it. We know some healthy food are not tasty...tasty food might contain a lot of addictive, right? I have to tell them about that.”* (Participant No. 1, male, under 45 year-old group)

*(2) Motivation to participate in regular exercises*

Motivation to stick to regular exercise occurred when participants had many friends “alike” to do it together. Community team sports, such as Tai Chi (a traditional martial art in China, and usually played in a group) and square dancing, usually involved in many people with the similar health goals. Participants remarked that the great happiness they acquired from team sports helped them to stick to exercise regularly.

*“Yes! When I was young, I had to work and look after my kids, so it was impossible to participate in (team sports). Now we are all old, we just greet each other and have good time together. Like what the song sings: it is the happiest thing to stay with somebody like you.”* (Participant No.3, female, over 60 year-old group)

*“All participate! I told my son, your mother was just like a fool; I always dance with other team members without feeling tired.”* (Participant No.4, female, over 60 year-old group)

*Bridging social capital*

*(1) Cooperative relationships with community health workers*

Participants mentioned the cooperative relationship with community health workers, which might encourage their health seeking behavior and enhancing health promotion campaigns.

*“Community health workers cooperate with each other in this village.”* (Participant No.5, male, over 60 year old group)

*“The community health workers are very nice! Just like our family. We like them.”* (Participant No.4, female, over 60 year old group)

*Linking social capital*

*(1) Nationwide high level of awareness of healthy lifestyles*

Linking social capital included nationwide high level of awareness of healthy lifestyles. Participants remarked the level of awareness were high due to various health promotion campaigns.

*“In the old days I didn’t know it (healthy lifestyle), now I understand how important it is. Nowadays health knowledge is disseminated through many ways, such as TV and social networks, and most of us understand that. We all know what should be done in order to live longer, but in the old days, nobody heard of that.”* (Participant No.4, female, over 60 year old group)

*Theme 2: the barriers of the healthy lifestyle adoption*

*Bonding social capital*

*(1) Negative influence from family/friends*

People in a close network influenced each other’s lifestyle negatively. Participants mentioned that unhealthy behaviors such as smoking and over-eating of fatty foods, were shared with all family members. If someone smokes at home, everybody in the same family receive a bad influence.

*“My husband keeps saying that it would be possible for him to fast but impossible to quit smoking...there are many people living in one house, if he smoked two or three boxes of tobacco, we could smell that even we were opening windows.”* (Participant No.5, female, 46–60 year-old group)

*(2) Insufficient support from family/friends*

Scarce support from family members and close friends may drive the person into unhealthy lifestyles. Unavailability of fellow players among members of the close network may impede people to play sports.

*“No family or friends (suggest me to adopt healthy life)! I eat anything I want.”* (Participant No.6, female, under 45 year-old group)

*“Too troublesome to go there (ping-pong room). And you need a partner. So I have very little chance to play ping-pong.”* (Participant No.1, male, under 45 year-old group)

*(3) Peer pressures*

People may adopt risky behaviors such as smoking, over-drinking and over-eating, as they want to be recognized by their peers. Participants believed that entertaining relatives or friends in a restaurant and drinking a lot of alcohol were necessary to earn respect of their guests and maintain the good relationship with them.

*“I have no choice...we are good friends, especially those who has been so for a long time. If they drink one bottle of alcohol, how can I just drink half?”* (Participant No.1, male, under 45 year-old group)

*“One reason (of why eating outside) is eating in the restaurant could show our hospitality... (Another participant interrupted with: ‘Win the respect!’)”* (The former: Participant No.1, male; the latter: Participant No.6, female; under 45 year-old group)

*(4) Tolerance towards unhealthy lifestyles*

Tolerance towards unhealthy lifestyle of the members of the close network made people think that it would be all right to adopt risky behaviors. For example, most of the participants accepted that it would not be a problem for old people to be fat. The high tolerance of family and friends towards obesity would decrease the motivation for changing behaviors.

*“We are already getting old. It is acceptable for old people to be fat. We don’t care.”* (Participant No.7, female, 46–60 years old group)

*Bridging social capital**(1) Insufficient support from health professionals*

Participants clearly expressed the strong motivation of changing behaviors, although they felt that they could not succeed without professional support from health workers. They thought that their health knowledge was too limited to change behaviors.

*“I really hope that...of course you can do some surveys here...I hope that you professionals could give us acceptable and feasible suggestions, to make us healthier. We need more knowledge to change our lifestyles. We all know we should reduce salt and oil, but we still like to put a lot when cooking. We know smoking is harmful, but we still are smoking. We know we should not drink too much, but we still like drinking.”* (Participant No.1, male, under 45 year-old group)

*Linking social capital**(1) Inequity in allocation of public resources*

Inequity in allocation of public resources due to insufficient rural development policies made it difficult for rural residents to access good quality of health services. Participants complained that the public health services in rural areas were much poorer than those in urban areas. For example, the number of health workers was disproportionately few in rural areas.

*“Generally speaking, (unlike the big hospital in the city), the community hospital doctors are not so impolite, but problem is too few doctors and no necessary instruments. There is little*



*investment to the community hospital.*" (Participant No.1, male, under 45 year-old group)

## DISCUSSION

We identified facilitators and barriers of healthy lifestyle adoption among rural residents in China through the perspective of social capital. Bonding, bridging and linking social capital would work as facilitators to adopt healthy lifestyles, as seen in knowledge sharing and mutual support among family members and close friends. However, social capital also work as a barrier, such as peer pressures to continue over-drinking and over-eating habits. The social capital framework with bonding, bridging and linking classification enabled us to capture the function and strength of different social networks in the rural community in China.<sup>12)</sup>

To our knowledge, it was the first qualitative study addressed to the lifestyle issues in rural China. Qualitative approach provided a very useful way to understand the underlying issues, which the previous epidemiological report alone could not achieve.<sup>14)</sup> We applied thematic approach which enabled us to analyze qualitatively through the social capital perspectives.<sup>15)</sup> We used local language, Mandarin Chinese, for discussions, transcription, and coding of text data, which enhanced comprehensive interpretation of the study findings.

Associations between social capital and health outcomes were documented by many studies.<sup>16)</sup> Several studies indicated the role of social capital in adherence to healthy lifestyles. For example, a Dutch study identified that people with high level of neighborhood social capital were more likely to be physically active and non-smoker.<sup>17)</sup> Lower level of social capital could significantly increase the odds of unhealthy behaviors among Swedish adolescents.<sup>18)</sup> Similar evidence was also found in China: a study proved that high individual social capital could lower the smoking likelihood among male employees.<sup>19)</sup>

We identified similar positive effects of social capital on adopting healthy lifestyles; however, we also found that social capital would also work as barrier for improving health by discouraging adoption of healthy lifestyles. Chinese culture emphasizes interpersonal relationships; therefore, heavy drinking, sharing tobaccos, and entertaining guests in a restaurant are considered as paying respect to others, particularly in rural communities. Urging others to drink a lot of alcohol is an important way to enhance interpersonal relationship, as described in a proverb: "true friends empty the bottom, but nodding acquaintances drink little". People had to drink a lot to maintain the friendship or enhance the group identity even though they do not want to drink at all.

In addition, many Chinese regard obesity as a symbol of health and rich: obesity is called "Fa Fu", which literally means "be happier". Although people's perceptions of obesity changed considerably in the last decade, most Chinese still think it is acceptable for middle-aged and old people to be overweight or obese. This tolerance towards unhealthy lifestyle among the family or friends could apparently decrease the motivation to change behaviors. Similar negative effect of family's perception could also be found in the case of obesity among Chinese adolescents: perceptions of parents and grandparents were suggested to be contributors of obesity among Chinese children.<sup>20-22)</sup>

The findings of the study would be very useful in setting intervention priorities in rural communities. For example, bonding social capital, which provides intensive supports to the individuals,<sup>9)</sup> is expected to play an important role in adopting healthy lifestyles, such as reducing salt intakes and exercising regularly. To mitigate the adverse effects of social capital such as peer pressures to continue smoking and over-drinking, interventions should target the whole community rather than individuals. Taking into account of the social capital perspective, strategies and interventions to control NCDs would be effective and sustainable.

This study has several limitations. First, due to time constrain, only summary of the FGDs transcript could be translated into English. Although key information was included in the English summary, some non-verbal information which could reflect the potential meaning of the conversation might be lost. To avoid possible information loss, a native Chinese speaker analyzed the original transcript and interpreted the true meaning of the participants' verbal and non-verbal conversation for all co-authors. Second, younger participants (18–30 years old) could not be recruited in this study, because most of them went out of the community for part-time jobs during the slack season for farmers.

In conclusion, our findings demonstrated that bonding, bridging and linking social capital could work as facilitators and barriers for adopting healthy lifestyles in a rural community in China. NCD control strategies in rural China should take social capital perspective into account, to make health promotion intervention effective and sustainable.

### ACKNOWLEDGMENTS

The authors thank all the participants of FGDs, Zhoukoudian community health center and Fangshan District Center of Disease Control. This study was supported by the Health and Labour Sciences Research Grants for Research on Global Health Issues (H24-chikyukibo-ippan-004) to A.A. from the Ministry of Health, Labour and Welfare, Government of Japan.

Conflicts of interest: None declared.

### REFERENCES

- 1) Van Dam RM, Li T, Spiegelman D, Franco OH, Hu FB. Combined impact of lifestyle factors on mortality: prospective cohort study in US women. *BMJ*, 2008; 337: a1440.
- 2) Khaw KT, Wareham N, Bingham S, Welch A, Luben R, Day N. Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. *PLoS Med*, 2008; 5: e12.
- 3) Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, *et al.* A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, 2012; 380: 2224–2260.
- 4) Yang G, Wang Y, Zeng Y, Gao GF, Liang X, Zhou M, *et al.* Rapid health transition in China, 1990–2010: findings from the Global Burden of Disease Study 2010. *Lancet*, 2013; 381: 1987–2015.
- 5) Tian X, Zhao G, Li Y, Wang L, Shi Y. Overweight and obesity difference of Chinese population between different urbanization levels. *J Rural Health*, 2014; 30: 101–112.
- 6) Li Q, Hsia J, Yang G. Prevalence of smoking in China in 2010. *N Engl J Med*, 2011; 364: 2469–2470.
- 7) Cheng L, Tan L, Zhang L, Wei S, Liu L, Long L, *et al.* Chronic disease mortality in rural and urban residents in Hubei Province, China, 2008–2010. *BMC Public Health*, 2013; 13: 713.
- 8) Wu N, Tang X, Wu Y, Qin X, He L, Wang J, *et al.* Cohort profile: the Fangshan Cohort Study of cardiovascular epidemiology in Beijing, China. *J Epidemiol*, 2014; 24: 84–93.
- 9) Szreter S, Woolcock M. Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology*, 2004; 33: 650–667.
- 10) Hennink MM. International focus group research. pp. 93–114, 2007, Cambridge University Press, Cambridge.
- 11) V Braun VC. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 2006: 25.
- 12) Halpern D. Social capital. pp. 1–40, 2005, Polity Press, Cambridge.
- 13) Putnam RD. Tuning in, Tuning out - the Strange Disappearance of Social Capital in America. *Ps-Political Science & Politics*, 1995; 28: 664–683.
- 14) Priscilla R. Ulin, Elizabeth T. Robinson, Tolley EE. *Qualitative Methods in Public Health: A Field Guide for Applied Research*. pp. 4–8, 2004, Jossey-Bass.
- 15) Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting

## Adopting healthy lifestyle in China

- a qualitative descriptive study. *Nursing & Health Sciences*, 2013; 15: 398–405.
- 16) Murayama H, Fujiwara Y, Kawachi I. Social capital and health: a review of prospective multilevel studies. *J Epidemiol*, 2012; 22: 179–187.
  - 17) Mohnen SM, Volker B, Flap H, Groenewegen PP. Health-related behavior as a mechanism behind the relationship between neighborhood social capital and individual health - a multilevel analysis. *Bmc Public Health*, 2012; 12.
  - 18) Aslund C, Nilsson KW. Social capital in relation to alcohol consumption, smoking, and illicit drug use among adolescents: a cross-sectional study in Sweden. *Int J Equity Health*, 2013; 12: 33.
  - 19) Gao JL, Nehl EJ, Fu H, Jia YN, Liu XD, Zheng PP. Workplace social capital and smoking among Chinese male employees: A multi-level, cross-sectional study. *Preventive Medicine*, 2013; 57: 831–836.
  - 20) Li J, Lei J, Wen S, Zhou L. Sex disparity and perception of obesity/overweight by parents and grandparents. *Paediatr Child Health*, 2014; 19: 346.
  - 21) Wen X, Hui SSC. Chinese parents' perceptions of their children's weights and their relationship to parenting behaviours. *Child Care Health and Development*, 2011; 37: 343–351.
  - 22) Li B, Adab P, Cheng KK. The role of grandparents in childhood obesity in China - evidence from a mixed methods study. *Int J Behav Nutr Phys Act*, 2015; 12: 91.