

## Preplanned Studies

## Trends in Leisure-Time Physical Activity Among Chinese Adults — China, 2000–2015

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### Summary

#### What is already known about this topic?

The monitoring report on nutrition and health status of Chinese residents from 2010 to 2013 reported that the participation rate of leisure-time physical activity (LTPA) was 13.8% among those 6 years and older.

#### What is added by this report?

Among 18 years old and older, the age-standardized LTPA prevalence increased from 7.13% in 2000 to 11.79% in 2011 before dropping to 7.33% in 2015.

#### What are the implications for public health practice?

As levels of LTPA participation are low, further research is necessary to develop and test valid interventions to encourage people to take part in more LTPA especially for residents in rural areas and with low-income.

China has a high prevalence physical inactivity which leads to poor health outcomes. Among Chinese adults, the prevalence of leisure-time physical activity (LTPA) participation is low. Data collected in the China Health and Nutrition Survey (CHNS) from 2000 to 2015 were used to observe trends in LTPA participation among adults aged 18 years and above. The overall age-standardized LTPA prevalence increased from 7.13% in 2000 to 11.79% in 2011 before dropping to 7.33% in 2015. Over 80% of LTPA participants reported vigorous-intensity LTPA. Although LTPA prevalence and the proportion to reach the vigorous-intensity level had been increasing overall, they were still at a low level. Efforts to improve rates of LTPA among Chinese adults, especially for residents in rural areas and with low-income, through education or other interventions has the potential benefits for improving overall health.

Physical inactivity contributes 12%–19% to the risks associated with the 5 major noncommunicable diseases (NCDs) in China (1). Increasing physical activity (PA) is an effective way to improve both individual and

population-level health outcomes. However, PA levels appear to be declining globally (2). Occupational, travel, domestic, and leisure-time PA are four dimensions of the overall PA and the first three showed a striking decrease. LTPA was the smallest contributor to overall PA, but it plays an important role to keep healthy (3). The proportion of LTPA in China was also much lower than that of Western countries (3–5) such as Brazil, the United States, Finland, etc. Increasing LTPA to compensate for declines in the other three domains of PA to maintain the current level of the overall PA and further promote its improvement is vitally important because only LTPA is self-directed and the other three types have passively declined due to high speed economic development, which include examples such as driving cars instead of walking to the office and using washing machines instead of washing by hand. To understand whether Chinese adults actively participate in LTPA to improve the decreasing total PA, CHNS provides the opportunity to investigate the trend of LTPA participation over time with the overall goal of informing health policies.

Details of the study design and methods of the CHNS have been previously reported (6). A multi-stage, stratified, random cluster sampling design was used across 10 rounds of surveys from 1989 to 2015. The samples in the present paper included 6 rounds of survey data collected in 2000, 2004, 2006, 2009, 2011, and 2015. Nine provincial-level administrative divisions (PLADs), including Shandong, Liaoning, Heilongjiang, Jiangsu, Henan, Guizhou, Hunan, Hubei, and Guangxi were chosen because they were present in all six surveys. Adults aged 18–100 years old with complete data on LTPA, socioeconomic status, and demographics in each survey year were considered eligible subjects. We excluded individuals who were disabled, pregnant, or lactating during each particular wave. Finally, our study consists of 59,504 observations in total.

Information on LTPA within the latest year

included participation in sports such as martial arts, gymnastics, dancing, aerobics, jogging, swimming, soccer, basketball, tennis, badminton, volleyball, or other LTPA (table tennis, or doing Tai Chi, etc.). For each LTPA item, respondents reported the average hours per week spent in the last year. To measure energy expenditure for each LTPA item, metabolic equivalent of task hour per week (MET·h/w) were calculated. Therefore, the average MET-hours per week measurements comprise both the average intensity of each activity and the time spent in each one. Participants were classified into four categories by LTPA (0 MET·h/w = inactive, 0.1–7.4 MET·h/w = low-intensity, 7.5–14.9 MET·h/w = moderate-intensity and  $\geq 15.0$  MET·h/w = vigorous-intensity) (7–8). LTPA prevalence was defined as the proportion of the number of LTPA participants among the total number of participants in each survey. Standard questionnaires were used by trained interviewers to collect sociodemographic characteristics and annual per household income, which was categorized into tertiles (high, middle, and low) according to each survey round. Descriptive analysis was stratified by gender, age group, and urban-rural residence in each round. The overall prevalence from 2000 to 2011 was standardized according to the age composition in 2015 of CHNS. Chi-square tests were used to test for differences among males and females, age groups, urban and rural residence, and LTPA levels. Trend Chi-square test was used for changes over time and income levels.  $p < 0.05$  were considered statistically significant. All tests were conducted in SAS software (version 9.4, SAS Institute, Inc., Cary, NC, USA).

Table 1 shows that the proportion of adults aged 18

to 44 years old declined in these 15 years and the proportion of 45–64 years old group and  $\geq 65$  years old group increased, consistent with observed aging of the population. Participants in urban area represented around 30% of the sample in each survey year. Figure 1 gives information about the LTPA prevalence of adults by demographic characteristics during the study period. The age-standardized LTPA prevalence increased from 7.13% in 2000 to 11.79% in 2011, then dropped to 7.33% in 2015. The proportion of participants that were male or living in urban areas were higher than that of females and rural residents, respectively. There was significantly statistical difference between males and females as well as urban and rural. Compared to groups of adults aged 45 to 64 years old and  $\geq 65$  years old, the group aged 18 to 44 years old had the highest LTPA prevalence. People at high income levels had approximately 7 to 15 percentage pointed higher LTPA prevalence than those at low income levels, and the income level trend tests were significant in each year. The increasing trend by years was statistically significant in the LTPA prevalence of total population, males and females groups, three age groups, rural group, high and low income groups, respectively. Figure 2 illustrates that from 2004 onward, over 80% of LTPA participants were able to reach the vigorous-intensity level and this proportion increased each year. Specifically, 60% of LTPA participants exercised at vigorous-intensity PA in 2000 and then rising to 90% in 2015.

## Discussion

PA was classified into four parts: occupational,

TABLE 1. Samples and proportion (%) of adults aged 18 years and above from 2000 to 2015, stratified by gender, age group and urban-rural.

Variable	2000	2004	2006	2009	2011	2015
Overall	11,308	9,618	9,662	9,892	9,427	9,597
Gender						
Male	5,781(51.12)	4,698(48.85)	4,625(47.87)	4,797(48.49)	4,512(47.86)	4,543(47.34)
Female	5,527(48.88)	4,920(51.15)	5,037(52.13)	5,095(51.51)	4,915(52.14)	5,054(52.66)
Age group (yrs)						
18–44	6,277(55.48)	4,178(43.44)	4,048(41.90)	3,701(37.41)	3,108(32.97)	2,945(30.69)
45–64	3,749(33.14)	3,942(40.99)	3,985(41.24)	4,393(44.41)	4,398(46.65)	4,452(46.39)
$\geq 65$	1,287(11.38)	1,498(15.57)	1,629(16.86)	1,798(18.18)	1,921(20.38)	2,200(22.92)
Urban-rural						
Urban	3,388(29.96)	3,010(31.30)	3,035(31.41)	3,139(31.73)	3,059(32.45)	2,994(31.20)
Rural	7,920(70.04)	6,608(68.70)	6,627(68.59)	6,753(68.27)	6,368(67.55)	6,603(68.80)

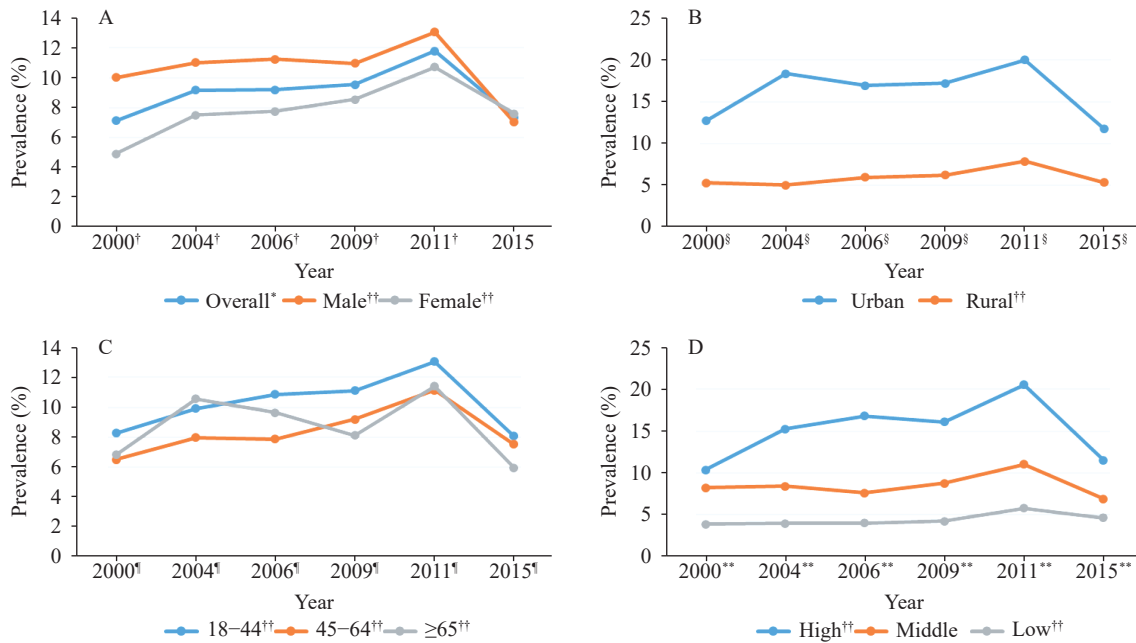


FIGURE 1. LTPA prevalence (%) of adults aged 18 years and above in subgroups from 2000 to 2015. (A) gender for LTPA prevalence; (B) area for LTPA prevalence; (C) age for LTPA prevalence; (D) income level for LTPA prevalence. \* indicates that the prevalence from 2000 to 2011 was standardized according to the age composition in 2015. † indicates a statistical significant difference by gender for LTPA prevalence in each survey round; § indicates a statistical significant difference between urban and rural for LTPA prevalence in each survey round; ¶ indicates a statistical significant difference among age groups for LTPA prevalence in each survey round; \*\* indicates a statistical significant income level trend for LTPA prevalence in each survey round; †† indicates statistical significant year trend for LTPA prevalence in each subtype group, such as male group, rural group, low income group.

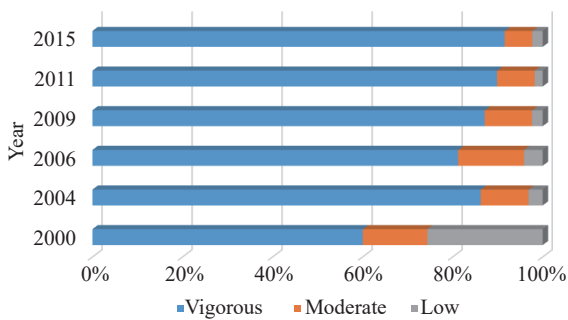


FIGURE 2. The proportion of LTPA participants (≥18 years old) at different intensity level from 2000 to 2015.

domestic, travel, and leisure-time (2). The first three domains were highly related to work type, whereas awareness and attitude were determining factors in participating in LTPA. Our study showed LTPA participation among Chinese adults is generally increasing, while other research from CHNS showed the total PA was decreasing (9). Health policies encouraging LTPA have increased the awareness of the effects of LTPA on health for all age groups, the effect of which may be seen in our study as yearly increases in LTPA participation. World Health Organization (WHO) published the global recommendations on

physical activity for health in 2010, in which adults were advised to increase their moderate-intensity PA at least 150 min/week and to go up to 300 min/week for additional health benefits (8). Seniors 65 years and older have the same recommended amount of exercise as adults. Chinese Adult Physical Activity Guidelines according to WHO recommendations was published the following year (7). These two guidelines advocated the LTPA in all populations. We observed the LTPA participation rate increased dramatically in 2011. The monitoring report on nutrition and health status of Chinese residents from 2010 to 2013 reported that the participation rate of LTPA was 13.8% in 6 years old and above (10), which was a little higher than our results in 2011 because they contained the students from 6 to 17 years old with the fixed physical training time set by school. However, the prevalence of LTPA decreased in 2015, which may be due to changes in survey method. Electronic questionnaires were used in the field survey in 2015, which was convenient to control the quality of data and upload data quickly. However, whether the new survey method would lead to the unexplained declines needs to be further investigated and verified.

In the United States, there was a distinct increase in the proportion of meeting minimum aerobic PA guidelines from 43.5% in 2008 to 54.2% in 2018, and the proportion of meeting high aerobic PA guidelines increased from 28.4% in 2008 to 37.4% in 2018 (4). In Finland, 37% of women and 43% of men were physically active in their leisure time in 2000–2002, then it increased to 39% of women and maintained in 43% of men in 2007, with 30 MET·h/w as the cut-off point of PA (5). The prevalence of LTPA of Brazilian adults was 30.2% (3). People in Western countries had much higher participation rate of LTPA than in China.

Women had lower LTPA participation rates than men in each survey year in our study, although their rates increased over time. High and moderate PA levels during leisure time was recommended especially for middle-aged women because women with high and moderate PA levels have less severe menopausal symptoms compared to inactive women (11).

Our study found that residents living in urban areas had higher LTPA than those living in rural areas. Residents in urban areas usually have higher education levels and incomes, which may increase enthusiasm for LTPA participation. Because a projected billion people will be living in China's urban areas in 2030, pushing the health of all populations starting from urban areas is one of the health strategies in China. China has launched the Healthy China campaign including the National Fitness Action Plan and achieved health integration in all policies for the initial goal of improving health (12). Improving the built and social environment to be more conducive to LTPA is an important step for achieving higher levels of LTPA (3). In addition, local CDCs should take responsibility for health promotion to improve the awareness of villagers, and fitness facilities should be constructed by local governments to provide more fitness accessibility in rural areas.

Our study showed that among those who were engaging in LTPA, 60%–92% reached vigorous-intensity because they maintained a regular exercise schedule including weekend only or daily exercise. LTPA plays an important role in reducing cancer, cerebrovascular disease (CVD), and all-cause mortality risk regardless of only exercising on weekends or other LTPA patterns characterized by one or two sessions per week (13). LTPA can also cut down on direct cost of short-term sickness absence for employers when employees are regularly physically active or improve from moderately active to vigorous activity (14). A recommended 150 minutes per week (7.5 MET·h/w)

in LTPA is the minimal level to reduce risk of NCDs, and 300 min/week (15 MET·h/w) is recommended to maintain weight (7–8).

Regular monitoring is an effective way to master the level of PA, and governments publishing PA guidelines is the universal mean in countries. Publicizing and educating about PA behavior and health and implementing necessary policies and plans are urgent (15). Longitudinal changes in LTPA in Chinese was clearly represented and it is necessary and significant to continue to monitor.

Overall, the LTPA prevalence and the proportion to reach the vigorous-intensity level increased over the years studied, but they were still at a relative low level. Continuous survey is necessary, and carrying out publicizing, educating, or other interventions to encourage people to take part in more leisure-time physical activity especially for residents in rural area and with low-income has potential benefits for improving overall health.

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