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## 青年学者论坛暨壁报展示摘要集 Abstracts of Young Scholar Forum and Poster Exhibition

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# Prevention and Treatment of COVID-19

## 1-1 Modelling analyses on transmissibility of COVID-19 epidemic and control effect in Border Cities along the “Belt and Road”-- A Case Study of Ruili City, Yunnan Province

LI Zhibo

Studying master, Kunming Medical University

Email: 2424620419@qq.com

**Objective:** The prevention and control of the importation of COVID-19 in Ruili, Yunnan, China, is challengeable due to the long border with Myanmar. By estimating the transmissibility of COVID-19 and the effect of the enhanced control measures for the COVID-19 epidemic in Ruili through a renewal equation model, this study aimed to provide scientific evidence for the prevention and control of COVID-19 epidemic in Border Cities along the “Belt and Road”.

**Methods:** The COVID-19 epidemic data in Ruili from March 30 to April 16, 2021 were collected from the official website of Ruili. The epidemiological analysis was carried out by using Excel 2019. To describe the transmission dynamics of the COVID-19 epidemic in Ruili, a renewal equation model was established using R language 4.0.5 under an assumption of index cases entering Ruili on 27 March 2021, three days earlier before the first reporting of the epidemic on 30 March 2021. In the context of strict prevention and control measures implemented from 30 March, it is further assumed that the transmission of COVID-19 would stop to increase at some time point. Markov Chain Monte Carlo algorithm (MCMC) was used to calculate the medians of model parameters and their 95% confidence interval.

**Results:** From March 30 to April 16 2021, a total 133 COVID-19 cases, including 90 confirmed cases and 43 asymptomatic infection cases, were reported in Ruili. The median age of the confirmed cases was 32 years and the median age of the asymptomatic infection cases was 28 years. Nineteen asymptomatic infection cases were further diagnosed as confirmed ones. The median of serial interval was about 5.00 days, and the median of its standard deviation was about 24.67 days. The reproduction number ( $R$ ) was about 1.5 in the early stage of the epidemic, and decreased to  $<1.0$  (about 0.6 ) within one week after the prevention and control measures were strengthened. According to the model, the daily number of new infections would decrease to  $<1$  after April 17.

**Conclusion:** Under the reasonable assumptions about index cases, the renewal equation model fitted the epidemic data well, which predicted that the COVID-19 epidemic in Ruili would be under control within a short period of time. The experience in the response of COVID epidemic in Ruili can be used as useful reference for COVID-19 epidemic prevention and control in Border Cities along the “Belt and Road”.

**Key words:** COVID-19; Epidemiology; Transmission dynamics model; Reproduction number; Ruili

## 1-2 Associations of COVID-19 lockdown with maternal and fetal health in Guangdong Province, China

Tao Liu, Professor

Department of Public Health and Preventive Medicine, School of Medicine, Jinan University, China.

Email: gztt\_2002@163.com

**Aims:** To explore the associations of COVID-19 lockdown with preterm birth (PTB) and gestational diabetes mellitus (GDM).

**Methods:** Medical records of 595396 pregnant women during 2015-2020 were extracted from 5 cities in Guangdong Province, China. The exposed group included women who experienced the COVID-19 Level I lockdown (1/23-2/24/2020) during pregnancy, while the unexposed group included women who were pregnant during the same calendar months in 2015-2019. Subgroup analyses were used to explore the potential susceptible exposure window of COVID-19 lockdown on gestational length, PTB, and GDM. Cumulative exposure was quantitatively estimated by assigning different weights to response periods with different exposure intensities. Generalized linear regression models were applied to estimate the associations of lockdown exposure with gestational length and risk of PTB and GDM.

**Results:** Compared with the control group, the exposed group had a shorter mean gestational length than unexposed group (38.66 vs 38.74 weeks: adjusted  $\beta = -0.06$  week [95%CI,  $-0.07, -0.05$  week]), and had a higher risk of PTB (5.7% vs 5.3%; adjusted OR = 1.08 [95%CI, 1.05, 1.11]). Moreover, after excluding subjects who were not screened for GDM, the rates of GDM in the exposed and unexposed groups were 15.2% and 12.4%, respectively, and significantly positive association (OR=1.22, 95%CI: 1.17, 1.27) was found between lockdown exposure and GDM risk. More pronounced associations were found in women who underwent the COVID-19 lockdown in their first four months of pregnancy. In addition, we also found higher cumulative lockdown exposure was associated with a shorter gestational length and a higher risk of PTB and GDM.

**Conclusions:** The COVID-19 lockdown measures were associated with increased risk of GDM, and a moderately higher risk of PTB. Early and middle pregnancy periods may be a more susceptible exposure window.

**Keywords:** COVID-19; Lockdown; Gestational length; Gestational diabetes mellitus; Preterm

Conflict of interest statement: All authors declare no competing interests.

# 1-3 Transmission dynamics modelling of COVID-19 pandemic within the big data era: Laos' epidemic as a case study

Luo Hong<sup>1</sup>, Liu Wei<sup>2\*</sup>, Zhang Xusheng<sup>3</sup>

<sup>1</sup>Associate professor, Yunnan University, Kunming 650091, Yunnan, China

<sup>2</sup>Professor Kunming Medical University, Kunming 650500, Yunnan, China

<sup>3</sup>Infectious disease modeler, Public Health England, London NW9 5EQ, United Kingdom

Email: 1031163283@qq.com<sup>1</sup>; Email: liuweikm@qq.com<sup>2</sup>

**Objectives:** In this study we incorporate the government control policy, Google mobility, WHO GISAID sequencing and vaccination data into a compartmental transmission model and investigate how the response policy and protective behaviors of people to impact the COVID-19 epidemics in Laos under the replacement of variants of concern of SARS-CoV-2 virus.

**Methods:** The S-V<sub>1</sub>-V<sub>2</sub>-E<sub>1</sub>-E<sub>2</sub>-I<sub>1</sub>-I<sub>2</sub>-R-W model we used to describe the COVID-19 epidemic outbreak in Laos includes two components: transmission dynamics with vaccination, and disease reporting. Transmission rate is assumed to change along with the changes in people's behaviors and control measures implemented in Laos and the replacement of one variant by another; the susceptibility is also assumed to change with vaccination and natural infections. Bayesian inference is used to estimate key epidemiological parameters by fitting the model predictions to observed data of confirmed cases, imported cases, deaths, recoveries from 11 April 2021 to 25 March 2022. **Results:**(1) Our model well regenerates the epidemic in Laos from 11 April 2021 to 25 March 2022, implying that the NPIs, vaccination and replacement of variant can explain the evolution of epidemic in Laos during the period from 11 April 2021 to 25 March 2022. (2) Initial reproduction number around 11 April 2021 is 3.25, and then it quickly reduced to about 0.6 within a short period of time, reflecting effectiveness of the rapid control measures implemented in Laos. (3) Alpha variant was circulated before Delta variant which became dominated in Laos from 24 September 2021; Delta variant was replaced by Omicron from 24 Feb 2022. Omicron is about three times more transmissible than Delta and Delta is about two times more transmissible than Alpha variant. (4) Our analysis further shows that the vaccine effectiveness against Omicron variant reduced substantially to 17.3% [95%CrI: 2.8%,38.5%] and 39.8% [95%CrI: 11.3%,59.0%] for those having one dose and fully vaccinated, respectively. (5) Our modelling suggested a low level of confirmation of SARS-CoV-2 virus infections with ascertainment rate being 5.17% [95%crI 5.0%, 5.77%]. Overall the case fatality rate is low: 0.96% [95%CrI: 0.87%, 1.07%]. **Conclusions:** Our model well regenerates the epidemic in Laos from 11 April 2021 to 25 March 2022. It indicates that the evolution of COVID-19 epidemic in Laos is a combining result of NPIs, alternation of circulating variants and vaccination. Without Omicron, herd immunity would be established in

Laos population around the end of 2021 and the COVID-19 would be completely suppressed. The emergence of Omicron, which is more transmissible and has a big immunity escape, destroyed this herd immunity, and incurred the epidemic from Feb 2022 again.

**Keywords:** Bayesian estimation, SARS\_CoV-2, Oxford Government COVID-19 policy index, Google mobility, Laos, Non Pharmaceutical Interventions (NPIs), transmission modeling, replacement of variants of concern, vaccination

## **1-4 The implications of COVID-19 vaccination for the pandemic: A cross-sectional study among 30,986 residents in 31 provinces of China**

Mingze Ma, Dongyang Xu, Zhanlei Shen, Quanman Li, Yifei Feng, Lipei Zhao, Yudong Miao, Jian Wu

School of Public Health, Shanxi Medical University

E-mail: coph16\_18@126.com

**Objective:** To investigate the vaccination rate of COVID-19 vaccine among a representative sample of adults from 31 provinces in mainland China, and identify its influencing factors. **Methods:** A national cross-sectional online survey among Chinese adults ( $\geq 18$  years old) was conducted via a market research company. We collected sociodemographic information, the awareness and behavior of COVID-19 and COVID-19 vaccine, accessibility of COVID-19 vaccination services, community environmental factors, the awareness and behavior of general vaccinations, the skepticism of COVID-19 and COVID-19 vaccine, trust in doctors and vaccine developers and so on. Odds ratios (OR) with 95% confidence intervals (CI) were used to estimate the associations by using logistic regression models. **Results:** A total of 29925 participants (51.4% female) responded. Overall, 89.4% of participants have been vaccinated. After adjusting for potential confounders, we found that no religious faith, occupational status did not change because of coronavirus, non-smoker, always physical activity, higher score of health condition, lower status in the community and society, global and local outbreak is serious, have risk of infection, high curability of COVID-19, higher level of convenient vaccination, the good life experience of community residents, the good performance of community leaders, higher level of awareness about general vaccinations, lower level of vaccine conspiracy beliefs, higher level of trust in doctor and developer have a higher vaccination rate than all others (all  $P < 0.05$ ). **Conclusions:** 31 provinces in mainland China currently have a relatively high rate of COVID-19 vaccination. To further increase the rate of COVID-19 vaccination, we must remove barriers associated with the community context and improve access to COVID-19 vaccine services. In addition, taking proactive and effective measures to address the reasons for non-vaccination with COVID-19 will aid in epidemic prevention and control. **Keywords:** COVID-19; COVID-19 vaccine; vaccination; factors; COVID-19 vaccination rate

# 1-5 Understanding the impact of Urban-Rural Dualistic Social Structure on COVID-19 vaccine hesitancy among Chinese population: a large-scale national study

Zhanlei Shen

Department of Health management, College of Public Health, Zhengzhou University, Henan, People's Republic of China

E-mail: zhanlei1208@163.com

**Objective:** To investigate the prevalence and influencing factors of COVID-19 vaccine hesitancy in urban areas and rural areas, respectively. And to assess whether the Urban-Rural Dualistic Social Structure effect COVID-19 vaccine hesitancy.

**Methods:** A national cross-sectional online survey among Chinese urban and rural adults ( $\geq 18$  years old) was conducted from 6th to 9th August 2021. A questionnaire was used to collect data on sociodemographic, perceptions of the COVID-19 pandemic, perceptions of the COVID-19 vaccine, and healthcare system. Binary logistic regression model was used to explore influencing factors of COVID-19 vaccine hesitancy. Propensity Score Matching (PSM) analysis was performed to explore the association between Urban-Rural Dualistic Social Structure and COVID-19 vaccine hesitancy.

**Results:** A total of 29,925 participants (80.56% urban participants) were recruited. Urban participants had a higher COVID-19 vaccine hesitancy than rural participants (9.39% vs 4.26%). After adjusting for potential confounders, we found that COVID-19 vaccine hesitancy among women was lower than among men in both urban areas (aOR=0.78, 95%CI 0.69-0.88) and rural areas (aOR=0.54, 95%CI 0.39-0.75). For urban participants, the lowest level of trust in vaccine developers had a higher COVID-19 vaccine hesitancy than the highest group (aOR=2.76, 95%CI 2.22-3.43). The rural floating population had a lower COVID-19 vaccine hesitancy than the rural permanent residents (aOR=0.58, 95% CI 0.42-0.80). PSM analysis revealed a 2.38% difference in COVID-19 vaccine hesitancy between urban and rural participants.

**Conclusions:** COVID-19 vaccine hesitancy among urban participants was higher than rural participants. Decreasing COVID-19 vaccine hesitancy in urban should be prioritized by increasing the trust in the healthcare system. Additionally, we suggested providing additional incentives and vaccination education for rural permanent residents.

**Key words:** COVID-19 vaccine hesitancy; Urban-Rural Dualistic Social Structure; China; Propensity Score Matching

## **1-6 From outbreak to near disappearance: How did non-pharmaceutical interventions against COVID-19 affect the transmission of influenza virus?**

Shuxuan Song

Teaching and Research Section of Military Epidemic Prevention and Epidemiology,  
Department of Military Preventive Medicine, Air Force Military Medical University  
E-mail: songshuxuan0712@qq.com

**Objective:** To assess the short- and long-term impacts of non-pharmaceutical interventions (NPIs) against COVID-19 on the infections of influenza virus.

**Methods:** Based on the surveillance data of influenza, Search Engine Index, and meteorological factors from 2011 to 2021 in Xi'an, and the different level of emergence responses for COVID-19 from 2020 to 2021, Bayesian Structural Time Series model and interrupted time series analysis were applied to quantitatively assess the impact of NPIs in sequent phases with different intensities, and to estimate the reduction of influenza infections.

**Results:** From 2011 to 2021, a total of 197,528 confirmed cases of influenza were reported in Xi'an, and the incidence of influenza continuously increased from 2011 to 2019, especially, in 2019-2020, when the incidence was up to 975.90 per 100,000 persons; however, it showed a sharp reduction of 97.68% in 2020-2021, and of 87.22% in 2021, comparing with 2019-2020. The highest impact on reduction of influenza was observed in the phase of strict implementation of NPIs with an inclusion probability of 0.54. The weekly influenza incidence was reduced by 95.45%, and an approximate reduction of 210,100 (95%CI: 125,100-329,500) influenza infections was found during the post-COVID-19 period.

**Conclusion:** NPIs against COVID-19 had significant impact on the reduction of influenza transmission, which exhibited significant variations in the geographical, population, and temporal distribution. Our findings demonstrated that NPIs against COVID-19 had a long-term impact on the reduction of influenza transmission.

**Key words:** influenza; COVID-19; respiratory diseases; non-pharmaceutical interventions; long-term impact

**Declaration of interest:** All the authors declare that they have no conflicts of interest.



# 1-7 Estimate of the Transmissibility of COVID-19 in India under Control Responses

Linxiong Wu<sup>1</sup>, Lingyun Ran<sup>2</sup>, Zufeng Cao<sup>3</sup>, Wei Liu<sup>1\*</sup>, Xusheng Zhang<sup>4</sup>

<sup>1</sup> School of Public Health, Kunming Medical University, Yunnan, China;

<sup>2</sup> School of Nursing, Kunming Medical University, Yunnan, China;

<sup>3</sup> School of Basic Medicine, Kunming Medical University, Yunnan, China;

<sup>4</sup> Infectious Disease Surveillance and Control Centre, Public Health Department of England, London NW9 5EQ, UK;

Linxiong Wu: wlx0871@qq.com; Wei Liu: liuweikm@qq.com

**Background:** COVID-19 was first reported in India on 30 January 2020. Since then India has been consistently in COVID-19 epidemic. From April 2021 the case number rose rapidly, and the Indian government has gradually relaxed its control since May 2020 and reached the lowest level of 57 in March 2021. The number of new cases decreased in May 2021, and the Indian government has taken much more strict control responses since April 2021. So it is obviously that the epidemic or outbreak of COVID-19 is highly consistent with the strict degree of control responses.

**Aims:** To estimate the transmissibility of COVID-19 in India and its change during the period from 30 Jan 2020 to 23 Aug 2021 under the response control.

**Methods:** Renewal Equation Modelling was used in our predictive model, which were mathematical models that can evaluate the epidemic of infectious diseases and predict its future trend by a small number of epidemiological parameters, such as serial interval and effective reproduction number  $R$ . Markov chain Monte Carlo (MCMC) algorithm and Gibbs sampling method were also used to obtain the estimates of model parameters.

**Results:** It is obviously there are two waves (two main turning points), three main different periods and six different detailed turning points. The maximum daily number of cases reached 414,188 on 6 May 2021. During the long period of epidemic outbreak in India from 0.93 to 2.53, the transmissibility of COVID-19 varied, and can be approximately described by seven different Reproduction numbers. At early stage it was 2.53 and then from day 35 it reduced to 1.31 and from day 82 to 1.18, from day 152 to 1.08, from day 198 to 0.93; from day 347 it increased to 1.11, and from 375 to 1.47. We found that these were influenced by Indian governmental control measures. From the perspective of the stringency of responses, the Indian government has gradually relaxed its control since May 2020 and reached the lowest level of 57 in March 2021, and the case number rose rapidly from April 2021.

**Conclusions:** The Indian government and various states have taken control measures during the epidemic period, but there is some discount in the strength of implementation. The Indian people and the world should continue to be vigilant and take effective measures to prevent the epidemic from rebounding and aggravating

**Key words:** COVID-19; transmissibility; control responses; India;

# **1-8 Orthodontic Care in orthodontic patients during the COVID-2019 pandemic: emergency, rechoose and telemedicine**

**Author:**

苗泽垚 硕士研究生 西安交通大学口腔医院, 牙颌颜面发育管理中心  
miaozeyao0720@163.com

王丽荣 讲师 西安交通大学医学部公共卫生学院 wanglr@mail.xjtu.edu.cn

王爽 教授 主任医师 西安交通大学口腔医院, 牙颌颜面发育管理中心  
wshuang@mail.xjtu.edu.cn

**Abstract:**

**Objective:**The objective of the present study were to evaluate the orthodontic emergency response, selection of orthodontic types and telemedicine development under the Xian COVID-19 pandemic.

**Subjects and Methods:**An electronic questionnaire was distributed to the orthodontic patients in Dentofacial Development Management Center, Hospital of Stomatology, XI'AN Jiaotong University including 4 sections. Section1 included demographic information. Section2 assessed the emergency conditions and the cognition of emergency. Section3 were Numerical Rating Scale and Manchester Orofacial Pain Disability Scale. Section4 showed the attitude of rechoosing orthodontic treatment and appliances types. Descriptive statistics, Pearson's Chi-square test, McNemar's Chi-square test, Wilcoxon's rank-sum test were performed with significance set at  $P < 0.05$ .

**Result:**The number of valid respondents were 154 (44 males and 110 females, mean age  $21.54 \pm 7.07$  years). The most common emergencies were "Debonded bracket(50%)", "Poking wire/Sharp ligature tie(44.44%)" in fixed appliances and "attachment drop(50%)", "run out of aligners(43.75%)" in clear aligners. The emergency rate, emergency treatment requirement were similar in the two types. The fixed appliances( $P < 0.05$ ), emergency( $P < 0.01$ ), "Poking wire/Sharp ligature tie( $P < 0.05$ )", refused orthodontic treatment( $P < 0.05$ ) and preferred clear aligners in fixed appliances( $P < 0.05$ ) suffered more pain. The fixed appliances preferred the other type( $P < 0.05$ ) and the epidemic influenced the decision( $P < 0.05$ ). There was a significant association between pain and disability ( $P < 0.001$ ) with the equation:  $y = 1.753x + 0.084$  in Linear regression mode.

**Conclusion:** Fixed appliances hadn't higher emergency rate and common emergencies in fixed appliance led higher pain and disability. The higher the intensity of pain, the more disability patients suffered. Avoid unnecessary orthodontic emergency treatment and care about psychology problem from delayed treatment duration was effective. Clear aligners was a better orthodontic type combined with telemedicine.

**Key words:** COVID-19, Questionnaire, Orthodontic emergencies, rechoose, pain, disability.

## **2-1 Immunotherapy effect of a recombinant *Mycobacterium smegmatis* overexpressing Ag85B on *Mycobacterium tuberculosis*-infected mice**

Lu Bai<sup>1,2</sup>, Xuan Liang<sup>1,3</sup>, Huanhuan Ning<sup>1</sup>, Jian Kang<sup>1</sup>, Yanling Xie<sup>1,2</sup>, Yanzhi Lu<sup>1</sup>, Rui Ren<sup>1</sup>, Yinlan Bai<sup>1</sup>

<sup>1</sup>Department of Microbiology and Pathogen Biology, Basic Medical School, Air Force Medical University, Xi'an, China

<sup>2</sup> School of Life Sciences, Yan'an University, Yan'an, China

<sup>3</sup>College of Life Sciences, Northwest University, Xi'an, China

Correspondence author: Yinlan Bai, Email: yinlanbai@fmmu.edu.cn

**Objective:** We evaluated the immunotherapy effect of a recombinant *Mycobacterium smegmatis* overexpressing Ag85B (rMs-Ag85B) on *M. tuberculosis* H37Ra-infected mice, which could be used for the therapeutic vaccine against *Mycobacterium tuberculosis*.

**Methods:** Mice model of *M. tuberculosis* H37Ra-infected was established by respiratory tract infection. Then mice were treated subcutaneously with rMs-sAg85B twice at a 2-week interval. The specific antibody levels of mice sera were detected at 6-week post the last immunotherapy. Furthermore, the proportion of total T cells and subsets of secreting Th1/Th2 cytokines in splenocytes were detected by Flow cytometry. The frequency of splenocytes secreting IFN- $\gamma$  was detected by ELISPOT methods, and the secretion levels of Th1/Th2 cytokines were measured by ELISA assay. Distribution of T cells in lung tissue were analyzed by immunohistochemistry technology in pathological sections. Finally, the pathological changes of lung tissue were observed after HE staining, and the bacterial loads in organs were counted by CFU on plates.

**Results:** Compared with mice with *M. smegmatis* immunotherapy and control groups, rMs-sAg85B inoculation increased the level of humoral immune response in *M. tuberculosis*-infected mice. Moreover, rMs-sAg85B significantly elevated the proportions of CD4<sup>+</sup> and CD8<sup>+</sup> T cells and splenocytes secreting IFN- $\gamma$  in spleens of *M. tuberculosis*-infected mice. rMs-sAg85B also stimulated the secretion levels of Th1 cytokines and IL-6 in splenocytes, but not Th2 cytokines. In lung tissues, rMs-sAg85B immunization promoted the accumulation of CD4<sup>+</sup> and CD8<sup>+</sup> T cells and improved the transcription levels of Th1/Th17 cytokines. rMs-sAg85B immunotherapy could alleviate the pathological injury induced by *M. tuberculosis* infection in lung, and reduce the number of bacterial loads in the lungs.

**Conclusions:** rMs-sAg85B subcutaneous immunization afforded immunotherapy effect on *M. tuberculosis*-infected mice, which could be used as a tuberculosis therapeutic vaccine.

**Keywords:** *Mycobacterium tuberculosis*; tuberculosis; *Mycobacterium smegmatis*; Antigen 85B; immunotherapy

## 2-2 Economic evaluation of comprehensive malaria prevention and control project of a Chinese-funded mining enterprise in Africa

DU Yan-qiu<sup>1</sup>; LIANG Cheng<sup>2</sup>; ZHOU Hua-yun<sup>2</sup>; CAO Jun<sup>2</sup>; HUANG Jia-yan<sup>1</sup>

<sup>1</sup> National Health Commission Key Laboratory of Health Technology Assessment, School of Public Health, Fudan University, Shanghai 200032;

<sup>2</sup> National Health Commission Key Laboratory of Parasitic Disease Prevention and Control Technology, Jiangsu Institute of Parasitic Diseases, Wuxi 214064

Email: yqdu21@m.fudan.edu.cn

**Object:** This study aimed to analyze the advantages of the "health-enterprise joint" model through the economic evaluation of overseas comprehensive malaria prevention and control project, and to put forward relevant suggestions of promoting the implementation of overseas malaria prevention and control projects and protecting the health of Chinese and local employees.

**Methods:** This study focused on the comprehensive malaria prevention and control project implemented by a Chinese-funded mining enterprise in the Democratic Republic of Congo. The project input cost was calculated from the perspective of the enterprise, and the "number of malaria cases avoided" was used as the effect index, and the cost-effectiveness ratio, net present value, and benefit-cost ratio were used as the evaluation indicators to carry out economic evaluation of the project.

**Results:** In the first year of project implementation, the cost was about 1.018 million yuan, and about 198 malaria cases were avoided. The cost-effectiveness ratio of the project was about 4,000 yuan per case. The monetization value of the direct healthy output of the project is about 2.608 million yuan, the benefit-cost ratio is 2.56, and the net present value is about 1.590 million yuan.

**Conclusion:** The project is effective in preventing and controlling the occurrence of malaria among employees, with remarkable results and certain economic benefits. The project also better reflected the advantages of the "health-enterprise joint" model in overseas malaria prevention and control, but there is still room for further reduction in the project cost. It was suggested to further expand the scale of the project, and actively promote the multi-party cooperation, normalization and institutionalization of malaria prevention and treatment.

**Key words:** overseas migrant workers; malaria prevention and treatment; economic evaluation; health-enterprise joint.

## 2-3 Establishment and comparison of mouse models of chronic mycobacterial infection

Xiaojing Gao<sup>1,2</sup>, Huanhuan Ning<sup>1</sup>, Jian Kang<sup>1</sup>, Yanzhi Lu<sup>1</sup>, Xuan Liang<sup>1,3</sup>, Rui Ren<sup>1</sup>, Yali Kang<sup>1,2</sup>, Linna Zhang<sup>2</sup>, Yinlan Bai<sup>1\*</sup>

<sup>1</sup> Department of Microbiology and Pathogen Biology, Basic Medical School, Air Force Medical University, Xi'an, China

<sup>2</sup> School of Basic Medicine, Ning Xia Medical University, Xi'an, China

<sup>3</sup> College of Life Sciences, Northwest University, Yinchuan, China

Correspondence author: Yinlan Bai, Email: yinlanbai@fmmu.edu.cn

**Objectives:** Tuberculosis (TB) is a serious chronic infectious disease, caused by *M. tuberculosis* infection. The development of new anti-TB drugs, vaccines and diagnostic reagents requires stable and reliable animal models. In this study, mice models of chronic mycobacterial infection were set up with slow-growing *M. tuberculosis* standard virulent strain H37Rv, attenuated strain H37Ra and vaccine strain of *Bacille Calmette-Guérin* (BCG), which immunological properties were also compared between models.

**Methods:** The levels of antibodies induced by mycobacteria and the levels of Th1/Th2 cytokines secreted by splenocytes were detected by ELISA; the pathological changes of spleen and lung tissues were observed by pathological sections; the number of colony-forming units (CFUs) in spleen and lung was counted by plates.

**Results:** After 24 weeks of infection with three mycobacteria, the mice weight showed no significant differences between all groups. Three strains induced higher mycobacteria-specific IgG levels in sera, especially IgG levels against Ag85B, an immunodominant antigen of *M. tuberculosis*, but no significances between three groups. Mycobacteria infection induced increased secretions of IFN- $\gamma$ , IL-2 and IL-10 in splenocytes, and the cytokines secretion of H37Rv infected mice was significantly higher than that of BCG and H37Ra infected mice. Three strains infections caused spleen and lung enlarged, and certain degree of inflammatory pathological damage, but there were no significant differences between the groups. The bacteria load in the spleen and lung of H37Rv and H37Ra-infected mice were similar, and both were higher than those of BCG-infected mice.

**Conclusion:** Mice models of chronic mycobacterial infection were successfully established here. Compared with H37Rv strain, there were no significant differences in the immune responses and the bacteria load in mice infected with H37Ra. Therefore, the attenuated H37Ra chronic mouse infection model could be used for anti-TB vaccines and drugs research.

**Key words:** Mycobacterium tuberculosis; mouse model; chronic infection.

## 2-4 The impact of multi-level interventions on the second-wave SARS-CoV-2 transmission in China

Yuanchen He

School of Public Health, Fudan University.

Email: 20211020002@fuda.edu.cn

**Objectives:** Assessing the impact of multi-level interventions on SARS-CoV-2 transmission in the worst-hit cities during the second wave of COVID-19 in China.

**Methods:** Five cities with over 100 reported COVID-19 cases within one month from Dec 2020 to Feb 2021 were included in our analysis. We fitted the exponential growth model to estimate basic reproduction number ( $R_0$ ), and used a Bayesian approach to assess the dynamics of the time-varying reproduction number ( $R_t$ ). We fitted linear regression lines on  $R_t$  estimates for comparing the decline rates of  $R_t$  across cities, and the slopes were tested by analysis of covariance.

**Results:** A total of 2,609 COVID-19 cases were analyzed in this study. We estimated that  $R_0$  all exceeded 1, with the highest value of 3.63 (95% CI: 1.36-8.53) in Haerbin and the lowest value of 2.45 (95% CI: 1.44-3.98) in Shijiazhuang. Downward trends of  $R_t$  were found in all cities, and the starting time of  $R_t < 1$  was around the 12th day of the first local COVID-19 cases. Statistical tests on regression slopes of  $R_t$  showed no significant difference across five cities ( $P=0.126$ ).

**Conclusion:** Timely implemented non-pharmaceutical interventions could control the transmission of SARS-CoV-2 for places where population immunity has not been established.

**Keywords:** COVID-19; second-wave; reproduction number; China

Conflict of interest: The authors declare no conflicts of interest.

## 2-5 基于传染病数据的传播链重建研究

李海东

昆明医科大学，昆明，650000

**目的：**为明确传染病传播路径以及详情，必须知晓传播链。但在实际研究中，由于回忆偏差等原因很难获得完整的传播信息。这就导致在估计一些流行病学参数（如序列间隔）时出现一些偏差。在此项研究中，使用现代统计方法从部分记录的感染者-被感染者对中重建完整的传播链，并进一步估计序列间隔和瞬时再生数。

**方法：**通过卫健委官方网站收集某城市某次的新冠肺炎数据，包括患者的基本信息，但已经进行脱敏处理。1.根据已知的 SI 可以通过 MCMC 得到后验分布，应用统计方法获得可能的传播对的概率，构建完整的传播链并估计每日瞬时再生数（ $R_t$ ）。2.序列间隔分布的估计，将构建传播链前的已知传播对数据和构建传播链后的传播对数据，运用伽马（Gamma）分布、威布尔（Weibull）分布、对数正态（Lognormal）分布对序列间隔数据进行拟合。

**结果：**1.对于该市疫情，在未构建完整的传播链之前，经过拟合序列间隔数据并使用 AIC 准则可知，序列间隔更加符合 Weibull 分布，平均序列间隔为 7.27(95%CI: 2.67~12.16) 天。在构建完整传播链后，经过拟合序列间隔数据并使用 AIC 准则可知，序列间隔拟合更符合 Gamma 分布，平均序列间隔为 6.47 (95%CI: 1.95~12.34) 天。每日的瞬时再生数  $R_t$ ，呈现出第一日  $R_t$  值异常高，在后续疫情发展中  $R_t$  值在 1 左右徘徊，在 1 月 6 号以后  $R_t$  值小于 1，表明疫情得到控制，不会再感染新发病例。

**结论：**研究发现，在构建完整的传播链以后计算出的各种流行病学参数与实际情况相符，这种方法可以用于其他类似传染病的爆发。在实际研究中，应注意收集所有的流行病信息，通过本文研究的方法使用这些有价值的信息，可以更好地估计流行病爆发期间的连续间隔和每日  $R_t$  值。这将为流行病的特点识别和实施的预防和控制措施的有效性提供更好的数据支持。

## 2-6 Impacts of medical insurance on treatment adherence of drug-resistant tuberculosis

Xiao Liu

Tongji Medical College, Huazhong University of Science and Technology, School of Medicine and Health Management, Wuhan, China

Email: 1563870730@qq.com

**Background:** Drug-resistant tuberculosis (DR-TB) is an increasingly serious global problem. According to the research results, the treatment adherence for DR-TB is worse than that of ordinary tuberculosis. Besides, the poor adherence of DR-TB will not only reduce the rate of treatment success, but also increase the risk of transmission of DR-TB. It is very important to improve treatment adherence of DR-TB.

**Methods:** The DR-TB patients registered in Wuhan Center for Tuberculosis Control and Prevention from January 2016 to December 2020 are selected as the research subjects. The SPSS 25.0 statistical software is utilized for statistical analysis. General descriptive statistical analysis is used to analyze treatment adherence and medical insurance compensation rate. Finally, the binary logistic analysis was performed by taking the data of treatment adherence as the dependent variable, and taking the data of age, gender, marriage, occupation, outpatient effective compensation ratio (ECR), and inpatient ECR as independent variables.

**Results:** There are 620 DR-TB patients in this study, including 209 patients (33.7%) who received the full-course treatment, 86 (13.9%) lost patients, 123 patients (18.4%) under treatment, 66 patients (10.7%) who refused treatment, and 136 patients with (21.9%) other situations. The ECR of outpatient has an impact on treatment adherence ( $P < 0.05$ ). The ECR of inpatient has no effect on treatment adherence ( $P = 0.117$ ). After improving the outpatient ECR, the proportion of patients treated with a full-course treatment increased by 35.7%.

**Conclusions:** There are still many patients in Wuhan give up or interrupt treatment. Improving the ECR of outpatient can effectively improve the treatment adherence of DR-TB. It is recommended to included DR-TB in the scope of compensation for outpatient severe diseases. And the financial investment should be appropriately increased to ensure a higher coverage ratio of subsidies for public health projects.

**Key words:** Drug-resistant tuberculosis; Medical insurance.



## 2-7 A school-based cross-sectional survey under Covid-19 pandemic regarding schistosomiasis in Zanzibar

Yiyun Liu<sup>1</sup>, Wenjun Hu<sup>2</sup>, Yuzhen Huang<sup>2</sup>

<sup>1</sup>School of Public Health, Nanjing Medical University

<sup>2</sup>Global Health Center, Jiangsu Institute of Schistosomiasis Control

Yiyun Liu: yiyun\_liu@yeah.net; Wenjun Hu: wenjunhu1004@126.com; Yuzhen Huang: yzhyz01@163.com

**Objectives:** Schistosomiasis is a common neglected tropical disease, leading a threaten to high-risk populations, especially for school-aged children because of their behavior. Due to Covid-19, the target of WHO NTD roadmap 2030 is undermined by the difficulties and challenges in schistosomiasis control. This study was to assess the cognitive level of schistosomiasis among school-aged students in Pemba Island under COVID-19 and to explore the influencing factors as the basis for reliable suggestions and the follow-up policy.

**Methods:** A Knowledge, Attitude and Practice (KAP) survey was conducted in 2 schools in Pemba Island, Zanzibar among grades 4-9 students in 2021, and a total of 217 valid participants responded to the questionnaires.

**Results:** Although 90% of the students knew schistosomiasis, the knowledge of the vector-borne disease (30.4%) and clinical symptom (24.4%) was insufficient. More than half of participants lack self-protection and treatment in daily life, even with higher awareness of perceived susceptibility (65.0%) and severity (90.8%) about schistosomiasis. Risky behaviors like bathing (84.3%), urinating (81.6%) and playing/swimming (70.5%) in fresh water were very common among students. Students with older age performed better on knowledge ( $P=0.016$ ) and attitude ( $P<0.01$ ), and those with smaller family got a higher score on attitude ( $P=0.037$ ). Practice was significantly correlated with gender ( $P<0.01$ ), caregivers ( $P<0.01$ ) and symptoms (bloody urine or not) ( $P<0.01$ ).

**Conclusions:** This study revealed a wide gap between the behavior and knowledge among school children, especially under the pandemic. We should still maintain students' learning about the etiology, transmission, and prevention of schistosomiasis. Behavioral interventions and health education need to be strengthened to reduce growing barriers by understanding the influencing factors of high-risk behaviors and expanding the scope of advocacy.

**Keywords:** Schistosomiasis; Zanzibar; Knowledge; Attitude; Practice

## 2-8 Sexual risk behaviors among factory workers in Shenzhen, China: a cross-sectional study

Dan Luo

School of Public Health (Shenzhen), Sun Yat-sen University, Shenzhen, China.

E-mail: luod9@mail2.sysu.edu.cn

**Aim:** This study aims to evaluate HIV/AIDS knowledge, sexual risk behaviors, and associated factors among factory workers in Shenzhen.

**Methods:** A cross-sectional study was conducted from November 2019 to April 2020 by multi-stage stratified cluster random sampling. Eligible participants were full-time workers aged 18 years and older. A self-administered questionnaire was used to collect information on demographic characteristics, HIV/AIDS knowledge, sexual risk behaviors, and non-sexual behaviors. Univariate and multivariable logistic regression were applied to examine factors associated with three sexual risk behaviors respectively.

**Results:** A total of 2029 factory workers were included. Of them, the mean age was 37.22 ( $\pm 4.39$ ) years; 48.5% were men; 89.3% had worked for more than 1 year in Shenzhen; 59.9% had basic HIV/AIDS knowledge. Sexual risk behaviors were reported including unprotected sex last time (32.3%), having multiple sex partners (11.5%) and engaging in commercial sex (44.3%) in the past year. Factors associated with having unprotected sex last time were being married or cohabitated (adjusted odds ratio [AOR] 1.53, 95% confidence interval [CI] 1.11-2.12), higher educational levels (0.62, 0.46-0.85), and using a condom at sex debut (0.17, 0.13-0.22). Males (3.24, 2.10-4.99 and 2.27, 1.35-3.80), being married or cohabitated (0.48, 0.33-0.70 and 0.38, 0.24-0.60), having sexual debut at 18 years or older (0.16, 0.09-0.28 and 0.34, 0.17-0.69), and using drugs before or during intercourse (4.20, 2.21-7.98 and 13.35, 6.89-25.87) were associated with both having multiple sex partners and engaging in commercial sex in last year.

**Conclusions:** Most respondents had basic HIV/AIDS knowledge, but their sexual risk behaviors were prevalent. Our findings demonstrated that programs aimed at the promotion of safer sexual practices should target vulnerable factory workers.

**Key words:** HIV; sexual risk behaviors; factory workers

## 2-9 Investigation on awareness of knowledge of tuberculosis prevention and control and health literacy among residents in Gansu Province

Hongmei Zhao<sup>1</sup>, Xiaohui Wang<sup>2</sup>  
School of Public Health, Lanzhou University  
zhaohm2021@163.com<sup>1</sup>; wangxiaohui@lzu.edu.cn<sup>2</sup>

**Objective:** To explore the health literacy and awareness of knowledge of tuberculosis(TB) prevention and control, and analyze their influencing factors among residents in Gansu province, so as to provide evidence for the prevention and control of TB.

**Methods:** This study was conducted as a cross-sectional study. According to the economic development level and geographical distribution of Gansu Province, a total of 451 people from Lanzhou, Dingxi and Wuwei were invited to participant the face-to-face survey by using the multi-stage sampling method. SPSS 26.0 software was used for statistical analysis. Chi-square test and Multivariate Logistic regression were used to analyze the influencing factors of TB knowledge awareness rate and health literacy.  $P<0.05$  was considered statistically significant.

**Results:** The overall awareness rate of knowledge of tuberculosis prevention and control among 451 residents of Gansu Province reached 76.35%, and 25.72% knew all of the TB knowledge. Awareness rate varied statistically in different gender, education level, occupation, self-assessment of health status, smoking and drinking ( $P<0.05$ ). The health literacy level of residents in Gansu province was 31.9%, and the education level and self-assessment results of health status were independent influencing factors of health literacy ( $P<0.05$ ).

**Conclusion:** The health literacy and awareness of knowledge of TB prevention and control among residents in Gansu province need to be improved. A variety of health promotion activities should be carried out in different target population especially farmers and low education level groups, and the publicity of TB-related policies also should be Strengthen. Additionally, it is necessary to innovate ways to publicize health knowledge and pay attention to the combination of online new media and traditional media to promote the health literacy of residents.

**Key words:** Tuberculosis; Prevention knowledge; Awareness rate; Health literacy; Questionnaire survey

## 2-10 The impact of multi-level interventions on the second-wave SARS-CoV-2 transmission in China

Yuanchen He, BSc<sup>1</sup>, Yinzi Chen, BSc<sup>1</sup>, Lin Yang, PhD<sup>2</sup>, Ying Zhou, PhD<sup>3</sup>, Run Ye, PhD<sup>4</sup>, Xiling Wang, PhD<sup>1,5\*</sup>

<sup>1</sup>School of Public Health, Fudan University, Key Laboratory of Public Health Safety, Ministry of Education, Xuhui District, Shanghai 200231, China

<sup>2</sup>School of Nursing, Hong Kong Polytechnic University, Hong Kong, China

<sup>3</sup> School of Public Health, Shenzhen University, Health Science Center, Shenzhen 518000, China

<sup>4</sup> Department of Tropical Diseases, Navy Medical University, Shanghai 200433, China

<sup>5</sup> Shanghai Key Laboratory of Meteorology and Health, Shanghai, China

E-mail: erinwang@fudan.edu.cn

**Objective:** Assessing the impact of multi-level interventions on SARS-CoV-2 transmission in the worst-hit cities during the second wave of COVID-19 in China.

**Methods:** Five cities with over 100 reported COVID-19 cases within one month from Dec 2020 to Feb 2021 were included in our analysis. We fitted the exponential growth model to estimate basic reproduction number ( $R_0$ ), and used a Bayesian approach to assess the dynamics of the time-varying reproduction number ( $R_t$ ). We fitted linear regression lines on  $R_t$  estimates for comparing the decline rates of  $R_t$  across cities, and the slopes were tested by analysis of covariance.

**Results:** A total of 2,609 COVID-19 cases were analyzed in this study. We estimated that  $R_0$  all exceeded 1, with the highest value of 3.63 (95% CI: 1.36-8.53) in Haerbin and the lowest value of 2.45 (95% CI: 1.44-3.98) in Shijiazhuang. Downward trends of  $R_t$  were found in all cities, and the starting time of  $R_t < 1$  was around the 12th day of the first local COVID-19 cases. Statistical tests on regression slopes of  $R_t$  showed no significant difference across five cities ( $P=0.126$ ).

**Conclusion:** Timely implemented non-pharmaceutical interventions could control the transmission of SARS-CoV-2 for places where population immunity has not been established.

**Keywords:** COVID-19; second-wave; reproduction number; China

## 2-11 Zfp335 调控病毒感染过程中记忆性 CD8<sup>+</sup> T 细胞命运的机制

刘海艳, 王昕, 丁人一, 焦安君, 郑会强, 张保军\*西安交通大学基础医学院病原生物学与免疫学系, 陕西 西安, 710061

E-mail:bj.zhang@mail.xjtu.edu.cn

记忆性 CD8<sup>+</sup> T 细胞针对病原体提供长期有效的保护作用。全面的转录和表观遗传网络参与调节记忆性 T 细胞的发育, 但参与其形成和长期存活的分子机制仍不完全清楚。本课题发现在急性感染中锌指蛋白 335 (Zfp335) 对 CD8<sup>+</sup> T 细胞记忆性的建立和维持不可或缺。CD8<sup>+</sup> T 细胞中特异性敲除 Zfp335 基因的小鼠在细菌清除后记忆前体细胞显著减少。同时, Zfp335 缺失的 CD8<sup>+</sup> T 细胞可导致记忆性特征基因 Eomes 和 IL-2R $\beta$  的表达下降, 进而引起 IL-7 和 IL-15 信号刺激条件下的记忆性 CD8<sup>+</sup> T 细胞记忆特性丧失及凋亡增加。机制上, Zfp335 直接结合并调控对记忆性 T 细胞发育至关重要的分子 TCF-1。过表达 TCF-1 基因可以挽救由 Zfp335 缺陷引起的 CD8<sup>+</sup>记忆前体细胞降低和记忆性 T 细胞存活的缺陷。因此, 我们的发现揭示了 Zfp335 作为 TCF-1 上游的一个新的转录因子参与调控 CD8<sup>+</sup> T 细胞的记忆性及抗感染作用。

### 3-1 Efficacy of an internet-based health management for patients with dyslipidemia: a long-term interventional study

Yuqi Dou<sup>1,2</sup>, Xue Yu<sup>1,3</sup>, Botian Chen<sup>1,4</sup>, Defu Ma<sup>1,\*</sup>

School of Public Health, Peking University Health Science Center, 38 Xueyuan Road, Haidian District, Beijing 100191, China.

Yuqi Dou: dyqhoney@126.com; Defu Ma\*: madefu@bjmu.edu.cn

**Objectives:** This study was conducted to provide health guidance and education to people with dyslipidemia using an Internet health management platform and to assess the effectiveness of Internet health management and intervention in improving health-related behaviors and controlling blood lipids.

**Methods:** Starting in 2013 (Baseline, N=56542), a Western cohort in China was established with all oilfield workers in the cohort population, and all workers were provided with internet health management. Health checkups were conducted annually, and questionnaires were administered every two years to analyze changes in health behaviors two years (2015) and four years (2017) following the intervention. In addition, factors affecting behavioral changes and lipid control were analyzed in the dyslipidemic population to understand the effectiveness and influencing factors of Internet health management on lipid control.

**Results:** By guiding oilfield workers through the Internet health management platform, the awareness rate of dyslipidemia increased from 19.1% in 2013 to 34.4% in 2017; and the control rate of dyslipidemia increased from 9.1% at baseline to 18.5%. Certain health-related behaviors that are beneficial to health (tobacco use, physical activity, and partial dietary) gradually improved over the intervention time. For patients with dyslipidemia, total cholesterol decreased as the years go by, from 2.90 mmol/L (2013) to 2.77 mmol/L (2017). Analysis of factors affecting lipid control showed that: non-compliance with health instructions and changes in tobacco use (1.643, 95%CI: 1.202-2.248), cereals and potatoes intake (1.418, 95%CI: 1.107-1.817), fish, poultry, eggs and meat intake (1.394, 95%CI: 1.086-1.789), fruit intake (1.750, 95%CI: 1.315-2.329), physical activity intensity (1.434, 95%CI: 1.054-1.950), and sedentary time (1.633, 95%CI: 1.129-2.363) all affected lipid control; in addition to these, female (0.722, 95%CI: 0.546,0.954) was found to be protective factor for effective lipid control.

**Conclusion:** The basic Internet-based health management platform in this study appear to be moderately successful and is a valuable and feasible application. Tobacco, dietary, and physical activity interventions provided significant protection against dyslipidemia in patients.

**Keywords:** Dyslipidemia; Internet-based health management; Interventional study; Lipid control

## 3-2 Impact of COVID-19 Pandemic on Mortality Rate of Liver Disease in the United States: A Population-based Study, 2010-2021

Xu Gao,<sup>1,2#</sup> Fan Lv,<sup>3#</sup> Xinyuan He,<sup>2</sup> Yunyu Zhao,<sup>2</sup> Yi Liu,<sup>2</sup> Jian Zu,<sup>3\*</sup> Linda Henry,<sup>4</sup> Jinhai Wang,<sup>1</sup> Yee Hui Yeo,<sup>5</sup> Fanpu Ji,<sup>2,6,7,8\*</sup> Mindie H. Nguyen<sup>4,9\*</sup>

<sup>1</sup>Division of Gastroenterology, the Second Affiliated Hospital of Xi'an Jiaotong University, Xi'an, Peoples Republic of China (PRC).

<sup>3</sup>School of Mathematics and Statistics, Xi'an Jiaotong University, Xi'an, PRC.

Jian Zu: jianzu@xjtu.edu.cn; Fanpu Ji: jifanpu1979@163.com; Mindie H. Nguyen: mindiehn@stanford.edu

**Objective:** The pandemic has resulted in an increase of deaths not directly related to COVID-19 infection. We aimed to use a national death dataset to determine the impact of the pandemic on people with liver disease in the U.S, focusing on alcohol-associated liver disease (ALD) and non-alcoholic fatty liver disease (NAFLD). **Methods:** Using data from the CDC WONDER platform of the National Vital Statistic System, we estimated the age-standardized mortality rates (ASMR) of liver disease between 2010 and 2021. We used joinpoint regression to assess the trend of mortality. Leveraging prediction modeling analysis based on trends from 2010-2019, and predicted mortality for 2020-2021. By calculating the difference between observe and predicted mortality rates, we quantified the impact of the pandemic on people with liver disease. **Results:** Among 624,693 chronic liver disease-related deaths between 2010 and 2021, ASMR for ALD dramatically increased between 2010-2019 and 2020-2021 (annual percentage change [APC] 3.5% to 16.6%,  $P<0.01$ ), leading to a much higher observed ASMR (per 100,000 persons) than predicted for 2020 (15.67 vs.13.04) and 2021 (17.08 vs.13.41). ASMR for NAFLD also increased during the pandemic (APC:12.3%), the observed ASMR of 3.11 in 2020 to 3.31 in 2021 were both higher than the predicted rates of 2.64 in 2020 and 2.80 in 2021. While the rates for hepatitis B and C decreased (APC: -2.0% and -4.1%). Notably, the ASMR rise for ALD was most pronounced in non-Hispanic Whites, Blacks, and Alaska Indians/Native Americans (APC: 11.7%, 10.8%, 18.0%, all  $P<0.05$ ). For NAFLD, the racial ethnic groups with the steepest ASMR rise during pandemic with APCs of 11.9%,11.9%, 12.9%,13.1% and 10.9% in non-Hispanic Whites, non-Hispanic Blacks, non-Hispanic Asians, Hispanics and American Indians/Alaska Natives, respectively. The ASMR rise for ALD was particularly severe for the 25-44 age group (APC: 31.1%, versus 13.8% and 11.2% for 45-64 and  $\geq 65$ , all  $P<0.05$ ), which were also all higher than pre-COVID-19 rates (all  $P<0.01$ ). For NAFLD, while significant change in trend was observed mainly for the youngest group (2018-2021 APC 13.5%), the older groups have had steady rise since 2010 with the  $\geq 65$  group having the highest ASMR change (2010-2021 AAPC 15.9, 95%CI 14.1-17.8,  $P<0.05$ ). Additionally, we found the observed ASMR to be significantly higher than predicted levels for all age groups for ALD. The sharp rise during the 2019 to 2021 period was

observed for both males and females for ALD (2019-2021 APC 15.7% for males, 18.2% for females, both  $P < 0.01$ ) while the ASMR increase was steady throughout the whole study period 2010-2021 for both sexes for NAFLD. **Conclusion:** ASMR for ALD and NAFLD increased at an alarming rate during the COVID-19 pandemic with the largest disparities among the young, non-Hispanic white, non-Hispanic black, and Alaska Indian/Native American populations.

**Keywords:** Alcohol-associated liver disease, Nonalcoholic fatty liver disease, Age-standardized mortality rates, Annual percentage change

### 3-3 Excess deaths among diabetics during the COVID-19 pandemic in the United States

Fan Lv,<sup>1#</sup> Xu Gao,<sup>2,3#</sup> Amy Huaishuan Huang,<sup>4#</sup> Jian Zu,<sup>1\*</sup> Xinyuan He,<sup>3</sup> Xiaodan Sun,<sup>1</sup> Ning Gao,<sup>3</sup> Yang Jiao,<sup>5</sup> Margaret G. Keane,<sup>6</sup> Yee Hui Yeo,<sup>7\*</sup> Youfa Wang,<sup>8</sup> Fanpu Ji,<sup>3,8,9,10\*</sup>

<sup>1</sup>School of Mathematics and Statistics, Xi'an Jiaotong University, Xi'an, Shaanxi, Peoples Republic of China (PRC).

<sup>2</sup>Division of Gastroenterology, the Second Affiliated Hospital of Xi'an Jiaotong University, Xi'an, Shaanxi, PRC.

Jian Zu: [jianzu@xjtu.edu.cn](mailto:jianzu@xjtu.edu.cn); Yee Hui Yeo: [yeehui.yeo@cshs.org](mailto:yeehui.yeo@cshs.org); Fanpu Ji: [jifanpu1979@163.com](mailto:jifanpu1979@163.com)

**Objective:** Diabetes mellitus (DM) is a critical risk factor for severe COVID-19 infection and mortality, and COVID-19 infection contributes to worsening glycemic control. The COVID-19 pandemic profoundly disrupted delivery of care for diabetic patients. We aimed to determine the overall impact of DM on excess deaths during the pandemic. **Methods:** In this serial population-based study between January 1, 2006 and December 31, 2021, mortality data of decedents aged  $\geq 25$  years from the National Vital Statistics System dataset was analyzed. Excess deaths were estimated by comparing observed versus expected age-standardized mortality rates derived from mortality during 2006-2019. The trends of mortality were quantified with joinpoint regression analysis. Subgroup analyses were performed by age, sex, race/ethnicity, and state. **Results:** Among 4.25 million DM-related deaths during 2006-2021, there was a significant surge in mortality during the pandemic, from 106.76 (per 100,000 persons) in 2019 to 144.13 in 2020 (33.28% excess mortality) and 145.70 in 2021 (32.89% excess mortality). COVID-19 infection contributed to about 60% of the excess mortality. Adults aged 25-44 years had the most pronounced rise in mortality. Widened racial/ethnic disparity was observed, with Hispanics demonstrating the highest excess deaths (67.5%), almost three times that of non-Hispanic whites (23.9%), who had the lowest rise in mortality across the racial/ethnic groups. **Conclusion:** The United States saw a dramatic surge in DM-related mortality during the pandemic. The disproportionate rise in young adults and the reverse of the “Latino mortality paradox” warrant urgent preventative interventions from diverse stakeholders.

**Keywords:** mortality, epidemiology, disparity, temporal trend, predictive analysis



### 3-4 Competing-risks model for predicting the prognosis of head and neck cancer: An analysis from the SEER database

Xin-Hua Jia<sup>1</sup>, Zheng Su<sup>2</sup>, Yu-Fei Li<sup>1</sup>, Ting Wu<sup>1</sup>, You-Lin Qiao<sup>1,3</sup>

<sup>1</sup>The State Key Laboratory of Molecular Vaccinology and Molecular Diagnostics, National Institute of Diagnostics and Vaccine Development in Infectious Diseases, School of Public Health, Xiamen University, Xiamen, Fujian, China

<sup>2</sup>Department of Epidemiology, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

<sup>3</sup>Center for Global Health, School of Population Medicine and Public Health Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China

Email: xibeijiaxinhua@163.com

**Background:** Using competing risk models, previous studies have rarely analyzed head and neck cancer risk factors. We performed a competing-risks analysis to identify prognostic factors of head and neck cancers based on the SEER database.

**Methods:** 83,119 patients with head and neck cancer and information on age, race, gender, marital status, primary site, grade, regional nodes examined, tumor size, American Joint Committee on Cancer, the tumor, node and metastasis staging system, and treatment were extracted from the SEER database. A cumulative incidence function and Grays test were used in the univariate analysis, and the Fine-Gray model was in the multivariate analysis. Comparing the cumulative risk model with the competitive risk model constructed using Kaplan-Meier estimation

**Results:** Fine-Gray multivariate analysis showed that 50 years or older, black, single, and DSW, TNM T2, T3, T4, and M1, surgery, radiotherapy, and chemotherapy, were significantly associated with reduced survival. Compared with regional lymph node examination, no examination was protective (HR=0.95, 95% CI=0.92-0.98); The same trends were seen in surgery (HR=0.69, 95% CI=0.67-0.72), radiotherapy (HR=0.73, 95% CI=0.70-0.75), and chemotherapy (HR=0.82, 95% CI=0.80-0.85), when group with no surgery, radiotherapy, or chemotherapy as reference. Different results were obtained using multivariate Cox regression, with Kaplan-Meier curve analysis leading to an overestimation of the cumulative risk of patients.

**Conclusion:** We found that compared traditional analysis methods with competing risk analysis models and incorporated more prognostic factors, which were overestimated by the conventional analysis methods.

### 3-5 The role and mechanism of BCG-induced trained immunity in immunotherapy of type 1 diabetes mellitus

Yali Kang<sup>1,2</sup>, Huanhuan Ning<sup>1</sup>, Rui Ren<sup>1</sup>, Jian Kang<sup>1</sup>, Yanzhi Lu<sup>1</sup>, Xiaojing Gao<sup>1,2</sup>, Jie Zhou<sup>3</sup>, Linna Zhang<sup>2</sup>, Yinlan Bai<sup>1\*</sup>

<sup>1</sup>Department of Microbiology and Pathogen Biology, Basic Medical School, Air Force Medical University, Xi'an, China

<sup>2</sup>School of Basic Medicine, Ning Xia Medical University, Yinchuan, China

<sup>3</sup>Department of Endocrinology, Xijing Hospital, Air Force Medical University, Xi'an, China

\*Correspondence author: Yinlan Bai; Email: yinlanbai@fmmu.edu.cn

**Objective:** Type 1 diabetes mellitus (T1DM) is a group of metabolic diseases characterized by hyperglycemia, and also an autoimmune disease which is driven by immune-mediated destruction of pancreatic  $\beta$  cells. As an immunomodulator, BCG could induce non-specific immune responses against unrelated infectious pathogens, tumors and some autoimmune diseases, which is known as a new immune response mechanism of trained immunity, characterized by metabolic changes, epigenetic modification and reprogramming of innate immune cells, and enhanced level of innate immune response. In a clinical trial, it was exhibited that BCG subcutaneous immunization could lower blood glucose level, but the mechanism is still unclear. Therefore, the aim of this study is to investigate the role and mechanism of BCG-induced trained immunity in T1DM immunotherapy. **Methods:** T1DM mice model was set up using multidose intraperitoneal injections of Streptozotocin 50 mg/kg. BCG was immunized subcutaneously to T1DM mice. The blood was obtained from tail nicks using an animal lancet and glucose was measured using a glucometer. HE staining was used to observe the pathological changes of kidney and pancreas. The expression of insulin was detected by immunohistochemistry in the pancreas. The regulatory T cell (Treg) subsets were detected by flow cytometry, the epigenetic reprogramming level of BMDMs was detected by Western-blot, and the levels of cytokines and inflammatory factors secreted in splenocytes were detected by ELISA. **Results:** BCG immunization decreases blood glucose level, increased C-peptide production and restored the islet cell function in T1DM mice. Besides, BCG immunization increased the number of Treg cells, the epigenetic reprogramming level of innate immune cells, and enhanced splenocyte cytokine and inflammatory factor secretions of splenocyte. **Conclusion:** BCG immunization could increase insulin secretion, restore islet cell function, and lower the glucose level of T1DM mice, which may be benefited from trained immunity induced by BCG. Overall, our study provides the experimental evidence that BCG-induced training immunization may be used for immunotherapy of T1DM.

**Key words:** Type I diabetes, *Bacille Calmette-Guérin* (BCG), Trained immunity, Immunotherapy

### 3-6 Analysis of dose-response relationship between the number of chronic disease co-morbidities and the strength of depression association in middle-aged and elderly hypertensive patients

Li Gaiyun, Xuemei Han

School of Public Health, Lanzhou University, Lanzhou, Gansu

Li Gaiyun: ligy20@lzu.edu.cn; Xuemei Han: xmhan123@163.com

**Objective:** Analysis of the dose-response relationship between serial changes in the number of chronic disease co-morbidities and the strength of the depression association in hypertensive patients.

**Methods:** A total of 1703 study subjects aged 45 years and older were included using baseline survey data from the 2018 CHARLS database. Generalized linear model and restricted cubic spline model were applied to analyze the association between the number of chronic disease co-morbidities and depression and dose-response relationship in hypertensive patients.

**Results:** The incidence of depression in middle-aged and elderly patients with hypertension was 59.37%, and the co-morbidity detection rate was 53.90%. The generalized linear model showed that the number of co-morbidities was associated with the occurrence of depression in middle-aged and elderly hypertensive patients with statistically significant differences after adjusting for confounders such as age and gender, with prevalence of 2, 3, and  $\geq 4$  and *OR* (95% *CI*) of 1.65 (1.30-2.10), 2.05 (1.51-2.80), and 2.73 (1.90-3.90), respectively. The results of restricted cubic spline analysis showed a linear dose-response relationship for the strength of the association between successive changes in the number of co-morbidities and the occurrence of depression in hypertensive patients ( $P < 0.01$  for the overall trend,  $P = 0.2875$  for the nonlinear test).

**Conclusion:** The risk of depression in middle-aged and elderly patients with hypertension co-morbidity is 1.65-2.73 times higher than that in patients with hypertension only. It is recommended to form a health care model of "community + family + hospital", to do health checkups, and to include a mental health screening component in the health checkups of residents. Shifting from a single disease model to a multimorbidity model, with a focus on continuous changes in the number of co-morbidities in hypertensive patients (rather than the traditional single chronic disease), thereby reducing the risk of depressive illness in middle-aged and older hypertensive patients.

There is no conflict of interest in this article.

### 3-7 Early detection of high-risk populations of esophageal squamous cell carcinoma by microbial biomarker based on metagenomics

Minjuan Li<sup>1</sup>; Zhiyuan Fan<sup>1</sup>; Junjie Qin<sup>2</sup>; Xinqing Li<sup>1</sup>; and Wenqiang Wei<sup>1</sup>

<sup>1</sup>National Central Cancer Registry, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China;

<sup>2</sup>Promegene Institute, Shenzhen, China;

Minjuan Li: liminjuan9@163.com; Wenqiang: weiwq@cicams.ac.cn

**Aim:** Previous studies have indicated there is a high possibility and feasibility to early detect the high-risk population of ESCC from the view of microbiota. To provide new scientific clues, we further explored the microbial biomarkers of ESCC at the species or strain level by metagenomics in this study.

**Methods:** Based on the national screening project of ESCC in China, we enrolled 45 participants, and collected esophageal swabs and epidemiological information from each participant. Specifically, there were nine in normal, nine in esophagitis, nine in low-grade intraepithelial neoplasia (LGIN), nine in high-grade intraepithelial neoplasia (HGIN), nine in ESCC. Metagenomic sequencing was performed on the Illumina NovaSeq platform. The microbial characteristics were analyzed based reads by MetaPhlAn2 and mOTUs respectively.

**Results:** The alpha diversity at species level by MetaPhlAn2 was lower than it at strain level by mOTUs in normal, esophagitis, LGIN, HGIN, and ESCC respectively. Then, we explored microbial biomarkers of ESCC at the strain level. There was no statistical difference in alpha diversity among normal, esophagitis, LGIN, HGIN, and ESCC. However, the beta diversity was significant, especially ESCC. Combined the results of LEfSe, pairwise comparison in STAMP, and random forest, *Fusobacterium nucleatum* [3183], *Dialister pneumostintes* [2391], *Peptostreptococcus stomatis* [8192], *Streptococcus australis* [6321], *Porphyromonas gingivalis* [3008], and unknown *Neisseria* [3964] were associated with the progression of ESCC. Then, combine normal and esophagitis into health group, LGIN, HGIN, and ESCC into disease group. The decision tree showed only *Porphyromonas gingivalis* [3008], *Fusobacterium nucleatum* [3183], and *Streptococcus australis* [6321] were actually included, of which the accuracy was 82.22%.

**Conclusions:** Microbial biomarkers can be used for the early detection and early diagnosis of ESCC and its precancerous lesion, which can help concentrate the high-risk population of ESCC then save the resources of endoscopy screening.

**Keywords:** esophageal squamous cell carcinoma; metagenomic; primary screening

Conflict of interests: there was no conflict of interests.

### 3-8 Expression of imprinted gene IGF-2/H19 in female offspring affected by chronic stress during pregnancy

Li Ye<sup>1,2</sup>, Ma Shuqin<sup>1,3</sup>, Chen Xiaohui<sup>1,2</sup>, Liu Hongya<sup>1,2</sup>, Wang Rui<sup>1,2</sup>, Zhu Jiashu<sup>1,2</sup>, GUAN Su-zhen<sup>1,2</sup>

<sup>1</sup> School of Public Health and Management, Ningxia Medical University,

<sup>2</sup> Key Laboratory of Environmental Factors and Chronic Disease Control,

<sup>3</sup> General Hospital of Ningxia Medical University, Yinchuan, Ningxia 750004, China

Li Ye E-mail: 15797899122@163.com

**Objective:** To investigate the changes of DNA methylation and expression of imprinted gene IGF-2/H19 in hippocampal tissue of female offspring with emotional injury caused by chronic stress during pregnancy.

**Methods:** The chronic unpredictable mild stress (CUMS) model was established and the blood samples from inner canthal vein were collected before and at the 1st, 7th, 14th, 21st and 28th day of stress, and plasma corticosterone concentration was measured. On postnatal Day 28 (PND28) and PND42, 8 female mice in each group were randomly selected, and plasma corticosterone concentration was determined after inner canthal vein sampling. At PND42, the emotional responses of the two female rat groups were measured by sucrose preference test, tail suspension test and forced swimming test. The expression of IGF-2/H19 and related transferases in the rat hippocampus was detected by RT-PCR and Western Blotting. And using Methyl Target technology, 19 CpG sites in IGF-2 DMR2 region fragment, 8 CpG sites in H19-ICR fragment 1 and 15 CpG sites in H19-ICR fragment 2 were captured and sequenced at the same time to calculate the average methylation level of each CpG site.

**Results:** On days 14, 21 and 28, the plasma corticosterone concentration in model group was higher than that in control group ( $P < 0.05$ ). Compared with the control female rat group, the total liquid consumption, sugar water consumption and 1% sucrose preference percentage of the model female rat group were decreased (all  $P < 0.05$ ). The duration of immobility was prolonged in suspended tail experiment and forced swimming experiment ( $P < 0.05$ ). The relative expression of IGF-2/H19 gene mRNA and IGF-2 protein in hippocampus of model female rats were lower than that of control female rats ( $P < 0.05$ ). The relative expression of CTCF mRNA and protein was higher than that of control female mice. Compared with the control female rat group, the average methylation level of CpG site, the methylation level of IGF-2 DMR and the relative expression levels of methyltransferase DNMT3A mRNA, DNMT3A and DNMT3B protein in the model female rat group were decreased ( $P < 0.05$ ).

**Conclusion:** Chronic stress during pregnancy leads to depression and despair in female mice, and the mechanism may be related to the decreased gene expression level caused by the decreased methylation level of IGF-2 /H19 gene.

**Key words:** chronic unpredictable mild stress; Female offspring; Emotional damage; IGF-2/H19

### 3-9 口服营养补充对头颈部肿瘤放疗患者营养状况及副反应的影响

李悦, 孙岩娜

新疆医科大学第一附属医院临床营养科, 新疆医科大学第一附属医院肿瘤科, 乌鲁木齐市 830011

联系方式: 孙岩娜 675413742@qq.com

**目的:** 探讨单纯口服营养补充对头颈部肿瘤放疗患者体重、膳食摄入量、营养相关血液指标及放疗副反应的影响。

**方法:** 将放疗前存在营养风险符合入组条件的头颈部肿瘤患者, 随机分为干预组和对照组。两组患者均采用单纯调强放射治疗, 放疗开始时为每例患者提供营养咨询及个体化的膳食建议。放疗期间及放疗后1月内营养干预组患者每天接受500ml的口服营养补充剂, 对照组不进行干预。主要研究终点为患者体重和膳食摄入变化, 次要研究终点包括营养相关血液指标和放疗副反应。

**结果:** 2019年12月至2021年3月, 最终完成研究随访的94例患者, 其中干预组48例, 对照组46例。两组患者一般资料比较无差异, 放疗期间及治疗结束后1月内干预组和对照组均有不同程度的体重减轻, 干预组体重减少的程度明显低于对照组( $P<0.05$ )。治疗期间干预组中62.50%的患者体重减少 $>$ 治疗前体重5%, 对照组此比例高达89.13%。治疗结束时和治疗结束1月后, 干预组膳食摄入减少百分比与对照组比较有明显差异( $P<0.05$ ), 治疗结束时干预组有41.67%的患者膳食摄入量减少 $>$ 正常膳食摄入量的30%, 对照组此比例高达69.56%。干预组在营养相关血液指标如铁蛋白、白蛋白、前白蛋白的下降值均优于对照组( $P<0.05$ ), 两组患者血红蛋白的下降值均无显著差异( $P>0.05$ )。放疗副反应方面, 在治疗结束时和结束1月后, 两组吞咽困难改变和味觉症状发生率比较, 差异均无显著意义( $P>0.05$ ), 但口腔黏膜炎和食欲减退症状的发生率比较, 干预组明显低于对照组, 差异均有统计学意义( $P<0.05$ )。

**结论:** 单纯口服营养补充可以减少头颈部肿瘤患者放疗期间体重及膳食摄入量的下降, 改善患者整体营养状况, 尤其是蛋白丢失程度, 降低放疗副反应, 进而提高患者的生活质量, 因此单纯口服营养补充对于头颈部肿瘤患者是一种值得广泛应用的营养治疗方法。

**关键词:** 头颈部肿瘤; 放疗; 口服营养补充; 营养状况

### **3-10 Lifetime cumulative effect of reproductive factors on stroke and its subtypes in Chinese postmenopausal women: a retro-prospective cohort study**

Leying Hou, Qian Yi, Wen Liu, Peige Song\*

School of Public Health, Zhejiang University School of Medicine, Zhejiang University, Hangzhou 310058, Zhejiang, China

Peige Song: peigesong@zju.edu.cn; Leying Hou: Leying2333@zju.edu.cn

**Objective:** To assess the association of lifetime cumulative exposure to reproductive factors with the risk of stroke and its subtypes among postmenopausal Chinese women.

**Methods:** From the China Kadoorie Biobank study, postmenopausal women without prior stroke at baseline (2004-2008) were selected. Lifetime cumulative exposure to reproductive factors was assessed using three indicators: reproductive lifespan (RLS), endogenous estrogen exposure (EEE), and total estrogen exposure (TEE). Stroke and its subtypes, including ischemic stroke, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH) were identified via disease registry system and health insurance data during follow-up (2004-2015). Cox proportional hazards models were applied to estimate adjusted hazard ratio (aHR) and 95% CI for the risk of stroke by quartiles of RLS, EEE and TEE respectively. Receiver operating characteristic (ROC) analysis was generated to determine discriminating capacity of these three indicators.

**Results:** A total of 122,962 postmenopausal women aged 40 to 79 years without prior stroke at baseline were included. 15,140 incident stroke cases were identified, including 12,854 ischemic stroke, 2,580 ICH and 269 SAH. Compared with the lowest quartile, the highest quartile of RLS ( $\geq 36$  years) showed lower risks of total stroke and ischemic stroke, with aHR of 0.95 (95% CI: 0.92-0.98) for both. Women with the highest quartile of EEE ( $\geq 30.67$  years) were associated with lower risks of incident total stroke (aHR: 0.85, 95% CI: 0.82-0.88), ischemic stroke (aHR: 0.86, 95% CI: 0.82-0.89) and ICH (aHR: 0.72, 95% CI: 0.65-0.81), similar to the association of TEE with stroke. EEE yielded a higher area under curve (0.543) than TEE and RLS ( $P < 0.05$ ).

**Conclusions:** Lifetime cumulative exposure to reproductive factors, as indicated by RLS, EEE and TEE, is negatively associated with the risk of stroke among postmenopausal women. And EEE provided a better predictive value for stroke.

**Key words:** reproductive factors; estrogen exposure; stroke; postmenopausal women

### 3-11 The association between circulating irisin concentrations and changes in blood pressure among children: a cohort study

Minyi Tan<sup>1</sup>, Yajun Chen<sup>2</sup>, Li Cai<sup>2</sup>

<sup>1</sup>Department of Child Health, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou, Guangdong, China.

<sup>2</sup>Department of Maternal and Children Health, School of Public Health, Sun Yat-sen University, Guangzhou, China.

Minyi Tan: tanminyi@mail2.sysu.edu.cn; Yajun Chen: chenyj68@mail.sysu.edu.cn; Li Cai: caili5@mail.sysu.edu.cn

**Objective:** Irisin is a novel myokine and adipokine, which has been suggested to regulate central and peripheral blood pressure. This study aimed to investigate the longitudinal association of circulating irisin concentrations with changes in blood pressure (BP) levels among children. Additionally, we assessed the interaction of physical activity (PA) or sedentary behavior (SB) with irisin levels on BP.

**Methods:** Basing on a cohort study, we used a cluster random sampling method to select school-aged children from five schools in Guangzhou in 2017 for the baseline survey and then follow-up in 2019. PA and SB were assessed by the validated international physical activity questionnaires. According to the baseline PA and SB levels, 521 children were selected to test plasma irisin by ELISA. Blood pressures were obtained with electronic sphygmomanometers, and defined as normal, pre-hypertension, and hypertension according to the BP references. Logistic regression analysis was used to estimate associations. Interactions of PA or SB with irisin concentrations on blood pressure were calculated using logistic regression models with dichotomized factors (low PA and high PA; low SB and high SB).

**Results:** The baseline systolic blood pressure (SBP) was 101.95±12.44 mmHg and diastolic blood pressure (DBP) was 64.69±8.1 mmHg. We did not find statistically significant association between irisin concentrations and changes in BP levels among the overall children. After stratified by SB, the irisin levels in the low SB subgroup were inversely associated with changes in DBP (OR 0.869, 95% CI 0.773-0.978  $P=0.0199$ ). In addition, SB level had a moderating effect on the relationship between circulating irisin levels and changes in DBP ( $P_{\text{interaction}}=0.0116$ ).

**Conclusion:** Circulating irisin concentrations were independent factors contributing to the decrease of DBP level among low SB children. Furthermore, SB levels have a moderating effect on the relationship of circulating irisin concentration and changes in DBP.

**Keywords:** Irisin; Blood pressure; Physical activity; sedentary behavior; Children



## 3-12 Hypertensive disorders of pregnancy and subsequent risk of chronic obstructive pulmonary disease and asthma:

### The Nurses' Health Study II

Yi-Xin Wang, MD, PhD<sup>a</sup>; Raphaëlle Varraso, PhD,<sup>b</sup> Orianne Dumas, PhD,<sup>b</sup> Carlos A. Camargo Jr, MD, DrPH,<sup>c,d</sup> Liang Wang, MD, DrPH,<sup>c</sup> and Jorge E. Chavarro, MD, ScD<sup>a,f</sup>

<sup>a</sup>Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA.

E-mail: yixinwang@hsph.harvard.edu.

**OBJECTIVES:** To evaluate the association between gestational hypertension and preeclampsia and subsequent risk of chronic obstructive pulmonary disease (COPD) and asthma during adulthood.

**METHODS:** We followed parous women in the Nurses' Health Study II who reported a pregnancy lasting at least 6 months between 1993 and 2017. Hazard ratios (HR) and 95% confidence intervals (CI) were estimated for the associations between HDPs and risk of COPD (n=72,875) and asthma (n=80,472) using Cox proportional hazards models.

**RESULTS:** During 28 years of follow-up, we documented 2965 and 673 incident cases of physician-diagnosed asthma and COPD, respectively. Women reporting HDPs, either gestational hypertension or pre-eclampsia, were 41% (95% CI 13 to 77%) and 22% (95% CI 9 to 36%), respectively, more likely to develop COPD and asthma during follow-up than women without any HDPs. These associations persisted, regardless of the subsequent development of chronic hypertension. The HRs for COPD and asthma were 1.42 (1.04 to 1.94) and 1.22 (1.07 to 1.40) for women reporting HDPs only, 1.24 (1.00 to 1.55) and 1.31 (1.15 to 1.48) for chronic hypertension only, and 1.63 (1.19 to 2.23) and 1.44 (1.20 to 1.72) for both HDPs and chronic hypertension, respectively, relative to none.

**CONCLUSIONS:** HDPs were associated with a greater risk of COPD and asthma, even in the absence of subsequent development of chronic hypertension.

**Key Words:** Hypertensive disorders; pregnancy; chronic obstructive pulmonary disease; women; asthma.

### **3-13 Breastfeeding duration and subsequent risk of mortality among US women: results from two prospective cohort studies**

Yi-Xin Wang, MD, PhD;<sup>a</sup> Mariel Arvizu,<sup>a</sup> MD, ScD;<sup>a</sup> Janet W. Rich-Edwards, ScD;<sup>b,c</sup> JoAnn E. Manson, MD, DrPH;<sup>b,d,e</sup> Liang Wang, PhD;<sup>a</sup> Stacey A. Missmer, Sc.D;<sup>b,f</sup> and Jorge E. Chavarro, MD, ScD<sup>a,b,d</sup>

<sup>a</sup>Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA.

E-mail: yixinwang@hsph.harvard.edu.

**Objective:** To prospectively assess the associations between breastfeeding duration and subsequent risk of total and cause-specific mortality.

**Participants:** We included 166,708 parous women from the Nurses' Health Study (1986-2016) and the Nurses' Health Study II (1989-2019) who experienced at least one pregnancy lasting at least six months across their reproductive lifespan. Hazard ratios (HRs) and 95% confidential intervals (CI) for total and cause-specific mortality according to lifetime breastfeeding duration, estimated with time-dependent Cox proportional hazards regression models.

**Results:** During 4.7 million person-years of follow-up, 36,634 deaths were documented in both cohorts, including 9880 from cancer and 7709 from cardiovascular disease (CVD). After controlling for potential confounders and pre-pregnancy lifestyle factors, lifetime total breastfeeding duration was associated with a lower risk of all-cause mortality during follow-up in a non-linear manner ( $p$  for non-linearity < 0.001). The pooled HRs of all-cause mortality were 0.95 (95% CI: 0.92, 0.98), 0.94 (0.91, 0.98), 0.93 (0.90, 0.97), and 0.93 (0.89, 0.97), respectively, for women reporting lifetime total breastfeeding duration of 4 to 6, 7 to 11, 12 to 23, and 24 or more months, compared to women who breastfed for less than 4 months over their reproductive lifespan. Cause-specific analysis showed a similar pattern of inverse associations between lifetime total breastfeeding duration and CVD and cancer mortality. These associations persisted when we used the average duration of total breastfeeding per child.

**Conclusions:** Parous women with longer lifetime breastfeeding duration had modestly lower risks of mortality.

**Key words:** women; breastfeeding; mortality; public health.

### 3-14 A study of $\beta$ -hydroxy- $\beta$ -methylbutyric acid (HMB) combined with exercise to intervene in a sedentary population

Wanghaoyu<sup>1</sup>, Feixueyin<sup>2</sup>

<sup>1</sup>School of Physical Education and Health Care, Chengdu College of Arts and Sciences;

<sup>2</sup>Graduate School of Beijing Sport University;

1955724228@qq.com<sup>1</sup>; motouryin@sina.com<sup>2</sup>

**Purpose:** COVID-19 is infectious worldwide. The sedentary lifestyle and muscle loss caused by home isolation have led to a huge health crisis worldwide, and health has become a common goal for all human beings. The promotion of physical fitness, prevention of muscle loss, and reduction of chronic disease risk have become important research topics in the academic field. This study summarizes previous studies on  $\beta$ -hydroxy- $\beta$ -methylbutyric acid (HMB) for muscle growth, and provides a theoretical basis for the application of HMB in people with muscle loss due to sedentary lifestyle.

**Methods:** In this study, a systematic review of the sources of HMB, mechanisms of muscle growth promotion, timing and dosage of supplementation, and safety as a supplement was conducted mainly through literature review, logical analysis, and comparative analysis.

**Results:** The literature review revealed that HMB, a metabolite of the essential amino acid leucine, is a legal and effective supplement recognized by the International Olympic Committee and the International Society of Sports Nutrition, and induces protein synthesis mainly through upregulation of the mTOR pathway, reduces protein degradation through attenuation of the ubiquitin-proteasome pathway and cysteine aspartase activity, and may have the ability to stimulate skeletal muscle satellite cell activation and increase HMB is used as a metabolic supplement for people with sarcopenia, usually in combination with exercise training, to increase their muscle mass and strength.

**Conclusion:** HMB can promote protein synthesis as well as inhibit protein catabolism, and has an important role in the regulation of protein metabolism. It can effectively treat muscle atrophy, promote skeletal muscle production and reduce catabolism, and have a positive effect on muscle protein turnover; at a time when sedentary lifestyle has become the norm, intake of HMB after resistance exercise in sedentary people can effectively enhance skeletal muscle content.

**Keywords:** Prevention and control of chronic diseases;  $\beta$ -hydroxy- $\beta$ -methylbutyric acid; Sarcopenia; Exercise intervention

**Conflict of interest statement:** Authors have no conflict of interest to declare.

### 3-15 The Relationship between Unmet Needs of Chinese Family Caregivers and the Quality of Life of Childhood Cancer Patients undergoing inpatient treatment: A Mediation Model through Caregiver Depression

Jiamin Wang<sup>1,2,3</sup>, Peter C. Coyte<sup>3</sup>, Di Shao<sup>1,2</sup>, Xuemei Zhen<sup>1,2</sup>, Ni Zhao<sup>1,2</sup>, Xiaojie Sun<sup>1,2</sup>

<sup>1</sup>School of Health Care Management, Cheeloo College of Medicine, Shandong University, Jinan, China.

<sup>3</sup>Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, University of Toronto, Toronto, Canada.

Jiamin Wang: jiaminw@mail.sdu.edu.cn; Xiaojie Sun: xiaojiesun@sdu.edu.cn

**Background:** A large proportion of the global burden of childhood cancer is borne by China. These patients have a poor quality of life (QoL) and the unmet needs of their family caregivers are high. However, the association between the unmet needs of family caregivers and a care-recipient's QoL are poorly understood.

**Objectives:** First, to measure the QoL of children with cancer and the unmet needs of their family caregivers; second, to assess the relationship between the unmet needs of family caregivers and the QoL of care-recipients; and third, to explore potential mediating role played by depression among caregivers on the relationship between the unmet needs of caregivers and the QoL of care-recipients.

**Methods:** A total of 286 childhood cancer caregivers were included in the study. The caregiver's unmet needs were assessed using the Comprehensive Needs Assessment Tool for Cancer Caregivers (CNAT-C) and the caregiver's depression was assessed through the Patient Health Questionnaire (PHQ-9). The patient's QoL was proxy-reported by the Pediatric Quality of Life Inventory Measurement Models (PedsQL 3.0 scale Cancer Module). Descriptive analyses, Independent Student's t-tests, one-way ANOVA, and mediation analyses were performed.

**Results:** The mean scores (and associated standard deviation, SD) for unmet needs, depression, and QoL were 65.47((26.24)), 9.87(7.26), and 60.13(22.12) respectively. A caregiver's unmet needs ( $r = -0.272$ ,  $P < 0.001$ ) and depression ( $r = -0.279$ ,  $P < 0.001$ ) were negatively related to a care recipient's QoL. Depression played a partial mediator role in the relationship between unmet needs and QoL, and the mediation effect ratio was 38.15%.

**Conclusion:** This study demonstrated the mediating role played by a caregiver's depression in the relationship between a caregiver's unmet needs and a care-recipient's QoL. Given the important role played by nursing interventions in addressing depression, it is important to standardize the programs that focus on psychological well-being of childhood cancer caregivers.

**Key words:** Childhood Cancer; Family Caregiver; Unmet Needs; Quality of Life; Depression.

### 3-16 Correlation Analysis of BMI, Waist-to-hip Ratio and Triglyceride Glucose Index and Fatty Liver in Patients with Carotid Atherosclerosis

WANG Yi-wen<sup>1</sup>, LIU Xu-na<sup>2</sup>, WANG li-xia<sup>1</sup>, HAN Tuo<sup>1</sup>, LI Ying<sup>1</sup>, ZHANG Ting<sup>1</sup>, FAN Ya-jie<sup>1</sup>, HU Yan-chao<sup>1</sup>, WANG Cong-xia<sup>1</sup>

<sup>1</sup>Department of Cardiology, the Second Affiliated Hospital of Xi'an Jiaotong University, Xi'an 710004, China

<sup>2</sup>Department of Gastroenterology, the Second Affiliated Hospital of Xi'an Jiaotong University, Xi'an 710004, China

E-mail: 1119450091@qq.com

**Objective:** To investigate the association between BMI, waist-to-hip ratio and triglyceride glucose index and fatty liver in patients with carotid atherosclerosis.

**Methods:** 280 people who underwent physical examination in the second affiliated Hospital of Xi'an Jiaotong University from May 2021 to June 2021 were selected as the research subject. According to the results of carotid duplex ultrasound and Abdominal ultrasonography, 140 patients with simple carotid atherosclerosis and 140 patients with carotid atherosclerosis complicated with fatty liver were divided into two groups. Clinical data and serological data of two groups were collected and analyzed by  $\chi^2$  test and Logistic regression.

**Results:** Compared with the patients with simple carotid atherosclerosis, the patients with carotid atherosclerosis complicated with fatty liver had higher BMI [23.61 (22.04, 25.65) vs 26.49 (24.74, 28.24),  $P<0.001$ ], waist-to-hip ratio [0.88 (0.82, 0.91) vs 0.91 (0.89, 0.95),  $P<0.001$ ] and triglyceride glucose index [3.21 (2.34, 4.81) vs 5.34 (3.83, 7.56),  $P<0.001$ ], and lower levels of high density lipoprotein cholesterol [1.20 (1.07, 1.38) vs 1.00 (0.91, 1.13),  $P<0.001$ ]. And BMI ( $B=1.306$ , 95%CI: 1.149~1.458,  $P<0.001$ ) and waist-to-hip ratio ( $B=1370.060$ , 95%CI: 2.781~674992.671,  $P<0.001$ ) were independent risk factors for fatty liver in patients with carotid atherosclerosis.

**Conclusion:** BMI, waist-to-hip ratio and triglyceride glucose index are associated with fatty liver in patients with carotid atherosclerosis.

**Key words:** Fatty liver; BMI; Triglyceride glucose index; waist-to-hip ratio; Carotid atherosclerosis

**Conflict of interest:** The authors declared that they have no conflicts of interest to this work.

### 3-17 Association between physical activity and Major Adverse Cardiovascular Events in Northwest China: a cross-sectional analysis from the Regional Ethnic Cohort Study

Yutong WANG<sup>a#</sup>, Huimeng LIU<sup>a#</sup>, Binyan ZHANG<sup>a</sup>, Yezhou LIU<sup>a</sup>, Kun XU<sup>a</sup>, Suixia CAO<sup>a</sup>, Yating HUO<sup>a</sup>, Jingchun LIU<sup>a</sup>, Lingxia ZENG<sup>a</sup>, Hong Yan<sup>a</sup>, Shaonong DANG<sup>a</sup>, Baibing MI<sup>a</sup>

<sup>a</sup>Department of Epidemiology and Biostatistics, School of Public Health, Xi'an Jiaotong University Health Science Center, Shaanxi, Xi'an, China.

Yutong WANG: wangyut@stu.xjtu.edu.cn; Baibing MI: xjtu.mi@xjtu.edu.cn

**Background:** To examine the association between daily physical activity (PA) and the risk of major adverse cardiovascular events (MACE) in northwest China.

**Methods:** The data were part of the baseline survey of the Regional Ethnic Cohort Study from June 2018 to May 2019 in Shaanxi province. Self-reported physical activity (in metabolic equivalent of task [MET]-hours per day, MET-h/d) and self-reported outcomes of MACE were used in this study. Penalized maximum likelihood logistic regression model was used to estimate the odds ratio (OR), adjusting for sociodemographic factors and health habits, and grouped by sex and age for subgroup analysis. Different body mass index (BMI) interactions were also explored.

**Results:** The average level of total PA was 17.51 MET-h/d. Every increase of four MET-h/d (approximately one hour of brisk walking per day) of total PA was associated with a lower risk of MACE (adjusted OR=0.95 [95% CI, 0.93~0.98]). Participants who were from 15.2 to 23.0 MET-h/d had a 34% lower risk of MACE (0.66 [0.53~0.81]) compared with those individuals from 8.9 to 15.2 MET-h/d, which had similar results in the males, females, and participants with equal or over 60-year-old. However, there was no statistically dose-response relationship between PA and MACE in total participants. Besides, PA was related to the lower risk of MACE in the obese population (BMI  $\geq 28$  kg/m<sup>2</sup>, 0.97 [0.94~0.99]). Among overweight population ( $24$  kg/m<sup>2</sup>  $\leq$  BMI < 28 kg/m<sup>2</sup>), participants whose METs  $\geq 23.0$  MET-h/d showed a 43% lower risk of MACE compared to those from 8.9 to 15.2 MET-h/d (0.57 [0.42~0.78]).

**Conclusions:** A higher level of PA was associated with a lower MACE risk, whereas there was no dose-response relationship between them. Future research should examine the longitudinal association of PA and the risk of MACE.

**Key words:** Physical activity; Cardiovascular Disease; Obesity

Conflict of Interest: None declared.

### 3-18 Spatiotemporal distribution and influencing factors of thyroid cancer in China from 2010 to 2016

**Objective:** To examine the spatiotemporal distribution and impact factors of thyroid cancer (TC) in China from 2010 to 2016.

**Methods:** The TC data we used were obtained from the China Cancer Registry Annual Report published by the National Cancer Center (NCC) from 2013 to 2019. The incidence and mortality rates were age-standardized to Segi's world population. Moran's I statistics and Spatial scan statistics were adopted to identify spatiotemporal distribution of TC. Univariate correlation analysis、generalized linear Poisson regression analysis、multivariate linear regression analysis were used to determine risk factors for morbidity and mortality of TC from the provincial and municipal levels.

**Results:** High risk region was detected in Zhejiang Province (RR=4.16). From 2010 to 2016, TC incidence displayed remarkable upward trend, the annual percentage change (APC) was 13.86% (95%CI:10.2%-17.7%); while TC mortality showed a relatively steady upward trend (APC=3.16%, 95%CI:0.4%-6.0%). High sex ratio (OR=0.546,95%CI:0.544,0.549), high per capita GDP(OR=1.132,95%CI:1.132,1.132) and aquatic product consumption ( $\beta=0.027$ ,  $p=0.000$ ), high average years of education(OR=1.065,95%CI:1.064,1.065), high obesity rate ( $\beta=0.034$ ,  $p=0.000$ ) can increase TC incidence. High salt iodine ( $\beta=-0.453$ ,  $p=0.001$ ) can decrease TC mortality.

**Conclusion:** We observed a rapid growth in incidence and a stable trend in mortality of TC. Risk areas of TC incidence were mostly located in Zhejiang Province. Women, high per capita GDP and aquatic product consumption, high average years of education and obesity rate are risk factors for TC incidence. High salt iodine is a protective factor for TC mortality. Our results may be helpful for providing analytical ideas and methodological references for the regionalized prevention and control of TC in a targeted manner.

**Key words:** TC; spatiotemporal distribution; influencing factors; China

### 3-19 Detection rate and changing trend of common chronic diseases among primary and secondary school teachers in a district of Chengdu, 2019-2021

XU Juan<sup>1,2</sup>, HE Zhaoxia<sup>2</sup>, NING Jiaqiong<sup>2</sup>, ZHANG Wenlong<sup>2</sup>, LIN Yao<sup>2\*</sup>

<sup>1</sup>Health Management Center, The People's Hospital of Wenjiang District, Chengdu 611130, Sichuan, China

<sup>2</sup>Department of Public health, College of Public Health, Zhengzhou University, Zhengzhou 450001, Zhengzhou, China

E-mail: 417685313@qq.com

**Objective:** to understand the detection rate and changing trend of chronic diseases among Primary and secondary school teachers in a district of Chengdu from 2019 to 2021, so as to provide scientific basis for the health management of the primary and secondary school teachers.

**Methods:** The health examination data of teachers in a district of Chengdu from 2019 to 2021 was analyzed, and the data were statistically analyzed by SPSS 22.0 statistical software. and  $\chi^2$  inspection and trend  $\chi^2$  inspection were used to analyze the differences in the detection rate among gender and age groups; The annual percentage change (APC) was calculated using Joinpoint software.

**Results:** The detection rates of diabetes (APC=13.86%) and fatty liver (APC=27.42%) showed an upward trend from 2019 to 2021, while the detection rate of hyperlipidemia showed a downward trend (APC=-7.65%). The detection rates of hypertension, diabetes, hyperlipidemia, hyperuricemia, overweight/obesity and fatty liver were higher in male than in female, and increased with age ( $P<0.01$ ); The most obvious upward trend was showed in the detection rate of diabetes in the male workers (APC=33.31), and the female workers showed the most obvious downward trend in the detection rate of hyperlipidemia (APC=-25.39%). From 2019 to 2021, the detection rate of hypertension decreased at the age group  $\leq 39$  years old (APC=-29.9%) and diabetes at 40-49 years old (APC=-32.41%). However, the detection rate of diabetes  $\leq 39$  years old (APC=20.72%) and 50-59 years old (APC=40.44%) showed increasing.

**Conclusion:** the detection rate of common chronic diseases shows an upward trend among primary and secondary school staff in this area. There are differences in the detection rate of chronic diseases between different gender and age groups, and the change trend is also different. The improvement of health education methods and health management, especially intervention measures for them, are still the focus of chronic disease management in this district.

**Key words:** Primary and secondary school teachers; Chronic diseases; Tendency; Annual percentage change

Conflicts of Interest: The authors declare no conflict of interest.



### **3-20 Views of cancer survivors and general practitioners on medical services in community health center for cancer survivor**

Xiaojingyuan Xu

School of Social Development and Public Policy, Beijing Normal University, 19 Xijiekouwai Street, Beijing 100875, China

E-mail: xxjingyuan@qq.com

**Objective:** Number of cancer survivors increasing rapidly because of advanced cancer screening and treatment, early diagnosis and an aging population. However, it is difficult for specialists to provide comprehensive and continuous care for cancer survivors completed conventional treatment, while of community health centers can provide continuous medical services and can make up for the shortage of specialist care. Through in-depth personal interviews with cancer survivors and general practitioners (GPs), this study explored their perceptions on providing cancer-related in community health centers.

**Methods:** We recruited 10 cancer survivors who had been diagnosed with cancer for more than one year and had completed initial treatment and 10 GPs for in-depth personal interviews. Cancer survivors were interviewed about their difficulties during diagnosis, treatment and their current review, as well as their usage and views of community health services. GPs talked about current cancer-related health services they can provide, as well as what they saw as barriers to providing care to cancer survivors and what might be available in the future.

**Results:** Cancer survivors reported difficulties in sequelae management, psychological pressure, economic pressure, traveling, and obtaining reliable and accessible medical care resources. They generally showed mistrust of medical staffs' ability in community, but they thought that the community medical services were convenient and willing to accept simple treatments like injections, blood test and X-ray. They want to develop good relationships with trusted GPs, and they want GPs to be able to contact with specialists, but they still prefer specialists' follow-up. GPs reported that they routinely provided cancer survivors with oral or injectable drugs for simple side effects management, cancer-related blood, ultrasound and X-ray examinations, postoperative wound or stoma care, simple follow-up and family education, etc. Some institutions could also provide pain relief or even palliative care for survivors of advanced cancer. GPs generally believed that cancer survivors were not their key service target, they had already provided enough treatments for cancer survivors, and specialists were more important in cancer treatments. They also reported a lack of systematic training, no related policies, cancer related knowledge was too complicated to grasp. They preferred to accept training on cancer screening and diagnosis rather than cancer survivorship care. Close contact with a specialist was required.

**Conclusions:** GPs can provide more convenient and accessible medical services for

cancer survivors, but only simple services. Policies on cancer management in community, cancer training, and close links with specialists and hospitals are needed to provide better medical care for cancer survivors.

**Key words:** cancer survivor; general practitioner; medical service

### **3-21 Associations between mental health problems and elevated blood pressure: findings from the CHCN-BTH cohort study and two-sample Mendelian randomization analysis**

Ling Zhang\*, Han Qi

Department of Epidemiology and Health Statistics, School of Public Health, Capital Medical University, and Beijing Municipal Key Laboratory of Clinical Epidemiology, Beijing 100069, China

E-mail: zlllyepi@ccmu.edu.cn\*

**Objective:** The associations of mental health problem and blood pressure (BP) are controversial, and the causality remain unclear. We aimed to explore whether mental health problem is associated with risk of elevated blood pressure by longitudinal and Mendelian randomization (MR) analyses.

**Methods:** Participants who completed the baseline 21 items Depression-Anxiety-Stress Scale (DASS-21) and blood pressure measurements were selected from the Beijing region of the Cohort Study on Chronic Disease of Community Natural Population in the Beijing-Tianjin-Hebei region (CHGN-BTH). Cox proportional regressions were used to estimate longitudinal associations between mental health problems and BPs. For two-sample MR analysis, single-nucleotide polymorphisms (SNPs) associated with mental health problems at the genome-wide significance level were regarded as instrumental variables (IVs). The summary data of the SNPs with mental health problems and elevated blood pressure were obtained from publicly available dataset of MRC-IEU Consortium and Neale lab.

**Results:** Totally, 5,624 participants were included. The incidence of SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg was significantly higher in participants with baseline anxiety symptoms (HR=1.48, 95% CI: 1.03 to 2.12,  $P=0.033$ ; HR=1.56, 95% CI: 1.05 to 2.32,  $P=0.028$ ), especially in men and higher educational level population, independent of baseline depression and anxiety in two years' follow-up. The two-sample MR analysis also showed the positive associations between mental health problems and elevated blood pressure (OR=1.17, 95% CI: 1.06 to 1.28,  $P<0.001$ ).

**Conclusion:** Anxiety was positively associated with higher BPs in longitudinal designs independent of the depression, stress, and other confounders. The results were verified in MR analysis with the evidence for a causal risk effects of mental health problem on elevated blood pressure.

**Key words:** Mental health; blood pressure; cohort; mendelian randomization; associations.

## 3-22 Qualitative research of rural hypertension health management model based on ICCC in Shandong Province

ZHANG Shuo<sup>1</sup>, SUN Xiaojie<sup>2</sup>, CHANG Lele<sup>1,2</sup>, SUN Xiaojie<sup>1,2</sup>

<sup>1</sup>Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University, No.44 Wenhuxi Road, Jinan 250012, Shandong, China.

<sup>2</sup>NHC Key Lab of Health Economics and Policy Research (Shandong University), No.44 Wenhuxi Road, Jinan 250012, Shandong, China

E-mail: shuozhang1997@mail.sdu.edu.cn<sup>1</sup>; xiaojiesun@sdu.edu.cn<sup>2</sup>

**Objective:** Based on Innovative Care for Chronic Conditions Framework (ICCC) proposed by WHO, we summarized the characteristics and shortcomings of the rural hypertension health management model in Shandong Province and put forward targeted recommendations.

**Methods:** Using the multistage stratified cluster sampling method to select 3 cities and its 36 villages in Shandong Province. Semi-structured interview method was used to conduct face-to-face interviews with 84 respondents, including hypertension managers, medical staff and hypertension patients. NVivo 12 software was used to encode and analyse the interview texts around the macro, meso and micro elements of the ICCC.

**Results:** At the macro level, the management of rural hypertension in Shandong Province was generally in a positive environment, but the policy system framework was not complete, the integration within the health system was poor, the shortage of hypertension management professionals and the lack of financial support were prominent; At the meso level, medical institutions at all levels strived to promote the continuity of medical services, but the organization and deployment of family doctor team and the use of information systems still needed to be further strengthened; At the micro level, the cooperation and enthusiasm of patients, families and family doctor team needed to be improved.

**Conclusion:** Give full play to the leadership and supervision role of the government, formulate and integrate relevant policies, promote the integration of various departments; increase financial support, and make up for the relatively lack of health human resources and weak information construction in rural areas to promote high-quality medical services; attach importance to the tripartite interaction between patients and families, health service team and community partners to promote patients' self-management.

**Key words:** Innovative Care for Chronic Conditions Framework; Rural; Hypertension health management; Qualitative research

### 3-23 Targeted EApt-engineered biomimetic nanovehicles enable regulation of the functional effects of a biointerface for synergistic chemotherapy

Xueyan Zhen<sup>a,b</sup>, Xiaoyu Xie<sup>a,b</sup>, Linhao Li<sup>a,b</sup>, Lanlan Jia<sup>a,b</sup>, Wanqing Yuan<sup>a,b</sup>, Sicen Wang<sup>a,b\*</sup>

<sup>a</sup>School of Pharmacy, Health Science Center, Xi'an Jiaotong University, Xi'an 710061, China;

<sup>b</sup>Shaanxi Engineering Research Center of Cardiovascular Drugs Screening & Analysis, Xi'an 710061, China

E-mail: zhenxueyan@stu.xjtu.edu.cn<sup>1</sup>; wangsc@mail.xjtu.edu.cn<sup>2</sup>

**Objective:** Erythrocyte membrane (EM)-camouflaged chemotherapeutic delivery nanovehicles hold promise for solid tumor therapy because of their excellent biostability and biocompatibility. However, it is accompanied with insufficient targeting effect and deficient pharmacokinetic behavior due to the lack of a regulated biointerface to navigate and overcome biological transportation obstacles in solid tumor therapy. Therefore, a biomimetic nano-drug delivery system was prepared via the functionalized regulation of EM biointerface technique. **Methods:** Firstly, Doxorubicin (DOX) loaded polymer core (PLGA-DOX) and EM was prepared. Then EM was coated on the surface of PLGA-DOX by mechanical extrusion to obtain biomimetic nano-carrier (PLGA-DOX@EM), along with whose biocompatibility and immune escape function were studied. Finally, EDC/NHS technique was employed to conjugate anti-EGFR aptamers (EApt) on EM, subsequently the biological interface targeted nanocapsules (PLGA-DOX@EM-EApt) were obtained. The efficacy of enhancing targeted delivery of chemotherapeutics and promoting apoptosis to tumor cells in synergistic antitumor applications were then investigated. **Results:** PLGA-DOX@EM-EApt nanomaterial exhibits an obvious core-shell structure with particle size of 151.8 nm and zeta potential of -21.9 mV, which displayed the efficacy that provided synergistic anti-tumor effect by precisely inhibiting EGFR expression level and delivering chemotherapy drugs (cell apoptosis rate: 79.89%). The results demonstrated that the immune escape and active targeting behaviors of PLGA-DOX@EM-EApt could significantly promote its drug retention and tumor inhibition abilities. **Conclusions:** The designed self-protective nanomissiles execute a two-edged sword function of inducing targeted drug delivery and cell apoptosis mediated by EApt, followed by a specific chemotherapy to promote triple negative breast cancer death simultaneously. Our findings propose a novel strategy using the biointerface functionalization technique, demonstrating a promising therapeutic platform *via* a biomimetic drug delivery system for precise solid tumor recognition and synergistic therapy.

**Keywords:** biomimetic nanovehicles; biointerface; aptamer; drug delivery; synergistic chemotherapy

### 3-24 Adverse childhood experiences and risk of diabetes: a systematic review and meta-analysis

Siyu Zhu<sup>1</sup>, Wen Liu<sup>1</sup>, Shuting Li<sup>1</sup>, Leying Hou<sup>1</sup>, Xuanyin Huang<sup>1</sup>, Yi Liu<sup>1</sup>, Qian Yi<sup>1</sup>, Weidi Sun<sup>1,2</sup>, Peige Song<sup>1\*</sup>

<sup>1</sup>School of Public Health and Women's Hospital, Zhejiang University School of Medicine, Zhejiang University, Hangzhou, Zhejiang, China;

<sup>2</sup>School of Public Health, Sun Yat-sen University, Guangzhou, China

Siyu Zhu: siyuzhu@zju.edu.cn; Peige Song: peigesong@zju.edu.cn

**Aims:** Findings on the association between the number of adverse childhood experiences (ACEs) and diabetes are inconsistent and the impact of specific types of ACEs on diabetes remains unclear. We aimed to quantify the association between the number and types of ACEs and diabetes.

**Methods:** Medline, PubMed, and Embase databases were searched for eligible studies published until 1 October 2021. We selected observational studies that presented the association between the number or types of ACEs and diabetes with sufficient data reporting ACE-related diabetes risk estimates. The random-effects model was used to pool odds ratios (ORs) and 95% confidence intervals (CIs).

**Results:** A total of 43 studies were included. Individuals who experienced any ACE (continuous OR = 1.06, 95% CI: 1.02, 1.10; binary OR=1.25, 95% CI: 1.18, 1.33) had a higher risk of diabetes compared with those who didn't. Individuals with 1 ACE (OR=1.08, 95% CI: 1.04, 1.12), 2 ACEs (OR=1.24, 95% CI: 1.13, 1.37), 3 ACEs (OR=1.38, 95% CI: 1.26, 1.51) or 4+ ACEs (OR=1.54, 95% CI: 1.33, 1.77) were at an increased risk of diabetes when compared with individuals without ACEs. Across specific ACE types, physical abuse (OR = 1.17, 95% CI: 1.08, 1.27), sexual abuse (OR =1.25, 95% CI: 1.08, 1.43), verbal abuse (OR=1.13, 95% CI: 1.03, 1.25), neglect (OR=1.41, 95% CI: 1.01, 1.96), living with divorced or separated parents (OR=1.18, 95% CI: 1.01, 1.37) and childhood economic adversity (OR=1.12, 95% CI: 1.04, 1.21) were associated with diabetes. However, incarcerated relatives, domestic violence, parental death, and having a family member with substance abuse or mental disorder were not significantly associated with diabetes.

**Conclusions:** ACEs may be a risk factor for diabetes. It is critical to prevent ACEs and build resilience in the individuals affected by ACEs.

**Keywords:** Adverse childhood experiences; diabetes; meta-analysis

### **3-25 Effects of antenatal micronutrient supplementation regimens on adolescent emotional and behavioral problems: A 14-year follow-up of a double-blind, cluster-randomized controlled trial**

Zhonghai Zhu<sup>a\*</sup>; Yingze Zhu<sup>a\*</sup>; Liang Wang<sup>a</sup>; Qi Qi<sup>a</sup>; Lin Huang<sup>a</sup>; Amanuel Kidane Andegiorgish<sup>a</sup>; Mohamed Elhoumed<sup>a,b</sup>; Yue Cheng<sup>d</sup>; Michael J Dibley<sup>e</sup>; Christopher R. Sudfeld<sup>f</sup>; Lingxia Zeng<sup>a,g</sup>

<sup>a</sup>Department of Epidemiology and Biostatistics, School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi 710061, P.R. China; E-mail: tjzlx@mail.xjtu.edu.cn

**Objective:** To examine the effect of antenatal folic acid (FA), iron-folic acid (IFA), and multiple micronutrient (MMN) supplementation on adolescent emotional and behavioral outcomes.

**Methods:** We conducted a double-blind, cluster-randomized trial of antenatal micronutrient supplementation in rural western China between 2002 and 2008. Pregnant women were randomized by village clusters to receive either daily (i) 400 µg FA, (ii) IFA containing 60 mg iron and 400 µg FA or (iii) MMN supplementation containing 30 mg iron, 400 µg FA plus 13 additional vitamins and minerals. All singleton births were eligible for enrollment in the adolescent follow-up conducted in 2016. Adolescents were administered the locally adapted Youth Self-Report-2001 which produced internalizing, externalizing, and total behavior problem scores. We used intention-to-treat analyses to assess the effect of the randomized regimens on YSR-2001 scores and explored the potential effect modification by household wealth and initial timing and duration of supplementation.

**Results:** A total of 1920 adolescents were included in the analysis, 1130 (58.9%) were male, and the mean (SD) age was 11.8 (0.78) years. Adolescents in IFA group had lower total (mean difference (MD): -2.89; 95% CI -5.75, -0.03) and externalizing (MD: -1.04; 95% CI -1.88, -0.20) problem scores as compared to those in FA group. There was no effect of MMN on behavior problem scores as compared to IFA and FA alone. Although, in effect modification analyses, MMN appeared to have greater beneficial effects in wealthier households as compared to IFA and FA alone.

**Conclusions:** Iron supplementation during pregnancy reduced adolescent emotional and behavioral problem scores which provides additional support for expanding coverage of iron-containing prenatal supplements in resource-limited settings.

**Key words:** Antenatal micronutrient supplementation, adolescent, socioemotional development, emotional and behavioral problems, randomized controlled trial.

### **3-26 Associations of head circumference trajectories during the first two years of life with adolescent cognition and emotional and behavioral problems: A birth cohort in rural western China**

Zhonghai Zhu<sup>a</sup>, Jiali Shen<sup>a</sup>, Yingze Zhu<sup>a</sup>, Liang Wang<sup>a</sup>, Qi Qi<sup>a</sup>, Xueyao Wang<sup>a</sup>, Chao Li<sup>a</sup>, Amanuel Kidane Andegiorgish<sup>a</sup>, Mohamed Elhoumed<sup>a,b</sup>, Yue Cheng<sup>c</sup>, Michael J Dibley<sup>d</sup>, Lingxia Zeng<sup>a,e</sup>

<sup>a</sup>Department of Epidemiology and Biostatistics, School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi 710061, P.R. China;  
E-mail: tjzlx@mail.xjtu.edu.cn

**Purpose:** The associations of early-life head circumference (HC) with child neurodevelopmental and mental health among generally healthy population remain unclear. We aimed to examine the associations of early-life HC trajectories with adolescent cognition and emotional and behavioral problems and to identify HC growth-sensitive period.

**Methods:** We conducted a prospective, community-based birth cohort in rural western China, and 745 adolescents aged 10-14 years were followed between June to December 2016. We repeatedly assessed child HC for eight times during the first two years of life, and adolescent cognitive and emotional and behavioral outcomes using Wechsler Intelligence Scale for Children-IV and Youth Self-Report-2001, respectively. We applied group-based trajectory modeling to identify HC trajectories and used conditional growth to derive HC-growth sensitive periods.

**Results:** We identified five distinct HC trajectories characterized as Start below average-then decrease (7.8% of the sample), Start below average-then increase (6.8%), Start average-then decrease (33.4%), Consistently average (37.9%), and Consistently above average (14.1%). Infants in the trajectory of consistently above average had higher cognitive scores at early adolescence as compared to those from suboptimal trajectories, with adjusted mean differences ranging from 2.84 to 8.99 points. The conditional gains show that the sensitive HC growth period appeared to be between 3-6 and 12-18 months for child cognition. While we found null associations between HC measures and adolescent emotional and behavioral problem scores.

**Conclusions:** Early-life HC trajectories were associated with adolescent cognitive development. HC may serve as a cheaper screening tool to monitor child development at risk particularly in resource-limited settings.

**Key words:** Anthropometric indicator, head circumference, child development, life-course epidemiology.

### 3-27 Ethnic differences in eating patterns and their associations with obesity among adults in West China

Wen Peng<sup>1,2\*</sup>, Yang Wu<sup>3\*</sup>, Yanxiang Wang<sup>1\*</sup>, Zhancui Dang<sup>1</sup>, Li Tong<sup>2,4</sup>, Yangrui Zhang<sup>1</sup>, Youfa Wang<sup>5</sup>

<sup>1</sup>Nutrition and Health Promotion Center, Department of Public Health, Medical College, Qinghai University, Qinghai, China

<sup>2</sup>Department of Traditional Chinese Medicine, Medical College, Qinghai University, Qinghai, China

<sup>3</sup>Department of Sociology, Jiangxi University of Finance and Economics, Nanchang, China

<sup>4</sup>Qinghai Provincial Key Laboratory of Traditional Chinese Medicine Research for Glucolipid Metabolic Diseases, Medical College, Qinghai University, Qinghai, China  
E-mail: wen.peng2014@foxmail.com

**Background** No study has investigated eating patterns and their associations with weight outcomes among a multi-ethnic population in China.

**Objectives** Examine ethnic differences in eating patterns, and their associations with obesity among a multi-ethnic adult population in West China.

**Methods** Self-reported data on demographics, eating behaviors, weight and height were collected from 4407 participants across seven provinces in West China. Overweight/obesity was defined using Chinese standards. Principal component analysis was conducted to identify eating patterns. Ethnic differences in eating patterns were compared. Multivariate regression analysis was used to examine their associations with weight outcomes. BMI was log-transformed due to heteroscedasticity and was later exponentiated.

**Results** Four eating patterns were identified: “meat-lover” - characterized by frequent consumption of meat (e.g., lamb, beef) and dairy products, “indulgent” - by frequent intakes of added salt, sugar, alcohol, and pickled food, “diversified-eating” - by frequently consuming food with diversified cooking methods (e.g., steamed) and eating out, and “nutri-concerned” - by good food hygiene behaviors and reading food labels. Ethnic differences in eating patterns were observed. Compared with Han, Hui was less likely to exhibit meat-lover or diversified-eating patterns; Tibetans were less likely to have meat-lover or nutri-concerned patterns; Mongolians were more likely to have indulgent pattern. BMI was positively associated with meat-lover pattern in both genders ( $\exp(\beta)$ : 1.029; 95% CI: 1.001-1.058 for men;  $\exp(\beta)$ : 1.018; 95% CI: 1.000-1.036 for women) and negatively associated with nutri-concerned pattern in women ( $\exp(\beta)$ : 0.983; 95% CI: 0.966-1.000). Mongolians were triple more likely to be overweight or obese (OR: 3.126; 95% CI: 1.688-5.790) than Han.

**Conclusions** Considerable ethnic differences exist in eating patterns in West China. Mongolians were more likely to be overweight or obese, which was associated with their indulgent patterns. Ethnic-specific healthy eating intervention programs are needed.

**Key words:** eating pattern, ethnicity, obesity, West China, adult



## Prevention and Control of Obesity

### 4-1 Impact of the COVID-19 pandemic lockdown on weight status and factors associated with obesity and weight gain in Massachusetts, USA

Wudeneh Mulugeta, MD, MPH, FACP Instructor, Harvard Medical School  
Diplomate, American Board of Obesity Medicine  
Department of Medicine, Cambridge Health Alliance  
E-mail: wudmul@gmail.com

**Study Aims:** The study aims to evaluate the impact of the coronavirus disease-2019 (COVID-19) pandemic lockdown on weight status and obesity and identify associated factors.

**Methods:** At a large safety net health system in Massachusetts, 11,534 adults and 701 children were retrospectively followed within 3 months of the first COVID-19 lockdown. Chi-square and paired *t*-test were computed for categorical and continuous variables, respectively. Multivariate analyses were performed to identify factors associated with obesity and weight gain.

**Results:** Post-lockdown, the overall obesity (23.2%-27.4%,  $p < .001$ ) and overweight (41.1%-44.5%,  $p < .001$ ) burdens increased among children. Obesity (40.5%-46.9%,  $p < .001$ ) was highest among Spanish speakers. The youngest age group (2-5 years) had the greatest obesity rate increase by 26% (19.7%-24.8%,  $p < .001$ ). Obesity was associated with younger age (odds ratio [OR] = 0.95, 95% confidence interval [CI] = 0.91, 1.00), higher baseline BMI (OR = 1.19, 95% CI = 1.15, 1.23) and Spanish speaking children (OR = 2.19, 95% CI = 1.10, 4.33). Among adults, greater proportion of women gained weight compared to men (46.1% vs 40.6%,  $P < .01$ ). More than 5% weight gain was associated with 18 to 39 vs  $\geq 60$  years of age (OR = 1.45, 95% CI = 1.07, 1.97), food and housing insecurity (OR = 1.44, 95% CI = 1.05, 1.97) and tobacco use (OR = 1.38, 95% CI = 1.07, 1.78) among men; and 18 to 39 vs  $\geq 60$  years of age (OR = 1.55, 95% CI = 1.25, 1.91), Hispanics (OR = 1.25, 95% CI = 1.01, 1.54), Brazilians (OR = 1.22, 95% CI = 1.03, 1.45), and tobacco use (OR = 1.36, 95% CI = 1.10, 1.69) among women.

**Conclusions:** During the COVID-19 lockdown, the obesity burden increased among children, and significant proportion of adults gained weight, disproportionately affecting disadvantaged subpopulations. Strategies are needed to counteract the impact of the COVID-19 lockdown on unhealthy weight gain and obesity.

**Key words:** COVID-19 lockdown; obesity; overweight; weight gain; body mass index

## 4-2 Incidence of abdominal obesity among primary and secondary school students and its association with parents' weight-related knowledge, attitude and practice in China—a national longitudinal study

HUANG Shan, GUI Zhaohuan, ZHANG Shuxin, JIANG Nan, HUANG Shaoyi, PU Xueya, CHEN Yajun\*

Department of Maternal and Child Health, School of Public Health, Sun Yat-sen University, Guangzhou (510080), China

E-mail: huangsh59@mail2.sysu.edu.cn

**Objective:** To investigate the association of parents' weight-related knowledge, attitude and practice (KAP) with abdominal obesity among primary and secondary school students, and to provide evidence for abdominal obesity prevention and control.

**Methods:** In September 2013, a national sample was selected from 94 primary and secondary schools in seven provinces/municipalities in China, by using the method of multistage random sampling strategy. A total of 17,307 students aged 6 to 18 years with normal waist circumference were recruited, and 14,118(81.6%) students attended a nine-month follow-up with all the measures. Parents' weight-related KAP were assessed by self-made questionnaires at baseline, and students' waist circumference was measured objectively at baseline and follow-up. Multiple linear regression models and multivariate logistic regression models were conducted to analyze the relationship between parents' KAP with the change in students' waist circumference and abdominal obesity, respectively.

**Results:** The nine-month cumulative incidence of pre-abdominal obesity and abdominal obesity among students was 6.67% and 0.85%, respectively. Meanwhile, the scoring rates of parents' knowledge, attitude and practice were 80.17%, 78.17% and 50.50%, respectively. In addition, the score of parents' weight-related attitude was inversely associated with the change in waist circumference ( $\beta=-0.182$ , 95% confidence interval (CI)=-0.261~-0.102), and the cumulative incidence of pre-abdominal obesity/abdominal obesity ( $OR=0.90$ , 95%CI=0.82~0.98), respectively. There was no relationship between parents' knowledge scores, practice scores and students' abdominal obesity.

**Conclusion:** Parents' positive and correct weight-related attitude was inversely associated with the incidence of abdominal obesity among primary and secondary school students. Interventions targeting establishing parents' correct beliefs may be an effective way to prevent abdominal obesity.

**Key words:** Abdominal obesity; Knowledge, attitude and practice; Waist circumference; Parents; Students

## 4-3 Association between household air pollution and overweight/obesity in Chinese children

Nan Jiang<sup>1</sup>, Zhaohuan Gui<sup>1</sup>, Yican Chen<sup>1</sup>, Shan Huang<sup>1</sup>, Shuxin Zhang<sup>1</sup>, Xueya Pu<sup>1</sup>, Shaoyi Huang<sup>1</sup>, Yajun Chen<sup>1,\*</sup>

School of Public Health, North Campus, Sun Yat-sen University, No. 74 Zhongshan 2nd Road, Guangzhou 712

E-mail: chenyj68@mail.sysu.edu.cn

**Background:** The prevalence of pediatric obesity continues to worsen worldwide. Few studies have investigated the association of exposure to multiple household air pollutants and pediatric obesity.

**Objectives:** We aimed to examine the association between exposure to multiple household air pollutants and obesity in Chinese children.

**Methods:** In 2019, 8,143 children aged 6-12 years were recruited randomly from five elementary schools in Guangzhou, southern China. We collected four different household air pollutants exposures including cooking oil fumes, indoor incense burning, home decoration, and secondhand smoke (SHS) using questionnaires and further converted them into an index with four categories. Weight and height were measured objectively, from which the body mass index (BMI) was calculated. Overweight/obesity was defined using BMI and according to the latest Chinese definition (WS/T 586-2017) which is age- and sex-specific. Logistic and multivariable linear regression models were used to reveal the association.

**Results:** Children who exposed to  $\geq 3$  types of household air pollutants had higher BMI, with the coefficient of 0.503[95% confidence interval (CI):0.056 to 0.950] and higher risk of overweight/obesity, with the odd ratio (OR) of 1.275(95%CI:1.005 to 1.618). And a dose-response relationship was discovered between the household air pollution index and BMI ( $P$  for trend = 0.011). Additionally, exposure to cooking oil fumes and SHS were individually associated with higher BMI. Moreover, there was a significant interactions between SHS exposure and cooking oil fumes, and SHS and incense burning on BMI and the risk of childhood obesity. Furthermore, stronger association for household air pollution index and obesity was observed in boys ( $P_{\text{Interaction}}=0.037$ ).

**Conclusion:** Household air pollution exposures were positively associated with higher BMI and increased odds of obesity in children.

**Keywords:** Household air pollution; obesity; overweight; children

## 4-4 步行和服用维生素 C 对超重学生氧化应激和炎症指标短期缓解作用的定组干预研究

张倩<sup>1,2</sup>, 杨旭<sup>1,3\*</sup>, 李丽娟<sup>1,2\*</sup>

<sup>1</sup> 大理大学天然抗氧化剂与抗氧化炎症研究院

<sup>2</sup> 大理大学公共卫生学院

<sup>3</sup> 华中师范大学环境生物医学实验室

**背景:** 超重/糖尿病是主要慢性病的危险因素, 氧化应激和炎症可能是导致这些慢性病持续存在的分子机制之一。探索减轻超重/糖尿病患者氧化应激和炎症的干预措施对公共卫生具有重要意义。

**方法:** 进行为期两周的小组干预研究 (Run0-Run1-Run2)。研究对象为 77 名体重指数  $>24\text{kg/m}^2$  的大理大学超重及肥胖本科生。重复体检指标包括 BMI、腰围、血清 ROS、TNF- $\alpha$ 、IL-1 $\beta$  和尿 8-OHdG。干预措施包括: 0 干预、步行、服用维生素 C 和步行+服用维生素 C。

**结果:** (a)步行对缓解 ROS 水平有显著作用, 这在 Run1 和 Run2 中是一致的; (b) 在 Run1 期间, 所有三种干预方法都减轻了 8-OHdG 的水平, 但在 Run2 期间出现了低水平的“反弹”; (c)在 Run1 和 Run2 期间, 未观察到三种干预模式对 TNF- $\alpha$  的缓解作用; (d)在 Run1 和 Run2 期间, 三种干预模式对 IL-1 $\beta$  的缓解作用是明显的。

**结论:** 超重者步行和服用维生素 C 可降低 ROS、8-OHdG 和 IL-1 $\beta$  水平, 但对 TNF- $\alpha$  没有影响。

**关键词:** 肥胖; 氧化应激; 氧化炎症; 定组干预研究

## 4-5 Influencing factors and intervention strategies of childhood obesity in early life

Luo Yue, Xu Ke, Wang Susu, Zhang Yimin  
Beijing Sports University  
E-mail: luoyue980803@163.com

**Objective:** In recent years, the problem of childhood obesity in my country has become increasingly prominent. Obesity not only affects the growth and development of children and is closely related to various diseases, but also affects the health status of the whole life cycle. Early life refers to the period from pregnancy to 1000 days after birth. The timing of childhood obesity is a key factor affecting childhood obesity, and it is also a window of opportunity to prevent childhood obesity. Nutritional attention and intervention can achieve the highest benefits. Therefore, this paper aims to explore the influencing factors of childhood obesity in early life, and to intervene on the influencing factors to formulate strategies to prevent the occurrence of childhood obesity.

**Methods:** For CNKI, "Children", "Obesity" and "Early-life nutrition" were used as keywords, and Web of Science, EBSCO, PubMed and other databases were used as "Children", "Obesity" and "Early-life nutrition". Key words were searched, and relevant literature was carefully studied and analyzed.

**Results:** 1. Parents' dietary behavior and nutrition, maternal obesity, excessive gestational weight gain and mode of delivery, body composition in infancy, feeding pattern and timing, complementary feeding intervention, children's dietary behavior, intestinal flora, etc. obesity-related factors. 2. The following strategies can be employed to maximize the prevention of childhood obesity in early life: (1) Improve nutritional behavior and body weight. During pregnancy and pregnancy, both parents should have a balanced diet, supplemented with appropriate micronutrients, and adequate intake of fat and protein; overweight/obese women who are trying to conceive should lose weight before pregnancy; weight gain should be controlled during pregnancy. (2) Systematic measurement, assessment and monitoring of body composition in early life children. (3) Exclusive breastfeeding is recommended in the first six months of life, and appropriate complementary foods should be introduced in time after breastfeeding for six months. (4) Carry out scientific dietary nutrition guidance and adjust children's eating behaviors to avoid nutritional imbalances. To ensure the intake of micronutrients, introduce vegetables and fruits when infants and young children learn to eat, these foods can reduce the risk of some chronic diseases; to limit animal protein intake, promote qualitative and adequate fat intake. (5) Implement preventive interventions such as promoting physical activity and maintaining adequate sleep time, especially the promotion of physical activity is a key component in the prevention and control of childhood obesity.

**Conclusion:** In recent years, early life factors have become an important influencing factor of childhood obesity. Understanding the influencing factors and their interactions

in childhood obesity is very important to guide intervention strategies to prevent childhood obesity. The prevention and control intervention strategy should focus on the zero-level prevention of childhood obesity, emphasize the growth and development patterns of pregnant women and infants in the early life, and explore the multi-dimensional early life comprehensive intervention work model.

**Keywords:** children; obesity; early life; intervention

## **4-6 Analysis of the incidence trend of obesity in China from 1980 to 2019 based on Joinpoint regression analysis**

Xiong Huan

Kunming Medical University

Email: 931768739@qq.com

**Objective:** To analyze the trends of obesity prevalence in China in the Global Burden of Disease study (GBD) database, and to provide a reference for executing the plan for a Healthy China 2030.

**Methods:** Data on the incidence of obesity in China from 1980 to 2019 and the population data in China Statistical Yearbook 2020 were extracted, and the age-scale incidence rate, annual change percentage (APC) and average annual change percentage (AAPC) of different genders in China were analyzed by using the Joinpoint regression model, and the trend of obesity incidence in China was estimated.

**Outcome:** From 1980 to 2019, the standardized incidence rate of obesity in China showed an overall increasing trend, and the increase rate was relatively large (AAPC=7.30%,  $P<0.05$ ). The growth rate was the largest from 2006 to 2010 (APC=14.46%,  $P<0.001$ ). The incidence of obesity in male was lower than in female before 2011, after the year, it increased year by year, except from 2013 to 2016 (APC=3.2%,  $P<0.05$ ), and was higher than female in other time periods. The AAPC of men and women was 8.5% and 6.6% respectively (both  $P<0.05$ ), with female growth is closer to general trend. The model selected 5 joinpoints, the first two joinpoints were different, which were male (2004, 2007), female (1983, 2007), and both (1983, 2006), the second three joinpoints were the same as (2010, 2013, 2016).

**Conclusion:** In the past 40 years, the incidence of obesity in China has been increasing, especially in the male group, the health problems brought about by obesity are becoming more and more serious, and more attention should be paid to the obesity problem.

**Key words:** Obesity; Incidence rate; Joinpoint regression analysis; GBD;

Conflict of interest: All authors declare no conflict of interest

## 4-7 Effect of high intensity interval training on cardiorespiratory fitness of obese adolescents aged 12-17: A systematic review and meta analysis

Liya Xu, Hongyi Gu, Yimin Zhang

Faculty of Sports and Human Sciences, Beijing Sports University, Beijing, 100084, China

E-mail: 15207149098@163.com

**Objective:** Meta analysis was used to quantitatively evaluate the effects of high intensity interval training (HIIT) on the maximum oxygen uptake, maximum aerobic speed and quiet heart rate of obese adolescents, so as to obtain the optimal HIIT exercise plan to improve the cardiorespiratory fitness of obese adolescents.

**Methods:** The randomized controlled research literature on the effect of HIIT on cardiorespiratory fitness of obese adolescents published at home and abroad from January 1, 2000 to April 1, 2022 in PubMed, web of science database, EBSCO sportsfocus and the Cochrane Library English database were searched. Two researchers independently searched the literature according to the inclusion and exclusion criteria, using Review Manager 5.4.1 evaluate the quality, overall effect, heterogeneity and bias risk of the selected research literature.

**Results:** A total of 256 obese adolescents were included in 13 RCT literatures. The results of meta-analysis showed that: (1) HIIT could significantly increase the maximum oxygen uptake [SMD = 0.89, 95% CI: 0.36-1.27, P = 0.0001] and the maximum aerobic speed [MD = 0.8, 95% CI: 0.57-1.23, P < 0.0001], and significantly reduce the quiet heart rate [MD = -8.91, 95% CI: 10.57--3.88, P < 0.0002]. (2) The results showed that the intervention plan and intervention time may be the reasons for the heterogeneity. Exercise intervention for 2-4 min, rest for 1-3 min and HIIT with intervention time  $\geq 28$  min can significantly improve the maximum oxygen uptake of obese adolescents.

**Conclusions:** HIIT has a positive health effect on improving the cardiorespiratory fitness of obese adolescents. Obese adolescents should adopt the intervention scheme of exercise intervention for 2-4min, rest for 1-3min and HIIT exercise scheme with intervention time  $\geq 28$ min.

**Key words:** high intensity interval training; cardiorespiratory fitness; obese; adolescent; meta analysis

## 4-8 Study on the Anti-obesity Effect of Probiotic Fermentation on Medicine and Food Homologous Compound (SHL)

Xian-Tao Yan, Ruixia Gu

School of Food Science and Engineering, Yangzhou University

Email: yanyang214@126.com; guruixia1963@163.com

**Objective:** SHL was fermented by *Lactobacillus fermentum* grx08 to remove the original bad flavors, such as bitterness and grass flavor, and improve acceptance. The purpose of this paper is to understand the effect of fermentation on the anti-obesity effect of SHL.

**Methods:** Six-week-old Wistar rats were randomly divided into 5 groups. The blank group (Con) was fed a normal diet, and the other groups were fed a high-fat diet. After the establishment of the obesity model, the positive control group (PC), grx08-fermented SHL group (SHLF) and grx08 live bacteria + SHL group (grx08+SHL) were treated with Shen-Ling-Bai-Zhu powder, grx08-fermented SHL and grx08+SHL for 4 weeks. The corresponding Con and M groups were treated with saline. After the intervention, the indexes related to safety and obesity were tested.

**Results:** (1) Safety index: The blood indexes of ALT, AST, CREA and BUN and the pathological sections of liver and kidney in the intervention group were not significantly different from those in the blank group ( $P > 0.05$ ). (2) Efficacy index: the diet and body weight in the intervention group were significantly lower than those in the model group ( $P < 0.05$ ), and the levels of body fat, blood glucose and uric acid in the intervention group were significantly lower than those in the model group ( $P < 0.05$ ). (3) Indexes related to mechanism: the levels of serum inflammatory factors, leptin, insulin and neuropeptide Y in the intervention group were significantly lower than those in the model group ( $P < 0.05$ ), while the content of serum glucagon-like peptide-1 (GLP-1), the weight of brown fat and the expression of uncoupling protein-1 (UCP1) in the intervention group were significantly higher than those in the model group ( $P < 0.05$ ). The weight loss effect of the SHLF group was better than that of the grx08+SHL group ( $P < 0.05$ ).

**Conclusion:** Probiotic fermentation can improve the antiobesity effect of SHL and is safe. The mechanism may be to play the role of weight loss through multiple targets and multiple ways, such as reducing the level of inflammation to reduce leptin resistance and insulin resistance, reducing appetite and reducing energy intake, increasing the heat production of brown fat and increasing energy consumption.

**Key words:** obesity; probiotics; medicine and food homology; inflammation; appetite; brown fat



## 4-9 Research progress on the mechanism of coffee's health-promoting effect on obese people

Hongyang Zhang

Graduate School of Xi'an University of Physical Education

E-mail: 634165792@qq.com

**Objective:** Obesity is a chronic nutritional disease with unbalanced energy metabolism, mainly caused by excessive accumulation of adipose tissue, and various diseases caused by it also bring a lot of trouble to human health. In recent years, a large number of studies have shown that caffeine, as the main stimulating and exciting component in coffee beans, has a positive effect on suppressing appetite, promoting fat metabolism and improving resting metabolism. This review will provide a theoretical basis for the health-promoting effect of coffee on obese people based on the conclusions of previous studies.

**Methods:** The literature data method was used to search and integrate in databases such as "PubMed, Web of science".

**Results:** (1) Increasing caffeine intake may lead to decreased appetite in a short period of time, thereby temporarily reducing dietary intake. There are currently no studies demonstrating that caffeine has any effect on long-term dietary intake. (2) Under the premise of increasing exercise, coffee has the effect of promoting fat metabolism. Caffeine stimulates the nervous system, leading to the secretion of more adrenaline into the blood, promoting the release of fatty acids from fat cells into the blood, and metabolizing energy to consume fat through exercise. And caffeine increases glycolysis and oxidative phosphorylation, up-regulates the expression of brown adipose tissue-related genes, greatly stimulates the activity of brown adipose tissue, and promotes its consumption. (3) Increasing the intake of caffeine may increase resting metabolism by 3-11% in the short term, leading to increased energy expenditure by increasing plasma lactate and triglyceride concentrations and increasing vascular smooth muscle tension.

**Conclusion:** Drinking coffee in moderation has a positive effect on health promotion in obese people in the short term, while the effect on fat loss in the long term needs further scientific confirmation.

**Key words:** caffeine; obese people

## 4-10 A Study on the Correlation between Oxidative Stress and Inflammatory Cytokine Levels in Overweight and Obesity College Students

Zhang Qian<sup>1</sup>, Yang Qianwen<sup>1</sup>, Cheng Huizhi<sup>1</sup>, Yin Chunlei<sup>1</sup>, Li Lijuan<sup>1, 2\*</sup>

<sup>1</sup>College of Public Health, Dali University, Dali, Yunnan 671000, China;

<sup>2</sup>Institute of Natural

zhangqian22918@163.com(Z.Q.); yqw@18708740961@126.com(Y.Q.); 10chz805525@126.com (C.H.); lelejuan@dali.edu.cn (L.L.)

**Objective:** To investigate the correlation between oxidative stress and inflammatory cytokine levels in overweight and obesity college students.

**Methods:** Overweight and obesity students were recruited among undergraduate students of Dali University; according to the inclusion and exclusion conditions, a total of 86 students were included in this study. Enzyme linked immunosorbent assay (ELISA) was used for oxidative stress level indicators in this population. Serum reactive oxygen species (ROS), urine 8-hydroxydeoxyguanosine (8-OHdG) and serum tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin-1 $\beta$  (IL-1 $\beta$ ) were measured. Body mass index (BMI) was calculated according to height and weight data.

**Results:** There was no significant difference in the levels of oxidative stress and inflammatory cytokines between the overweight and obesity groups; the mean waist circumference of the overweight group was lower than that of the obesity group, and the difference was statistically significant. In overweight groups, the level of oxidative stress (urine 8-OHdG) in the central obesity group was higher than that in the non-central obesity group, and the difference was statistically significant ( $P=0.001$ ). The results of correlation analysis showed that TNF- $\alpha$  and ROS were positively correlated in overweight group, TNF- $\alpha$  and IL-1 $\beta$  were positively correlated with ROS in obese group.

**Conclusion:** There is a certain correlation between the levels of oxidative stress and inflammatory cytokines in overweight and obese college students.

**Key Words:** College Students; Overweight; Obesity; Oxidative Stress; Inflammatory Cytokine

## **4-11 Application prospect analysis of intelligent chronic disease management mode of big data in overweight and obesity**

Zhao Ai

Second Affiliated Hospital of Air Force Military Medical University, Health Management Division

E-mail: cmiao2017@163.com

**Abstract:** Overweight and obesity have become one of the major public health problems in China, posing a severe challenge to health management in China, and the management of overweight and obesity is urgent. The existing weight management is about crowd classification management, implementation of the multiple perspectives, comprehensive and multidisciplinary joint diagnosis and treatment, however, the current management of overweight obesity effect is not ideal, risk early warning model of full cycle has not yet mature, the incidence is rising year by year trend, not effectively maintain weight loss effect, development of all kinds of slow disease planted hidden dangers. Big data intelligent chronic disease management mode has advanced advantages in incidence probability, high risk warning, development trend and active intervention of various chronic diseases. It is an inevitable outcome of the development of the Internet era and provides a new direction for overweight and obesity risk warning, active intervention and health management of the whole life cycle in the future.

**Key words:** overweight; obesity; big data; intelligent medical treatment; chronic disease management; application prospect

## 4-12 Application of food education in intervention in childhood obesity

Jinning Zhao<sup>1</sup>; Jingming Cheng<sup>2\*</sup>

<sup>1</sup> School of public health, Shanxi Medical University, Taiyuan 030001

<sup>2</sup> School of management, Shanxi Medical University, Taiyuan 030001

E-mail: 425453347@qq.com

**Abstract:** In the past 30 years, the detection rate of overweight and obesity among children and adolescents in China has shown a continuous growth trend. Child obesity is increasing at an alarming rate and has become an increasingly serious public health problem. Obesity not only leads to diabetes, fatty liver, cardiovascular and cerebrovascular diseases in children and adolescents, but also has a negative impact on the psychology of children and adolescents. There are many factors affecting childhood obesity, and the nutritional imbalance caused by the unreasonable energy supply ratio of the three macro nutrients and the excessive intake of sugary drinks are the key factors. It is urgent to control the overweight obesity rate of children and adolescents in China and further strengthen the research on children's nutrition and health. In recent years, food education curriculum and food education have been continuously developed. Food education, that is, food education and dietary behavior education, is a practice of repeated "eating". It strengthens the understanding of food and food, enables feeding objects to establish a scientific dietary model in subtle way, and gradually forms a healthy diet and world outlook to achieve the purpose of nourishing morality by eating. The existing results show that diet can guide children to develop good eating habits, form a scientific concept of nutrition, promote children's nutritional balance, and improve children's physical and mental health. This article analyzes the harm of childhood obesity and the main causes of childhood obesity. From the aspects of guiding parents to establish the concept of scientific and healthy diet, actively carrying out food education in schools, and strengthening the supervision of the food industry by relevant departments of society, strengthening dietary education, improving children's health level and reducing childhood obesity rate. discussion.

**Key words:** food; education; obesity

## **5-1 Metabolomic-proteomic combination analysis reveals the targets and molecular pathways associated with high-fat diet induced brain dysfunction and cognitive impairment**

Yu An, Jia Liu, Guang Wang\*

Department of Endocrinology, Beijing Chao-Yang Hospital, Capital Medical University, Beijing 100020, China

First author: Yu An, research assistant, anyu900222@126.com,

\*Corresponding author: Guang Wang, Director of Department of Endocrinology, wangguang@bjcyh.com

**Objectives:** Diabetes and obesity have been shown to significantly affect brain functions and metabolism, subsequently causing cerebral atrophy and cognitive impairment. However, it remains to be determined whether brain dysfunction induced by obesogenic diets results from brain metabolic alterations.

**Methods:** C57BL/6 mice were fed with normal chow diet or high fat diet (HFD) for a total 24 weeks. The combination analysis of metabolomics and proteomics of brain tissues was performed to discover the candidate targets and potential molecular pathways involved in HFD-induced brain dysfunction and metabolism.

**Results:** Mice fed the HFD developed obesity, glucose intolerance, insulin resistance as well as impaired memory in object recognition tasks and spatial memory as evaluated by Morris water maze. By comparing the differences in metabolites and proteins in the brains from HFD treated and control mice, we discovered 133 differential metabolites between comparative analysis of HFD vs Control on brain metabolomics. Moreover, a total of 245 proteins were obtained whose changes were significantly differed between HFD and Control mice brains. A combined analysis of brain metabolomics and proteomics was then conducted, revealing 22 shared molecular pathways, as well as the enrichment of purine metabolism, beta-alanine metabolism, lysosome, butanoate metabolism and neuroactive ligand-receptor interaction.

**Conclusions:** We performed the first study combining metabolomics and proteomics to explore the mechanisms behind the HFD-induced cognitive impairment. Our results reveals possible molecular mechanisms as well as preventive and therapeutic targets for HFD-induced brain dysfunction.

**Key words:** High-fat; Cognitive impairment; Metabolics; Proteomics

## 5-2 Systematic Review and meta-analysis of the effect of fructooligosaccharides supplementation on the gut microbiota in humans.

Dou Yuqi<sup>1&2</sup>, Zhu Jing<sup>2&\*</sup>, Ma Defu<sup>1&\*</sup>

<sup>1</sup> School of Public Health, Peking University Health Science Center

<sup>2</sup> Beijing Research Institute for Nutrition Resources

\*Corresponding author, Email: [jingzhu.nutri@outlook.com](mailto:jingzhu.nutri@outlook.com), [madedfu@bjmu.edu.cn](mailto:madedfu@bjmu.edu.cn)

Dou Yuqi: dyqhoney@126.com

**Objective:** The aim of study is to further understand the effect of Fructooligosaccharides (FOS) intake at different doses on changes in human microbial populations and to investigate whether it may produce gastrointestinal symptoms in humans. To our knowledge, this is the first meta-analysis to explore the effect of FOS on intestinal flora and to evaluate the adverse effects of FOS intake on the gastrointestinal tract.

**Method:** Using the electronic databases, relevant peer review manuscripts published before January 10th, 2022 were included. The units of colony counts are all log colony forming unit per gram. Gastrointestinal complaints were rated on a 4-point Likert scale (none; mild; moderate; severe) or used a 0–10 scale.

**Results:** The present study demonstrates that bifidobacterial counts significantly increased during FOS ingestion (0.579, 95%CI: 0.444-0.714,  $p_{\text{effect}} < 0.001$ ;  $Q=13.14$ ,  $I^2=39.1\%$ ,  $p_{\text{heterogeneity}} = 0.107$ ). Subgroup analysis showed that the amount of *bifidobacteria* was higher in adults (0.861, 95%CI: 0.651-1.108,  $p_{\text{effect}} < 0.001$ ;  $Q=5.68$ ,  $I^2=0$ ,  $p_{\text{heterogeneity}} = 0.460$ ) than in infants (0.458, 95%CI: 0.297-0.619,  $p_{\text{effect}} < 0.001$ ;  $Q=0.25$ ,  $I^2=0$ ,  $p_{\text{heterogeneity}} = 0.615$ ), and the doses  $>5\text{g}$  (1.116, 95%CI: 0.685-1.546,  $p_{\text{effect}} < 0.001$ ;  $Q=3.31$ ,  $I^2=9.3\%$ ,  $p_{\text{heterogeneity}} = 0.347$ ) were higher than those  $\leq 5\text{g}$  (0.521, 95%CI: 0.379-0.663,  $p_{\text{effect}} < 0.001$ ;  $Q=3.22$ ,  $I^2=0$ ,  $p_{\text{heterogeneity}} = 0.522$ ). In contrast to the findings for *bifidobacteria*, significant differences in change from baseline between the FOS groups and the placebo groups, we are not observed for counts of *Enterobacteriaceae* or *Lactobacillus*. The overall result of *Bacteroides* showed that there is an increased trend after intervention (0.289, 95% CI: 0.048-0.530,  $p_{\text{effect}} = 0.019$ ;  $Q=12.25$ ,  $I^2=51\%$ ,  $p_{\text{heterogeneity}} = 0.057$ ); however, sensitivity analysis suggested that the Kapiki et al. Study (a shorter intervention time) had a significant impact result, and when this study was removed, neither the results of the pooled analysis nor the results of the subgroup analysis were significant (0.134, 95%CI: -0.044-0.312,  $p_{\text{effect}} = 0.139$ ;  $Q=4.44$ ,  $I^2=0\%$ ,  $p_{\text{heterogeneity}} = 0.488$ ). As for gastrointestinal symptoms, the pooled results for borborygmi (0.055, 95%CI: -0.041-0.152), bloating (0.128, 95%CI: -0.123-0.379), abdominal pain (-0.061, 95%CI: -0.244-0.123) and flatulence (0.134, 95%CI: -0.161-0.429) were not heterogeneous and indicated that oligofructose intake did not increase or relieve these symptoms.

**Conclusion:** In conclusion, at less than 15 g/day, which was well tolerated, the ingestion of FOS led to an increase in colonic *bifidobacteria* and the intake of FOS does not increase or relieve the symptoms of gastrointestinal discomfort.

### 5-3 Leucine aminopeptidase 3 (LAP3): a promising serum invasion biomarker for nonalcoholic fatty liver disease (NAFLD) detection

Lina Feng<sup>1,2</sup>, Kaikai lu<sup>1,2</sup>, Litao Wu<sup>1,2</sup>, Qian Chen<sup>1,2</sup>, Rong Zhao<sup>1,2</sup>, Xiaona Cheng<sup>1,2</sup>, Yimeng Zhou<sup>1,2</sup>, Luyun Yang<sup>1,2</sup>, Dongmin Li<sup>1,2\*</sup>

<sup>1</sup> Department of Biochemistry and Molecular Biology, School of Basic Medical Science, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi, 710061

<sup>2</sup> Key Laboratory of Environment and Genes Related to Diseases (Xi'an Jiaotong University), Ministry of Education of China, PR China. Xi'an, Shaanxi, 710061

\* lidongm@mail.xjtu.edu.cn

**Aim:** NAFLD affected the 25% population worldwide, and the number is still climbing. Recently, the dysfunction of LAP3 was found in HCC and NAFLD. However, the role of LAP3 in the NAFLD is uncovered. We aimed to illustrate the role of LAP3 in NAFLD and the utility of LAP3 in the diagnosis of NAFLD. **Methods:** Liver tissues and serum from NAFLD patients and NASH rats fed with HFD were collected to detect the expression of LAP3. Measured GSSG/GSH, intracellular reactive oxygen species (ROS), and LC3 expression by elevation/ reduction of LAP3 expression in LO2 cells to explore the mechanism of LAP3 in NAFLD pathogenesis. Correlation analysis was used to evaluate the association between LAP3 expression and clinical indexes of NAFLD patients. ROC curves of LAP3 in liver and serum from the multi-NAFLD models were used to analyze whether LAP3 is a candidate biomarker of NAFLD diagnosis in serum. **Results:** LAP3 is significantly elevated in the serum and liver tissues in NAFLD group, compared to control groups. Upregulation of LAP3 by cholesterol participated in pathogenesis of NAFLD via inhibiting hepatocytes autophagy. Correlation analysis between liver-LAP3 expression from CHB patients with NAFLD and clinical index indicated that LAP3 was negatively correlated with INR, AST and AST/ALT, and was strongly positively correlated with HA, TC and TG. Correlation analysis between serum-LAP3 expression from NAFLD patients and clinical index indicated that LAP3 is positively correlated with fasting blood glucose (FBG), total cholesterol (TC),  $\gamma$ -glutamyltranspeptidase (GGT), and the negative correlation with HDL levels. AUC of ROC curves in liver tissue from CHB patients with NAFLD is 0.8736,  $p=0.0010$ , AUC of ROC curves in serum from NAFLD patients is 0.6584,  $p=0.0168$ . **Conclusion:** Elevation of LAP3 participated in the pathogenesis of NAFLD via inhibiting hepatocytes autophagy. LAP3 is a new promising serum invasion biomarker for NAFLD detection.

**Keywords:** LAP3, autophagy, NAFLD, MAFLD, biomarker

## 5-4 Pre-diagnostic dietary consumption of calcium and magnesium and calcium-to-magnesium intake ratio and ovarian cancer mortality: results from the ovarian cancer follow-up study (OOPS)

Ting-Ting Gong <sup>1</sup>

<sup>1</sup> M.D., Ph.D. Department of Obstetrics and Gynecology, Shengjing Hospital of China Medical University, Shenyang, China. No. 36, San Hao Street, Shenyang, Liaoning 110004, P. R. China. Phone: 86-24-96615-13652

E-mail: [gongtt@sj-hospital.org](mailto:gongtt@sj-hospital.org)

**Objective:** Previous studies have indicated that dietary calcium (Ca), magnesium (Mg), and the Ca-to-Mg (Ca:Mg) ratio are associated with different health outcomes. However, no studies have evaluated the association between pre-diagnostic Ca, Mg, and Ca:Mg ratio consumption and ovarian cancer (OC) survival.

**Methods:** The aforementioned associations were investigated in a cohort of 853 Chinese women diagnosed with OC between 2015 and 2020. A validated food frequency questionnaire was used to evaluate pre-diagnosis diet information. Deaths were recorded until March 31, 2021 via medical records. Cox proportional hazards model was applied to calculate the adjusted hazard ratios (HRs) and 95% confidence intervals (CIs).

**Results:** A total of 130 deaths were observed during a median follow-up of 37.2 months. After adjustment for potential confounders, pre-diagnosis Ca (HR  $< 600$  vs.  $> 1000 = 1.45$ , 95% CI = 0.47–4.46, p for trend = 0.69) and Mg (HR  $< 250$  vs.  $> 330 = 0.90$ , 95% CI = 0.39–2.08, p for trend = 0.77) intake was found to be unrelated to OC survival, whereas a higher Ca:Mg ratio was significantly associated with worse survival (HR  $< 1.7$  vs.  $> 2.5 = 2.72$ , 95% CI = 1.28–5.78, p for trend  $< 0.05$ ). A significant result was also observed when treating the Ca:Mg ratio as a continuous variable (HR = 1.69, 95% CI = 1.12–2.55) for one-unit increment.

**Conclusion:** Pre-diagnostic consumption of Ca and Mg was unrelated to OC survival, while a higher Ca:Mg ratio was strongly associated with worse survival among OC patients.

**Keywords:** Calcium; Calcium: magnesium ratio; Cohort; Magnesium; Ovarian cancer; Survival.

### Competing Interests

The author declares that there is no conflict of interest regarding the publication of this paper.



## 5-5 Association between Nutrition Literacy or Food Literacy and Health Outcomes: A Systematic Review and Meta-analysis

Yuxin Guo Undergraduate, Juan Xia\* Ph.D.  
Capital Medical University, Beijing, China  
Email: [gyxin2014@163.com](mailto:gyxin2014@163.com); [cristinner@163.com](mailto:cristinner@163.com)

### Abstract

**Objective:** Accumulating epidemiologic evidence has suggested the associations between nutritional literacy(NL)/food literacy(FL) and the dietary habits of people. In the meantime, the association between dietary habits and the risk of chronic diseases has also been confirmed. However, a direct association between NL/FL and the risk of chronic diseases remains to be elucidated.

**Methods:** Therefore, a systematic search of PubMed, Medline, CNKI, EBSCO host and Web of Science as well as reference lists was conducted and data analysis was performed between February 2022. All observational studies that examined the association between FL/NL and the risk of chronic diseases were identified. After assessing the quality of articles, the odds risk (OR) and 95% CI were calculated for the level of FL/NL and the risk of chronic diseases.

**Results:** A total of 16 articles were included. Six of them showed a negative association between higher FL/NL and risk of overweight/obesity(OR: 1.25 95%CI: [1.01; 1.54]  $I^2=67\%$ ) and four of them showed a negative association between higher FL/NL and risk of diabetes (OR: 1.37 95%CI:[1.00, 1.87]  $I^2=62\%$ ). Five investigations showed no significant association between higher FL/NL and risk of underweight(fixed effect model OR: 0.95 95%CI: [0.66; 1.37]  $I^2=5\%$ ). The systematic analysis including 10 researches showed a negative association between higher FL/NL and risk of several chronic diseases. Total BMI is also negatively associated with higher FL/NL while weight change is positively related to higher FL/NL based on the systematic review of 3 researches.

**Conclusion:** In general, the result suggested a negative association between higher FL/NL and overweight/obesity and other chronic diseases(diabetes, hypertension and hyperlipidemia) while positively associated with underweight and weight loss.

**Key words:** food literacy, nutrition literacy, obesity, diabetes, health

## 5-6 Effects of 12weeks treadmill training on bone of vitamin deficient mice

Si-Qi Li<sup>1</sup>, Jing-Hua Zhang<sup>2</sup>, Zhen-Bo Cao<sup>\*</sup>

<sup>1</sup> Master Candidate School of Kinesiology, Shanghai University of Sport, Shanghai, China.

Email: siqiphysio@163.com

### Abstract

**Purpose:** Vitamin D deficiency is an important cause of various of bone damages. Exercise is proved to improve BMD of bone or bone mass, however, the effect of exercise on bone of vitamin D deficiency is not clear. This study aimed to determine the effect of exercise on bone with the status of vitamin D deficiency.

**Methods:** 3weeks of C57/BL6 mice(N=24) were randomly assigned to 4groups; Control group(n=6), Control group with exercise (n=6, CONE), vitamin D deficiency group (n=6,VDD), and vitamin D deficiency with exercise group (n=6,VDDE). All the group was fed in standard environment for 12weeks, while the VDD and VDDE group was fed on vitamin D deficiency diet and light with no UV to increase vitamin D deficiency. After 12weeks, the treadmill exercise for CONE and VDDE group lasted for another 12weeks, 1hour per day, six days a week. After 12 weeks, Tb.BV/TV, Tb.Th, Tb.N, Tb.Sp, Tb.BMD of femur trabecular bone was measured by Micro-CT.

**Results:** Two-factor variance analysis show that the interaction between exercise and vitamin D was only significant for Tb.BV/TV. Tb.BV/TV was significantly decreased in VDDE vs VDD (between-group difference, -0.046,95%CI, -0.082 to -0.011; P=0.01),VDDE vs CONE(between-group difference, -0.049, 95%CI, -0.085 to -0.014; P=0.01). Tb.Th was significantly decreased in VDDE vs VDD ( between-group difference,-0.584mm,95%CI, -0.97 to -0.198; P=0.01 ) ; Tb.Sp was significantly increased in VDDE vs VDD(between-group difference,0.039,95%CI, 0.015 to 0.063; P<0.01). There were no significant changes in Tb.BMD.

**Conclusions:** The findings suggests that the treadmill exercise has negative effect on bone with the status of vitamin D deficiency. It may suggest that the vitamin D deficiency need to be corrected before exercise.

**Keywords:** exercise, bone, Vitamin D deficiency

**Conflict of interest statement:** The authors declare that they have no competing interests.

## 5-7 FADS2 rs1535 基因多态性与口腔颌面部良性肿瘤易感性的关联研究

王慧英<sup>1,2</sup> 王娜<sup>1,2</sup> 范毅<sup>1,2</sup> 施斌<sup>3</sup> 林李嵩<sup>3</sup> 邱宇<sup>3</sup> 潘丽珍<sup>3</sup> 汪靖<sup>4</sup> 刘凤琼<sup>1,2</sup> 陈法<sup>1,2</sup> 何保昌<sup>1,2,3</sup>

**作者单位:** 1. 福建医科大学公共卫生学院流行病与卫生统计学系, 福建 福州 350108; 2. 福建医科大学消化道恶性肿瘤教育部重点实验室, 福建 福州 350108; 3. 福建医科大学附属第一医院口腔颌面外科, 福建 福州 350108; 4. 福建医科大学公共卫生学院实验中心, 福建 福州 350108

**通信作者:** 何保昌, Email: hbc@fjmu.edu.cn

**【摘要】目的** 探讨脂肪酸去饱和酶 2(fatty acid desaturases 2, FADS2)基因 rs1535 位点多态性与口腔颌面部良性肿瘤(oral maxillofacial benign tumors, OMFBTs)的关联。**方法** 采用病例对照的研究方法, 收集 2011 年 3 月-2018 年 12 月期间符合研究纳入标准的 195 例新发 OMFBTs, 同期选取来自社区的对照人群 302 例, 应用 MassArray 质谱法进行分型检测。采用非条件 Logistic 回归模型用于探寻 rs1535 基因单核苷酸多态性位点与口腔颌面部良性肿瘤发病的易感性, 结合叉生分析探索 rs1535 基因与环境因素间的联合及交互作用。**结果** 经性别、年龄、婚姻状况、文化程度、BMI、居住地、肿瘤家族史、吸烟、饮酒、饮茶、口腔卫生、红肉、禽肉、海鲜、奶制品、蔬菜调整后, 在显性遗传模型下, 携带 AG+GG 基因型个体 OMFBTs 易感性降低, *OR* 值为 0.54 (95%*CI*: 0.30-0.99)。进一步进行分层分析后发现, rs1535 AG+GG 基因型在非吸烟、非饮茶、年龄<60 岁及蔬菜摄入<2 次/天者中保护效应更为显著。交互作用结果显示, 无吸烟、无饮茶、年龄<60 岁、蔬菜摄入<2 次/天者中, rs1535 AA+AG 基因型 OMFBTs 危险性分别是 rs1535 AA 基因型 0.43 倍 (95%*CI*: 0.20-0.92)、0.35 倍(95%*CI*: 0.16-0.74)、0.30 倍(95%*CI*: 0.12-0.75)、0.42 倍(95%*CI*: 0.21-0.82); 与携带 rs1535 AA 基因型且蔬菜摄入<2 次/天者相比, 蔬菜摄入≥2 次/天可能是 OMFBTs 发病的保护因素。此外, 发现 rs1535 基因与性别之间有相乘交互作用(*OR*=0.61, 95%*CI*: 0.40-0.91)。**结论** 在显性模型下, FADS2 rs1535 AG+GG 基因型携带者可能使 OMFBTs 发病风险降低, 且 rs1535 基因与性别之间存在相乘交互作用。

**【关键词】** 颌面部良性肿瘤; 脂肪酸去饱和酶 2; 交互作用

## 5-8 Associations of multiple plasma metals with dyslipidemia risk: A cross-sectional study in the middle-aged and older Chinese population

Qingping Xue<sup>1</sup>, Suli Huang<sup>2</sup>, Yachao Li<sup>1</sup>, Tian Wang<sup>2</sup>, Ying Huang<sup>3</sup>, Xuejun Fu<sup>3</sup>, Zhaoqiong Chen<sup>1</sup>, Ying Wen<sup>2</sup>, Jinqian Cheng<sup>2</sup>

<sup>1</sup>School of Public Health, Chengdu Medical College, Chengdu, Sichuan, China

<sup>2</sup> Shenzhen Center for Disease Control and Prevention, Shenzhen, China

<sup>3</sup> Shenzhen People's Hospital, Shenzhen, China

Corresponding Authors: Ying Wen: Shenzhen Center for Disease Control and Prevention, 8 Longyuan Rd, Shenzhen 518055, Guangdong, China.

Ying Wen: [windy4805@gmail.com](mailto:windy4805@gmail.com)

Qingping Xue: [xueqp\\_stat@163.com](mailto:xueqp_stat@163.com)

### Abstract

**Background:** The metal exposures have been reported to be associated with dyslipidemia risk, but the results were mixed. Meanwhile, limited studies explored the associations between co-exposures to metals and dyslipidemia risk. Thus, our study aimed to explore the relationships between single and mixed metal concentrations and dyslipidemia risk in a middle-aged and older Chinese.

**Methods:** A cross-sectional study was conducted in 1,410 Chinese adults who underwent routine physical examination in the Eighth Affiliated Hospital of Sun Yat-Sen University in Shenzhen. The inductively coupled plasma mass spectrometry (ICP-MS) was used to detect 13 plasma metals. Multivariable logistic regression models and restricted cubic spline (RCS) models were used to assess the associations between single plasma metals and dyslipidemia risk. The weighted quantile sum (WQS) regressions and Bayesian kernel machine regression (BKMR) analyses were used to explore the associations between co-exposures to multiple metals and dyslipidemia risk.

**Results:** Among 1,410 individuals included in our study, 46.52% had dyslipidemia. Compared with the lowest tertile, the odds ratio (ORs) of prevalence of dyslipidemia in the highest tertile were 0.72 (95% CI: 0.55, 0.93) for calcium, 0.71 (95% CI: 0.54, 0.92) for cobalt, 0.71 (95% CI: 0.54, 0.93) for iron, and 0.76 (95% CI: 0.59, 0.99) for magnesium. When treating the concentrations of plasma metals as continuous variables, the results showed negative associations of cobalt (OR, 0.97; 95% CI: 0.95, 0.99), calcium (OR, 0.95; 95% CI: 0.92, 0.98) and manganese (OR, 0.96; 95% CI: 0.93, 0.99) concentrations and prevalence of dyslipidemia. Non-linear associations were found in the associations between plasma cobalt, iron, and manganese concentrations and dyslipidemia risk ( $P \leq 0.04$ ). In addition, we found co-exposures to cobalt, iron, manganese, magnesium and calcium were negatively associated with dyslipidemia risk using WQS regressions and BKMR analyses.

**Conclusions:** Elevated levels of plasma single and mixed calcium, cobalt, iron, magnesium and manganese exposures were related with lower risk of dyslipidemia. More large-population based prospective studies and animal experiments were needed to warrant these associations and explore the underlying mechanisms.

**Key words:** Dyslipidemia; Metals; WQS; BKMR; Chinese

Declaration of Competing Interest: None

## 5-9 Psychiatric Symptoms and Frequency of Eating Out among Commuters in Beijing: a Bidirectional Association?

Ling Zhang, Juan Xia

Department of Epidemiology and Health Statistics, School of Public Health, Capital Medical University, and Beijing Municipal Key Laboratory of Clinical Epidemiology, Beijing, 100069, China. No. 10 Xitoutiao, Youanmenwai, Beijing, 100069, China. Tel/Fax: +86-010-83911777, E-mail: zlilyepi@ccmu.edu.cn

### Abstract

**Background:** Mental illness placing as a distant first in global burden in terms of years lived with disability, exceeding both cardiovascular and circulatory diseases. The emergence of the new and burgeoning area “Nutrition Psychiatry” offers promise in improving mental health by diet. Mental health and well-being are critical to commuters but rarely get the attention they need.

**Objective:** To examine the bidirectional relationship between frequency of eating out with depression, anxiety, and stress symptoms in the sample of Beijing commuters.

**Methods:** A total of 3337 commuters (mean[SD] age, 38.78[10.41]; 74.74% Males) from the Cohort Study CHCN-BTH were included. The psychiatric symptoms were evaluated by the 21-item self-reported Depression-Anxiety-Stress Scale(DASS-21). Cochran-Armitage trend chi-square test, restricted cubic spline, multiple logistic regression, multinomial logit models and E-values were performed to estimate the associations between eating out and psychiatric symptoms in both directions.

**Results:** Daily rate of eating-out more than 50% had a higher risk for depression (OR, 95%CI:1.68,1.184-2.393), anxiety (1.73,1.259-2.369), and stress (1.99,1.191-3.329) than the individuals eating at home. The higher frequency of eating out for lunch was significantly associated with increased risk of depression (1.78,1.28-2.46), anxiety (1.67,1.26-2.23), and stress (2.05,1.31-3.22); similar results were found in dinner: depression 2.20(1.59,3.06), anxiety 1.91(1.42,2.59), and stress 2.61(1.68,4.05). Limited evidence supporting the effects of psychiatric symptoms on frequency of eating out in the reverse analyses.

**Conclusion:** The frequency of eating out are positively associated with an increased risk of psychiatric symptoms, especially for the frequency of eating out for lunch and dinner. People eating at home have the lowest risk of suffered psychiatric symptoms, followed by eating in the workplace canteen. Eating at home could be considered for future recommendations for the prevention of psychiatric symptoms.

**Keywords:** Eating out; depression; stress; anxiety; commuters; Beijing

# 5-10 Delphinidin Inhibits PD-L1 Synthesis in Human Triple Negative Breast Cancer Cells via the PI3K/AKT and MAPK Signaling Pathways

Yufei Zou<sup>1</sup>, Xiaoying Fu<sup>2</sup>, Xiaoping Yu<sup>3</sup>

<sup>1</sup>Graduate student, School of Public Health, Chengdu Medical College, justhollyhock@163.com

<sup>2</sup>Graduate student, School of Medical Laboratory, Chengdu Medical College, fuxiaoying999@163.com

<sup>3</sup>Professor, School of Preclinical Medical, Chengdu University, cyggwsyxp@sina.com

## Abstract

**Objective:** Delphinidin (Dp) is an anthocyanidin monomer with outstanding antioxidation and anticancer activities. This study aimed to explore the effects and underlying mechanisms of Dp on PD-L1 in human triple negative breast cancer cells.

**Methods:** MDA-MB-231 cells and normal MCF-10A cells were treated with a range of Dp dose and the anti-proliferative effects were evaluated by cell counting kit 8 assay, while ELISA kit was conducted to test the concentration of p-EGFR. The PD-L1 protein expression was measured by using Western blotting and qRT-PCR, and localization analysis via confocal fluorescence microscopy. To clarify the molecular mechanism of Dp, the expression of factors involved in the PI3K/AKT and MAPK signaling pathways was further detected by Western blotting.

**Results:** Dp inhibited the viability of MDA-MB-231 cells with dose-dependence manner, and the secretion level of p-EGFR increased in these cells. Dp downregulated the expression and transcription level of PD-L1 on the cell membrane. In addition, the Western blotting analysis showed that Dp inhibited the activation of Ras, b-Raf, MEK1/2, p44/42, c-fos and c-Jun, and significantly decreased the expression of PI3K, AKT, mTOR and STAT3.

**Conclusion:** These results suggest that Dp effectively prevents MDA-MB-231 cells proliferation and inhibits PD-L1 synthesis via the PI3K/AKT and MAPK signaling pathways. Therefore, Dp exhibits novel anticancer properties by inhibiting PD-L1 expression, and may be a potential therapeutic option for breast cancer.

**Keywords:** Delphinidin, PD-L1, breast cancer, PI3K/AKT pathway, MAPK pathway

## Conflict of Interests

The authors declare no conflict of interests.

### 6-1 The effect of NaF on the pregnant ratio and level of testosterone in female rats

Siyuan Dong<sup>1</sup>, Biqu He<sup>2</sup>, Zhao Xu<sup>3</sup>, Fang Guan<sup>3</sup>, Zhen Li<sup>4</sup>, Jinhai Wang<sup>5</sup>, Qun Chen<sup>6</sup>

<sup>1</sup> Gupei class s0141, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University;

<sup>2</sup>class 0128#, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University;

<sup>3</sup>School of Chemistry, Xi'an Jiaotong University;

<sup>4</sup>Department of Gynecology and Obstetrics, The First Affiliated Hospital of Xi'an Jiaotong University;

<sup>5</sup>Department of Gastroenterology, The Second Affiliated Hospital of Xi'an Jiaotong University, Xi'an Jiaotong University,

<sup>6</sup>Institute of Endemic Diseases, Key Laboratory of Trace Elements and Endemic Diseases, National Health and Family Planning Commission of the people's Republic of China, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University  
E-mail: chenqun2003076@163.com

**Objectives:** Long-term excessive fluoride intake can cause dysfunction of female ovary. However, the mechanism is not clear. The aim of this study was to investigate the relationship between the level of testosterone in serum and the pregnant ratio in female rats induced by NaF.

**Methods:** Sprague-Dawley rats weighing 80-100 g (n=120, female) were randomly divided into 4 groups with 30 for each group. Rats drank distilled water containing different concentrations of NaF (0 mg/L, 50 mg/L, 100 mg/L and 150 mg/L) every day. Ten female rats in each group were mated with male rats at the ratio of 4:1 for one week and then sacrificed every two months. And the results of mating was recorded by vaginal smears. Levels of testosterone in serum were measured by enzyme linked immunosorbent assay (ELISA).

**Results:** The level of testosterone of the 150mg/L NaF group was significant higher than that of the other three groups. However, there was no significant difference among the other groups, and the pregnancy rate in the treated group was significant lower than that of the control group. While after 4 months treatment, the level of testosterone of the 150mg/L group was still significant higher than the other groups. The pregnancy rate from the 50mg/L and 150mg/L NaF group was significant lower than that of the Control group. After 6 months treatment, there was no significant difference on level of testosterone in serum among all groups. And the pregnancy rate was significantly decreased in all NaF treated groups when compared with that of the Control group.

**Conclusion:** High level of testosterone in serum maybe involved in the mechanism of dysfunction of female ovary induced by NaF which need to be further studied. This

work was funded by National Natural Science Foundation of China (82073496 and 81673115).

**Key words:** fluorosis; testosterone; infertility

## **6-2 The Cell Viability of KGN cells transfected with miR-378d Empty Vector in Excessive Fluoride**

Biqi He<sup>1</sup>, Siyuan Dong<sup>2</sup>, Zhao Xu<sup>3</sup>, Fang Guan<sup>3</sup>, Zhen Li<sup>4</sup>, Qun Chen<sup>5</sup>

<sup>1</sup>class 0128#, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University;

<sup>2</sup>Gupei class s0141, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University;

<sup>3</sup>School of Chemistry, Xi'an Jiaotong University;

<sup>4</sup>Department of Gynecology and Obstetrics, The First Affiliated Hospital of Xi'an Jiaotong University;

<sup>5</sup> Institute of Endemic Diseases, Key Laboratory of Trace Elements and Endemic Diseases, National Health and Family Planning Commission of the people's Republic of China, Xi'an Jiaotong University Health Science Center, Xi'an Jiaotong University

**Objectives:** This study aimed to investigate the effects of cell viability on ovarian granulosa cell line (KGN) transfected with miR-378d mimic negative control plasmid (MNC) or miR-378d inhibitor negative control plasmid (INC) induced by excessive fluoride.

**Methods:**The KGN cells were transfected with miR-378d mimic negative control plasmid and miR-378d inhibitor negative control plasmid, respectively. Then, the cells were seeded in a 96-well plate. The new fresh medium containing serum with different concentrations of sodium fluoride (NaF) was added. Cultured for 24h, 20  $\mu$ L of MTT was added and incubated for 4 h. The absorbance of each well at 495 nm was measured using a microplate reader.

**Results:**The shape of KGN cells was spindle-shaped or polygonal in normal state by microscope. When the concentration of NaF increases, more and more cells gradually became round and fell off from the adherent state, showing an apoptosis-like morphology. Meanwhile, the proliferation rate of the cells slowed down and the number of living cells decreased. In terms of cell viability, we can see that the absorbance of the two types of cells decreases continuously with the increase of NaF concentration, indicating that the cell viability decreased and the number of living cells decreased significantly. The cell viability was negatively correlated with the NaF concentration.

**Conclusion:** Our findings demonstrate that excessive NaF can gradually reduce the cell viability of KGN cells and promote the apoptosis. This results were consistent with the results of the normal control cells in the previous study of our group. The two cells can be regarded as normal control cells, which lays the foundation for the subsequent study of miR-378d-mediated apoptosis of KGN cells. This work was funded by National Natural Science Foundation of China (grant number 82073496 and 81673115).

**Key words:** fluorosis; KGN; miR-378d; empty vector.



## 6-3 试析生态马克思主义下的“新陈代谢断裂”理论

卢洪瀑

北京化工大学 马克思主义学院 北京 100000

Emails: 929998140@qq.com

随着资本主义全球化进程的加快,全球性的生态危机进一步加剧,西方一些马克思主义者开始转向对马克思生态思想的研究,来分析和研究生态危机的原因,并进而产生了生态马克思主义。从上世纪 70 年代起,西方生态运动和社会主义思潮相结合,产生了如下共识:资本主义制度是造成全球生态危机的根本原因。在生态马克思主义的阵营中,福斯特关于马克思生态思想的论述尤为具有研究价值。其中的“新陈代谢断裂”理论阐释出资本主义生态危机的原因,并得出了制度层面的解决方案。本文便着眼于福斯特关于马克思“新陈代谢断裂”理论开展研究。

**关键词:** 新陈代谢断裂、土壤肥力、生态马克思主义

## 6-4 Heat-shock protein 47 knockdown Mediates Autophagy-lysosome regulation and Chondrocyte Death in Kashin-Beck Disease

Yawen Shi<sup>1</sup>

<sup>1</sup>School of Public Health, Xi'an Jiaotong University Health Science Center, Key Laboratory of Trace Elements and Endemic Diseases, National Health and Family Planning Commission, No. 76 Yanta West Road, Xi'an, 710061, Shaanxi, People's Republic of China

Emails: shi\_yawen0522@163.com

**Purpose:** Heat shock protein 47 (HSP47) is an important chaperone required for the correct folding and secretion of collagen, which disturbances in its own metabolism plays a crucial role in the pathogenesis of osteoarthropathy. In this study, we aim to further explore the biological function of HSP47 and the relationship between HSP47 expression and the pathological progression of Kashin-Beck disease (KBD).

**Design:** KBD cartilage samples were collected from 6 patients. The HSP47 gene of ATDC5 chondrocytes was knocked down (KD) by using shhsp47 interference silencing, and the chondrocyte with low expression of HSP47 was examined by RT-qPCR and Western blotting. Protein and mRNA expression levels of lysosome function were measured using immunohistochemistry, western blotting, and quantitative real-time reverse transcription-polymerase chain reaction analyses. Subsequently, the cultured shhsp47-ATDC5 chondrocytes were treated with the CTSB inhibitor CA-074-me, and detects lysosomal pH changes and different enzyme activity levels (eg, acid phosphatase, CTSB, CTSD) by corresponding kits.

**Results:** The cartilages from patients with KBD showed significantly decreased expression of HSP47 compared to cartilages from controls. The stable HSP47 KD in ATDC5 cells was successfully constructed with HSP47 mRNA and protein expression by about 80-90% reduction. HSP47 KD caused a decrease in Lysosomal acid phosphatase activity and up-regulates the expression of genes related to autophagy-lysosome regulation in ATDC5 cells ( $P < 0.05$ ). Furthermore, inhibition of CTSB rescued in chondrocyte death of ATDC5 chondrocytes, as well as decreased p62/SQSTM1 expression and increased LC3-II/I expression at the mRNA and protein levels.

**Conclusion:** We found that shRNA-mediated knockdown of HSP47 in chondrocyte is sufficient to cause lysosomal dysfunction in KBD cartilage destruction. Therefore, inhibition of HSP47 may alleviate chondrocyte death related to the pathological progression of KBD.

**Keywords:** Kashin-Beck disease, Heat shock protein 47, chondrocyte death

## 6-5 Down-regulation of Selenoprotein S induced by low selenium conditions is involved in extracellular matrix degradation in KBD

Hui Wang, Meng Zhang, Yinan Liu, Yawen Shi, Ying Zhang, Ge Mi, Kunpan Chen, Jinghong Chen\*

The Institute of Endemic Disease, School of Public Health, Xi'an Jiaotong University, Xi'an, Shaanxi, China 710061

\* E-mail:jixiang46@163.com

**Objective:** The purpose of this study was to investigate the role of Selenoprotein S (SelS) down-regulation in extracellular matrix degradation in Kashin-Beck disease (KBD).

**Methods:** (1) The immunohistochemical staining was used to detect the expression of SelS in articular cartilages from KBD patients (n=5) and rats fed with low selenium diet (n=6). (2) ATDC5 cells were cultured with 1% FBS or 5% FBS for 5 days, and then treated with 0, 10, 20, and 50 nM of sodium selenite for 24 h. QRT-PCR and western blotting were used to detect the effect of selenium level on SelS expression. (3) The SelS gene of hypertrophic ATDC5 chondrocytes was knocked down by shRNA with lentivirus as vector, and the expression of extracellular matrix proteins and proteases were detected by RNA sequencing and western blotting.

**Results:** (1) Compared with the normal group, SelS-positive cells were significantly reduced in articular cartilages from KBD patients and rats fed with low selenium diet. (2) The mRNA and protein levels of SelS increased with selenium levels in normal (5% FBS) and low selenium (1% FBS) cultured cells. (3) RNA sequencing identified that knockdown of SelS in hypertrophic ATDC5 chondrocytes led to the decreased gene expression of *Col11a2*, *Col1a1*, *Col1a2*, *Col20a1*, *Col2a1*, *Col6a2*, while the gene expression levels of *Mmp3*, *Mmp10*, *Mmp13*, *Mmp19* were increased. Furthermore, western blotting results showed that the protein levels of MMP13 and MMP19 were increased, and the levels of COLII were decreased in hypertrophic ATDC5 chondrocytes with knockdown SelS.

**Conclusion:** Reduced expression of SelS under low selenium conditions led to degradation of extracellular matrix, which may be involved in KBD cartilage damage.

**Keywords:** Kashin-beck disease, Selenoprotein S, Extracellular matrix degradation, Low selenium condition

## **6-6 Research on the current status of anxiety during pregnancy and its influencing factors: the mediating effect of family care and the moderating effect of pre-pregnancy BMI**

Wang Rui

Ningxia Medical University School of Public Health and Management

Email:wangrui990224@163.com

**Objective:** To explore the status of anxiety of pregnant women during pregnancy in Yinchuan, Ningxia Hui Autonomous Region, the relationship between pregnancy anxiety and social support, the mediating effect of family care on the relationship between pregnancy anxiety and social support, and the moderating effect of pre-pregnancy BMI.

**Methods:** A questionnaire survey was conducted among 1258 pregnant women recruited in a hospital in Yinchuan City using a self-designed general demographic information questionnaire, Pregnancy-related Anxiety Questionnaire (PAQ) and Perceived Social Support Scale (PSSS) and the family adaptation, partnership, growth, affection and resolve (APGAR) questionnaire.

**Results:** Anxiety was related to gestational age, family care, social support, and pregnancy intention ( $P < 0.05$ ), but had nothing to do with occupation, pre-pregnancy BMI, residence, education, and personality ( $P > 0.05$ ). In this study, pregnant women's anxiety self-evaluation score was  $21.48 \pm 5.53$ , and the score of perceived social support was  $46.37 \pm 8.383$ ; the score of family caring was  $6.85 \pm 2.17$ . Pregnant women's family caring degree played a partial mediating role between anxiety and social support during pregnancy, with an effect size of 32.95%. Pre-pregnancy BMI played a partial moderating role between social support and family caring degree.

**Conclusion:** This study found that the family caring degree of pregnant women played a partial mediating role between anxiety and social support during pregnancy, and pre-pregnancy BMI played a partial moderating role between social support and family caring degree.

**Keyword:** Pregnant women; Anxiety; Family care; The mediation effect; Moderating effect

## **6-7 CIRBP attenuates hypoxia-induced mitochondrial dysfunction and brain memory disorder**

Xue Chong

Department of Occupational and Environmental Health, Fourth Military Medical University

E-mail: xuechong456@fmmu.edu.cn

**Objective** To determine the role of CIRBP in hypoxia-induced brain memory disorder and elucidate its molecular mechanism/s.

**Methods** Human SY5Y and murine HT22 cells were exposed to hypoxia (1% O<sub>2</sub>) for 24 h, and analogously, C57BL/6 male mice were challenged to hypobaric hypoxia exposure (simulated altitude of 6000 m) for 3 weeks to assess the exposure effects on energy production, oxidative stress, cognition and memory retention. The overexpression and knockdown cell-lines and animal model were established to explore the role of CIRBP in this process. Finally, the underlying mechanism were revealed by bioinformatics analysis and RNA-IP experiments.

**Results** Hypoxic exposure engendered increased ROS level, reduced respiratory chain complexes II (SDHB) and IV (MT-CO1) expression, attendant decreased ATP production in vitro, and poorer cognition and memory performance in vivo. Notably, hypoxia triggered less CIRBP expression in both in vitro and in vivo models. Furthermore, the overexpression and knockdown experiments revealed that CIRBP could sustain protein expressions of respiratory chain complexes II (SDHB) and IV (MT-CO1), rescue insufficient ATP production, attenuate hypoxia-induced oxidative stress, and thus protect brain from memory disorders. The RNA-IP experiments suggested Atp5g3 as the candidate target of CIRBP.

**Conclusion** Our data established CIRBP as a critical protective factor against hypoxia-induced mitochondrial dysfunction and brain memory disorder.

**Key words:** Hypoxia; Mitochondrial dysfunction; Cognition and memory; Cold inducible RNA-binding protein

## 6-8 Green space and health in China: evidence from several large-scale epidemiological studies

Bo-Yi Yang

Department of Occupational and Environmental Health, School of Public Health, Sun Yat-Sen University

Email: yangby23@mail.sysu.edu.cn

**Objectives:** With rapid urbanization, nature vegetation covers have been substantially destroyed, and thus urban dwellers' access to green space was reduced and challenged. Accumulative studies have examined the associations between greenness and various health outcomes in western countries, but such evidence is scarce in China. We thus aimed to explore if there exist associations between green space and health in Chinese population.

**Methods:** We conducted several large scale epidemiological studies across China, which mainly included “the 33 Communities China Health study”, “the Seven Northeastern Cities Study”, “National Children Health Study”, and “the Guangdong Registry of Congenital Heart Disease”. Outcomes we assessed included adult and children's cardiovascular health, children's visual acuity and mental health, and infant's heart health. Greenness exposure was assessed using two vegetation index including the normalized difference vegetation index and the soil-adjusted vegetation index. We fitted GLIMMIX model to assess the associations between greenness and health outcomes, and secondary analyses including stratified analyses and mediation analyses were also performed.

**Results:** In adults, we observed that greater levels of greenness exposure was associated with lower odds of hypertension, dyslipidemia, diabetes, and cardiovascular diseases. In children, we also observed beneficial associations between greenness levels and visual acuity, attention-deficit/hyperactivity disorder, blood pressure, blood lipids, and obesity. In infants, we found that maternal exposure to higher greenness levels was associated with lower odds of congenital heart disease. In addition, air pollution levels partly mediated the above associations.

**Conclusion:** Our findings indicate that living in greener areas may bring various benefits to our health, and part of the effects may be via reducing ambient air pollutants. These findings may be helpful for developing strategies of diseases prevention and urban green space plan.

**Key words:** Greenness, Health, Epidemiology, Chinese

## 6-9 Associations between PM<sub>2.5</sub> Exposure and Alzheimer's Disease prevalence Among elderly in eastern China

Yang Li

Zhejiang Hospital

E-mail:619858830@qq.com

**Background:** Studies showed that PM<sub>2.5</sub> might be associated with various neurogenic diseases such as Alzheimer's Disease (AD). However, this topic had been little studied in Zhejiang province of China.

**Methods:** In 2018, we established a cohort of AD high-risk population with 1742 elderly aged 60 and above. In 2020, the cohort was followed up, a total of 1545 people participated the 2 surveys. Data collection included questionnaires and basic physical examinations. The average residential exposure to PM<sub>2.5</sub> for each participant, that in a 5-years period prior to the first survey, was estimated using a satellite-based spatial statistical model. We determined the association between PM<sub>2.5</sub> and AD prevalence by cox proportional hazards regression model.

**Results:** This study showed that PM<sub>2.5</sub> was an important factor that contributed to AD, and the average PM<sub>2.5</sub> exposure levels among the study population ranged from 32.69 $\mu\text{g}/\text{m}^3$  to 39.67 $\mu\text{g}/\text{m}^3$  from 2013 to 2017, which were above 10 $\mu\text{g}/\text{m}^3$  that specified in the WHO air quality guidelines. There was an association between PM<sub>2.5</sub> exposure and AD, and the correlations between PM<sub>2.5</sub> and Mini-Mental State Examination (MMSE), Montreal cognitive assessment scale (MoCA) scores were statistically significant. An increase in the PM<sub>2.5</sub> level by 10 $\mu\text{g}/\text{m}^3$  elevated the risk of AD among residents by 2%-5% (HR=1.02 to 1.05). The subgroups of male, with old age, with low education levels, used to work as farmers or blue-collar workers before retirement, overweight and obese were associated with a higher effect of PM<sub>2.5</sub>.

**Conclusions:** There was a suggestion that reducing PM<sub>2.5</sub> exposure might be a good way to prevent AD.

**Key words:** Alzheimer's Disease, PM<sub>2.5</sub> exposure, Association

## 6-10 Study on the Mechanism of Notch signaling Pathway on Kashin-Beck disease

Di Zhang<sup>1</sup>, Dandan Zhang<sup>1</sup>, Xiaoli Yang<sup>1</sup>, Qiang Li<sup>1</sup>, YongMin Xiong<sup>1\*</sup>

<sup>1</sup> Institute of Endemic Diseases and Key Laboratory of Trace Elements and Endemic Diseases, National Health Commission of the People's Republic of China, School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi 710061, P.R. China.

\* Corresponding author: Yongmin Xiong, PhD, Professor. Institute of Endemic Diseases, School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi 710061, P.R. China.

E-mail address: xiongym@mail.xjtu.edu.cn.

**Objectives:** Kashin-Beck disease (KBD) is a food-sourced osteoarthropathy caused by environmental factors-environmental response genes and their interaction, and selenium (Se) deficiency is an environmental risk factor for KBD. Studies showed Notch signaling pathway plays a vital role in regulating cartilage development and occurrence, chondrocyte proliferation and differentiation but its exact mechanisms in KBD remain unknown. This study aims to explore the mechanism of the Notch signaling pathway in the pathogenesis of KBD, and further search for new molecular targets for the early diagnosis, warning and treatment of KBD.

**Method:** The Se contents in the flour samples were determined using the hydride atomic fluorescence spectrometry (AFS) assay technique. The mRNA levels in KBD patients and cultured chondrocytes were detected via qRT-PCR. The chondrocyte injury models were established by Se deficiency and hydrogen peroxide tert butyl alcohol (tBHP), respectively. Apoptosis and necrosis rates were detected using Hoechst 33342/PI.

**Results:** The results showed that the selenium levels in the flour of the KBD group were significantly lower than that of the control group ( $P=0.0034$ ). The notch signaling pathway (*NOTCH1/JAG1/HES1*) was activated in patients with KBD ( $P=0.0457$ ,  $P=0.0480$ ,  $P=0.0431$ ) and *NOTCH1* was negatively correlated with the expression level of *BCL-2* gene ( $R^2=0.5999$ ,  $P=0.0143$ ), and the mRNA level of *NOTCH1* was positively correlated with the expression level of *BAX-2* gene ( $R^2=0.5931$ ,  $P=0.027$ ). The expression of Notch signaling pathway increased ( $P=0.0019$ ,  $P=0.0056$ ,  $P=0.0412$ ), and chondrocyte apoptosis and necrosis increased ( $P<0.0001$ ) in Se deficiency group, while Se supplementation reversed it ( $P=0.0110$ ,  $P=0.0033$ ,  $P=0.0358$ ;  $P<0.0001$ ).

**Conclusions:** Se deficiency may be involved in the occurrence and development of KBD by activating the Notch signaling pathway to induce excessive apoptosis of chondrocytes, and appropriate Se supplementation could reverse it. The importance of Notch signaling pathway in the development of KBD provides a new potential target for KBD treatment. (This study was supported by the National Natural Science Foundation of China 82073494, 81773372).

**Keywords:** Kashin-Beck disease; Notch signaling pathway; Selenium; Chondrocyte apoptosis.



## 6-11 Association of plasma cytokines with indoor airborne PAEs and urinary phthalate metabolites in Healthy Young Adults: A Randomized, Double-Blind Crossover Trial of Air purification

Bingxiao Li,<sup>a,1</sup> Jing Huang,<sup>b,1</sup> Shaowei Wu,<sup>c,\*</sup> Ling Zhang,<sup>a,\*</sup>

<sup>a</sup> Department of Epidemiology and Health Statistics, School of Public Health, Capital Medical University, and Beijing Municipal Key Laboratory of Clinical Epidemiology, Beijing, 100069, China

<sup>b</sup> Department of Occupational and Environmental Health Sciences, School of Public Health, and Key Laboratory of Molecular Cardiovascular Sciences of Ministry of Education, Health Science Center, Peking University, Beijing, 100191, China

<sup>c</sup> Department of Occupational and Environmental Health, School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi, 710061, China  
Email: shaowei\_wu@bjmu.edu.cn

**Background:** Phthalic esters (PAEs) are a group of chemical plasticizers and have been health risks worldwide. However, little studies explored the associations between indoor airborne PAEs exposure and plasma cytokines.

**Objectives:** The present study was conducted to investigate the effect of internal and external PAEs exposures on plasma cytokines.

**Methods:** A randomized, double-blind crossover trial was conducted among 46 healthy young adults in Beijing. The health measurements and 38 cytokines were tested under real and sham air purification with at least 2 weeks washout interval. The external exposure (indoor airborne PAEs) and internal (urinary phthalate metabolites, mPAEs) of PAEs were determined by gas chromatography-orbit ion trap mass spectrometry. Associations between PAEs and cytokines were estimated by two-level generalized linear mixed models adjusted by personal weighted PM<sub>2.5</sub> exposures, indoor airborne ozone, total volatile organic compounds (TVOC) and meteorological factors.

**Results:** Air purification was significantly decreased with 90.6% of indoor airborne PAEs and slightly decreased with 7.0% of urinary mPAEs. Each IQR increase of airborne DMP and metabolite of DMP (mMP) were associated with plasma MCP-1, the percent change and 95%CI were 8.64% (1.57%, 16.21%) and 4.58% (0.07%, 9.30%), respectively. There were statically positive correlations between airborne DMPP, DEEP, DHP, BBP, DBEP and plasma MCP-1; DEEP, DBEP and Eotaxin; DHP, DMP and MIP-1 $\alpha$ ; DBEP and IL-13, the percent change and 95%CI of cytokines was ranged from 0.26% (0.04%, 0.47%) to 11.69% (0.36%, 24.3%), and negative association between airborne DMP, DMEP, DEHP, DMPP, DEEP, BBP, DNOP,  $\Sigma$ PAEs with IP-10 and DEEP, BBP, DBEP with GRO- $\alpha$ , the percent change and 95%CI of cytokines was ranged from -12.19% (22.03%, -1.10%) to -0.60% (-1.16%, -0.04%). Each IQR increase of  $\Sigma$ mPAE was significantly associated with increase of 12.93% (95%CI: 0.19%, 27.29%) and 3.58% (95%CI: 0.05, 7.23%) in IL-1RA and TNF- $\alpha$ , respectively. There were positive associations between mEHP and EGF, FGF-2, Fractalkine, IFN- $\alpha$ 2, IFN- $\gamma$ , IL-17A, MCP-1, MIP-1 $\alpha$ , MIP-1 $\beta$ , TNF- $\alpha$ , VEGF; mMP and EGF, IL-1RA, MCP-1, MIP-1 $\beta$ , VEGF; mBP and TNF- $\alpha$ ; mBzP and eotaxin, the percent change and 95%CI of

cytokines was ranged from 3.58% (0.05%, 7.23%) to 52.89% (15.12%, 103.05%).

**Conclusions:** We found significant associations between both external and internal PAEs exposure with levels of plasma cytokines, and air purification might reduce the external PAEs exposure but not internal PAEs exposure.

## **6-12 Maternal personality traits and pregnancy-related anxiety: the mediating effect of social support**

Zhu Jiashu;

Ningxia medical university

E-mail: 2652565079@qq.com

**Objective:** To explore the role of social support as a mediating factor in the relationship between maternal personality and pregnancy-related anxiety.

**Methods:** A total of 1259 singleton pregnant women who underwent prenatal examination in the department of Obstetrics in a affiliated hospital of Ningxia Medical University from July to December 2021 were selected as the research subjects. The social support, pregnancy-related anxiety and self-conscious personality traits were investigated, and then univariate analysis and correlation analysis were performed with SPSS software, and the mediating effect was verified by Bootstrap method.

**Results** (1) 170 pregnant women (13.5%) describe themselves as introverted; The total score of social support was  $46.37 \pm 8.38$  (60 points), and 68.5% of pregnant women had low or medium social support level. The total score of related anxiety was  $21.48 \pm 5.53$  (52 point), the score of concern about fetal health was  $10.09 \pm 3.24$  (20 point), and 368 (29.2%) pregnant women had pregnancy-related anxiety. (2) Pregnant women with only child, urban family, higher educational level, regular job, extroversion and planning pregnancy had higher overall social support, and the difference was statistically significant ( $P < 0.05$ ). Pregnant women with different personalities and pregnancy intentions had statistically significant differences in pregnancy-related anxiety ( $P < 0.05$ ), and the anxiety scores of pregnant women with introversion and unintended pregnancy were higher than those of other pregnant women. (3) Personality traits of pregnant women were negatively correlated with pregnancy-related anxiety ( $r = -0.076$ ,  $P < 0.05$ ), and it was positively correlated with social support during pregnancy ( $r = 0.127$ ,  $P < 0.05$ ). Social support during pregnancy was negatively correlated with pregnancy-related anxiety ( $r = -0.236$ ,  $P < 0.05$ ). (4) Social support partially mediated the relationship between personality traits and pregnancy-related anxiety, with a relative effect value of 38.39%.

**Conclusion** Social support plays a role in the occurrence of pregnancy-related anxiety among pregnant women with different personality traits. Therefore, attention should be paid to the level of social support of introverted pregnant women to reduce the proportion of pregnancy-related anxiety.

## 6-13 Intertwined Pathways Linking Street-view and Satellite-based Greenness to Physical and Mental Health through Key Health-related Behaviors

Ting Zhang

School of International and Public Affairs, Shanghai Jiao Tong University

E-mail: tingzhang@sjtu.edu.cn

**Aims:** The study addressed three important research questions: 1) How does residential greenness influence physical and mental health through several key health-related behaviors; 2) Does residential greenness affect eating, drinking and smoking directly or indirectly through PA behaviors; and 3) What is difference between greenness–behaviors–health pathways of street-view greenness with two satellite-based greenness metrics.

**Methods:** Using cross-sectional survey data of 1,977 adults in Hong Kong together with objective environmental data, this study examined the mediating role of six health-related behaviors (i.e., vigorous physical activity [VPA], moderate physical activity [MPA], prolonged sitting, infrequent fruit and vegetables [FV] consumption, drinking and smoking) on the associations between residential greenness and health. We tested the same serial mediation models with three greenness metrics (street-view greenness by Google Street View images and two satellite-based greenness metrics (Normalized Difference Vegetation Index (NDVI) and greenspace density by GlobeLand30)) based on a novel conceptual model.

**Results:** Street-view greenness and NDVI shared the same pathway of reducing poor physical health through less infrequent FV consumption. Street-view greenness also reduced poor physical health through less prolonged sitting and then less infrequent FV consumption. Street-view greenness and greenspace density shared the same pathway of reducing poor mental health through less drinking. Street-view greenness could also reduce poor mental health through less prolonged sitting. No evidence was found that greenness could reduce mental or physical health through MPA, VPA or smoking directly.

**Conclusions:** The findings of this study indicate passive exposure to greenness could be beneficial to health through reducing drinking and infrequent FV consumption directly, regardless of physical activity behaviors. Street-view greenness presents more pathways to health than NDVI and greenspace density. We advise policymakers to introduce multiple residential greenness metrics, especially street-view greenness, in urban planning standards and construct multilevel green networks in communities.

**Keywords:** Street-view greenness; sitting; eating; drinking; physical activity

### **7-1 A study on family kinship maintenance of the elderly in old-age care institutions**

Gong Baofa

The School of Communication, Shenzhen University.

E-mail: 1768167642 @qq.com

While the material life of the elderly has been improved, the problems of spiritual comfort and emotional needs have become increasingly prominent. As a "separated family" in a special context, the vision of "three generations living together" in the nursing home can realize "online coexistence" with the help of mobile phones, but the lack of family structure makes what kind of problems they are facing in their inner or spiritual world worth thinking about. From the perspective of "the elderly as the core", this paper takes a high-end elderly care institution in Shenzhen as the field and explores how the elderly maintain family affection with the help of wechat through qualitative research methods such as in-depth interview and participatory observation, combined with the three-law framework of ICT media universal co-appearance. The study found an interesting phenomenon, that is, the elders and their family members' daily interaction patterns were mostly text > voice > video.

**Key words:**pension institutions;The elderly;;WeChat;;Family transmission;Online family bonding

## 7-2 Hierarchical and nested relationship between depression, quality of life, social support and marriage and suicide risk for the elderly in rural China: A machine learning analysis of psychological autopsy data

Yourong Cao<sup>a</sup>, Xinguang Chen, PhD<sup>b</sup>, Cunxian Jia, PhD<sup>c</sup>, Liang Zhou, MD, PhD<sup>d</sup>, Zhenyu Ma, PhD<sup>a</sup>

<sup>a</sup> Guangxi Medical University, Nanning, Guangxi, China

<sup>b</sup> University of Florida, Gainesville, Florida, USA

<sup>c</sup> Shandong University, Jinan, Shandong, China

<sup>d</sup> The Affiliated Brain Hospital of Guangzhou Medical University, Guangzhou, Guangdong, China

E-mail: 984163404@qq.com

**Objective:** to identify the factors related to suicide for old adults in rural China using machine learning approach, mechanisms underpinning the complex relationship between risk factors and suicide risk, advance our understanding of suicide and better inform evidence-based precision interventions.

**Methods:** A case-control suicide study with psychological autopsy among rural residents aged 60 years and older, using a two-stage stratified cluster sampling method to select study sites and participants, collecting 242 subjects who died by suicide and 242 matched the living control group. Using a classification and regression tree of stepwise exclusion (CART) to detect potential mechanisms by which risk factors are associated with suicide, the results of CART and multivariate logistic regression were compared.

**Results:** Of the total sample, 270 (55.8%) were male with mean age =74.2 (SD=8.2) years old. Four CART models were established each consisting of a lead predictor plus 8-10 factors hierarchically nested to predict suicide. Depression was the lead predictor for Model 1 (AUC=0.96, sensitivity=0.95, specificity=0.91). After exclusion of depression, quality of life (QOL) became the lead for Model 2. After exclusion of depression and QOL, social support became the lead for Model 3. After exclusion of depression, QOL and social support, marital status became the lead for Model 4. Factors not significantly associated with suicide from multivariate logistic regression were important from CART.

**Conclusion:** The relationship between multiple risk factors and suicide for Chinese rural elderly is not linear but hierarchically nested. Findings of this study provide new and compelling evidence supporting tailored precision interventions at the clinical and community levels.

**Keywords:** Suicide; Rural Chinese; Machine learning; Depression; Quality of life; Social support

### 7-3 Analysis of hotspots in smart elderly care research

Yuqi Wang , Hongman Wang

Yuqi Wang, master degree candidate, The School of Health Humanities, Peking University Health Science Center

Hongman Wang, professor, The School of Health Humanities, Peking University Health Science Center, Corresponding author,

E-mail:2011210184@bjmu.edu.cn ;pkuwhm2006@163.com

**Objective:** To analyze the research hotspots of smart elderly care, this paper conducts a bibliometric analysis of English articles on smart elderly care research.

**Methods:** Using the Web of Science core collection as the data source, a total of 2141 English papers published before 31 October, 2021 were obtained, and 1699 valid papers were finally included for analysis. The information such as time, country, and keywords were extracted using SATI software, and the knowledge map was drawn with COOC.

**Results:** From the perspective of the time distribution of literature, the research on smart elderly care can be roughly divided into two stages: 1997-2014 and 2015-2021, the former has less than 100 annual publications, while the latter has more than 100; the top three countries in terms of the number of publications are the United States, China, and the United Kingdom; the research hotspots of smart elderly care are divided into the following five aspects: smart home, aging in place, information technology, fall detection, and health monitoring.

**Conclusion:** On the whole, the research on smart elderly care has become increasingly popular. To cope with the increasing population aging, the role of science and technology in the elderly population should be fully utilized. More research is needed in the field of smart elderly care in the future.

**Keywords:** smart elderly care; bibliometric analysis; hotspot

## 7-4 Reliability and validity of Barratt Impulsiveness Scale-11 in psychological autopsy study among Chinese rural elderly

Xinyu Bai<sup>1</sup>, Cunxian Jia<sup>2</sup>, Liang Zhou<sup>3</sup> and Zhenyu Ma<sup>1</sup>

<sup>1</sup> Department of Social Medicine, School of Public Health, Guangxi Medical University, Nanning, China

<sup>2</sup> Department of Epidemiology, School of Public Health, Shandong University, Jinan, China

<sup>3</sup> Department of Social Psychiatry, The Affiliated Brain Hospital of Guangzhou Medical University (Guangzhou Huiai Hospital), Guangzhou, China

E-mail: bai\_xinyu2020@163.com; ma\_zhenyu@gxmu.edu.cn

**Objectives:** This study aimed to evaluate the reliability and validity of the Barratt Impulsiveness Scale-11 (BIS-11) as used in psychological autopsy method with rural elderly in China.

**Methods:** Two-stage stratified cluster random sampling was used to select research sites. A total of 12 counties in Guangxi, Hunan and Shandong were used as the survey locations. Data for people aged  $\geq 60$  years who had died by suicide were consecutively collected based on the death certification system. Living comparisons were 1:1 matched with the suicide case in age and gender in the same village. The Spearman correlation method was used to analyze the correlation between each item of the total score. Intraclass correlation coefficient (ICC) was used to evaluate the agreement between subject based and informants based. Cronbach's Alpha coefficients was used to analyze internal consistency reliability. Structural validity was analyzed by exploratory factor analysis and confirmatory factor analysis were used to analyze the construct validity.

**Results:** A total of 242 suicide elderly and 242 living control elderly were conducted. The total score of impulsivity scale of suicidal elderly was higher than the control group. Subject-proxy concordance for BIS-11 was fair (ICC=0.475) in the living controls. The corrected correlation coefficient between items and total score were 0.146-0.734. The Cronbach's  $\alpha$  was 0.913, with good reliability. The KMO value in exploratory factor analysis was 0.951. In confirmatory factor analysis, the  $\chi^2/df$  was 2.423, RMSEA was 0.054, GFI was 0.916, IFI was 0.916, and TLI was 0.909, indicating that the scale has good construct validity.

**Conclusions:** The information provided by the informants through psychological autopsy method had high reliability to reflect the actual situation of suicides and controls. The BIS-11 scale has good reliability and validity in rural suicidal elderly and community elderly in rural China.

**Keywords:** suicide, impulsivity, psychological autopsy

## 7-5 Life course circumstances contribute differently to the acceleration of phenotypic and functional aging in Chinese middle-aged and older adults

Xingqi Cao<sup>1#</sup>, Chao Ma<sup>2#</sup>, Zhoutao Zheng<sup>1</sup>, Liu He<sup>1</sup>, Meng Hao<sup>3</sup>, Xi Chen<sup>4,5</sup>, Eileen M. Crimmins<sup>6</sup>, Thomas M. Gill<sup>7</sup>, Morgan E. Levine<sup>8</sup>, Zuyun Liu<sup>1\*</sup>

<sup>1</sup>Center for Clinical Big Data and Analytics, Second Affiliated Hospital and Department of Big Data in Health Science, School of Public Health, Zhejiang University School of Medicine, Hangzhou, Zhejiang, China

<sup>2</sup>School of Public Health, Southeast University, Nanjing, Jiangsu, China

<sup>3</sup>Ministry of Education Key Laboratory of Contemporary Anthropology, Department of Anthropology and Human Genetics, School of Life Sciences, Fudan University, Shanghai, China

E-mail: [Zuyun.liu@outlook.com](mailto:Zuyun.liu@outlook.com)

**Objective:** Accelerated aging implies health inequalities in late life and consequently, poses a huge challenge to the society. With two well-developed aging measures, this study aimed to evaluate the relative contributions of life course circumstances to variance in these aging measures with policy implications.

**Methods:** We assembled data for 6224 middle-aged and older adults ( $\geq 45$  years) who participated in the 2014 life course survey, the 2015 biomarker collection, and the 2015 main survey of the China Health and Retirement Longitudinal Study (CHARLS). Two aging measures, including physiological dysregulation (PD) and frailty index (FI), were calculated. Life course circumstances, i.e., 70 circumstances variables involving childhood and adulthood circumstances, demographics, and behaviors, were categorized into 11 study domains for simplicity. The Shapley value decomposition, hierarchical clustering, and general linear regression models were performed.

**Results:** The Shapley value decomposition revealed that all 11 study domains accounted for about 6.3% and 29.7% of the variance in PD and FI, respectively. We then identified six subpopulations who shared similar patterns in terms of childhood and adulthood circumstances. One subpopulation (i.e., red) who reported experiencing more childhood and adulthood adversity consistently exhibited accelerated aging indicated by the two aging measures. Relative to the turquoise subpopulation (i.e., advantaged), PD and FI in the red subpopulation (i.e., disadvantaged) were increased by an average of 0.14 (standard error [SE]=0.04,  $P<0.001$ ) and 0.10 (SE=0.01,  $P<0.001$ ), respectively.

**Conclusion:** Life course circumstances contribute differently to the acceleration of phenotypic and functional aging in Chinese middle-aged and older adults. Special attention should be given to promoting health for the disadvantaged subpopulation and narrowing their health gap with advantaged counterparts. Our findings highlight the potential of life course management in ameliorating health inequalities in late life.

**Key words:** Aging measures; Frailty index; Life course; Physiological dysregulation.



## 7-6 Association of Pain and Sleep Duration in Rural Elderly of northwestern China

Xuejiao Zeng<sup>1</sup>, Liansheng Li<sup>2</sup>, Xiaoming Liu<sup>1</sup>, Jinli Mahe<sup>1</sup>, Kai Guo<sup>1</sup>, Lipeng Jing<sup>1</sup>

<sup>1</sup>Institute of Epidemiology and Statistics, School of Public Health, Lanzhou University, Lanzhou, 730000, Gansu Province, China

<sup>2</sup>Jing Yuan County Hospital of Traditional Chinese Medicine, Baiyin, 730900, Gansu Province, China

Email address: jinglp@lzu.edu.cn

**Background:** Pain is under-detected and undertreated in rural elderly, and the evidence of relationship between pain and sleep is scarce. The present study is aimed to investigate the prevalence of pain in elderly in rural of northwestern China and the association between pain and sleep duration.

**Methods:** 1508 adults aged 60 or older were included in this observational study and completed present pain intensity (PPI) to elicit the prevalence and characteristics of the pain. Chi-square tests were used to compare prevalence rates between groups. Differences in sleep duration between subgroups in demographic features were performed using the t-test or analysis of variance. A multivariate regression analysis was performed to evaluate the associations among pain and the sleep duration.

**Results:** The prevalence of pain was 63.3% among the elderly in rural areas of northwestern China in our research, the prevalence of pain was significantly higher in women than in men (73.0% vs 48.7%,  $P < 0.05$ ). The pain level was divided into six grades according to PPI (no pain, mild, discomforting, distressing, horrible, excruciating), and analysis of variance showed that there was significant difference in the sleep duration of each group, which were 8.04, 8.25, 7.63, 7.52, 7.53 and 6.59 hours, respectively. Multiple linear regression results show that in either the unadjusted model ( $\beta = -0.133$ ,  $P < 0.001$ ), crude adjustment model ( $\beta = -0.062$ ,  $P < 0.05$ ) or fully adjusted model ( $\beta = -0.061$ ,  $P < 0.05$ ), there was a significant correlation between pain and sleep duration.

**Conclusion:** Pain is highly prevalent in the rural elderly population, and pain is negatively correlated with sleep duration among the elderly significantly, which indicates that collaborative action should be taken to improve pain and sleep state in older adults.

**Key words:** pain; elderly; sleep; northwestern China

## 7-7 Effects of social capital on the psychological status of rural elderly patients with hypertension from the perspective of gender

CHANG Lele<sup>1,2\*</sup>, LIU Xinyu<sup>1,2</sup>, ZHANG Shuo<sup>1,2</sup>, FU Yingjie<sup>1,2</sup>, SUN Xiaojie<sup>1,2</sup>

Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University, No.44 Wenhuxi Road, Jinan 250012, Shandong, China.

E-mail: xiaojiesun@sdu.edu.cn

**Objective:** To analyze the gender differences in the effects of social capital on the psychological status of rural elderly patients with hypertension, based on the perspective of social capital theory of “social network resource view”.

**Methods:** According to the level of economic development, 960 elderly hypertensive patients aged 60 and over were randomly selected from 36 administrative villages in 3 different counties (cities, districts) in the east, middle and west of Shandong Province from June to July, 2021. A questionnaire survey was conducted using Kessler Psychological Distress Scale 10 (K10) and “Resource Generator” scales to assess their psychological status and social capital state. Ordinal logistic regression was used to analyze the gender differences in the influence of social capital on the psychological status of elderly hypertensive patients.

**Results:** Rural male elderly hypertensive patients and female elderly hypertensive patients had different expert consultation resources, and the difference was statistically significant ( $P < 0.01$ ); rural male elderly hypertensive patients and female elderly hypertensive patients had different mental health status, the difference was statistically significant ( $P < 0.01$ ); Ordinal polytomous Logistic regression analysis showed that overall social capital had an impact on the mental health of rural male and female elderly hypertensive patients ( $OR = 0.93$ , 95%CI 0.89-0.98,  $P < 0.05$ ) ( $OR = 0.90$ , 95%CI 0.87-0.94,  $P < 0.05$ ), and the influence of total social capital on the mental health of rural female hypertensive patients was greater than that of rural male elderly patients; the influence of the mental health status of hypertensive patients was statistically significant ( $OR = 0.80$ , 95%CI 0.68-0.94,  $P < 0.05$ ), and the influence of daily life resources on the mental health status of rural female hypertensive patients was statistically significant ( $OR = 0.86$ , 95%CI 0.78-0.95,  $P < 0.05$ ).

**Conclusion:** The mental health status of male in rural elderly hypertensive patients is better than that of female; there are gender differences in the influence of total social capital and daily life resources on the mental health of rural elderly hypertensive patients. Moreover, the influence of female patients' mental health status is more significant, and daily life resources only promote the mental health status of rural female elderly hypertensive patients.

**Keywords:** social capital; Psychological status; Elderly hypertensive; Rural; Gender

## 7-8 The Association of Age at Diagnosis of Hypertension With Cognitive Decline: The China Health and Retirement Longitudinal Study (CHARLS)

Linlin Ding<sup>1</sup>, Xinhong Zhu<sup>1\*</sup>, Fen Yang<sup>1</sup>, Zhenfang Xiong<sup>1</sup>, Xiaona Zhang<sup>1</sup>

<sup>1</sup>School of Nursing, Hubei University of Chinese Medicine, Wuhan 430065

Email: [zxh88@hbtcmm.edu.cn](mailto:zxh88@hbtcmm.edu.cn)

**Aim:** This study investigated whether an individual's age at diagnosis of hypertension is associated with a decline in cognitive performance in CHARLS participants.

**Methods:** Our analysis was based on the CHARLS with baseline data collected between 2011 and 2018. This longitudinal study included 2413 participants, mean age 68.3 years at baseline (2011), who attended visit 2(2013), visit 3(2015) and visit 4(2018). Participants were divided into two groups. (Hypertension diagnose  $\geq 55$  years, hypertension diagnose  $< 55$  years) Cognitive performance was measured in both visits and evaluated by the scores of the memory, executive function, and orientation and global cognitive Z score. The associations were investigated using Generalized linear mixed models.

**Results:** After multivariable adjustment, compared to hypertension diagnose  $\geq 55$  years group, hypertension diagnose  $< 55$  years had lower memory test, orientation test and global scores. Individuals with hypertension diagnosed  $< 55$  years had a significantly faster cognitive decline in memory test scores ( $\beta$  (95%CI, -0.051 [-0.019 to -0.011]), orientation test scores ( $\beta$  (95%CI, -0.128 [-0.224 to -0.033]) and global scores ( $\beta$  (95%CI, -0.044 [-0.085 to -0.003]) than that in the hypertension diagnose  $\geq 55$  years group. A longer hypertension duration was associated with worse memory test ( $\beta$  (95%CI, 0.026 [0.009 to 0.042]), orientation test ( $\beta$  (95%CI, 0.011 [0.005 to 0.017]) and global scores ( $\beta$  (95%CI, 0.005 [0.003 to 0.008]) but not with executive function.

**Conclusions:** In this relatively old cohort, age at diagnosis of hypertension is independent predictor of cognitive decline in distinct cognitive abilities. Individuals in the hypertension diagnose  $\geq 55$  years group did not experience significantly faster cognitive decline compared with those in the hypertension diagnosed  $< 55$  years group. Our findings suggest that hypertension diagnosed in young adulthood or mid-life, and duration of diagnosis, but not in late life is associated with cognitive decline in different abilities.

**Keywords:** Blood pressure, Hypertension, Cognitive dysfunction

## 7-9 A Study on Relationship between Social Capital, Health and Subjective Well-being among Rural Elderly Patients with Hypertension in China

FU Yingjie<sup>1,2</sup>, SUN Xiaojie<sup>1,2</sup>

<sup>1</sup>Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University, Shandong Jinan 250012, China

<sup>2</sup>NHC Key Lab of Health Economics and Policy Research( Shandong University), Shandong Jinan 250012, China

Email:18363019838@163.com

**Objective:** The pursuit of health and happiness are the two eternal themes of human beings. In the context of national strategy healthy China and actively coping with population aging, it is significant to study the relationship of social capital, health and subjective well-being among elderly patients with hypertension in rural area.

**Methods:** Using multistage cluster sampling, a face-to-face questionnaire survey was conducted among rural elderly patients with hypertension in Shandong province, from May to July, 2021. Based on the survey data of 950 rural elderly patients with hypertension, this paper empirically analyzed the relationship of social capital, health and subjective well-being among rural elderly patients with hypertension by using Binary Logistic and Karlson-Holm-Breen (KHB) model.

**Results:** The results of Binary Logistic regression analysis showed that different types of social capital had different effects on the health and subjective well-being of rural elderly hypertensive patients. Expert consultation resource is important factor affecting the health ( $\beta=0.131$ ,  $P<0.05$ ,  $OR=1.140$ , 95%  $CI=1.030\sim1.261$ ) and subjective well-being ( $\beta=0.126$ ,  $P<0.05$ ,  $OR=1.134$ , 95%  $CI=0.990\sim1.300$ ) of rural elderly patients with hypertension. Skill resource had a significant positive effect on the health ( $\beta=0.119$ ,  $P<0.05$ ,  $OR=1.127$ , 95%  $CI=1.015\sim1.252$ ) of rural elderly patients with hypertension, but had no significant effect on subjective well-being. The mediating effect analysis showed that subjective well-being mediated the relationship between social capital and health after adjusting for potential confounding factors by propensity score matching ( $OR=1.010$ , 95%  $CI=1.001\sim1.020$ ,  $P<0.05$ ).

**Conclusions:** Different types of social capital have different effects on the health and subjective well-being of rural elderly hypertensive patients. Subjective well-being plays a partially mediating role in the relationship between social capital and health of rural elderly hypertensive patients. Improving the level of social capital of elderly patients with hypertension can not only improve their health directly, but also contribute to their health by enhancing subjective well-being.

**Key Words:** rural; elderly patients with hypertension; social capital; health; subjective well-being

## **7-10 Personal social capital and health-related quality of life among Chinese older people: a cross-sectional study on rural-urban differences**

Dongdong Jiang

Zhejiang University

Email: dongdjiang@zju.edu.cn

**Purpose:** Lower health-related quality of life (HRQoL) can result in adverse effects on the health of older people. This study aims to explore the relationship between personal social capital (PSC) and HRQoL among Chinese older people.

**Methods:** 4802 samples were included from China's Health-Related Quality of Life Survey for Older Adults 2018. The PSC, including bonding and bridging social capital (BOC and BRC), was measured by the Chinese version of the Personal Social Capital Scale (PSCS-16). The HRQoL was evaluated by the European Five Dimensions Scale (EQ-5D-3L). Linear and Tobit regression models were conducted to examine the relationship between PSC and HRQoL.

**Results:** The BOC and BRC of rural older people were significantly lower than those of urban older people. Pain/discomfort and anxiety/depression were the most significant health problems affecting the older samples. In the five dimensions, the proportion of rural older people with problems was higher than that of urban older people. Among rural older people, BOC was significantly related to self-rated health and EQ-5D utility index ( $p < 0.05$ ); while BRC was insignificantly associated with self-rated health ( $p > 0.05$ ) but related to EQ-5D utility index ( $p < 0.05$ ). Both BOC and BRC were significantly correlated with self-rated health and EQ-5D utility index ( $p < 0.05$ ).

**Conclusion:** Our study reveals older people's worrying PSC and HRQoL status. The relationship between PSC and HRQoL suggested that more social support and care of intimates should be encouraged to increase the PSC of older people, especially rural older people.

**Keywords:** the Chinese older people; personal social capital; health-related quality of life; urban-rural distribution

## 7-11 Quality of life, hopelessness, impulsivity and suicide in the rural elderly in China: a moderated mediation analysis of psychological autopsy data

Dongyang Liu<sup>1</sup>, Cunxian Jia<sup>2</sup>, Liang Zhou<sup>3</sup>, Zhenyu Ma<sup>1</sup>

<sup>1</sup>School of Public health, Guangxi Medical University, Nanning, Guangxi, China

<sup>2</sup> School of Public Health, Shandong University, Jinan, Shandong, China

<sup>3</sup>The Affiliated Brain Hospital of Guangzhou Medical University, Guangzhou, Guangdong, China

E-mail: ma\_zhenyu@gxmu.edu.cn

**Objectives:** By testing a model in which the QOL- suicide relationship was mediated by hopelessness and moderated by impulsivity in order to understand mechanisms underlying the association among quality of life (QOL), hopelessness and suicide.

**Methods:** A two-stage stratified cluster sampling method was used to select 3 out of 31 provinces in China according to GDP ranking. After ranking the counties in each province according to annual income, 242 rural suicide victims over 60 years old and 242 controls were randomly selected from 12 counties, and two informants were selected for each participant. Data provided by 968 informants were collected using standard psychological autopsy techniques, and questionnaires were administered by investigators using the Quality of Life Scale, the Despair Scale, and the Barratt Impulsivity Scale.

**Results:** Of the total sample, 55.8% were male with mean age of 74. 5 years (SD=8.2). Relative to the controls, the suicide cases were more likely to be maritally unstable, living alone, unemployed, and diagnosed with physical and mental disorders. Correlation analysis indicate that suicide was significantly correlated with QOL( $r=-0.55$ ,  $p<.01$ ) and hopelessness ( $r=0.68$ ,  $p<.01$ ), and QOL and hopelessness was also correlated ( $r=-0.71$ ,  $p<.01$ ). In addition, impulsivity was significantly correlated with QOL ( $r=-0.50$ ,  $p<.01$ ) and hopelessness ( $r=0.49$ ,  $p<.01$ ) and suicide ( $r=0.35$ ,  $p<.01$ ). Results from the moderated mediation analysis indicated that QOL was negatively associated with suicide ( $\beta=-0.141$ ,  $p<.01$ ); this association was mediated by hopelessness (indirect effect:  $\beta=0.578$ ,  $p<.01$ ), accounting for 73% of the total effect. Impulsivity significantly moderated the mediation effect from QOL to hopelessness ( $\beta=0.005$ ,  $p<.01$ ).

**Conclusions:** Study findings have confirmed the negative association between QOL and suicide with psychological autopsy data, and demonstrated the role of hopelessness in mediating the QOL-suicide relation that is further modified by impulsiveness. These findings contribute to our understanding of the suicide epidemiology among the elder in rural China, and provide information much needed for suicide prevention.

**Key words:** Suicide; Quality of life; Hopelessness; Impulsivity; Moderated mediation; Psychological autopsy.

## 7-12 Falls Risks and Related Factors for Homebound People: Evidence of Older People with Dementia in East China

Rui Min, Guan Jun Liu

School of Public Health, Huazhong University of Science and Technology

E-mail: minrui0801@hust.edu.cn

**Objective:** Falls are a major public health problem, especially for older people. This research was aimed to give a direct illustration of fall risks among homebound dementia older people in China, and to identify risk factors associated with falls, for promoting health in China's aging populations.

**Methods:** Taking the morse elderly fall risk assessment scale result as the dependent variable, basic health problems, living environment problems, social support problems, and behavioral awareness issues are independent variables, and  $\chi^2$  tests and four multivariate ordinarily ordered logistic regression models are performed.

**Results:** 931 older people with dementia were included in this study (effective rate was 89.34%). Older people with dementia with severe dementia were the most (27.9%), 16.2% of older people had fallen in the past three months, and 16.8% of them are at high risk of falling. 80-90 years old, vascular dementia, marital status, and history of falls were risk factors for cognitive function in older people ( $P < 0.05$ ); the kinds of chronic diseases, the activities of daily living, living environment, caregiver burden, caregiver knowledge, results of the Cohen Mansfield Agitation Inventory, and the Clinical Dementia Rating are protective factors for the risk of falls in older adults ( $P < 0.05$ ).

**Conclusion:** The risk of falling for homebound older people with dementia in China was high. Factors at different levels are the influencing factors of old age falls, and the interaction between the factors. Caregivers such as relatives need to pay attention to these risk factors and take appropriate measures to prevent falls.

**Keywords:** Fall Risk; Older people with dementia; Homebound care; Morse elderly Fall risk assessment

## 7-13 The effects of long-term care insurance on burdens among informal caregivers and labor force participation: a quasi-experimental study in China

Xingtong Pei<sup>1</sup>, Mingming Xu<sup>1\*</sup>

School of Public Health (Shenzhen), Sun Yat-sen University, Shenzhen, China

E-mail:15068006086@163.com, xumm27@mail.sysu.edu.cn

**Objectives:** Rapid demographic changes in the ageing China has foreseen surging demand for informal care, a major source of caregiving in China, and shrinking supply in the labor market. The long-term care insurance (LTCI) is expected to create more formal care as the substitution of informal care and to help the informal caregivers return to the labor market. However, convincing evidence still lacks in the Chinese context. The introduction of the LTCI provides us a good quasi-experimental setting to explore the above issues.

**Methods:** Drawing data from the China Health and Retirement Longitudinal Study of 2011, 2013, 2015 and 2018, this study evaluates the effects of the rollout of the first LTCI pilots on burdens among informal caregivers and household income with a staggered difference-in-differences model and propensity score matching.

**Results:** We find that the LTCI reduced the burdens among informal caregivers by 11 hours/month (spouses and children by 6.6 and 4.2 hours/month, respectively), and increased the household income by 39.2%. Heterogeneous results show that informal caregivers of the elderly with moderate and severe disabilities and with income lower than the median benefit more in terms of care burdens. In addition, the burdens among informal caregivers of the enrollees in the Urban and Rural Resident Medical Insurance (URRMI) were significantly lightened more than in the Urban Employee Basic Medical Insurance. In terms of the household income, only the households enrolled in the URRMI were significantly impacted (70.7%, larger than the whole sample).

**Conclusion:** Our findings indicate that the implementation of LTCI has indeed lightened the burdens among informal caregivers, who are possibly released into the labor market subsequently and contribute to their own household income, especially for the URRMI enrollees and people with lower income. We urge the policymakers to expand the coverage to the URRMI enrollees nationwide.

**Keywords:** Long-term care insurance, informal caregiver, labor force participation, staggered difference-in-differences, China



## 7-14 Estimating bidirectional transitions and post-reversion of mild cognitive impairment

Yao Qin, Hongmei Yu

Department of Health Statistics, School of Public Health, Shanxi Medical University,  
E-mail:yaoqin@163.com, yu@sxmu.edu.cn

**Objectives:** Various resources exist for treating mild cognitive impairment (MCI) or dementia separately as terminal events or focusing solely on a one-way path from MCI to dementia without fully understanding the natural history of dementia. Little is known about the trajectory of reversion from MCI to normal cognition (NC) and pattern of post-reversion. Our objectives were to: 1) quantitatively predict bidirectional transitions of MCI (reversion and progression), 2) explore patterns of future cognitive trajectories for post-reversion, and 3) estimate the effects of demographic characteristics, apolipoprotein E, cognitive function, ability to perform daily activities, depression and neuropsychiatric symptoms on transition probabilities.

**Methods:** We analyzed 24,220 observations from 6,651 participants with an MCI diagnosis at study entry at least two visits between June 2005 and February 2021. Defining NC and MCI as transient states and dementia as absorbing state, we used continuous-time multi-state Markov models to estimate instantaneous transition intensity between states, transition probabilities from one state to another at any given time during follow-up, and hazard ratios of reversion-related variables.

**Results:** Among the 6,651 MCI participants, there were 2,729 transitions to dementia and 1,785 transitions of reversion. For post-reversion, there were 630 transitions of re-progression to MCI and 73 transitions of re-progression to dementia. Transition intensity of re-progression to MCI for post-reversion was 0.317 (2.48-fold greater than that for MCI progression or reversion). For post-reversion participants, the probability of re-progressing to dementia increased by 2% yearly. Participants who re-progressed to MCI were likely to reverse again (probability of 40% over 15 years). Age, cognition, daily activity ability, and depression were significant predictors of the natural history of dementia.

**Conclusion:** The nature of bidirectional transitions of MCI cannot be ignored for multi-dimensional MCI research. Post-reversion participants remained at an increased risk of re-progression to MCI or dementia over the longer term.

**Key words:** Dementia, mild cognitive impairment, reversion.

## 7-15 Spatiotemporal heterogeneity in associations of national population ageing with socioeconomic and environmental factors at the global scale

Chao Song<sup>a,b,c\*</sup>, Jay Pan<sup>a,b</sup>, Mingyu Xie<sup>b</sup>

<sup>a</sup> HEOA Group, West China School of Public Health and West China Fourth Hospital, Sichuan University, Chengdu, Sichuan 610044, China

E-mail: chaosong@scu.edu.cn

Global concerted and sustained action is required under a rapid population ageing trend, while global ageing varies across countries in space and time. To support the global sustainable development and healthy ageing action, we investigate the spatiotemporal heterogeneity towards relationships between national ageing rates (percentage of the population aged 65 and older) and various socioeconomic and environmental factors for 189 countries and territories from 2001 to 2020. Bayesian spatiotemporally-varying-coefficients (STVC) modeling is applied to fit the spatiotemporal heterogeneous relationships among variables, and variance partitioning is integrated into STVC modeling to identify the relative importance (explainable percentage) of influencing factors considering their spatiotemporal heterogeneous impacts. The results showed that global ageing had increased rapidly over the past 20 years, especially after 2009, and presented significant geospatial agglomerations where Europe and Africa possessed the highest and lowest regional ageing levels. The total explainable percentages of socioeconomic and environmental aspects for global ageing were 61.85% (95% credible intervals: 58.57% – 64.9%) and 37.4% (CIs: 34.38% – 40.65%), respectively. Specifically, the cumulative explainable percentage of the top five factors with global ageing exceeded 90%, namely, male-to-female ratio, gross national income (GNI), PM<sub>2.5</sub>, normalized difference vegetation index (NDVI), and temperature. Temporally, the yearly heterogeneous impacts of education, sex ratio, physicians, and temperature were increasing year by year; in contrast, the yearly impacts of hospital beds, GNI, NDVI, PM<sub>2.5</sub>, and precipitation showed downward trends. Geospatially, the national-scale heterogeneous impacts of all factors showed substantial geographical disparities globally but significant clusters regionally. Sex ratio, national economy, air quality, greenness, and climate consistently played essential roles in four country-based groups with various ageing stages (not-ageing, ageing, aged, and hyper-aged society). Our findings focusing on spatiotemporal disparities aim to provide a leading reference for differentiated policies tailored to local conditions in response to global ageing. The environmental modeling approach of STVC-based variance partitioning can be generally applied to broader natural and social sciences to characterize the explainable percentages of space-time factors.

**Keywords:** Global population ageing; socioeconomic and environmental factors; spatiotemporal heterogeneity; space-time factors' relative importance; spatiotemporal variance partitioning; Bayesian STVC model.

## 7-16 A meta-analysis of the effectiveness of interactive situational simulation training in preventing falls in the elderly

Wang Susu<sup>1</sup>, Zhang Yinmin<sup>1</sup>, Xu Ke<sup>1</sup>, Luo Yue<sup>1</sup>, Zang Ruitao<sup>2</sup>

<sup>1</sup>Beijing Sport University, Beijing, 100084, China

<sup>2</sup>Shuxiang Primary School, Shenzhen, 518000, China

E- mail: bsususu@163.com

**Objective:** This study evaluated the effectiveness of VR in preventing falls in the elderly by conducting a meta-analysis of domestic and foreign randomized controlled trial literature on the application of VR in preventing falls in the elderly.

**Methods:** The retrieval strategy and inclusion and exclusion criteria were strictly established. The databases such as CNKI, Wan Fang Data, VIP, CBM, PubMed and Web of Science were searched by computer. The literatures were retrieved from January 2011 to January 2022. The search criteria are (" elderly OR older adults OR aged OR senior ") AND (" Virtual reality OR computer game\*exergame\*OR interactive" Game \* ")AND ((" Accidental falls OR falls prevention OR falls Risk ") OR (" balance OR strength OR Gait OR posture "). A total of 1123 Chinese and English related literatures were retrieved, and 12 literatures were finally included after literature screening.

**Results:** (1) Gait: Compared with the traditional mode, the gait improvement effect of the elderly based on VR exercise training was more obvious, and the difference was statistically significant [SMD=0.63,95%CI(0.03,1.22),P=0.04]. (2) Static balance ability: VR-based exercise training and traditional fall prevention intervention had a statistically significant difference in the elderly standing time on one foot [MD=2.17,95%CI(0.31,4.03),P=0.02]. Compared with traditional fall prevention intervention, the FRT score of the elderly based on VR exercise training was higher [MD=3.21,95%CI(2.22,4.20),P<0.001]. (3) Dynamic balance ability: BBS score of experimental group was higher than control group[MD=1.73,95%CI(0.81,2.65),P=0.002]; The TUG score of vr-based exercise training was lower than that of traditional fall prevention intervention [SMD=-0.64,95%CI(-0.87,-0.40),P<0.001]. (4) Muscle strength of lower limbs: Comparison of THE FTSST score and 30 s SST score between the two groups of older adults with vr-based exercise training and traditional intervention, There was no statistically significant difference between the groups [MD = 2.62, 95% CI (6.23, 0.99), P = 0.15], [SMD = 0.28, 95% CI (2.59, 2.02), P = 0.81].

**Conclusions:** Compared with traditional fall prevention intervention, VR-based intervention can better improve gait and dynamic and static balance function and reduce the risk of fall in healthy elderly people. However, the effect of VR-based intervention on lower limb muscle strength of the elderly is still unclear.

**Key words:** Interactive situational simulation training; The elderly; Sports training; Fall; Meta analysis

## 7-17 Unhealthy lifestyle mediates the adverse effect of childhood traumas on acceleration of aging: analysis of 110,596 UK Biobank participants

Gan Yang<sup>1#</sup>, Xingqi Cao<sup>1#</sup>, Xueqin Li<sup>1</sup>, Jingyun Zhang<sup>1</sup>, Chao Ma<sup>2</sup>, Ning Zhang<sup>3</sup>, Qingyun Lu<sup>4</sup>, Eileen M. Crimmins<sup>5</sup>, Thomas M. Gill<sup>6</sup>, Xi Chen<sup>7,8</sup>, Zuyun Liu<sup>1\*</sup>

<sup>1</sup>Department of Big Data in Health Science School of Public Health, Zhejiang University School of Medicine, Hangzhou 310058, Zhejiang, China

<sup>2</sup>School of Economics and Management, Southeast University, Nanjing 211189, Jiangsu, China

<sup>3</sup>Department of Social Medicine School of Public Health and Center for Clinical Big Data and Analytics Second Affiliated Hospital and, Zhejiang University School of Medicine, Hangzhou 310058, Zhejiang, China

<sup>4</sup>School of Public Health, Nantong University, Nantong 226007, Jiangsu, China

<sup>5</sup>Davis School of Gerontology, University of Southern California, Los Angeles, CA 90089, United States of America

E-mail: zuyunliu@zju.edu.cn

**Objective:** To examine the associations of childhood traumas with a phenotypic aging measure and the role of unhealthy lifestyle in mediating these associations.

**Methods:** We assembled data from 110,596 members of the UK Biobank aged 40-69 years who participated in the baseline survey (2006-2010) and online mental health questionnaire (2016). A phenotypic aging measure—Phenotypic Age Acceleration (PhenoAgeAccel) was calculated, with the higher value indicating the acceleration of aging. Body mass index, smoking status, alcohol consumption, physical activity, and diet were combined to construct an unhealthy lifestyle score (range: 0-5). Childhood traumas including physical neglect, emotional neglect, sexual abuse, physical abuse, and emotional abuse were assessed. General linear regression and formal mediation analysis were performed.

**Results:** Each individual childhood trauma and cumulative childhood traumas were significantly associated with PhenoAgeAccel. For instance, compared with participants who did not experience childhood traumas, those who experienced four ( $\beta=0.292$ , standard error [SE]: 0.091) or five childhood traumas had higher PhenoAgeAccel ( $\beta=0.669$ , SE: 0.169) in fully adjusted models. The formal mediation analysis revealed that unhealthy lifestyle partially mediated the associations of childhood traumas with PhenoAgeAccel (26.1%-42.6%).

**Conclusions:** In a large sample from UKB, childhood traumas were positively associated with acceleration of aging; and more importantly, unhealthy lifestyle partially mediated these associations. These findings reveal a novel pathway from childhood traumas to late-life health through lifestyle and underscore the potential of more psychological strategies beyond lifestyle interventions to promote healthy aging.

**Keywords:** Aging; Childhood traumas; Lifestyle; Phenotypic Age Acceleration; Mediation analysis

## 7-18 Implementation of Integrated Care for the Aged Population in Anhui and Fujian Province of China: A Qualitative Study

Shasha Yuan, Meng Jia, Fang Wang

Institute of Medical Information & Library, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, 100020, China

E-mail: yuanshasha417@163.com

**Introduction:** Implementing integrated care for the aged population has been regarded as a mechanism to achieve healthy ageing. However, evidence from undeveloped nations has been scant. This study aims to explore the integrated care experience in Anhui and Fujian Province of China based on the Rainbow Model of Integrated Care (RMIC).

**Methods:** The qualitative study was conducted in Anhui (in the middle area) and Fujian Province (in the eastern area) between May and September in 2018. The interviewees included twenty-eight policy makers working at departments of health and civil affairs at different levels and seventeen heads of medical and elderly care institutions.

**Results:** The preliminary progress of integrated care in the sample cities of two provinces are mainly shown at solid policy basis by multiple key government agencies and political commitment achieved (system integration); preliminary coordination mechanism established between medical and elderly care institutions (organizational integration); consolidation of multi-disciplinary collaboration (professional integration); and reinforced role of family doctor teams for community-home dwelling elderly (service integration). Main challenges are also identified at insufficient inter-agency coordination, weak service capacity, lack of sustainable funding schemes, low level of information integration, and shortage of professional supply.

**Conclusion:** Our findings provide a feasible path for other countries to strengthen integrated care for the aged population, particularly for those confronting rapid population ageing but with fragmented health care and elderly care systems.

**Keywords:** integrated care; implementation; aged population; qualitative study; China

## 7-19 Association between sarcopenia and its components and functional disability in Chinese older adults: Evidence from the China Health and Retirement Longitudinal Study

Zhang Hao, Shi Yuhui

Department of Social Medicine and Health Education, School of Public Health, Peking University

E-mail: yuhuishibmu@bjmu.edu.cn

**Objectives:** Sarcopenia is an age-related geriatric syndrome and is associated with an increased risk of numerous adverse health outcomes. The aim of this study was to analyze the association between sarcopenia status and its components (muscle mass, muscle strength, and physical performance) with functional disability among Chinese older adults.

**Methods:** This is a cross-sectional study using the nationally representative data from the China Health and Retirement Longitudinal Study (CHARLS) in 2015. According to the Asian Working Group for Sarcopenia 2019 criteria, sarcopenia status were classified into three categories: no sarcopenia, possible sarcopenia and sarcopenia. Muscle mass and muscle strength were estimated by the height-adjusted appendicular skeletal muscle mass ( $ASM/Ht^2$ ) and handgrip strength (HS), respectively, and physical performance was measured by repeated chair stands (RCS) or gait speed (GS). Functional disability was assessed by activities of daily living (ADL) and instrumental activities of daily living (IADL). Logistic regression models were used to estimate the association between sarcopenia and its components with ADL/IADL disability.

**Results:** A total of 4893 participants aged 60 years and above (2220 males and 2673 females, mean age  $68.26 \pm 6.46$ ) were recruited from CHARLS 2015. In total population, 31.62% and 18.72% of participants were diagnosed with possible sarcopenia and sarcopenia. And the rate of ADL/IADL disability were 7.68%, 27.30%, respectively. Both possible sarcopenia (OR=2.07, 95%CI: 1.41-3.02; OR=1.74, 95%CI: 1.39-2.17) and sarcopenia (OR=2.01, 95%CI: 1.25-3.23; OR=1.77, 95%CI: 1.34-2.34) were significantly associated with ADL/IADL disability after adjustment for covariables (all  $p < 0.05$ ). With all sarcopenia components in the regression model, HS (OR=0.95, 95%CI: 0.92-0.97; OR=0.97, 95%CI: 0.96-0.99), RCS (OR=1.08, 95%CI: 1.05-1.11; OR=1.06, 95%CI: 1.03-1.08) and GS (OR=0.29, 95%CI: 0.12-0.74; OR=0.34, 95%CI: 0.20-0.59) remained positively associated with ADL/IADL disability, whereas these effects for  $ASM/Ht^2$  were not significant.

**Conclusion:** Both possible sarcopenia and sarcopenia were strongly associated with ADL/IADL disability among Chinese older adults. And HS, RCS and GS were three important factors affecting the development of ADL/IADL disability in sarcopenia.

**Keywords:** sarcopenia, possible sarcopenia, functional disability, older adults

## 7-20 Levels and trends of significant injury-caused deaths in the Chinese population, 2010-2019

Zhang Mengge, Zhou Yabing, Li Chuancang, Qu Mengbing, Meng Jingjing, Cai Qian, Fan Haohao, Sun Liang

Department of Social Medicine and Health Management, College of Public Health, Zhengzhou University

E-mail: 1973088076@qq.com

**Objective** To analyze the level and changing trend of significant injury-caused deaths in the Chinese population from 2010 to 2019 and provide evidence for related intervention.

**Methods** Data on notable injury-caused deaths in areas under National Disease Surveillance Programs were collected from 2010 to 2019. Crude and standardized mortality rates of four significant injuries were calculated to describe the status of injury-caused deaths. The trend of changes in standardized mortality rates was analyzed using the Joinpoint regression model.

**Results** The overall trend of standardized mortality rate on an injury during 2010-2019 was consistently decreasing (AAPC=-3.5%,  $P<0.001$ ) while the general direction of accidental fall standardized mortality rate was increasing (AAPC=1.0%,  $P=0.104$ ). The standardized mortality rate for significant injuries fluctuated with age, increasing for those aged 50-79 years (AAPC=3.9% for the 50- group, AAPC=5.6% for the 60- group, and AAPC=4.6% for the 70- group, all  $P<0.001$ ). The standardized mortality rates for all major injuries were higher in males than those in females, with road traffic accidents and drowning declining faster in males than that in females (AAPC=-5.3% in the male road traffic accident group, AAPC=-3.8% in the female road traffic accident group, AAPC=-4.0% in the male drowning group, AAPC=-3.5% in the female drowning group, all  $P < 0.001$ ), and suicide and sequelae declining faster in females than that in males (AAPC=-6.4% in female, AAPC=-4.7% in male, all  $P < 0.001$ ). The standardized mortality rate for significant injuries was higher in rural than that in urban areas and decreased faster than that in urban areas. The central region had the highest standardized mortality rate for suicide and sequelae. The western part had the highest standardized mortality rates for road traffic accidents, accidental falls, and drowning, with the fastest decline in road traffic accidents and drowning (AAPC=-5.3% in the road traffic accident group and AAPC=-5.3% in the drowning group, both  $P < 0.001$ ).

**Conclusions** The mortality rate from significant injuries in the Chinese population showed a continuous downward trend from 2010 to 2019, with a rebound in the standardized mortality rate from accidental falls in recent years among the elderly, males, rural residents, and central and western regions being the focus of future prevention and control.

**Key words:** Injury; Mortality level; Trend analysis

## 7-21 Impact of negative life event on quality of life of rural elderly hypertension patients: A moderated mediating effect

Zhang Shuo, Fu Yingjie, Sun Xiaojie

Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University, No.44 Wenhuxi Road, Jinan 250012, Shandong, China.

E-mail: xiaojiesun@sdu.edu.cn

**Objective:** This study aimed to determine how mental health and social capital affect the relationship between negative life event and quality of life of rural elderly hypertension patients.

**Methods:** Using the multistage stratified cluster sampling method, a total of 953 rural elderly hypertension patients more than 60 years were recruited from Shandong Province in mainland China. Negative life event, quality of life, mental health, and social capital were measured with the following questionnaires: Minimum Data Set, Patient Reported Outcomes, the 10-item Kessler Psychological Distress Scale, and “Resource Generator” scales, respectively.

**Results:** Negative life event was positively associated with mental health ( $r=0.408$ ,  $P<0.01$ ); negative life event was negatively correlated with quality of life, as well as social capital ( $r=-0.383$ ,  $-0.121$ ;  $P<0.01$ ). Mental health had a partial mediating effect on the relation between negative life event and quality of life, and the mediating effect accounts for 68.54% of the total effect. Moreover, social capital played a moderating role in the relationship between negative life event and mental health (the interaction term between negative life event and social capital:  $\beta=-0.106$ ,  $t=-2.064$ ,  $P<0.05$ ), as well as between mental health and quality of life (the interaction term between mental health and social capital:  $\beta=-0.034$ ,  $t=-2.346$ ,  $P<0.05$ ) among rural elderly hypertension patients. That is to say, the impact of negative life event on mental health, and the impact of mental health on quality of life weakened with the enhancement of social capital.

**Conclusion:** Social capital could alleviate the negative impact of negative life event on mental health, as well as the negative impact of mental health on quality of life.

**Key words:** negative life event; quality of life; mental health; social capital; elderly hypertension patients



## 7-22 Associations of walking impairment with visual impairment, depression, and cognitive function in US older adults: NHANES 2013–2014

Yurong Zhang<sup>1</sup>, Panpan Zhang<sup>1</sup>, Wei Gao<sup>2</sup>, Pengfei Dai<sup>2</sup>, Yuqian Wang<sup>2</sup>

<sup>1</sup> Department of Neurology, The First Affiliated Hospital of Xi'an Jiaotong University, Xi'an, Shaanxi, China

<sup>2</sup> Department of Ophthalmology, Xi'an Peoples Hospital (Xi'an Fourth Hospital), Xi'an, Shaanxi, China

E-mail: zhangyurong72@mail.xjtu.edu.cn

**Background:** Walking impairment, a common health problem among older adults, has been linked to poor vision and mental health. This study aimed to investigate the associations of walking impairment with visual impairment, depression, and cognitive function in older adults.

**Methods:** A total of 1,489 adults aged 60 years and older who had participated in the National Health and Examination Survey (NHANES) 2013–2014 in the United States were included. Multivariate logistic regression models were used to examine the associations of walking impairment with visual impairment, depression, and four subdomains of cognitive function. Sample weights were used to ensure the generalizability of the results.

**Results:** Among all the participants (median age=68 years; 53.7% women), 17.5% reported walking impairment. Walking impairment was significantly associated with visual impairment (adjusted odds ratio [aOR] =2.76; 95% CI: 1.47–5.20) and depression (aOR=4.66; 95% CI: 3.11–6.99). Walking impairment was only associated with the Digit Symbol Substitution (DSST) subdomain of cognitive function in all participants (aOR=0.97; 95% CI: 0.95–0.99), and in non-Hispanic white adults (aOR=0.96; 95% CI: 0.94–0.98). Participants with two or three impairment indicators had higher OR of walking impairment (aOR = 3.64, 95% CI =2.46–5.38) than those with 0–1 (reference group) impairment indicator.

**Conclusions:** Walking impairment was associated with visual impairment, depression, and cognitive impairment in the American older adults and also positively associated with the number of impairment indicators. The association between walking impairment and cognitive impairment varied according to race. Evaluations of vision, cognition, and depression should be conducted among older adults with walking impairment, and the needs of older adults should be provided in the evaluations alongside information on the biological aspects of their particular race.

**Keywords:** Cross-sectional study, walking impairment, depression, visual impairment, cognitive function, older adults

## 7-23 多组分训练在老年人群中的研究进展

钟水玲

北京体育大学

E-mail: zhong.shuiling@qq.com

**研究目的：**多组分训练（Multicomponent exercise training）是将多种运动方式相结合，包括有氧训练、抗阻训练、平衡训练和（或）伸展训练（柔韧性训练）和（或）协调训练的一种全面的训练方式，多用于老年人，在改善老年人认知能力、身体功能和生活质量等方面起到积极作用。作为一种可代替传统运动训练的新型运动方式，本文通过对国内外与多组分训练相关文献进行整理归纳，为后续研究提供理论依据。

**研究方法：**文章采用文献资料法和数理统计法，通过 Web of Science 和中国知网（CNKI）数据库，以“Multicomponent exercise training”、“The elderly”；“老年人”、“多组分训练”、“多元化训练”、“多模式训练”为主题进行检索，对检索出的文献进行整理分析，综述多组分训练的研究进展，为更好推动其发展提供指导及借鉴作用。

**研究结果：**（1）多组分训练训练形式多样化，较为常见的是有氧训练、抗阻训练、平衡训练以及伸展训练相结合的运动训练形式。（2）对认知能力的影响：多组分运动可以通过对视空间与执行功能、注意及延迟回忆功能等方面的正向效益，改善老年人的认知能力，研究表明多组分训练对认知功能障碍、痴呆症、阿尔兹海默症等疾病也有益处。（3）对身体功能的影响：多组分训练可以提高肌肉内蛋白质的合成速率，增加骨密度，最大限度地减少肌肉力量和骨骼肌的丢失；增强机体代谢能力，改善血脂水平，促进心肺健康；改善平衡能力，提高步速和步幅，有效改善和维持老年人的肌肉表现，降低出现骨折、跌倒等不良事件的风险，延缓衰老过程。（4）对生活质量的影響：多组分运动训练可以延缓老年人身体机能的衰退，保持身体健康。此外，多组分训练还可以扩大老年人的社交网络，缓解焦虑、抑郁等不良情绪，促进心理健康。（5）多组分训练研究常与其他训练方式相结合：通过与其他干预手段（例如经颅直流电刺激、全身振动训练等）相结合，可以改善训练效果或延长训练效果的持续时间。研究结论：多组分训练作为一种多模式运动训练方式，能够有效改善老年人认知功能，躯体、心理健康，延缓衰老，提高生活质量，有助于老年人保持独立的日常活动能力。可用于患有认知障碍、痴呆症、糖尿病、骨质疏松等慢性疾病老年群体中，是理想且经济的康复训练手段，值得推广应用，根据实际情况设计训练计划，从而使更广大老年群体从中获益。

**关键词：**多组分训练；老年人；运动干预；康复

### 8-1 HPV vaccination challenges in African regions

Nasra Mohamoud Ali <sup>1\*</sup> Xiaonan Cui<sup>2</sup> Youlin Qiao<sup>3</sup> Ran Ren<sup>4</sup>

Global Health Research Center of Dalian Medical University

E-mail: nasra\_egeh@hotmail.com

**Background:** Cervical cancer is the fourth most common cancer among women globally, it's also most preventable and manageable cancer. However, more than 90% of the 311,365 women who died from the disease occurred in low- and middle-income countries (LMICs). Socio-cultural and religious factors play major roles in cervical cancer prevention and screening which need to be addressed.

**Objectives:** to study and evaluate the factors that prevent HPV vaccine availability and acceptance in African regions.

**Results:** Implementing HPV vaccination and screening programs in African regions has so far proven to be challenging due to sociocultural, religious and financial factors but also lack of governmental prioritization of cervical cancer as a public health problem. To date 110(57%) countries implemented HPV immunization program Globally, and 84(43%) have not introduced or have no plan yet, among those 84 countries 39(46%) are African countries. Most studies in African regions have shown that Socio-cultural determinants have a powerful effect in women's health and might always be a challenge. To achieve the strategy that World Health Organization (WHO) launched to reduce the current worldwide incidence of 13.3 per 100,000 (age-adjusted) 2 to 4 per 100,000 women by 2030 as the first step towards elimination of cervical cancer, counts on collective and coordinated effort of multiplayers that are crucial for women's health. Firstly, educating young girls and women would prevent needless mortality and long-term economical cripple. Secondly, education, awareness programs to address and persuade every level of the society from community and religious leaders to young girls and women about HPV and cervical cancer to gain society endorsement. Finally, governmental prioritization and recognition of cervical cancer as a public health problem, international organizations, companies, funding agencies cooperation and focus on underprivileged regions with significant cervical cancer mortality is crucial.

**Conclusion:** No women should suffer in silence because of the most preventable health problems due to socio-cultural determinants.

**Keywords:** HPV vaccination challenges, socio-cultural barriers, African regions.

## 8-2 Analysis of the implementation of health assistance by the US government (2001-2020)

DU Yan-qiu<sup>1</sup>, Hu Kai<sup>1</sup>, Liang Di<sup>1,2</sup>, Huang Jia-yan<sup>1,2\*</sup>

1. School of Public Health, Fudan University, Shanghai 200032, China

E-mail: yqdu21@m.fudan.edu.cn

**Objective:** To analyze the characteristics of the US government's implementation of health assistance, and to provide reference for the formulation of China's health assistance policy.

**Methods:** Based on the U.S. Agency for International Development Foreign Aid Explorer (FAE) database, this study quantitatively analyzed the health assistance provided by US government agencies from the two dimensions: government departments (horizontal) and the presidency (vertical). This study also compared the similarities and differences between the assistance channels, the recipient regions and the health fields.

**Results:** From 2001 to 2020, the main channels for the U.S. government to implement health assistance were government departments, non-governmental organizations (NGO), multilateral organizations and enterprises. Native organizations in the United States were the main body of NGO and enterprise channel. The main recipient regions was sub-Saharan Africa, and the health field was AIDS prevention and control. The U.S. Department of State, the Agency for International Development, and the Ministry of Health and Human Services were the three major funding agencies. The health assistance during the last three terms of the presidential term had shown a certain consistency in the distribution of regions, countries, and health fields.

**Conclusions:** In terms of top-level design, it is recommended that the Chinese government continue to strengthen the strategic positioning of health assistance in foreign policy. At the implementation level, it is recommended that the Chinese government actively mobilize non-state actors, including NGOs, private enterprises and research institutions, to participate in health assistance, and at the same time strengthen the evaluation and supervision system of health assistance.

**Key words:** United States; Health assistance; Non-governmental organization; health;

### **8-3 Balance between regional autonomy and centralized leadership during the pandemic: based on an analysis of European health security system**

Fang Zheyi

School of Public Health, Fudan University, Global Health Institute, Fudan University

E-mail: Zheyi\_Fang@163.com

**Objective:**As an active participant in global health governance, EU countries are well-known for their advanced medical and health systems. However, the impact of COVID-19 pandemic has exposed some shortcomings of European health security systems.

**Method:**This study takes four European countries as examples, review the regional and national policies on EU health security system, and analyze the health security systems' operational effects based on their performance during the pandemic.

**Outcome:**We found that the health systems in Germany and Sweden show a high level of regional autonomy, and the degree of regional autonomy in French health system is relatively low. However, the health system in Hungary is under the governance of centralized leadership. Meanwhile, Germany has the strongest health emergency response capability at grass-roots level among 4 countries to serve its high degree of autonomy. In addition, countries' performance during pandemic were affected by various factors including cultural traditions and the contradiction between the European Union and European countries.

**Conclusion:**This research discusses the importance of a reasonable balancing mechanism between regional autonomy and centralized leadership in health security system, so that to provide a reference for countries to make rapid decision in responding to other emergencies in the future.

**Keywords:**COVID-19 pandemic; European country; Health security

## 8-4 Assessing the Quality of Primary Health Care in Seven Provinces in China with Unannounced Standardized Patient: A Pilot Study

Wenpin Hu,Xiaohui Wang

School of Public Health, Lanzhou University

E-mail: wangxiaohui@lzu.edu.cn

**Objective:** This pilot study using unannounced standardized patient (USP) to assess the quality of primary health care in seven provinces in China aims to (1) explore the feasibility and reasonableness of the procedure of USP recruitment, interview and training; (2) provide an effective measurement tool for the evaluation of primary care service quality in the main experiment; (3) provide experience and methodological support for subsequent related studies.

**Methods:** we recruited and interviewed participants to act as USPs in seven capital cities (Guangzhou, Lanzhou, Guiyang, Changsha, Hohhot, Chengdu, Xi'an). And used eleven common cases in primary health care (migraine with aura, postpartum depression, infantile diarrhea, acute upper respiratory tract infection, chronic non-atrophic gastritis, asthma, unstable angina, chronic non-specific low back pain, stress urinary incontinence, essential hypertension, and type 2 diabetes) to train USPs and investigators in a combination of online and offline formats. Number of participants and the whole procedure were qualitative analyzed and recorded in detail.

**Results:** Recruitment was conducted in July 2020 in seven cities and received 354 application forms. After selection, a total of 195 applicants participated in the interview and finally 110 participants were included in the training. The training was conducted simultaneously in seven cities from 23 August to 31 August, resulting in a total of 50 pairs of USPs and investigators participating in the final visits. 776 visits were conducted in seven cities, of which 729 visits were successfully completed, and the success rate was 93.94%.

**Conclusion:** The results showed that trained USPs can perform standard and stable roles and can accurately evaluate the quality of primary health care. But the quality of some USPs, the data collection and management still needs to be improved. and some key outcomes such as detection rate and safety need to be analyzed and explored in the main study.

**Keywords:** Unannounced Standardized Patient; Pilot Study; Quality of Primary Health Care

## 8-5 Characteristics of medical disputes in public hospitals and the role of third-party mediation: a cross-sectional study

Li Gaiyun<sup>1</sup>, Yanfei Shen<sup>2</sup>, Xuemei Han<sup>1</sup>

<sup>1</sup>School of Public Health, Lanzhou University, Lanzhou, Gansu

<sup>2</sup>Gansu Provincial People's Hospital, Lanzhou, Gansu

E-mail: ligy20@lzu.edu.cn

**Objective:** Understand the characteristics of medical disputes in public hospitals and their compensation in Gansu, analyze the process of third-party mediation of medical disputes and the factors affecting third-party mediation.

**Methods:** This paper conducts a retrospective study on 5948 cases of medical disputes in public hospitals accepted by the People's Mediation Committee for Third-Party Medical Disputes in Gansu from 2014 to 2019. The  $\chi^2$  test and binary logistic regression were used to analyze the influencing factors of third-party mediation in medical disputes.

**Results:** From 2014 to 2019, the number of medical disputes in public hospitals in Gansu and the amount of compensation showed an increasing trend year by year, medical disputes most often occurred in secondary and tertiary hospitals, and the maximum number of surgeries is 42.50%. The success rate of third-party mediation of medical disputes in public hospitals in Gansu is 89.01%, and the average compensation amount of third-party mediation is CNY 48,688.73, which is far less than the judicial judgment of CNY 148,113.76 and judicial mediation of CNY 161,139.28. Years, genders, departments, responsibility assessment opinions and compensation amounts were significantly different in whether or not to choose third-party mediation ( $P<0.05$ ). The results of binary logistic regression analysis show that compared with zero compensation, the possibility of choosing third-party mediation is higher when the compensation amount is  $\leq$  CNY 10,000, compensation amount  $\leq$  CNY 10,000 ( $OR$  3.14, 95% $CI$  1.53-6.45),  $\leq$  CNY 100,000 ( $OR$  0.24, 95% $CI$  0.14-0.42) and  $>$ CNY 100,000 ( $OR$  0.08, 95% $CI$  0.05-0.14) results were significantly different ( $P<0.05$ ).

**Conclusion:** Prevention and handling of medical disputes mainly focus on establishing a medical risk sharing mechanism that combines medical dispute mediation, compensation, and medical risk prevention. The third-party mediation of medical disputes has a great positive effect on alleviating the relationship between doctors and patients, maintaining the legitimate rights and interests of both doctors and patients, and creating a good and healthy medical atmosphere.

**Keywords:** Medical disputes, Public hospitals, Medical mediation, Compensation, Third-party mediation

## **8-6 A study on the spatio-temporal differentiation and influencing factors of health status in the Belt and Road countries**

LI Jie, SHAO Luyao, ZHU Hong\*

School of Geography and Remote Sensing, Guangzhou University, Guangzhou 510006, China

E-mail: 1179042196@qq.com

The Belt and Road Initiative, while promoting political mutual trust, economic connectivity and cultural inclusiveness, has also played a positive role in promoting the health development of the participating countries. In order to analyze the impact of the Belt and Road Initiative on the health status of member states and comprehensively understand the health status of the Belt and Road member states, a comprehensive and unified evaluation system of health indicators was designed in this study, and spatial analysis methods such as Moran index, cold hot spot and standard deviation ellipse were adopted. The health status of 139 Belt and Road member countries from 2017 to 2019 was analyzed, and the possible influencing factors were discussed using spatial statistics software Geodetector. The results showed that: (1) From 2017 to 2019, the health indicators of most member countries increased, and showed significant spatial autocorrelation. (2) The health status of member states showed obvious spatial heterogeneity. The health status of Member states in Europe was the best, the health status of member states in North and South America, Oceania and Asia was generally good, and the health status of member states in Africa was poor. (3) As a measure of health inequality, the Gini coefficient has the strongest explanatory power for the health status of residents of member countries, and the interaction between the Gini coefficient and the number of people using basic drinking water facilities has the greatest impact on health status. The results confirm the health promotion and spatial differentiation of the Belt and Road Initiative for member states, which can provide a basis for government departments to formulate health policies related to the Belt and Road initiative.

**Keywords:** the Belt and Road; health status; spatial analysis; spatial heterogeneity



## 8-7 公共产品视角下我国新冠肺炎疫苗筹资责任分担机制研究

林坤河<sup>1</sup>，刘宵<sup>1</sup>，项莉<sup>1</sup>

<sup>1</sup>华中科技大学同济医学院医药卫生管理学院 武汉

Email:425389064@qq.com

新冠肺炎疫苗是一项特殊时期新产生的公共产品，实施新冠肺炎疫苗全民免费接种政策是维护我国居民健康的重要方式，也是维护全球公共卫生安全的关键手段。医保基金和政府财政补贴是保障新冠肺炎疫苗全民免费接种政策正常运行和全国居民政策均等化的重要支撑，然而过度使用医保基金结存将会影响基金的可持续性，多层次财政责任分担机制尚未建立，基层财政也将面临承受较重筹资责任的风险。新冠肺炎疫苗筹资责任分担机制尚存优化空间，需要在公共产品视角下，从确定疫苗接种政策筹资需求、明确医保与财政筹资责任、建立财政筹资责任分担机制等三个方面统筹考虑、合理筹资，推动疫苗接种时间、空间公平可及。

**关键词：**新型冠状病毒肺炎；疫苗；公共产品；筹资

## 8-8 A Multiple Streams analysis of the decision regarding government-funded HPV vaccination in China

Liu Shujun<sup>1</sup>, Qiao Youlin<sup>2</sup>, Zhou Caihong<sup>1</sup>

<sup>1</sup>National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, 100021, China

<sup>2</sup> Peking Union Medical College, department of population and public health, Beijing, 100730, China

Email: 13521290838@126.com

**Objective:** To Analyze the factors that underpin government decisions to fund the HPV vaccine and make feasibility recommendations.

**Method:** Combine literature studies with the experience of pilot cities introducing HPV immunization programs and use a theoretical policy model, Kingdon's Multiple Streams framework to assess the policy development by examining the problem stream(HPV-related diseases burden and Current status of HPV vaccination coverage), Policy stream( Suitability, Acceptability and Cost-effectiveness of HPV vaccine), Politics Stream, the policy spillover effect of Pilot cities and the role of policy entrepreneurs.

**Result:** 1. The burden of HPV-related diseases in China is serious and the coverage rate of HPV vaccination is low; 2. The HPV vaccine is safe, effective, and cost-effective. The public and government officials are willing to get vaccinated and promote it; 3. The party and the government attach importance to cervical cancer prevention and HPV vaccine promotion; 4. Pilot cities have played a good leading role; 5. policy entrepreneurs such as experts, scholars, and people's congress deputies make full use of their resources and seize key opportunities to promote government funding for HPV vaccines.

**Conclusion:** 1. Strengthen the monitoring and evaluation of HPV-related disease burden, and provide accurate big data references for government policy; 2. Explore appropriate vaccination strategies and adopt various financing mechanisms to improve the feasibility of HPV vaccines included in immunization programs; 3. Implement government responsibilities, improve supporting guarantees, pay attention to publicity and guidance to create a good atmosphere for the inclusion of HPV vaccines in immunization programs; 4. Policy entrepreneurs play a synergistic role, summarize the pilot experience and increase promotion efforts to promote the inclusion of HPV vaccines in immunization program elevation to a national-level policy.

**Keywords:** HPV vaccine; immunization programs; Kingdon's Multiple Streams framework

## 8-9 Government Control Measures and Online Public Participation: China Experience on COVID-19 Control (January to April 2020)

Xiaolin Lu<sup>1</sup>, Yanjie Bian<sup>1,2</sup>

<sup>1</sup>Institute for Empirical Social Science Research, School of Humanities and Social Science, Xi'an Jiaotong University, Xi'an, XA, China

<sup>2</sup>Department of Sociology, University of Minnesota, Minneapolis, MN, USA

E-mail: lxlucya@163.com

**Objectives.** To examine the interacting effect of government interventions and online public participation on epidemic control in the first 3 months of COVID-19 across 31 provinces of China.

**Methods.** We applied textual analysis to measure the intensity of non-pharmaceutical interventions (NPI) and measured public participation by daily microblog posts of netizens from different provinces which mentioned COVID-19. Based on the panel data across 31 provinces during 90 days, we used spatial error regression to analyze the impact of government interventions and public participation on daily new cases of COVID-19.

**Results.** Six different sets of NPIs taken by provincial governments significantly reduces daily new cases of COVID-19, including mobility restriction, social distancing, resource allocation, digital surveillance, organizational resources mobilization, and normalization. Online public participation significantly reduces daily new cases. The effect of NPIs and public participation are not separately linear but slightly weaken each other's influence.

**Conclusions.** During the Covid-19 pandemic in China, NPIs and online public participation are the two effective and interacting mechanisms for epidemic control. The two mechanisms interplay and weaken the anti-pandemic effect of each other. The policy implications of this research are as follows: ①Improve the quality, speed, and transparency of governmental information disclosure at the early stage of public health emergencies. ②Encourage rational expression in online public debate that can provide constructive suggestions about emergency response. ③Timely communicate and respond to hot spots of public debates online apart from strict censoring to reduce public doubts and maintain government credibility. ④Actively respond to the public demand gathered from the online platform and timely adjust the anti-pandemic interventions when necessary.

**Key words:** COVID-19; risk governance; policy mechanism; social mechanism; civic engagement

## 8-10 The impact of the three-child policy on fertility intention in current China: A cross-sectional study

Ning Ni, Sun Mei

Central South University, Changsha, China

E-mail: smnjw2008@126.com

**Objective :** Fertility intention is reported to influence the overall fertility level of society, except for fertility policies. But limited studies have considered the third birth intention and factors affecting intention among the reproductive-aged population after issuing the ‘three-child policy’. This study aimed to evaluate and analyze the fertility intention and impact factors to have a third child in mainland China after the ‘three-child’ policy issued by the Chinese government against the backdrop of persistently low fertility.

**Methods :** A cross-sectional study was conducted with 1444 participants who have two children in mainland China. Data were collected online, using the Fertility Intention Questionnaire. Descriptive statistics were used to describe the socio-demographic characteristics. A binary logistic regression model was applied to determine the impact factors.

**Results:** Only 10.8% of participants reported having third birth intention. 45.2% of participants heard of the policy but not clear. We found the gender of first 2 children were both girls (OR = 4.278, 95% CI = 2.661-6.877), policy support (OR = 1.145, 95% CI = 1.078-1.216) and fertility responsibilities (OR = 1.205, 95% CI = 1.118-1.298) dimensions of Fertility Intention Questionnaire had positive impact on the third birth intention. Working in government (OR = 0.254, 95% CI = 0.072-0.895), COVID-19 pandemic (OR = 0.450, 95% CI = 0.321-0.632) and perceived risk (OR = 0.866, 95% CI = 0.820-0.914) dimensions of Fertility Intention Questionnaire had negative impact on the third birth intention.

**Conclusions:** The third birth intention and knowledge level of the ‘three-child’ policy among parents who have two children in China is still low after the announcement of the three-child policy. It is necessary to deepen parents’ understanding of the ‘three-child policy’ and implement supporting measures to remove barriers after having a third birth.

**Keywords:** fertility intention; three-child policy; COVID-19; influencing factor

## **8-11 Assessing sustainability of long-term care insurance system based on a Policy-Population-Economy complex system: A case study of China**

Rong Peng<sup>a,\*</sup>, Xueqin Deng<sup>a</sup>, Yinghua Xia<sup>b</sup>, Bei Wu<sup>c</sup>

a, Institute of New Development, Guangdong University of Finance and Economics, Guangzhou, China

b, Guangdong Provincial Institute of Public Health, Guangdong Provincial Center for Disease Control and Prevention, Guangzhou, China.

c, Rory Meyers College of Nursing, New York University, New York, U.S.A.

E-mail: rongpeng13@163.com

Although China has launched a long-term care insurance (LTCI) pilot program in 2016, there is a great challenge of developing a sustainable LTCI system due to limited financial resources and rapid increase of aging population. This study constructed a LTCI Policy-Population-Economics (PPE) system to assess the sustainability of LTCI system in China. Based on the latest 76 LTCI policy documents published between 2015 and 2021, this study evaluated the strength of LTCI policy modeling in 14 pilot cities by constructing a PMC-index containing 9 main variables and 36 sub-variables. Coupling coordination model was used to evaluate the interactive relationships linking LTCI policy, population aging and economic development. The results showed that the PMC-index ranged from 0.627 to 0.950. Qingdao, Nantong and Shanghai had the highest level of policy strength ( $PMC > 0.9$ ). The main policy weaknesses were the coverage of LTCI, the sources of funds, the scope of care services and the benefit eligibility. The value of coupling coordination degree of PPE system varied from 0.429 to 0.921, with a mean of 0.651. Shanghai, Nantong and Suzhou had the highest level of coordination. The coordination between subsystems of PPE in most pilot cities (12 of 14 cities) was at a basic or low level. The findings from this study suggest that the coordination within the PPE system should be improved to develop a sustainable China's LTCI system.

**Keywords:** Long-term care insurance; policy modeling; policy strength; coupling coordination degree; pilot scheme

## 8-12 Analysis of the price reform of medical services in Ningxia public hospitals

Shao Li-na, Wu Jing, Du Qian-qian, Wang Zhi-hao, Sun Xiao-tong, Lang Ying

School of Public Health and Management, Ningxia Medical University

E-mail:1072861385@qq.com

**Objective:** To analyze the medical income institutions and changes of the pilot hospitals in Ningxia since the implementation of the pilot work of adjusting and optimizing the medical income structure, to explore the impact of various medical projects on the medical income structure, and to provide effective theoretical support for the subsequent optimization of the medical income structure.

**Methods:** The degree of correlation between various incomes and medical income was analyzed by grey correlation method, and the degree of influence of adjusting income structure on medical income changes was analyzed by using structural variation.

**Results:** The structural change of the secondary hospital was the largest (17.57%), followed by the top three hospitals; the medical service income of different levels of hospitals showed basically positive changes, and the change range was the largest, with the degree of change of 7.94%, 12.69% and 24.71%, respectively, and the income of drug consumption and examination and testing showed negative changes, and the comprehensive change of the comprehensive degree of change was -9.49% and -18.36%, respectively.

**Conclusion:** The optimization effect of medical income structure is generally good, and the adjustment of inspection and inspection income needs to be strengthened; the control of the average cost of outpatient visits has achieved initial results, and the average cost of inpatient visits has not decreased but increased; the expenditure of medical insurance funds has decreased significantly, and the scope of medical insurance payment still needs to be expanded. It is recommended to continue to deepen the medical reform, build a dynamic adjustment mechanism for medical service prices; improve the efficiency of internal cost management in hospitals, strengthen the measures of low drug consumption to prevent rebound; establish a mechanism for mutual recognition of inspection results to improve inspection quality and achieve mutual recognition and sharing.

**Key words:** public hospitals; medical revenue structure; change trend

## 8-13 容错与追责：突发公共卫生事件行政问责结果差异何以形成？——基于 50 个案例的模糊集定性比较分析

魏海斌

广西大学公共管理学院

E-mail:1760896192@qq.com

突发公共卫生事件行政问责具有容错与追责的结果差异，鉴于疫情常态化的客观事实，深入探讨此差异的因果路径具有重大的理论价值和现实意义。基于制度分析与发展理论框架，运用模糊集定性比较分析方法对公开行政问责结果的 50 个案例进行研究。研究发现：公众关注度、责任类型、严重程度、发生地域、上级干预、问责职级、问责人数是问责结果的七个前因条件，其中严重程度低和问责人数少构成了容错的必要条件，严重程度和问责职级构成了追责的充分条件；组态分析得出公众问责驱动式高层追责、主体内生驱动式基层容错、多元主体驱动式发达地区严厉追责和多元主体驱动式西部地区双向选择四条行政问责结果差异解释路径。本文理论价值在于拓展了 IAD 理论框架的应用情境，现实意义在于指导行政问责实践。为了进一步提升突发公共卫生事件行政问责的有效性，本文建议从五个方面着手：扩大问责主体范畴、健全联防联控监督体制、丰富具体情境中的问责行为集合、加大同级政府监督力度、增强数字技术赋能，对于其他突发公共事件行政问责也有一定贡献。

**关键词：**行政问责 模糊集定性比较分析 突发公共卫生事件 制度分析与发展框架

## 8-14 Analysis of China's development assistance for health to countries along the "Belt and Road"

Xiao Anqi<sup>1\*</sup>, Huang Jiayan<sup>1</sup>, Liang Di<sup>1</sup>

School of Public Health, Global Health Institute, Fudan University, Shanghai 200032, China

\*Email: 20211020213@fudan.edu.cn

**Objective:** This study summarized the characteristics of China's development assistance for health (DAH) to countries along the "Belt and Road."

**Method:** Based on the DAH database from the Institute for Health Metrics and Evaluation and AidData database, this study described the time trend, spatial distribution, relative importance among donors, and overall flow of China's DAH from 2000 to 2017 and compared the two periods before and after the launch of the "Belt and Road."

**Results:** China's DAH to countries along the "Belt and Road" increased from US\$20 million in 2000 to US\$880 million in 2017. Before and after the launch of the initiative, the main area receiving China's DAH changed from Africa to Asia, accounting for 57% and 52.7% of total DAH. Among donors, China's ranking of its contribution has increased among half (63 countries) of all recipient countries. Among China's DAH, 97.1% was transferred through bilateral channels, and 89.7% focused on Health System Strengthening.

**Conclusion:** From 2000 to 2017, China's increasing DAH to countries along the "Belt and Road" has focused on Health System Strengthening, primarily through bilateral channels. It is worth noting that China's DAH has a tendency to shift from Africa to Asia. China's relative importance in DAH has increased compared with other traditional donor countries.

**Key words** China; "Belt and Road" Initiative; Development assistance for health



## 8-15 Research on policy texts of TCM informatization in my country from the perspective of policy tools

Xu Xin-yi, Zhu Pinghua ,Zhang Xiu-lan, Huang Jing-yu, Zhang Shu-ya, Liang Jing-rui, Huang Yin

School of Humanities and Social Sciences, Guangxi Medical University

**Objective:** To analyze the characteristics and deficiencies of my country's traditional Chinese medicine informatization policy in terms of policy tools, policy objectives, and policy themes, and to provide reference for optimizing traditional Chinese medicine informatization policies.

**Methods:** Using content analysis and quantitative analysis methods, this paper constructs a three-dimensional framework of "coordination of policy tools, policy objectives and policy subjects" from the perspective of policy tools, and conducts multi-dimensional comparative analysis on 40 national-level and 41 local-level policy texts.

**Results:** The frequency of TCM informatization policy at the national level was 85 (52.80%), 54 (33.54%), and 22 (13.66%), respectively. At the local government level, 68 (72.34%), 21 (22.34%), and 5 (5.32%) were respectively; the proportion of the national level in the three policy goals of managing the business application of the department, promoting the development of related industries, and promoting the quality of traditional Chinese medicine services was 51%, 13%, and 36%, and the frequencies at the local government level are 42.72%, 18.45%, and 38.83%, respectively; in the dimension of policy subject coordination, the overall level of policy subject coordination at the national and local levels has been continuously improved. 4.19 points.

**Conclusion:** The government should adjust the proportion of supply-type and demand-type policy tools, optimize the internal structure, promote the coordinated development of policy objectives, and give full play to the synergistic effect of policy entities.

**Keywords:** traditional Chinese medicine; informatization; policy tool

## **8-16 The Influence of Health Insurance on Social Integration of Migrant Population: An Evaluation of Institutional Effects and Analysis of Mechanisms**

YUE Zongpu, LIU Cai

School of Management, Tianjin University of Traditional Chinese Medicine

E-mail:yuezongpu@outlook.com

**Objective:** To evaluate the social integration index and analyse the influence and mechanism of health insurance on the social integration of migrant population in China and explore the relevant measures to improve the social integration of migrant population through the health insurance.

**Methods:** Based on the 2017 migrant population survey data collected by the National Health Commission, the factor analysis method is used to construct the comprehensive index of social integration and propensity score matching method (PSM) is applied to analyse the effect of health insurance on social integration and the influencing mechanisms.

**Results:** The social integration index of migrant population is 0.699, which indicates the social integration level is high. The social integration index of migrant people who have health insurance is 0.700, which is higher than those who do not have, which shows that health insurance can significantly improve the social integration level of migrant population. The effect of health insurance exists in the employed people and the unemployed people and the effect in in-province migration is much higher than out-province migration. Additionally, the utilization rate of primary health service is the important channel for health insurance to play its role in promoting social integration.

**Conclusion:** Government should expand the cover rate of health insurance and improve the social integration level in migrant population. Also, they should construct the job training system for migrant population and the utilization of primary care service could improve by the health education.

**Key words:** Health insurance; migrant population; social integration; PSM

## 8-17 Analysis of Health Human Resource Allocation in Guangxi

Zhang Ruida, Wang Qianqiang

School of Humanities and Social Sciences, Guangxi Medical University

E-mail: wangqq69@126.com

**Objective:**To understand the current situation of the allocation of medical and health human resources in Guangxi, and explore countermeasures for the construction of medical and health personnel in Guangxi.

**Methods:**The relevant indicators of medical and health personnel in Guangxi in 2015 and 2019 were statistically described and analyzed, and the values of the relevant indicators in 2019 were compared with the levels of the whole country and the western provinces, and the cities in Guangxi were compared.

**Results:**The number and level of health personnel allocation in Guangxi was lower than the national level, ranking in the middle and lower reaches of the western provinces, and most cities in the region were lower than the average level of Guangxi.

**Conclusion:**From 2015 to 2019, the total number of medical and health personnel in Guangxi has increased year by year and developed rapidly, but there is still a large gap compared with the national and western provinces. The distribution of medical and health personnel in different cities is uneven and the difference is obvious. It is suggested to formulate a reasonable health personnel training plan, improve the medical personnel training system, and improve the incentive mechanism of health personnel.

**Keywords:** health personnel; Configuration; Guangxi

## **8-18 Study on Capacity Building of Public Health Service in Guangxi**

Zhang Ruida, Wang Qianqiang

School of Humanities and Social Sciences, Guangxi Medical University

E-mail: wangqq69@126.com

During the 13th Five-Year Plan period, health undertakings in Guangxi have made positive development, and the health level of residents has been further improved. However, due to the special geographical location, emerging infectious diseases, public health emergencies and other threats to public health security still exist. This paper reviewed the main achievements in the construction of public health service capacity in Guangxi during the 13th Five-Year Plan period in the aspects of chronic diseases, endemic diseases, occupational diseases and the prevention and control of dust and toxin hazards. In view of the main problems, countermeasures and suggestions were put forward from the aspects of disease prevention and control, public health education, public health emergency, major disease prevention and health Guangxi construction, so as to improve the public health service capacity in Guangxi and meet the higher requirements of the people on public health security and service capacity.

**Key words:** thirteen five; Public health services; Guangxi

### 9-1 书法对高血压患者的影响研究

卞宏毅<sup>1</sup> 徐伟<sup>2</sup> 魏晓敏<sup>1</sup>

<sup>1</sup> 上海市健康促进中心

<sup>2</sup> 上海市静安区疾病预防控制中心

**【摘要】 目的** 本研究试图利用科学的手段以及方式，了解书法和健康的内在联系 **方法** 从某街道收集 20 人高血压书法练习者，按照年龄（上下不超过 5 岁）、高血压病史、是否有糖尿病、冠心病史、是否服药等因素寻找同一社区 20 人高血压病人进行配对。干预组人群每天练习书法 2 小时，对照组人群不做干预，监测记录日期为三个月，并自填问卷。基线和终末进行调查问卷（健康知识、健康行为、心理量表、血压心率测量等）；干预组人群每天通过健康手环监测血压并每日记录。 **结果** 干预后二组人群在 BMI 的数据上发生了变化，对照组从干预前的 23.6 上升到 25.3，干预组则体重基本不变，二者在干预后在统计学上有显著意义， $P$  值 $<0.05$ 。在 SAS（焦虑量表）和 SDS（抑郁自评量表）方面，干预组人群和对照组人群均呈现不成程度的下降，但二者统计学上没有显著差异。在收缩压和舒张压方面，干预组下降明显，干预组的收缩压从干预前的 158.5 下降到干预后的 144.5，和对照组相比有显著差异， $P$  值 $<0.01$ 。干预组的舒张压从干预前的 85.8 下降到干预后的 80.6，和对照组相比有显著差异， $P$  值 $<0.05$ 。在干预组第 1 天至第 90 天，收缩压和舒张压都呈现下降趋势，尤其是在练习书法 2 小时后血压下降明显。干预组人群在心率上，尤其在练习书法 2 小时后心率比刚开始练习和练习 1 小时候都要低。 **结论** 练习书法对高血压人群有一定作用，并能够维持人体体重。并加强人群的文化自信，增强书法在人群中的健康地位。

**【关键词】** 高血压；监测；文化自信；健康

## 9-2 The impact of Integrated Medical Insurance Schemes on health seeking behavior: A difference-in-differences analysis in China

Chen Huayong<sup>1</sup>, Xiao Mimi<sup>1</sup> (Corresponding author)

Author Affiliation: Chongqing Medical University, School of Public Health and Management

E-mail: [xiaomimi@cqmu.edu.cn](mailto:xiaomimi@cqmu.edu.cn)

Phone Number: 13638309426

**Objective:** China consolidated the Urban Resident Basic Medical Insurance (URBMI) and the New Rural Cooperative Medical Scheme (NRCMS) as one Integrated Medical Insurance Schemes (IMIS) from 2008. Under the IMIS scheme, the covered population are supposed to access the same level of health care at a lower level of cost due to a higher percentage of reimbursement, so they might change their health seeking behavior. This study aims to evaluate the effect of IMIS on health seeking behavior in the targeted area using panel data

**Methods:** Statistics for the study were derived from China Family Panel Studies (CFPS) 2012, 2014, 2016, 2018 and 2020. We employed the difference-in-differences (DID) model. In total, 7864 residents were incorporated for a final sample covered 8 provinces.

**Results:** The results indicated that the implementation of IMIS had a significantly positive effect on the probability of going to low tier of health facilities for contact for both urban and rural residents. Self-assessed health, chronic disease, satisfaction with the quality of medical care were also found to be focal factors of health seeking behavior.

**Conclusions:** In conclusion, the implementation of IMIS has led to improved health seeking behavior. For policy makers, efforts to improve the capacity of primary care facilities, especially for chronic diseases, should be carried out.

**Key words:** Integrated Medical Insurance Schemes, difference-in-differences, Health seeking behavior

## 9-3 基于微信公众号干预对美沙酮维持治疗动机和效果的影响

冯林宏<sup>1</sup> 李海东<sup>1</sup> 陈政吉<sup>1</sup> 刘伟<sup>1\*</sup>

1.昆明医科大学公共卫生学院 云南昆明 650500

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作者简介：冯林宏（1996—），女，昆明医科大学在读硕士，公共卫生专业，

Email: 2249582615@qq.com

通讯作者：刘伟，男，博士，昆明医科大学公共卫生学院教授

Email: liuweikm@qq.com

**【目的】**目前由于新冠疫情的影响美沙酮维持治疗（MMT）患者获得的服务有所减少，脱失率较高，我们通过创建一个以移动互联网为基础的友好的服务渠道，让 MMT 患者可以在不受时间、空间的限制下获得服务，同时探索基于微信公众号干预对 MMT 患者治疗动机和效果的影响，以期对基于移动互联网的社戒社康干预提供思路和依据。

**【方法】**对纳入的 185 名 MMT 患者开展基线调查，采用改良编制的中文版《MMT 动机量表》评估治疗动机，将 MMT 患者按照多中心完全随机分组的方法分为干预组和对照组。设计开发一个适合于 MMT 患者干预的微信公众号。从 2020 年 9 月开始，对照组只接受常规性关注，常规性关注主要包括工作人员定期到家走访及电话回访、门诊医生日常诊疗、政府部门发放宣传资料；干预组在常规性关注的基础上通过微信公众号进行干预，干预主要包括有奖个人行为改变计划、健康教育资料推送、风险预警及响应、线上问题反馈及咨询，到 2021 年 10 月干预满一年后对两组研究对象再次进行治疗动机评估，以评价干预对治疗动机和效果的影响。

**【结果】**干预一年后，干预组和对照组相比，干预组的动机量表总得分、求助意愿维度得分较对照组高（ $P<0.05$ ）；干预组脱失率为 38.1%，对照组脱失率为 56.8%，干预组的脱失率低于对照组（ $P<0.05$ ）。

**【结论】**基于微信公众号对 MMT 患者干预具有可行性，可降低 MMT 患者的脱失率、提高治疗动机，在今后 MMT 患者的治疗中可考虑加入微信公众号干预作为改善治疗效果的辅助手段。

**关键词：**美沙酮维持治疗；微信公众号；干预活动；动机激励

## 9-4 Reliability and validity of Healthy Fitness Measurement Scale (HFMS V1.0) for urban elderly residents in Lanzhou city, Gansu Province

Hu Wenpin<sup>1</sup>, Wang Xiaohui<sup>2</sup>

<sup>1,2</sup> School of Public Health, Lanzhou University

<sup>1</sup> Email: huwp16@lzu.edu.cn

<sup>2</sup> Email: [wangxiaohui@lzu.edu.cn](mailto:wangxiaohui@lzu.edu.cn)

### Abstract

**Objective:** To test the reliability and validity of the Health Fitness Measurement Scale Version 1.0 (HFMS V1.0) developed by Xu Jun et al. in measuring the health fitness of urban elderly residents in Lanzhou.

**Method:** Stratified cluster sampling method was employed. A total of 1124 elderly urban residents in Lanzhou, Gansu Province were selected and surveyed using the Health Fitness Measurement Scale. The reliability was assessed by internal consistency coefficient and split-half reliability. Content validity, structural validity and calibration validity were used to assess the validity.

**Result:** The Cronbach's  $\alpha$  for HFMS V1.0 was 0.932, the Spearman-Brown coefficient was 0.772 and the Guttman coefficients was 0.771. The correlation coefficients of item-to-dimension were 0.557~0.896 ( $P<0.05$ ) and dimension-to-subscale were 0.629~0.929 ( $P<0.05$ ). The results of the exploratory factor analysis were generally consistent with the initial structure of the scale. In the confirmatory factor analysis, CMIN/DF=4.376, RMESA=0.057, NFI=0.890, RFI=0.875, IFI=0.913, TLI=0.901 and CFI=0.913. 34 observed variables had factor loadings of 0.41-0.94, all of which were greater than 0.4. The correlation coefficients between the four overall assessment items and their corresponding scales were all greater than 0.6 ( $P<0.05$ ).

**Conclusion:** HFMS V1.0 has good reliability and validity when applied to elderly urban residents in Lanzhou, and using this scale, we can better carry out research related to population health fitness and its influencing factors.

**Keywords:** Elderly residents; HFMS V1.0; Reliability; Validity



## 9-5 The moderating role of mental healthy literacy on the relationship between life course bullying experiences and psychological symptoms in Chinese college students

Xuexue Huang<sup>1</sup>, Jie Hu<sup>1</sup>, Yanni Xue<sup>1</sup>, Yuhui Wan<sup>1</sup>, Jun Fang<sup>2,3\*</sup> and Shichen Zhang<sup>4,1\*</sup>

<sup>1</sup> Department of Maternal, Child and Adolescent Health, School of Public Health, Anhui Medical

University, and MOE Key Laboratory of Population Health Across Life Cycle/ Anhui Provincial Key Laboratory of Population Health and Aristogenics, No 81 Meishan Road, Hefei 230032, China

<sup>2</sup> Department of Toxicology, School of Public Health, Anhui Medical University, and Key Laboratory of Environmental Toxicology of Anhui Higher Education Institutes, No 81 Meishan Road, Hefei 230032, China

<sup>3</sup> Faculty of Pharmaceutical Science, Sojo University, Ikeda 4-22-1, Kumamoto 860-0082, Japan

<sup>4</sup> School of Public Health and Health Management, Anhui Medical College, No 632 Furong Road, Hefei 230601, China

### Abstract

**Objective:** The aim of our study was to examine the patterns of life course bullying experiences, and investigate whether mental health literacy moderates the relationship between bullying patterns and psychological symptoms, i.e. anxiety and depressive symptoms in Chinese college students.

**Methods:** A total of 4036 college students were enrolled in this study from November 2019 to January 2020. Bullying experiences, mental health literacy, and psychological symptoms were measured by self-report validated questionnaires. A latent class analysis was applied to identify bullying experiences patterns. The PROCESS program was conducted to analyze whether mental health literacy moderated the link between patterns of bullying and psychological symptoms.

**Results:** The detection rates of bullying in before school, elementary school, junior high school, high school and college were 2.9%, 8.5%, 13.1%, 9.0% and 8.9%, respectively. Three latent patterns were identified, characterized as persistent bullying pattern, moderate bullying pattern, and low bullying pattern, which were 5.7%, 11.3% and 82.9% of involved participants, respectively. Positive correlations were found between bullying pattern and psychological symptoms: lower bullying pattern accompanied decreased anxiety and depressive symptoms. Specifically, mental health literacy moderated the association between bullying patterns and anxiety symptoms ( $B = 0.0383$ ,  $p < 0.05$ ), while mental health literacy did not moderate the association between bullying patterns and depressive symptoms ( $B = -0.005$ ,  $p > 0.05$ ).

**Conclusions:** Our findings indicated that identifying different patterns of life course bullying experiences would be helpful for the design of tailored interventions programs related to psychological symptoms. It's worth noting that mental health literacy plays a certain moderating role in the relationship between them, should enhance mental health literacy levels and attenuate the severity of psychological symptoms.

**【Keywords】** Mental health literacy, Life course bullying experience, Psychological symptoms, College students

### Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## 9-6 The development of indicators to measure the implementation of clinical practice guideline for stroke with integrative medicine

Lu Sensen, Cai Yiyuan, Ni Xiaojia, Cai Yefeng, Xu Dong

Lu Sensen: School of Health Management, Southern Medical University, lvsensen678@gmail.com (co-author)

Cai Yiyuan: Associate Professor, PhD, School of Public Health and Wellness, Guizhou Medical University, caiyiyuan@gmc.edu.cn (co-author)

Ni Xiaojia: Associate Researcher, Guangdong Provincial Hospital of Traditional Chinese Medicine

Cai Yefeng: Professor, Guangdong Provincial Hospital of Traditional Chinese Medicine

Xu Dong: Professor and PhD Director, School of Health Management, Southern Medical University, romanxu@i.smu.edu.cn (Correspondence)

**Abstract Objective:** To develop indicators based on the RE-AIM framework for the implementation outcome for the clinical practice guideline on stroke management with integrative traditional Chinese and western medicine and also to illustrate how framework-based indicators can be developed in implementation research. **Methods:** These measurements on implementation outcomes were developed using the RE-AIM framework in implementation science. The authors used the Silent & Anonymous FEedback (SAFE) technique which was developed by combining the Delphi method and nominal group technique to modify these measurements. The results of the positive coefficients of experts, the authoritative coefficient ( $Cr$ ), consistency of evaluation (coefficient of variation ( $CV$ ) and Kendall's  $W$ ), and qualitative feedback (importance, clarity, and feasibility of the items) were used to guide the revision of measurements. **Results:** In the two rounds of evaluation, the positive coefficients of experts were 90% and 100%, the authoritative coefficient ( $Cr$ ) were  $>0.8$ , the coefficient of variation ( $CV$ ) were  $<0.3$ , and Kendall's  $W$  were 0.875 and 0.916, (all  $P<0.001$ ). And the percentage of item agreement was 99.5% (206/207) and 98.8% (244/247), and items were more important or very important in 99.0% (205/207) and 99.2% (245/247) of the items were considered clear and very clear by the experts in 21/21 cases, and 19/22 items were considered more feasible or very feasible by the experts. The measurements were modified according to the quantitative and qualitative evaluation results. There were 24 measurements in the series of measurements, and it contains 5 dimensions: Reach, Effectiveness, Adoption, Implementation, and Maintenance. **Conclusion:** The index system was constructed with a high degree of expert participation and authority, and the consistency of expert evaluation results was good.

**Keywords:** Stroke; Guideline; Implementation science; RE-AIM framework; Delphi method; Nominal group technique; Silent & Anonymous feedback technique

## 9-7 Is lifestyle a bridge between perceived social support and depression in Chinese university students?

Ma Yichen<sup>1</sup>, Lu Chuntian<sup>2</sup>

Department of Sociology, School of Humanities and Social Sciences, Xi'an Jiaotong University, Xi'an 710049, China

<sup>1</sup> Title: PhD candidate

E-mail: [mayichen1997@stu.xjtu.edu.cn](mailto:mayichen1997@stu.xjtu.edu.cn)

<sup>1</sup> Title: Professor

E-mail: [luchuntian@xjtu.edu.cn](mailto:luchuntian@xjtu.edu.cn)

### Abstract

**Purpose:** The purpose of this study was to examine the link between perceived social support and depression in Chinese university students. The present study also aimed to test whether lifestyle mediates this link.

**Methods:** Convenience sampling and cluster sampling were used to collect data from 1007 university students from six universities in northwest China. Survey data were analyzed using a structural equation model (SEM).

**Results:** there was a negative link between perceived social support and depression in Chinese university students. Further, only one of the lifestyle factors — sleep quality — mediated the link between perceived social support and depression.

**Conclusion:** These findings underscored the importance of perceived social support and lifestyle related to sleep quality, in alleviating depressive symptoms among Chinese university students. Therefore, families, friends, schools, and students themselves need to work together to help university students establish a social support network, form a healthy lifestyle, especially a good sleep habit, reduce recreational screen time, so as to maintain the mental health of college students and reduce their depression risk.

**Keywords:** Chinese university students; Depression; Lifestyle; Perceived social support; Sleep quality; Structural equation model

**Interest statement:** This paper has been submitted to Children and Youth Services Review, but is still in the preliminary review process and has not been confirmed for publication.

## 9-8 Latent Profile Analysis of Mental Health Literacy Among Patients with Stroke and Its Influencing Factors

REN Juanjuan <sup>1\*</sup>

1.School of Nursing and Health, Zhengzhou University, Zhengzhou 450001, China

\* Author: REN Juanjuan, Nursing, Master's degree; E-mail: 2235936158@qq.com

**[Abstract] Objective** To investigate the potential typology of mental health literacy in stroke patients and to analyse the differences in demographic and disease characteristics between different categories of patients. **Methods:** A convenience sampling method was used to select 287 stroke patients from July 2020 to October 2020 in the neurology department of a triple A hospital in Henan Province. They were surveyed using the General Information Questionnaire, the Modified Rankin Scale, the Multiple Mental Health Literacy Scale and the Social Support Scale. Latent Profile Analysis of mental health literacy characteristics of stroke patients were analysed, and factors influencing their potential categories were identified by univariate analysis and multiple logistic regression. **Results:** There was a clear categorisation of mental health literacy characteristics of stroke patients into "Middle Type" (19.9%), "Triple low type" (48.8%), "High knowledge-high resource" (12.5%) and "High knowledge-high resource" (12.5%). "(12.5%) and "High beliefs-low resources" (18.8%). Taking the "Triple low type" as reference, primary school and below, living with children, living with spouse and children and having a monthly per capita household income of 3,000~RMB were more likely to be intermediate types; the older the patient was, the greater the probability of being classified as high knowledge-high resource type, while the younger the patient was, the greater the probability of being classified as high belief-low resource type; Social support was negatively associated with mental health literacy; career workers were a risk factor for the high knowledge-high resource type. **Conclusions:** Clinical staff should pay attention to the heterogeneity of the characteristics of stroke patients, and provide targeted mental health interventions and health education according to the different categories and levels to meet the differential needs of patients for mental health knowledge, beliefs and resources.

**[Keywords]** Stroke; Psychology; Patients; Mental Health literacy; Latent Profile Analysis

## 9-9 The Effect of Procrastination on Physical Health Improvement of College Students: The Mediating Effect of Exercise Behavior

Song Di<sup>1</sup>, Chen Shan-ping<sup>1\*</sup>

<sup>1</sup> Dept of PE, Xi'an Jiaotong University, Xi'an 710049, China.

\* Corresponding author. E-mail address: chshp@mail.xjtu.edu.cn(Chen Shan-ping)

**Objective:** The overall physical health of college students shows a rapid decline in the third and fourth grades of the "premature senility" phenomenon, the main reason is the lack of physical education courses and the existence of bad habits; The purpose of this paper is to explore the effect of procrastination on the improvement of college students' physical health and its mechanism, and to provide theoretical reference for the promotion of college students' physical health.

**Methods:** The physical health test data of 2486 non-physical education undergraduates in the second and fourth academic years were collected by the physical education department of ordinary colleges and universities. The physical health changes after the end of physical education courses were reflected by the difference value. The general procrastination behavior scale and physical exercise behavior questionnaire were used to investigate the students. The process plug-in of SPSS26 was used to test the mediating effect of exercise behavior on the path of delaying behavior affecting physical health improvement.

**Results:** (1) The physical health of college students showed a downward trend ( $-11.92 \pm 8.97$ ), and the physical health in the fourth academic year was significantly lower than that in the second academic year ( $P < 0.001$ ). (2) Procrastination behavior was significantly negatively correlated with physical health ( $r = -0.055$ ,  $P < 0.01$ ), and exercise behavior was significantly positively correlated with physical health ( $r = 0.057$ ,  $P < 0.01$ ). Procrastination behavior was negatively correlated with exercise behavior ( $r = -0.175$ ,  $P < 0.001$ ). (3) When procrastination affected physical health, exercise had a partial mediating effect, and the effect value ( $\beta = -0.01$ ,  $P < 0.01$ ) accounted for 15.61% of the total effect.

**Conclusion:** (1) The phenomenon of "premature senility" still exists in college students' physical health. (2) Procrastination is not conducive to the healthy development of physical fitness, which hinders the exercise behavior and leads to the decline of college students' physical health in advance. (3) In the teaching process, students' procrastination behavior should be corrected, students' exercise behavior supervision should be strengthened, the execution of personal exercise plan should be improved, and the healthy and sustainable development of college students should be promoted.

**Key words:** Physical health; Procrastination behavior; Exercise behavior; School sports; College students

## 9-10 抖音新媒体全国优质账号“科普中国”传播状况分析

韦佳莹 学生 西安体育学院 965942870@qq.com

随着社会互联网不断发展和移动端设备大量增加,短视频在我国实现了飞速发展,以抖音、快手 app 为代表的短视频平台,逐渐成为大众快速获取信息、知识等的途径,同时也成为内容传播带来新的机遇。在当下短视频的行业也在不断蓄力,多元化内容输出成为各大平台竞争的着陆点,并且科普短视频作为科普创作的形式之一,其在传播科学内容上充分发挥了优势,展现的直观性、生动性相较于文字而言,更容易吸引受众的青睐并主动接受信息,从而实现了向公众传播科学的目的。

本研究聚焦于“科普中国”抖音短视频传播状况进行分析,研究方法主要以内容分析法为主,选取不同类型短视频从传播内容、传播策略及传播效果着手分析,垂直化细分内容,深究科普传播意义,试图将科学传播带给大众以此提高科学素养。研究发现“科普中国”内容类型趣味多样,多用碎片化表达科普知识,视频多元化符合用户观看需求,选题内容利用热点新闻事件传播科学原理,其专业化团队提高内容科学性,打造全方面的权威科普平台,从而提升视频传播速度,实现与受众的有效互动。

With the continuous development of social Internet and a large number of mobile devices, short video has achieved rapid development in China. Short video platforms represented by Douyin and Kuaishou app have gradually become a way for the public to quickly obtain information and knowledge, and also become new opportunities for content communication. In the present short video industry is also in constant xu li, diverse content output become each big platform competition landing site, and the popular science short video as one of science popularization creation form, its in the spread of science content, give full play to the advantage of intuitive, vivid than words, more easy to attract the audience's favor, and take the initiative to accept information, Thus achieving the purpose of communicating science to the public.

This study focused on the "science" of China trill short video transmission condition analysis, research methods are mainly composed of content analysis, selection of different types of short video from the communication content, communication strategies and communication effect analysis of vertical segment content, explore science dissemination significance, to the masses to science communication, trying to improve the scientific literacy. Study found that "science" of China content type taste diversity, popular science knowledge, multi-purpose fragmentation expression can meet the demand of users to watch video diversification, selected topic content using the hot news events spread scientific principle, the professional team to improve the scientific content, make all aspects of the authority of the science popularization platform, promote video transmission speed, thereby achieve the effective interaction with the audience.

## 9-11 Relationship Between Exercise-induced Fatigue and Nutritional Supplement

WuJunpeng;Master;Beijing Sport University;745904746@qq.com

**Abstract:** **Background:** Nowadays, China vigorously promotes physical exercise throughout the country. However, sports fatigue always occurs after physical exercise, which will affect the state and effect of the second training of exercisers or athletes. **Purpose:** The human body will produce fatigue after exercise. How to deal with this fatigue and coordinate the nutritional relationship under fatigue plays an important role in reducing sports injury and promoting post exercise recovery. **methods:** This paper summarizes the data of sports fatigue by using the method of literature, and analyzes the causes and solutions of fatigue according to sports physiology and nutrition. **result:** 1. Sports fatigue is mainly caused by the accumulation of metabolic products of sports offspring, imbalance of internal environment stability, energy and material consumption and conservation inhibition. The amount of energy supplement before competition must be determined according to different sports events, intensity and time, so as to make the energy sufficient during sports and delay the generation of fatigue; 2. In some endurance events (such as marathon), supplement nutrients that need to be consumed a lot, such as water, sugar, electrolyte, vitamins and trace elements; 3. It is also necessary to supplement nutrition reasonably for a period of time after exercise, so as to promote the recovery of exercise-induced fatigue. 4. Athletes in adults are less able to metabolize fat and amino acids than athletes in adults, but they consume more fat and amino acids than athletes in adults. **Conclusion:** 1. Nutritional supplement after sports fatigue is an effective means to alleviate symptoms, promote recovery and ensure training. 2. Whey protein can be supplemented after exercise-induced fatigue, which can provide rich branched chain amino acids and transform into glutathione to alleviate fatigue; Supplement vitamins, trace elements and taurine to alleviate fatigue reaction caused by excessive free radicals; 3. Supplement creatine, fructose 1,6-diphosphate and branched chain amino acids to provide energy for the body; 4. Supplement sports drinks, maintain constant blood sugar, supplement lost body fluids and electrolytes, and reasonable nutritional supplement can accelerate the elimination of fatigue, which has scientific guiding significance for human development. 5. Diet is not only an essential element of human life, but also an effective way for athletes to enhance their physique and improve their sports ability. Especially after high-intensity and large amount of exercise training, nutritional supplement is the most effective means of recovery.

**Key words:** nutritional supplement, health, exercise-induced fatigue, reasonable diet, eliminate fatigue

## **9-12 A probe into the involvement of Social work in College Girls' appearance anxiety from the Perspective of gender**

Abstract: under the social background of advocating high appearance and slim beauty, social members are dissatisfied with and anxious about personal appearance, especially college female students have significant appearance anxiety problems. In this study, a questionnaire survey was conducted among 800 students from 3 universities in Xi'an. It was found that 88.95% of the college girls rated their appearance less than 80, and 71.4% of the college girls had appearance anxiety. At the same time, there are five main reasons for college girls' appearance anxiety: the discipline of history and culture, the gender stereotype created by the mass media, the entrapment of the trend of consumerism, the oppression of the employment market and the negative effects of social relations. From the perspective of gender, the author uses the method of social work casework, combined with rational emotional therapy and ACT therapy, to achieve effective intervention to the victim.

Key words: gender order, female appearance anxiety, gender equality



## 9-13 Research on the diagnosis and educational intervention path of new -type loneliness among college students

Xie Li-jun, Chen Shan-ping (corresponding author)

Dept of PE, Xi'an Jiaotong University, Xi'an 710049, China.

mail:1475356296@qq.com; [chshp@mail.xjtu.edu.cn](mailto:chshp@mail.xjtu.edu.cn)

**Objective:** The new-type loneliness is a new mental health problem, which is used to explain new problems caused by the wide use of internet. The existing studies on internet use and loneliness mainly focus on the young and the elderly. Studies on the youth often analyze loneliness as an influential factor of the internet use, but do not regard loneliness as a practical problem to be solved. There is a lack of research on the mechanism of loneliness caused by internet use. This paper aims to probe into the current situation, characteristics, and mechanism of new-type loneliness among college students, providing theoretical reference for the current health education promotion of college students.

**Methods:** Through theoretical analysis, a theoretical model of the influence of internet use on loneliness was constructed, and 1510 college students were surveyed by loneliness scale, Comprehensive Interpersonal Relationship Diagnostic Scale and the questionnaire on internet use behaviors. Amos24 was used to verify the model.

**Results:** (1) The total score of loneliness of college students was  $11.60 \pm 2.263$ . 1097 students (72.6%) were diagnosed as new-type loneliness, including 55 students (3.6%) with severe loneliness, 305 students (20.2%) with moderate loneliness, and 737 students (48.8%) with mild loneliness. (2) One-way ANOVA showed that there were significant differences in realistic interpersonal communication among college students with different loneliness levels ( $P < 0.001$ ). In the three dimensions of internet use behavior, there were significant differences in internet leisure behavior ( $P < 0.01$ ) and internet information behavior ( $P < 0.01$ ), but there was no significant difference in internet social behavior ( $P > 0.05$ ). (3) There was a significant positive correlation between realistic interpersonal communication and loneliness ( $P < 0.01$ ), but there was no significant correlation between internet social behavior and loneliness ( $P > 0.05$ ). (4) The fitting index of the structural equation is  $X^2/DF=5.598$ ,  $RMSEA=0.055$ ,  $GFI=0.978$ ,  $AGFI=0.959$ ,  $NFI=0.968$ ,  $CFI=0.973$ ,  $IFI=0.97$ . (5) Internet use behavior affected loneliness through two mediating paths: internet information behavior  $\rightarrow$  realistic interpersonal communication  $\rightarrow$  loneliness (0.204,  $P < 0.05$ ), [0.124, 0.324]; internet information behavior  $\rightarrow$  internet leisure behavior  $\rightarrow$  realistic interpersonal communication  $\rightarrow$  loneliness (-0.116,  $p < 0.05$ ), [-0.214, -0.065].

**Conclusion:** (1) The new-type loneliness of college students is very serious with the main reason of the realistic interpersonal alienation caused by the bad internet use. Social online communication is ineffective in solving the new-type loneliness problem. (2) Internet leisure behavior reduces realistic interpersonal communication and thus leads to loneliness, while internet information behavior promotes realistic interpersonal communication and reduces loneliness. (3) By teaching students how to use the internet correctly and helping them solve real interpersonal problems, the combination of online and offline interpersonal relationships can effectively prevent and alleviate students' new-type loneliness.

**Key words:** loneliness; Internet use; Interpersonal communication; Education; College students'

## 9-14 Patterns of five behaviors and suicide behaviors among adolescents of six provinces in China

Yanni Xue<sup>1#</sup>, Chunyu Guo<sup>2#</sup>, Zhengmei Xia<sup>2</sup>, Yingying Cui<sup>2</sup>, Jie Hu<sup>1</sup>, Xuexue Huang<sup>1</sup>, Yuhui Wan<sup>1</sup>, Jun Fang<sup>2,3\*</sup> and Shichen Zhang<sup>4,1\*</sup>

<sup>1</sup> Department of Maternal, Child and Adolescent Health, School of Public Health, Anhui Medical

University, and MOE Key Laboratory of Population Health Across Life Cycle/ Anhui Provincial Key Laboratory of Population Health and Aristogenics, No 81 Meishan Road, Hefei 230032, China

<sup>2</sup> Department of Toxicology, School of Public Health, Anhui Medical University, and Key Laboratory of Environmental Toxicology of Anhui Higher Education Institutes, No 81 Meishan Road, Hefei 230032, China

<sup>3</sup> Faculty of Pharmaceutical Science, Sojo University, Ikeda 4-22-1, Kumamoto 860-0082, Japan

<sup>4</sup> School of Public Health and Health Management, Anhui Medical College, No 632 Furong Road, Hefei 230601, China

### Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

### Abstract

**Objective:** This study aimed to identify the patterns of five behaviors and explore the association between different patterns and suicide behaviors in Chinese adolescents.

**Methods:** From November 2015 to January 2016, a total of 22,628 middle school students were enrolled from six provinces in China. Five behaviors [smoking, alcohol use(AU), diet pills use (DPU), screen time (ST), problematic mobile phone use (PMPU)] and suicide behaviors (suicide ideation, suicide plan and suicide attempt) were measured by self-reported validated questionnaires. A latent class analysis (LCA) was applied to identify five behaviors patterns. The multivariable logistic regressions models were utilized to examine the associations between five behaviors patterns and suicide behaviors.

**Results:** The prevalence of suicide ideation, suicide plan and suicide attempt were 14.1%, 7.3% and 4.4%, respectively. By this study we found four latent patterns among Chinese adolescents: Low-risk pattern, moderate-risk pattern 1 (DPU/PMPU), moderate-risk pattern 2 (smoking/AU/ST), and high-risk pattern which were 71.2%, 22.3%, 3.2% and 3.3% of involved students, respectively. Logistic regression analysis of suicide ideation indicated that compared with low-risk pattern, high-risk pattern [6.08 (5.16-7.16)] had the highest risk, followed by moderate-risk pattern 1 [3.30 (3.03-3.59),] moderate-risk pattern 2 [2.35 (1.91-2.88)] showed the lowest risk. Compared with low-risk pattern, the results of suicide plan suggested the degree of risk was high-risk pattern [7.96 (6.58-9.61)], moderate-risk pattern 2 [3.92 (3.50-4.39)] and moderate-risk pattern 1 [3.20 (2.49-4.11)] respectively. Compared to the low-risk pattern, moderate-risk pattern 1, moderate-risk pattern 2, and high-risk pattern showed that adjusted OR (95% CI) value of 5.59 (4.81-6.49), 4.17 (3.07-5.66) and 12.36 (9.95-15.35) were significantly associated with suicide attempt.

**Conclusions:** These findings suggested that the latent patterns of five behaviors are related to suicide behaviors in Chinese adolescents, so different intervention and prevention protocol need to be taken for different patterns of adolescents.

**Keywords:** Behaviors, Adolescent, Latent lass analysis, Suicide behaviors

## 9-15 Reliability and validity test of Chinese version of the Vaccine Hesitancy Scale

Chengcheng Yu, Department of Health Management of Public Health, Zhengzhou University, ycc5410@163.com

**[Abstract] Objective:** To translate and revised the Vaccine Hesitancy Scale (VHS) into Chinese, and test its reliability and validity. **Methods:** Based on the Brislin translation model, we conducted literal translation, back translation and cross-cultural debugging of the VHS scale. After the evaluation of the expert group, the Chinese version of VHS scale was formed. From March 23 to 28, 2022, 160 parents were investigated by convenience sampling. The critical ratio method and Pearson correlation coefficient method were used for project analysis; Internal consistency reliability, split-half reliability and test-retest reliability were used to test the reliability of the scale; Exploratory factor analysis and content validity index were used to evaluate the structural validity and content validity of the scale. **Results:** The Chinese VHS scale included 2 dimensions of lack of confidence and risk, consisting of 7 and 3 items, respectively. The total Cronbach's  $\alpha$  coefficient of the scale was 0.753, the split-half reliability was 0.749, the test-retest reliability was 0.769; The content validity index was 0.900, and each item was 0.830~1.000; 2 common factors were extracted by exploratory factor analysis, with a cumulative contribution rate of 63.08%. **Conclusion:** The Chinese version of the VHS scale has a good reliability and validity, which can be used as a special scale to evaluate parents' hesitancy about childhood vaccines in China.

**[Key words]** vaccine hesitancy scale (VHS); children vaccine; reliability; validity  
There is no conflict of interest in this article.

## 9-16 "Beautiful" and "Healthy": The Effect of Obesity Image on Physical Activity

Long Zhang <sup>a,b</sup>, Chuntian Lu <sup>a</sup>, Meng Liu <sup>a</sup>

<sup>a</sup> Department of Sociology, School of Humanities and Social Science, Xi'an Jiaotong University, No. 28 Xianning West Road, Xi'an, 710049 China

<sup>b</sup> Department of Physical Education, Xi'an University of Technology, No. 5 Jinhua South Road, Xi'an, 710048 China

### Abstract

**Objective:** Body image is an important factor affecting the physical and mental health development of college students, and it is also an important perspective for spying on their physical activity. This paper discusses the relationship between obese body image and college students' physical activity from both objective and subjective aspects, and further analyzes the cognitive bias of obesity image and the heterogeneity of gender.

**Methods:** Firstly, based on the data of "Survey of Physical Exercise and Physical and Mental Health Status of College Students", the distribution of subjective and objective obesity images and their cognitive biases was analyzed by univariate description statistics, and whether there were sex differences in each variable was tested by chi-square. Secondly, the multiple linear regression model (OLS) was used to investigate the effects of subjective and objective obesity body image on the physical activity of college students and their gender heterogeneity, respectively.

**Results:** Adjusted estimates showed that the objective obesity image significantly positively affects the physical activity of college students ( $\beta=0.206$ , 95% confidence interval [CI]: 0.086 to 0.327), while the subjective obesity image has a significant negative effect ( $\beta=-0.143$ , 95% CI: -0.249 to -0.037). In addition, the cognitive bias of obesity image is an important factor affecting the physical activity of college students, the more objective the cognition, the higher the level of physical activity ( $\beta=-0.093$ , 95% CI: -0.193 to 0.007), the more subjective the cognition, the lower the level of physical activity ( $\beta=0.118$ , 95% CI: -0.012 to 0.024), but the heterogeneous effect of sex is not significant.

**Conclusions:** This paper suggests that college students should have a scientific and objective understanding of the image of self-obesity, and on this basis, shape their body image through physical activity, which plays an important role in their physical and mental health development.

**Keywords:** Obesity Image; Cognitive bias; Physical activity; College students

### Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared – influence the work reported in this paper.

## 9-17 The relationship between unhealthy lifestyle patterns and depressive symptoms among residents in Beijing, China: a community-based cross-sectional study

Zhang Xiaoyue, Chang chun

Zhang Xiaoyue : Department of Social Medicine and Health Education, School of Public Health, Peking University, 2011210122@bjmu.edu.cn

Chang chun : Department of Social Medicine and Health Education, School of Public Health, Peking University, [changchun@bjmu.edu.cn](mailto:changchun@bjmu.edu.cn)

### Abstract

**Introduction:** Depression is a prevalent mental disorder that has an irreversible impact on people's health. Unhealthy lifestyles are modifiable and have a significant impact on depression. The purpose of this paper is to explore the impact of different unhealthy lifestyles and their patterns on depressive symptoms.

**Methods:** The community-based cross-sectional study was conducted in the Beijing Daxing District Community and included 6252 samples. The PHQ-9 was used to measure depressive symptoms, and questionnaires were utilized to investigate five unhealthy lifestyles, including lack of sleep (SL), lack of fruits and vegetables (FV), lack of exercise (E), smoking (S), and drunk (D). We used unhealthy lifestyle scores (ULS) to measure the overall behavior of the participants. That is, the unhealthy lifestyle received 1 point, no 0 point, and a total score of 0 to 5. By combining five unhealthy lifestyles, multiple patterns were formed, each named using behavioral abbreviations. Descriptive analyses and Firth's logistic regression model were used to analyze the relationship between unhealthy lifestyle patterns and depression symptoms.

**Results:** In our study, 12.1% of participants reported depressive symptoms. Compared with the ULS of zero, those with one (OR1.21, 95%CI:0.84~1.79), two (OR1.47, 95%CI:1.03~2.15), three (OR2.30, 95%CI:1.58~3.43), four (OR 3.00, 95%CI:1.95~4.71), and five (OR4.10, 95%CI:2.10~7.83) were more likely to have depressive symptoms after adjusting the covariates. When participants had three or more unhealthy lifestyles at the same time, including the patterns of SLFVE (OR1.95, 95%CI:1.44~2.61), SLFVD (OR2.97, 95%CI:1.43~5.87), FVED (OR1.97, 95%CI:1.32~2.89), SLFVES (OR2.04, 95%CI:1.32~3.06) and SLFVED (OR2.79, 95%CI:1.47~5.04), they were more likely to have a negative effect on depressive symptoms.

**Conclusion:** Unhealthy lifestyles have been linked to the prevalence of depressive symptoms. And the findings suggest that people with multiple unhealthy lifestyles are more likely to develop depressive symptoms, particularly in people with behaviors such as lack of sleep or fruits and vegetables deficiency. In the future, we'll need more tailored behavioral intervention tactics to reduce risk, prevent depression, and improve people's mental health.

**Keywords:** depressive symptoms; unhealthy lifestyle; patterns

# 9-18 Low mental health literacy and non-suicidal self-injury potentially increase the risks of suicidal behaviors in Chinese middle school students

Zhixian Zhang<sup>1</sup>, Xuexue Huang<sup>1</sup>, Jie Hu<sup>1</sup>, Yanni Xue<sup>1</sup>, Liyuan Jia<sup>1</sup>, Danlin Li<sup>1</sup>, Yi Zhang<sup>1</sup>, Yuhui Wan<sup>1,2</sup>, Fangbiao Tao<sup>1,2</sup>, Shichen Zhang<sup>3,2</sup>,

<sup>1</sup>Department of Maternal, Child and Adolescent Health, School of Public Health, Anhui Medical University; Hefei 230032, Anhui, China; <sup>2</sup>MOE Key Laboratory of Population Health Across Life Cycle /Anhui Provincial Key Laboratory of Population Health and Aristogenics, Anhui Medical University, Hefei 230032, Anhui, China; <sup>3</sup>Anhui Medical College, Hefei 230601

Corresponding author: Zhang Shichen, Email: [zhangshichen@ahmu.edu.cn](mailto:zhangshichen@ahmu.edu.cn); Wan yuhui, Email: [wuyhayd@163.com](mailto:wuyhayd@163.com)

## Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Abstract

**Objective:** The present study aimed to examine the interactive associations between mental health literacy and non-suicidal self-injury (NSSI) with suicidal behaviors in Chinese middle school students.

**Methods:** A cross-sectional study was conducted from October 2020 to June 2021. A total of 16 853 middle school students were enrolled in this study. Mental health literacy, NSSI and suicidal behaviors were measured by self-reported validated instruments.. Multivariate logistic regression models were conducted to examine relations between them.

**Results:** The prevalence of suicidal ideation, suicidal plan and suicidal attempt were 31.3%, 16.3% and 7.5%, respectively. Low mental health literacy was significantly associated with suicidal ideation (OR=1.13, 95%CI: 1.04-1.23), suicidal plan (OR=1.31, 95%CI: 1.18-1.46) and suicidal attempt(OR=1.85, 95%CI: 1.58-2.17). NSSI was significantly related with suicidal ideation (OR=7.11, 95%CI: 6.59-7.66), suicidal plan (OR=6.66, 95%CI: 6.09-7.29) and suicidal attempt(OR=7.75, 95%CI: 6.79-8.85). Interaction analysis indicated that low mental health literacy and NSSI were interactively associated with increased risks of suicidal behaviors.

**Conclusions:** The finding indicate that Chinese middle school students with low mental health literacy and NSSI are intending to exhibit suicidal behaviors. The intervention programs of mental health problems should enhance mental health literacy levels and attenuate the severity of NSSI..

**[Keywords]** Mental health literacy; NSSI; Suicide-related behavior; Interaction

## 9-19 Fertility intentions and fertility behavior among only children: Evidence from China

Hang Zhao<sup>1</sup>, Xiao Mimi<sup>1</sup> (Corresponding author)

Author Affiliation: Chongqing Medical University, School of Public Health and Management

E-mail: [xiaomimi@cqmu.edu.cn](mailto:xiaomimi@cqmu.edu.cn)

Phone Number: 13638309426

### Abstract

**Background:** The one-child policy in the 1980s have created a large group of only children. The fertility intentions and fertility behavior of only children affect the implementation effects of the two-child policy and the three-child policy. Therefore, the purpose of this study is to investigate the fertility intentions, fertility behavior and influencing factors of only children in China, examining the intergenerational transmission effects of fertility patterns.

**Methods:** The fertility intentions, fertility behavior and influencing factors of only children were investigated using Chinese Social Survey (CSS) in 2019, a nationally representative dataset. Poisson regression analysis was used to assess the effect of only-child status on fertility intentions and fertility behavior, and robustness and heterogeneity tests were conducted using ordered logistic regression and grouped Poisson regression.

**Results:** Fertility intentions and fertility behavior were lower than normal replacement levels for both only children and non-only children. The fertility intentions and fertility behavior of the only child were significantly lower than that of the non-only children ( $p < 0.01$ ). The intergenerational transmission of fertility pattern was validated by the fact that only children preferred the low fertility pattern of the native family. Compared with fertility intentions, only-child status had a greater effect on fertility behavior. As for other influencing factors, age, education, ethnicity, pension insurance, socioeconomic status, and family size had significant effects on fertility intentions (all  $p < 0.05$ ). Age, education, marriage, pension insurance, the household register, personal income, and family size had a remarkable effect on fertility behavior (all  $p < 0.05$ ). The effect of one-child status on fertility intentions and fertility behavior differed by age, household register and education, with one-child status having a greater effect on those with higher education, rural hukou and under 40 years of age.

**Conclusion:** Both only children and non-only children fertility behavior are lower than fertility intentions, and fertility intentions are yet to be further transformed into fertility behavior. Fertility policies should take into account the special characteristics of only children, such as giving higher childbirth subsidies and personal tax deductions to only children in order to enhance the fertility intentions of the one-child group.

**Keywords:** Only child, Fertility intention, Fertility behavior

## **9-20 The impact of the two-child policy on the fertility behavior of people of childbearing age: an empirical study based on CFPS data**

Hang Zhao<sup>1</sup>, Xiao Mimi<sup>1</sup> (Corresponding author)

Author Affiliation: Chongqing Medical University, School of Public Health and Management

E-mail: [xiaomimi@cqmu.edu.cn](mailto:xiaomimi@cqmu.edu.cn)

Phone Number: 13638309426

**Background:** The two-child policy is an important population policy to promote the optimisation of population structure and sustainable socio-economic development. However, few studies have examined the impact of the two-child policy on fertility behavior. This study aims to evaluate the impact of the two-child policy on the fertility behaviour of the target population.

**Methods:** Data from the 2010, 2012, 2014, 2016 and 2018 China Family Panel Studies (CFPS) were used to analyse the impact of the two-child policy on the fertility behaviour of people of childbearing age. The sample includes 84,865 observations, consisting of 33,492 individuals, individuals of age 19-45 were included. Descriptive statistics were used to describe trends in fertility behaviour. The difference-in-differences (DID) model was used to evaluate the impact of the two-child policy on fertility behaviour.

**Results:** The descriptive statistics show a significant increase in fertility behaviour of the target group after the implementation of the policy.

Results showed that the two-child policy increased the fertility level of the target population of childbearing age by 18.02% ( $p < 0.01$ ). After adding control variables such as personal and family characteristics, the two-child policy increased the fertility behaviour of the childbearing age group by 11.54% ( $p < 0.01$ ). Other influencing factors such as education, marriage, personal income, health level, family size and household income had a significant effect on the fertility behaviour of the target population.

**Conclusion:** The two-child policy significantly increased the level of fertility behaviour of the target population.

**Key words:** two-child policy, fertility behavior, difference in differences



## 9-21 Study on the strategy of integrating the development of national fitness and national health ——Based on a health-related physical fitness perspective

Zhu Haoan; Lin Yitong

Job title: Master's degree student

E-mail: zhuhaoan2021@cupes.edu.cn

Company: Capital University of Physical Education and Sports

**Research Objective:** The integration of national fitness and national health can boost national physical fitness, prevent chronic diseases, reduce the death rate of cardiovascular and cerebrovascular diseases, and improve national well-being. Health-related physical fitness has the function of evaluating physical constitution and guiding fitness interventions. Furthermore, it can be used as a bridge to promote the integration of national fitness and national health. The purpose of this study is to investigate how to promote the integration of the two based on the perspective of health-related physical fitness.

**Research Method:** Literature method, expert interview method, logical induction method

**Research Result:** 1. Bringing health-related physical fitness in campus is available to raise students' awareness of students' own health levels and strengthen their willingness to be fit. 2. The establishment of health-related physical fitness testing as a medical examination item, that could help to better evaluate the fitness of the population and predict the risk of chronic diseases. The data and information supplied by examination could help doctors provide sport advices to people and fitness industry practitioners make a more targeted plan for improving fitness. To provide a basis for linking the health sector with the sports sector.

**Research Conclusion:** The integration of national fitness and national health is a complex project that requires multi-sectoral collaboration and policy support. The concept of health-related physical fitness can be used to promote the integration of the two in many different ways.

**Key Word:** National Fitness; National Health; Health-related Physical Fitness

Conflicts of interest: None

## Health Big Data and System Sciences

### **10-1 Data Analytics for Healthcare: Opportunities & Challenges**

FATEMA AHMED

Master Student in Xi'an Jiaotong University

Major: Nursing

E-mail: fatema92w@gmail.com

#### **AIM**

It is aimed that through this conference arranged by The 4<sup>th</sup> Belt & Road Initiative Global Health International congress & 2022 University Alliance of the Silk Road Health Forum, learn about Health Big data and System Science

To apply that knowledge and learn about the use of data-analytics in health industry

#### **OBJECTIVES**

To understand and emphasize the importance of the data-analytics/big-data use in health-care industry and specially nursing.

How the world have coped with pandemic in recent year or so through the efficient use of data-analytics/big-data.

#### **Conclusion/Suggestions**

Big data analytics, which leverages legions of disparate, structured, and unstructured data sources, is going to play a vital role in how healthcare is practiced in the future. One can already see a spectrum of analytics being utilized, aiding in the decision making and performance of healthcare personnel and patients

We need policy changes that diminish the barriers to health analytics. While there is potential for radical overhaul, the initial priority should be making sure all hospitals can record, use, and share patient data in [useful ways](#).

Leverage Nursing Informatics Experts: Healthcare organizations should utilize Nurse Informaticists who will provide valuable insight into concept representation, design, implementation, and optimization of health IT to support evidence-based practice, research, and education. Nurse Informaticists should have formal informatics training, education, and certification.

## 10-2 Utilization status and influencing factors of maternal healthcare services in Papua New Guinea : an Anderson model-based analysis

LI Hao JIANG Yi PU Yi-ran LI Zhen JIN Zi-yang

School of Public Health and Management, Research Center for Medicine and Social Development, Public Health Safety Research Center, Chongqing Medical University, Chongqing 400016, China

**Abstract Objective** To analyze the utilization status and influencing factors of maternal healthcare services in Papua New Guinea and to provide reference evidence for the cooperation in the field of maternal health between China and Papua New Guinea.

**Methods** Data were collected from Papua New Guinea Demographic Health Survey 2016-2018. Based on Anderson model, descriptive analysis, Chi-square ( $\chi^2$ ) and Logistic regression was adopted to analyze the utilization status and influencing factors of maternal healthcare services in Papua New Guinea. **Results** Among the 5236 women surveyed, the utilization rate of antenatal care, skilled birth attendant and postnatal care services was 56.8%, 64.1% and 27.4%, respectively. Multivariate logistic regression analysis showed that work status, education, exposure to newspapers or magazines, exposure to radios, exposure to television, distance to health facility, getting money needed for treatment, women's health care decision making autonomy, wealth index, region, pregnancy intention and pregnancy terminations were the influencing factors of the utilization of antenatal care services. Age, work status, education, exposure to newspapers or magazines, exposure to television, distance to health facility, wealth index, health insurance, region and residence were the influencing factors of the utilization of skilled birth attendant services. Education, exposure to newspapers or magazines, exposure to radios, distance to health facility, wealth index and region were the influencing factors of the utilization of postnatal care services.

**Conclusion** The utilization rate of maternal healthcare services in Papua New Guinea was low, maternal health needs to be improved. The utilization of maternal healthcare services in Papua New Guinea was affected by predisposing factors, enabling factors and need factors.

**Key words** maternal healthcare services; influencing factors; Anderson model; Papua New Guinea

## 10-3 The Trends and Predict of COVID-19 Booster Vaccination in the World

Quanman Li. Ph.D. candidate

Address: College of public health, Zhengzhou university

E-mail: [Liqmzzu@163.com](mailto:Liqmzzu@163.com)

### Abstract

**Aims:** The COVID-19 epidemic prevention and control is still facing severe challenges. As there is no specific treatment for COVID-19, Vaccinations are still the most effective and economic measures to control the COVID-19 pandemic. However, few evidences exist regarding the trend of COVID-19 booster vaccination.

**Methods:** We sourced real-time data from countries through a publicly available dataset with information on variables of COVID-19 booster vaccination. Between June 30, 2021 and February 28, 2022, we searched the websites of our world in data, using the search terms “vaccine booster doses”. We used several time-series models (ARIMA, GM and RM) to find the trend in COVID-19 booster vaccination. Data reported from March 1, 2022 to March 31, 2022 were used to assess the prediction accuracy of the models. The root mean square error (RMSE), mean absolute percentage error (MAPE), coefficient of determination ( $R^2$ ) were used to evaluate the performance of these models.

**Results:** Up to March 31, 2022, the rate of COVID-19 booster vaccination was 21.35% in the world. And the rate of COVID-19 booster vaccination varied from 83.84% (Chile) to 0.00% in countries. Through screening and comparison, the optimal fitting time-series models of COVID-19 booster vaccination rate were varied from countries. The optimal fitting model conducts prediction on the rate of COVID-19 booster vaccination on April 30, 2022 is 23.3% in the world. Notably, COVID-19 booster vaccination rate will continue to be the highest in the high-income countries and lowest in the low-income countries.

**Conclusion:** The rate of COVID-19 booster vaccination shown a stably growing in overall. However, a considerable portion of residents do not vaccinate in the end of April, 2022. Political leaders should prioritize policies that enable residents especially from low-income countries to uptake vaccine, thereby enabling them with greater ability to overcome the COVID-19 epidemic.

**Keywords:** Time-Series Analysis, COVID-19 Booster Vaccination, Trend, Predict

### Conflict of interest:

The author declares that there are **none** conflict of interest.

## 10-4 Effectiveness of AI-guided digital colposcopy cloud platform for cervical cancer screening in the era of COVID-19

Peng Xue<sup>1</sup>, Ph.D., Maria Jose Gonzalez<sup>2</sup>, Ph.D., Yu Jiang<sup>1</sup> Ph.D., Youlin Qiao<sup>1</sup>, Ph.D.  
<sup>1</sup>Department of Epidemiology and Biostatistics, School of Population Medicine and Public Health, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China;

<sup>2</sup>Department of Public Health, Dalian Medical University, Dalian, China.

Corresponding author: Prof. You Lin Qiao, Ph.D., Email: qiaoy@cicams.ac.cn.

### Abstract

**Background** The COVID-19 pandemic led to a halt in health procedures, such as colposcopy, to minimize contact between patients and clinicians. Despite the pandemic, there was still a high demand for this procedure by patients who needed urgent colposcopic referrals to rule out or confirm a cervical cancer diagnosis. AI-guided digital colposcopy platform enables clinicians to share cervical images on the internet to predict biopsies, which helps to reduce the number of patients at diagnostic centers during a pandemic.

**Objective** To demonstrate the effectiveness of using the AI-guided digital colposcopy cloud platform for predicting cervical biopsy.

**Methods** This study enrolled 5274 patients, aged 24-65 years, referred for colposcopy and biopsy from six hospitals across China. We validated the performance of the cloud platform by calculating diagnostic performance and compared it with colposcopists of different expertise levels.

**Results** The pathological results were the gold standard. The accuracy to predict a biopsy ranged from 0.856 to 0.867 in six hospitals. The cloud platform's diagnostic accuracy was similar to competent colposcopists with 5-10 years of clinical experience (0.866 vs 0.877,  $p=0.323$ ), significantly superior to junior colposcopists with 3-5 years of clinical experience (0.866 vs 0.546,  $p<0.0001$ ), and slightly inferior to expert colposcopists with over 10 years of clinical experience (0.886 vs. 0.947,  $p<0.0001$ ).

**Conclusion** These results prove that colposcopy could be performed efficiently by using an AI-guided digital cloud platform, sharing images through the internet with patients and avoiding crowds in health centers during the COVID-19 pandemic.

**Keywords** Global elimination of cervical cancer; Deep learning; COVID-19; Colposcopy diagnosis; Cervical biopsy.

No potential conflicts of interest

### 11-1 Investigation on the application of “ Internet+ ” pharmaceutical care among chronic diseases patients in Guangzhou

Taizhen Li<sup>1</sup>, Kexin Liang<sup>2\*</sup>

<sup>1</sup> School of Public Health, Southwest Medical University

<sup>2</sup> School of Sociology and Population Studies, Renmin University of China

<sup>1</sup> E-mail: 815197943@qq.com

\*Corresponding author: Kexin Liang

\*E-mail: lkxbwxcx@163.com

#### Abstract:

**Objective:** To update future “Internet+” pharmaceutical care mode in chronic disease management, this study aims to identify the facilitating and hindering factors in the cognition and preference of “Internet+” pharmaceutical care among chronic disease patients in China.

**Methods:** Of the total 316 valid questionnaires were collected by convenient sampling from 8 medical institutions in Guangzhou, descriptive analysis was analyzed to understand the situation of “Internet+” pharmaceutical care use in the management of chronic diseases. Chi-square test was conducted to identify factors associated with use intention of “Internet+” pharmaceutical care.

**Results:** Overall, only 23.1% participants utilized “Internet+” pharmaceutical care, 76.71% of them used it less than once a week. Convenience (69.86%) and the intelligent self-management of chronic diseases through reminding and recording medication intake on time (35.62%) were the most driving factors for receiving “Internet+” pharmaceutical care. Advanced age ( $\chi^2=48.219$ ,  $p<0.05$ ) and low level of education ( $\chi^2=30.746$ ,  $p<0.05$ ) were both independent risk factors of use intention, but variety of drugs and habits of reminding medicine were not statistically significant. To participants who never used, the most common concerns regarding “Internet+” pharmaceutical care use were professionalism (46.58%) and effectiveness of communication (28.77%), 75.61% proposed to allow primary pharmacists participate in it.

**Conclusion:** Given the contradiction between the low utilization rate of “Internet+” pharmaceutical care and the patient’s ever-growing needs for their personalized management of chronic diseases, administrative departments should enhance relevant propaganda and education towards various chronic disease patients, standardize and innovate “Internet+” pharmaceutical care quality management to improve its professionalism and effectiveness. Through promoting high-quality pharmaceutical resources to serve the grassroots, patients will have a convenient access to “Internet+” pharmaceutical care.

**Keyword:** Internet+; Pharmaceutical care; Chronic disease; Guangzhou

**Declarations of Interest:** No authors have any conflict of interests to declare.

## 11-2 Effects of E-health-based interventions on glycemic control for patients with type 2 diabetes: A Bayesian network meta-analysis

Zhang Xiaoyue , Zhang Lanchao, Changchun

Zhang Xiaoyue : Department of Social Medicine and Health Education, School of Public Health, Peking University, [2011210122@bjmu.edu.cn](mailto:2011210122@bjmu.edu.cn)

Zhang Lanchao : Department of Social Medicine and Health Education, School of Public Health, Peking University: [1610306110@pku.edu.cn](mailto:1610306110@pku.edu.cn)

Changchun : Department of Social Medicine and Health Education, School of Public Health, Peking University: [changchun@bjmu.edu.cn](mailto:changchun@bjmu.edu.cn)

**Introduction:** The high disease burden of type 2 diabetes(T2DM) seriously affects the quality of survival of patients, and with the deep integration of the Internet and healthcare, the application of electronic technology to disease management has become a trend. The aim of this study is to evaluate the effectiveness of different forms of E-health applied to T2DM patients' glycemic control and the effect of different durations on the effectiveness of the intervention.

**Methods:** The electronic databases (PubMed, Embase, and Cochrane) was searched to include the randomized controlled trials on glycemic control in T2DM patients with different forms of E-health intervention, including apps, phone calls, SMS, telemedicine, and wearable devices and usual care. The inclusion criteria were as follows: (1) adults(age $\geq$ 18) with type 2 diabetes mellitus; (2) minimum intervention period of 6 months; (3) outcome is HbA1c (%); (4) RCT of E-health approach. The Cochrane tools were used to assess the risk of literature. R 4.1.2 was used to conduct the Bayesian network meta-analysis.

**Results:** A total of 31 studies with 5697 T2DM patients were included in this study. Compared to the usual care group, the intervention with phone call achieved the best effect on reducing HbA1c level (MD-0.50, 95%CI: -0.75 to -0.25), followed by telemedicine (MD-0.40, 95%CI: -0.62 to -0.21), apps (MD-0.26, 95%CI: -0.41 to -0.13) and SMS (MD-0.23, 95%CI: -0.47 to -0.012) , with statistically significant differences ( $P < 0.05$ ). Furthermore, in subgroup analysis of age, sex, duration, it was found that each intervention was more effective when the duration was 6 months than when it was longer than 6 months, and the telemedicine (MD-0.51, 95%CI:-0.84 to -0.19) had the best effect when the duration was 6 months.

**Conclusion:** Glycemic control in T2DM patients can benefit from disease management in using any type of E-health. The phone call intervention is highly interactive and achieve a best effect on lowering HbA1c level than other types E-health intervention. And the effects of E-health interventions change over time, 6 months probably is the appropriate duration of intervention.

**Keywords:** type 2 diabetes; E-health; glycemic control; Bayesian network meta-analysis

## Integration of Sports and Medicine

### **12-1 Research on the construction of service mode of elderly care institutions under the "Physical, medical and nursing integration"**

Guo Limin

Guo Limin: Female, Master degree

Wuhan Institute of Physical Education, No. 461 luoyu Road, Hongshan District, Wuhan, Hubei province

**E-mail:** 1583188423 @qq.com

**Phone:** 18535560232

**Abstract:** With the progress of medical care technology and the improvement of life quality, the population base of aging and chronic diseases in China is increasing year by year and has entered an aging society. And since the outbreak of COVID-19, according to official statistics, the elderly and those with chronic diseases and low immunity are the key groups affected by the virus. The epidemic has aroused the public's health awareness of active exercise, spawned the internal demand for scientific epidemic prevention and promoted the development of the "sports + medical" model.

《Healthy China 2030》 brings the concept of "physical and medical integration" to the national level. "Sports power" also aims to strengthen the national fitness, the elderly as the representative of its end. Therefore, active pension and active health are in line with the current development trend of China, and the innovative mode of "physical medical care" can cope with China's aging population and reduce the probability of disease risk of vulnerable groups. This paper analyzes the sports facilities and exercise methods, medical nursing health and nursing services, implementation subjects and service subjects under the "combination of physical, medical and nursing care" pension mode in China by using the method of literature, case analysis and logical analysis. Research results: There are the following dilemmas in the pension mode of "physical and medical care integration" : (1) Insufficient supply of sports facilities and single use channels. (2) Medical nursing resources need to be integrated, and the service system is not complete. (3) Outdated and backward medical nursing equipment and lack of professional nursing physicians. (4) Lack of physical education professionals and low enthusiasm for fixed courses. Conclusion: In order to broaden the development of the mode of "physical health care", the study believes that the path of sports and medical rehabilitation should be parallel. (1) Investment in construction funds — improve sports infrastructure. (2) Integrating medical nursing resources — consolidating services according to local conditions. (3) Update medical nursing facilities — encourage the introduction of medical talents. (4) Deepen the training of PE teachers — flexible, diversified and active health.

**Key words:** Physical integration of medical care; The elderly; Pension institutions; Build path



## 12-2 Investigation on health and physical exercise of Chinese elderly men: from the perspective of gender differences

Chen Shan-ping<sup>1</sup>, Chen Mo<sup>1</sup>, Ru Yao<sup>2</sup>, Yang Yin-Kun<sup>1</sup>

1.Dept of PE, Xi'an Jiaotong University, Xi'an 710049, China.

2.Dept of PE, Suzhou University of science and technology, Suzhou, 215009

E-mail:chshp@mail.xjtu.edu.cn

About the first author: Chen Shan-ping (1970-), male, professor, ph. D.

**Objective:** The life expectancy of men is generally lower than that of women in China, and the health status of elderly men is more worrying. The purpose of this paper is to analyze the physical exercise of elderly men and its influence on the health of elderly men from the perspective of gender difference, so as to provide reference for promoting the health of elderly men in China and realizing healthy aging.

**Methods:** The short form health survey (SF-36) and physical exercise behavior questionnaire were used to investigate the elderly respondents for matching extraction of 200 elderly over the age of 60, each pair of the elderly men and women with same community, with Similar age. the independent sample t-test was used to compare the mean value of health and physical exercise of elderly men and women, Pearson correlation coefficient was used to analyze the correlation between health and physical exercise behavior of elderly men.

**Results:** (1) The 7 dimensions scores of health of elderly men were significantly lower than those of elderly women ( $P < 0.001$ ), including Role-Physical ( $41.75 \pm 35.543$ ), Bodily Pain ( $51.50 \pm 13.734$ ), General Health ( $56.65 \pm 11.504$ ), Vitality ( $64.20 \pm 12.221$ ), Social Functioning ( $77.50 \pm 21.022$ ), Role-Emotional ( $62.66 \pm 37.084$ ) and Mental Health ( $65.36 \pm 11.317$ ), only Physical Functioning ( $75.70 \pm 17.437$ ) had no significant difference ( $P > 0.05$ ). (2) The number of sports participation ( $1.40 \pm 0.651$ ), exercise frequency ( $2.92 \pm 1.022$ ) and exercise persistence ( $3.15 \pm 1.077$ ) of elderly men were significantly lower than those of elderly women ( $P < 0.001$ ), but there was no significant difference in exercise time ( $2.94 \pm 0.930$ ) ( $P > 0.05$ ). (3) There was a significant positive correlation between all 8 dimensions of health of elderly men and 4 indexes of exercise behavior ( $0.250 < R < 0.597$ ), among which the significant of correlation between Physical Functioning, General Health, Vitality, Social Functioning, Mental Health and exercise behavior were 0.001.

**Conclusion :** (1) The health of elderly men is very poor. From the perspective of healthy aging, elderly men are the vulnerable groups that should be paid more attention to. (2) In the right range, the more elderly men participate in physical exercise programs, the higher the frequency of exercise, the longer each exercise time, and the longer the exercise persistence, the more conducive to the improvement of health. (3) The main reason for the poor health is that the physical exercise behavior of the elderly men is seriously insufficient. In the promotion of healthy aging, it should be taken as an important measure to organize elderly men to participate in physical activities.

**Key words:** The Elderly; Men; Healthy; Physical exercise; SF-36; Healthy aging

## 12-3 Research on the Target Heart Rate Evaluation Model

Yingxue Dai, Jianxin Zhang.

Yingxue Dai: Associate chief physician, Sichuan University, yingxuedai@163.com

**Abstract Objective:** To provide a more suitable evaluation method for target heart rate (THR). **Methods:** A total of 324 people who claimed healthy were enrolled. Gender, age, resting heart rate (RHR), postexercise heart rate, and rate of perceived exertion (RPE) in four levels were collected. Target heart rate evaluation model was established through multiple stepwise regression analysis among people reporting RPE in the second level, and comparison between the new model and the traditional THR calculation formula was conducted. **Results:** The postexercise heart rates of participants who reported different levels of RPE, were lower than the THRs which were calculated using the traditional formula. A new THR model was established, lower limited  $THR = 202.5 - age * 0.954 - RHR * 0.474$ , and upper limited  $THR = 212.5 - age * 0.954 - RHR * 0.474$ . The R-square value was 0.767. According to the new model, THRs of people who reported RPE in the first and fourth level were not included from the lower value to the upper value, while THR of people who reported RPE in the third level was shortly close to the upper value. **Conclusion:** Compared to the traditional THR calculation formula, the new model might be a better practice to evaluate exercise load, and further to prevent physical damage resulting from overload exercise, and to promote doing exercise with suitable load.

**Keywords:** physical exercise, target heart rate, model

## **12-4 Effect of kinesiology taping combined with different treatment techniques on hemiplegic shoulder pain**

Hou Xue

Title: Postgraduate

Setting: Graduate Department of Xi'an physical education university

Subject: Integration of physical education and medicine

Email: houxue2021@163.com

### **Abstract**

**Objective:** The incidence of hemiplegic shoulder pain (HSP) is about 84%. Kinesiology taping (KT) is always used in sports injury, gradually it is also used in the HSP, but only use KT is single. This paper summarizes the methods of KT combined with other technologies to treat HSP in recent years and explores the therapeutic effect.

**Methods:** Using the key words of "hemiplegic shoulder pain, post-stroke shoulder pain, kinesiology taping " were searched in CNKI. 74 literatures were obtained through screening.

**Results:** Currently, others combined with KT has sun block, local injection of botulinum toxin type A, extracorporeal shock wave therapy, needle knife therapy, drug therapy, suprascapular nerve block, neurodevelopmental therapy, shoulder intensive training, acupuncture, electrical stimulation, Frenkel Gymnastics training and improved compulsory exercise therapy. The evaluation indexes are different, such as FMA, VAS, MBI. Except for one on acupuncture combined with KT in the treatment of upper limb after stroke, the effect is not effective, Others combined with KT are better than single treatment, especially in shoulder pain and function. One study compared acupuncture combined with conventional rehabilitation and KT combined with conventional rehabilitation show that the effects are equivalent, which may be related to the binding methods of KT and the inclusion of research objects. Combined with KT, botulinum toxin local injection, extracorporeal shock wave therapy and routine rehabilitation training have significant effects on spasm, Suprascapular nerve block, extracorporeal shock wave therapy, drugs, electroacupuncture combined with KT have significant effects on shoulder passive range of motion.

**Conclusion:** The effect of kinesiology taping combined with other treatment techniques on HSP is better than single treatment, especially in reducing pain and improve function. It can be used as an auxiliary technology for HSP.

**Key words:** Kinesiology taping; Hemiplegia shoulder pain; Shoulder pain after stroke;

## 12-5 The joint association of sedentary behavior and physical activity with musculoskeletal disorders among occupational population in China

Yihua Liu<sup>1</sup>, Chun Chang

Department of Social Medicine and Health Education, School of Public Health, Peking University, Beijing, China

<sup>1</sup>[lyh5096@bjmu.edu.cn](mailto:lyh5096@bjmu.edu.cn)

Corresponding author's email: [changchun@bjmu.edu.cn](mailto:changchun@bjmu.edu.cn)

### Abstract

**Objectives:** The purpose of this study was to describe the current status of musculoskeletal disorders (MSDs) and sedentary behavior among occupational population in different provinces in China, and to explore the joint and stratified associations of sitting and physical activity (PA) with MSDs.

**Methods:** The data was from the 2021 Asia Best Workplace (Mainland China) program. MSDs were assessed by standardizing questions based on the Nordic Musculoskeletal Questionnaire. The multivariable-adjusted odds ratios (OR) of sitting for each sitting-PA combination group and within each PA groups was calculated by logistic regression model to estimate the effect on MSDs.

**Results:** A total of 6642 (55.8%) workers reported the presence of pain in any body region among 11903 participants. The average daily sitting time of participants was 9.4 hours, and the percentage of those who exceeded 8 hours sitting time reached 73.9% in the past week. The analysis of logistic regression showed that depressive tendencies (OR=2.26, 95% CI: 2.02-2.52), smoking (OR=1.24, 95% CI: 1.23-1.39), overweight (OR=1.17, 95% CI: 1.06-1.28), prolonged sitting time and lower PA level were risk factors for MSDs, and longer daily sleep time (OR=0.67, 95% CI: 0.62-0.73) was a protective factor. Combination of increased sitting time and lower levels of PA showed a dose-response relationship with higher risk of MSDs. In both the joint and stratified analyses, high level of PA does not eliminate the effects of sedentary behavior on musculoskeletal disorders.

**Conclusion:** The status of MSDs and sedentary behavior among the occupational population in China should be pay more attention. Low level of physical activity and prolonged sitting time are both risk factors for MSDs, and strengthening the intensity of physical activity can not attenuate the harmful effects of sedentary behavior on MSDs.

**Keywords:** musculoskeletal disorders; occupational population; sedentary behavior; physical activity

**Conflicts of Interest:** The authors declare no conflict of interest.

## 12-6 Exploring the Training Mode of Professional Talents in the Context of Integration of Body and Medicine

PENG Aijia, LIU Changjiang

PENG Aijia: Xi'an Jiaotong University Sports Center, 1184483122@qq.com

**Abstract:**In 2016, the Central Committee of the Communist Party of China (CPC) and the State Council issued the "Health China 2030" planning outline, which clearly proposes to strengthen the integration of physical medicine and non-medical health interventions. In recent years, the proportion of chronic diseases caused by physical inactivity has gradually increased, and it is imperative to use the integration of sports and medicine to promote the development of health for all. Today, the development of sports-medicine integration is not yet complete, especially the lack of sports + medicine complex talents. In order to let the public get professional guidance in sports, it is necessary to explore the mode of composite talents training. This paper explores the mode of cultivating sports + medicine composite talents through literature method and logical analysis. The research shows that: the rational use of the educational resources of the integration of physical education colleges as well as medical schools to form a perfect mode of cultivating sports + medicine composite talents; signing agreements with communities or institutions to encourage students to initiate internships and participate in social practice; regulating the industrial development of sports + medicine integration services to solve the problem of employment of sports + medicine The employment problem of integrated talents.

**Key words:** integration of body medicine; talent development; health China

## 12-7 Analysis of postoperative rehabilitation effects of different therapies on ankle fracture in adolescents

Huimin Wang<sup>1</sup>, Fengying Chen<sup>2</sup>

(1. Institute of physical education, China University of Geosciences (Wuhan), Wuhan 430074 Hubei; 2. Institute of physical education, China University of Geosciences (Wuhan), Wuhan 430074 Hubei;)

<sup>1</sup> Tel: 13293873253, E-mail: [2421043591@qq.com](mailto:2421043591@qq.com)

<sup>2</sup> Tel: 18971082345

**Abstract:** Objective: to explore the effect of sports rehabilitation training, massage treatment and Chinese herbal fumigation on the rehabilitation of ankle fractures in adolescents. Methods: By using the methods of Literature Review, logical analysis and mathematical statistics, the author summed up and sorted out the concrete methods, implementation methods and application value of the three different treatment methods in the rehabilitation of ankle fracture after operation, combined with the pain and functional recovery of the ankle and foot of the teenagers before and after treatment, the advantages and disadvantages of sports rehabilitation training, massage treatment and Chinese Medicine Fumigation and washing nursing were obtained, finally, the actual curative effect of the three methods was analyzed and compared. Conclusion: Sports Rehabilitation training combined with massage therapy and Chinese medicine fumigation and washing can relatively quickly and effectively restore the joint function of the affected limbs and reduce the occurrence of other associated diseases to the greatest extent, the Clinical Curative effect is remarkable to the convalescent fracture patient.

**Key words:** teenage fracture; ankle joint; postoperative; functional rehabilitation

## 12-8 Fusion·Hub·Path: Sports Value and Scientific Diagnosis in the Integration of Sports and Medicine

ZHAO Xu<sup>1</sup>, HU Yulong<sup>1</sup>, HUANG Rongyan<sup>1</sup>, HUI Xinyi<sup>1</sup>

(Sport Training School, Wuhan Sports Univ., Wuhan 430079, China)

<sup>1</sup> Email: zhaoxumark@163.com

**Abstract:** The integration of sports and medicine is one of the specific implementation measures of the national strategy for a healthy China proposed by the government. Due to the backward construction of the public's physical fitness monitoring network system, the lack of effective incentives for medical staff, and the lack of diversified physical and medical talents. In the medical system, the operation effect is average, and it is difficult to meet the individualized physical exercise needs of the masses. The integration of sports and medicine needs to further realize the specific quantitative process of promoting physical and mental health through sports, deeply excavate the medical value of sports, and realize the integration of sports training and scientific medical treatment. The implementation path from innovation to build system mechanism. This paper adopts the method of bibliography and logical analysis to conduct research. First, form an innovation-driven model and create a diversified development model of "ideological upgrading, intelligent orientation, and resource integration". Second, optimize systems and institutions, and build a policy and institutional system of "vertical deepening, horizontal synergy, and systemic effects". Third, activate the market to increase supply and demand, tap market potential, fully stimulate industrial demand, and optimize the supply structure. Fourth, co-construction, sharing and development, to promote the circular development of "bringing in" and "going out". It is necessary to formulate scientific and effective goals and strategies, fully tap the rigid needs of development at all stages, strengthen policy and institutional guarantees, activate the momentum of management organizations, and attract the influx of social resources, so as to promote the multi-integrated development of the integration of sports and medicine, and maximize the synergy of the integration of sports and medicine. effect and marginal effect, and create a new pattern of high-quality development of the integration of sports and medicine.

**Key words:** fusion; hub; path; integration of sports and medicine; sports value; scientific diagnosis

## Health Disparities

### 13-1 The social determinants of type 2 diabetes in China: a systematic literature review of scientific evidence from China in 2001–2021

Wen Wang<sup>1</sup>, Jiayi Hee<sup>2</sup>, Wenzhen Cao<sup>†</sup>

<sup>1</sup> Email: wen.wang.21@ucl.ac.uk. Institution: Institute of Epidemiology and Health Care, University College London, London WC1E 6BT, UK.

<sup>2</sup> Email: xujiayi21@mails.tsinghua.edu.cn, Institution: Vanke School of Public Health, Tsinghua University, No. 30 Shuangqing Road, Haidian District, Beijing 100084, China.

<sup>†</sup>Corresponding author: caowz@pku.edu.cn, School of Public Health and Management, Wenzhou Medical University, Chashan University Town, Wenzhou 325035, Zhejiang Province, P. R. China.

#### Background

In recent years, the prevalence of type 2 diabetes mellitus (T2DM) has increased dramatically. Socioeconomic status (SES) can cause health inequities and disease. In China, changes in socioeconomics alter morbidity distributions and create health inequities. By investigating the social determinants of T2DM in the context of rapid economic development in China, we can develop contextually appropriate interventions to prevent T2DM and mitigate health disparities.

#### Purpose

This study aims to analyse the possible mechanisms linked to the association between the occurrence of T2DM and SES in China by reviewing literature published within the last 20 years.

#### Methods

Relevant studies up to December 24, 2021, on the Web of Science and PubMed were gathered. English-language studies focused on the social determinants of diabetes occurrence in China were included. Two reviewers independently searched for articles and extracted data, adjudicating results through consensus. The quality of included studies was appraised using a modified Newcastle–Ottawa Scale. The data was summarised descriptively.

#### Results

A total of 199 articles were identified, and 7 met the criteria for review. All the studies selected for this review were cross-sectional studies. Sample sizes ranged from 1,429 to 512,891 participants. Findings indicate that people with lower education, higher income and non-manual jobs have higher risk of T2DM. However, there are different findings among studies conducted in different areas at different periods using different methodological approaches. Moreover, certain factors, such as unhealthy diet, low physical inactivity, and high body mass index, mediated the association between SES and T2DM.

#### Conclusions

This study provides the social and economic perspectives for T2DM prevention. Findings indicate that T2DM prevention in developing countries should prioritize modifiable behavioural factors including dietary pattern, sedentary behaviour, and weight control for the lower educated, low income and non-manual population.



**Keywords:** Type 2 diabetes, China, Social determinants, mediator

**Conflicts of interest:**

All authors have no conflicts of interest, real or perceived, to disclose. The funding source played no role in the study design, the collection, analysis, and interpretation of data, the writing of the report, and the decision to submit the manuscript.

## **13-2 Research on the Balance of Time and Space Allocation of Ningxia Maternal and Child Health Resources under the Background of the New Fertility Policy**

Sun Xiaotong<sup>1</sup>, Lang Ying<sup>2</sup>

School of Public Health and Management, Ningxia  
Medical University, Yinchuan, Ningxia 750004, China

<sup>2</sup> Corresponding author: E-mail: 1072861385@qq.com

**Abstract:** Objective To study the status, changing trend, fairness and balance of Ningxia's maternal and child health resource allocation, so as to provide a basis for the rational allocation of health resources in maternal and child health institutions.

**Methods** The number of institutions, the number of beds, and the number of health technicians of Ningxia's maternal and child health resources from 2011 to 2019 were described by spatial statistics, combined with population, transportation, medical service capacity, location conditions, etc., and the agglomeration index and spatial accessibility. The overall and township scales are used to evaluate the fairness and balance of the health resource allocation of maternal and child health institutions, explore the spatial distribution characteristics and differences of Ningxia maternal and child health resources, and construct a spatial and temporal distribution model of health resources in Ningxia. **Results** The total number of maternal and child health resources in Ningxia has been increasing year by year; from the resource agglomeration index, Yinchuan and Shizuishan have the best geographical accessibility for resource allocation (0.7336~1.5735), followed by Wuzhong and Guyuan (0.6316~1.7485), the city of Zhongwei is relatively poor (0.3831~0.5831); the spatial accessibility of health resources of the maternal and child health care institutions in each residential area is relatively scattered, and the accessibility range is between (92.05-345.07), showing the characteristics of high north and low south. **Conclusion** At present, the total amount of health resources for maternal and child health care in Ningxia is increasing steadily; the allocation of maternal and child health resources shows obvious spatial agglomeration and low spatial balance, and the regional differentiation of resource allocation is obvious. It is necessary to further consider location factors on the basis of full consideration of population and economic factors, reduce regional differences, and improve the equity and balance of maternal and child health resources.

**Keywords:** maternal and child health care, allocation of health resources, equity, balance

### 13-3 Spatial variation characteristics of physical health status of adolescents in China

TONG Zihan<sup>1</sup>, ZHANG Yimin<sup>1</sup>

<sup>1</sup>Key Laboratory of Physical Fitness and Exercise, Ministry of Education, Beijing Sport University, Beijing 100084, China

Author's Email: tzh119900@163.com

**【Abstract】 Objective:** Exploring the spatial pattern of the physical health of students in China in various regions is an important part of the research on the physical fitness of adolescents, and it is also a prerequisite for proposing regionalized physical health improvement measures, so it is necessary to examine the spatial variation characteristics of the physical condition of students in various regions of China. **Methods:** Junior high school students in 31 provinces, autonomous regions, and municipalities in the 2018 National Student Physical Fitness and Health Survey were selected for analysis. The sampling method was stratified random group sampling, and the total number of samples with complete indicators was 48922, and the variation of the central agglomeration location and main evolution direction of the physical health related indicators of junior high school students in China was empirically studied by sex through the standard deviation ellipse analysis model. **Results:** In the direction of the main body of the space, the student's physical fitness rate is generally maintained in the "east-west" direction of 100 degrees, the physical fitness pass rate and the physical failure rate are higher in the "northeast-southwest" direction, the center of the high physical fitness index is relatively fixed, and the central position of the physical failure rate is shifted in the northeast direction, and the health of adolescents in the northeast needs to be highly concerned. **Conclusion:** In this paper, the standard deviation ellipse analysis method is introduced into the research work of adolescent physique, which as a tool for quantitatively describing the characteristics of spatial variation can better reflect the uneven characteristics of adolescent physical development in China, which not only helps to promote the application of geographical methods in the field of public health, but also provides a scientific basis for improving the unbalanced and insufficient development of students' physique between regions.

**【Keywords】** Adolescent health; Uneven development; Spatial pattern; Standard deviation ellipse

## 13-4 Research on the Contribution and Mechanism of Medical Insurance to Health Poverty Alleviation: Based on the Perspective of Poverty Vulnerability

Wenlong Zhang

Master of Health Economics, Dong Fureng Economic & Social Development School, Wuhan University.

**Abstract:** China has achieved a complete victory in the fight against poverty, and studying and summarizing the valuable experience of China in the process of poverty alleviation is conducive to providing useful reference for other countries in the world. Poverty caused by illness is not only the main cause of poverty among the poor, but also the main risk of the return of the people who have been lifted out of poverty, so healthy poverty alleviation is of vital importance to winning the battle against poverty. Based on the data of six China Family Panel Studies (CFPS) surveys from 2012 to 2020, from the perspective of poverty vulnerability, this paper uses 3FGLS to construct vulnerability to poverty, the probability of individuals falling into poverty, measured by assets, and then employs the PSM-DID model and the 2RIS model empirical methods to investigate the impact of medical insurance on poverty vulnerability from three aspects: the participation behavior, security level and mechanism of medical insurance. The results show that medical insurance can significantly reduce the risk of individuals falling into poverty, while the poverty reduction effect has heterogeneity of health level and heterogeneity of outpatient and inpatient coordination. The poverty reduction effect of medical insurance for individuals with poor health status is more significant, and inpatient coordination reduces poverty vulnerability more significantly than outpatient co-ordination. Further analysis shows that the mediating effect of reducing health care expenditure is not significant, and increasing labor supply is the main intermediary channel for health insurance to affect poverty vulnerability. These indicate that in order to give full play to the role of health poverty alleviation, it is may be more important to tilt limited resources to the poor population with poor health, further reform the outpatient coordination, and strengthen the hospitalization coordination.

**Keywords:** health poverty alleviation; health insurance; vulnerability to poverty

**Declaration of Competing Interest:** I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## 13-5 The effects of sociodemographic characteristics, sleep quality, and diet patterns on hypertension among highlanders in Sichuan province of China

Yuewen Zhang<sup>1</sup>, Ziqian Zeng<sup>2</sup>

<sup>1</sup>Master of Public Health, Department of Epidemiology and Statistics, Chengdu Medical College; [zyw619946349@163.com](mailto:zyw619946349@163.com)

<sup>2</sup>Associate professor, Department of Epidemiology and Statistics, Chengdu Medical College; [zengyun856@163.com](mailto:zengyun856@163.com)

### Abstract

**Objective:** High-altitude (H-ALT) hypertension contributes significantly to the global burden of chronic disease, which was also an important part of health poverty alleviation research in China. Until now, the pathogenesis and risk factors of H-ALT hypertension have been widely research. However, there is lack of studies explore the interrelationship between sociodemographic characteristics, sleep quality, and diet in H-ALT, and their direct, indirect effect on hypertension among H-ALT inhabitants.

**Methods:** A cross-sectional study was conducted in Ngawa Prefecture of Sichuan Province of China between January-September 2021. Sociodemographic characteristics, sleep quality, and diet information were collected using standardized questionnaire, exploratory factor analysis (EFA) and structural equation model (SEM) was applied to explore the influencing paths and estimated the effect of factors on hypertension.

**Results:** The overall prevalence of hypertension was 36%. Food (dairy, fruit and vegetables, meat) frequency was found had the strongest effect on hypertension among H-ALT inhabitants ( $\beta=-0.272$ ,  $P<0.001$ ), followed by lifestyle (smoking, alcohol drinking) ( $\beta=0.249$ ,  $P<0.001$ ) and sleep quality ( $\beta=-0.232$ ,  $P<0.001$ ). Sleep quality is a key mediator in the effect path of H-ALT hypertension. The model paths showed that sleep quality, diet behavior, food frequency, socioeconomic status (SES) and lifestyle were directly associated with hypertension, the effects were -0.232, 0.230, -0.157, -0.398, and 0.248 respectively. And food frequency, SES, and lifestyle were indirectly associated on hypertension, the effects were -0.115, 0.478, and 0.001 respectively.

**Conclusion:** We evidence that food frequency was the dominant risk factor of H-ALT hypertension, sleep quality was a key mediator in the effect paths. Based on the epidemiology evidence, we can provide a new perspective for the possible pathogenesis of H-ALT hypertension, then to develop the corresponding chronic disease prevention and control policy which aim to alleviated the health imbalance in H-ALT area.

**Key words:** hypertension; high altitude inhabitants; influencing paths; health imbalance

### Conflict of Interest

The authors declare that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## **13-6 Rates and determinants of hospitalization for five chronic ambulatory care sensitive conditions among the rural poor population in China: evidence from Sichuan province**

Chu Chen, Ting Chen, Haoyu Zhao, Jay Pan

Chu Chen: Health Research Institute, Fujian Medical University

HEOA Group, West China School of Public Health and West China Fourth Hospital, Sichuan University, Chengdu, China

Email: chuchen1988@fjmu.edu.cn

Ting Chen : HEOA Group, West China School of Public Health and West China Fourth Hospital, Sichuan University, Chengdu, China

Haoyu Zhao: HEOA Group, West China School of Public Health and West China Fourth Hospital, Sichuan University, Chengdu, China

Jay Pan (Corresponding author): HEOA Group, West China School of Public Health and West China Fourth Hospital, Sichuan University, Chengdu, China

Email: panjie.jay@scu.edu.cn

### **Background**

Socio-economic status disparities in hospitalization rates for chronic ambulatory care sensitive conditions (ACSCs) are concerning and may signal differential access to high-quality primary health care. Understanding the rates and determinants of this hospitalization of poor populations can help improve the equity of health care delivery. However, there has been little rigorous evidence to date about the hospitalization for chronic ACSCs in poor populations in China. Therefore, this study aimed to describe the prevalence of hospitalization for chronic ACSCs in poor populations and analyzed their determinants.

### **Methods**

The medical information system in Sichuan Province for the poor population in 2018 and 2019, a collection that covers all basic and medical information for the people living below the national poverty line, was the primary data source for this study. Crude rates, characteristic, and costs of hospitalization for five ACSCs (COPD, Asthma, Diabetes, Hypertension, and heart failure) of the poor was calculated. Multi-level regression was used to explore the determines of ACSCs admission.

### **Results**

The rates of hospitalization for COPD, Asthma, Diabetes, Hypertension, and heart failure were 39.97, 0.6, 21.21, 53.79, and 0.33 per 1000 populations, respectively. The highest ACSCs admission rates generally occurred in older age. Five chronic ACSCs admission costs 604 million RMB, and COPD was the most expensive of the five diseases. Besides, Higher ACSCs admission was associated with older age, females, low education, ethnic group, and big size family.

### **Conclusion**

Because hospitalization for ACSCs is generally considered a failure of primary health care. Our study suggests that the health care system should enhance the access of the poor population, and policymakers should prioritize targeted efforts to reduce hospitalization of these five chronic ACSCs.

**Key words** Ambulatory care sensitive conditions, potentially avoidable hospitalization, low income