Nutritional challenges for children in China (transition societies)

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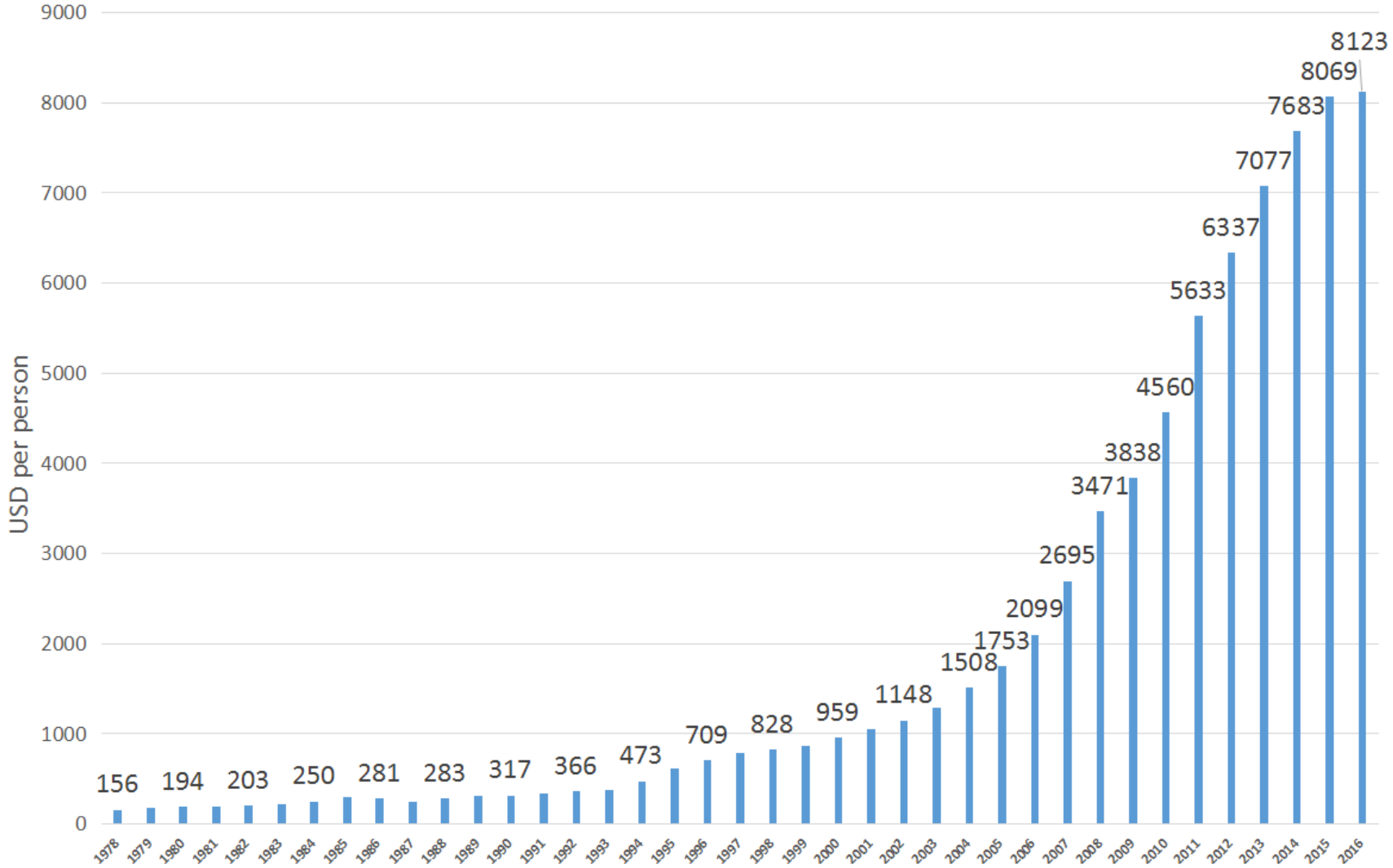
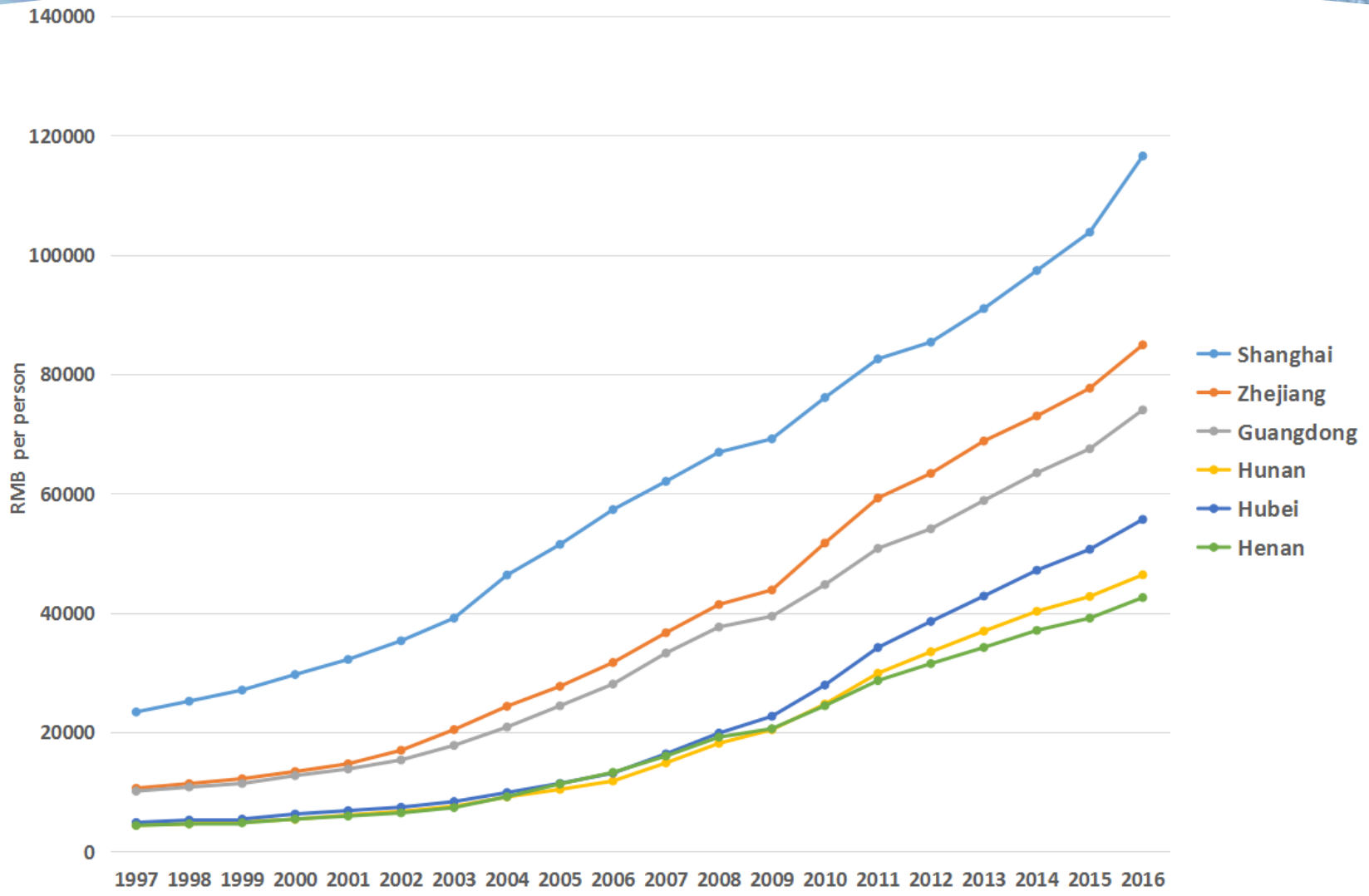
China's Per Capita GDP
1978-2016



Data from:National Bureau of Statistics of China

Per Capita GDP in Major Cities in China 1997-2016



Data from: National Bureau of Statistics of China

Problems in Transitional Countries

1 Malnutrition

2 Childhood overweight/ obesity

3 Stunting growth & micronutrient deficiency

4 NCDs

What & How to do in transitional countries ?

Social and Dietary Transition

- Globalization has played a major role in changes of dietary patterns and lifestyle

a traditional low-fat diet → a Westernized fat-rich diet

energy intake ≠ energy expenditure

varying degrees of malnutrition exist in "left-behind" or "floating" children

Contents

- **Premature infants in China**

  Birth weight change
  EUGR in premature infants of hospitalization

- **Growth faltering in Children**

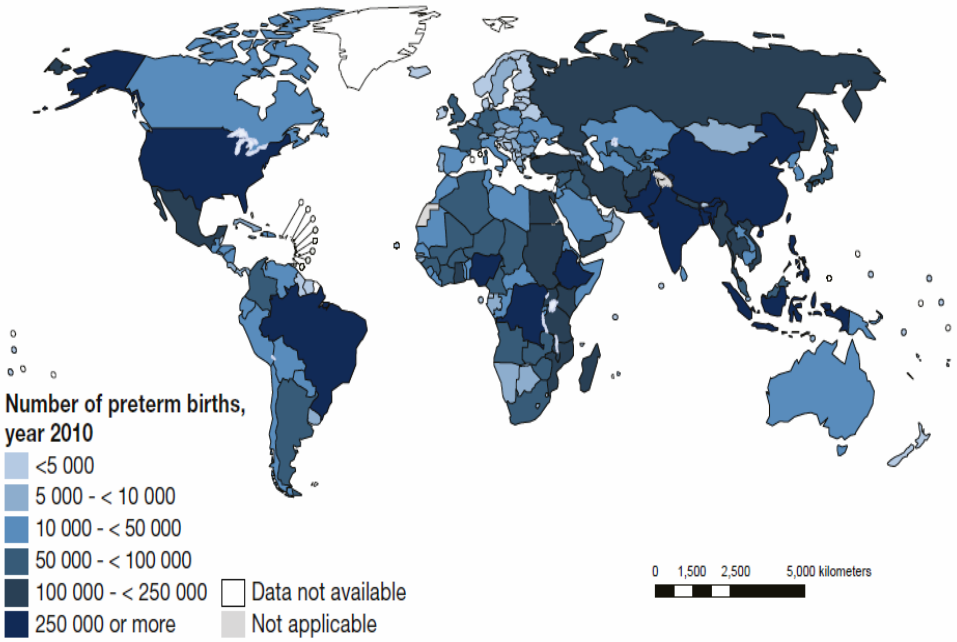
  Prevalence in urban and rural area
  Disease related in children of hospitalization

- **Overweight and obesity in Children**

- **Food allergy**

Global Epidemiologic Data for Premature Infants

- 15 million premature infants yearly from WHO reported and over 10% total number of newborns. Top 2 for China.



Top 10 countries for number of premature infants	
1.India	6.USA
2.China	7.Bangladash
3.Nigeria	8.Philippines
4.Pakistan	9.Congo
5.Indonesia	10.Brazil

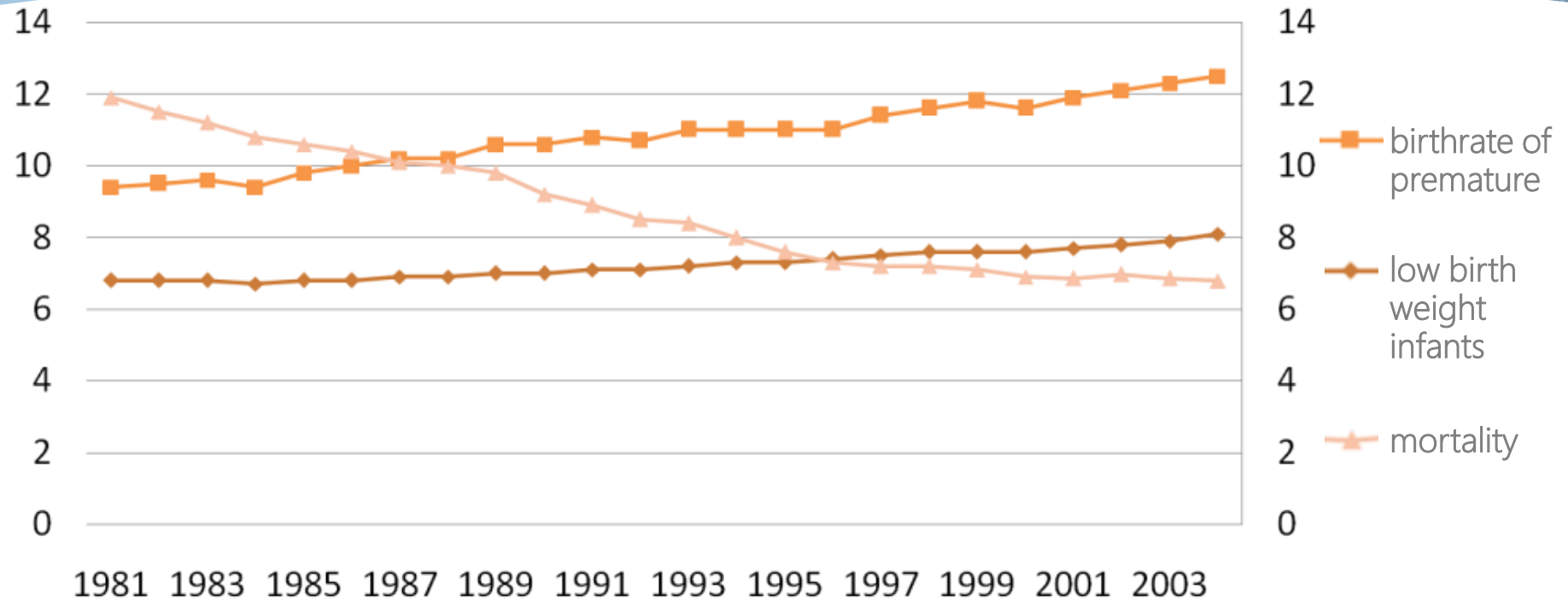
WHO. Born Too Soon: The Global Action Report on Preterm Birth. May 2, 2012. from http://www.who.int/pmnch/media/news/2012/preterm_birth_report/en/index.html

Epidemiologic Data from China for Premature infants

- 7.8% in 2005 report from Neonates Working Group of Chinese Society of Pediatrics
- 1.0-1.2 million in China yearly
- **1.2-1.4 million in China Recent 2 years**

华医学会儿科学分会新生儿学组. 中国城市早产儿流行病学初步调查报告. 中国当代儿科杂志 2005;7(1):25-28.
贲晓明. 早产儿静脉营养的临床策略与依据. 中华围产医学杂志 2012;15(9):526-532.

Number of Premature Going Up



- Up with multiple births increasing
- 6 times premature infant incidence for twins and multi births
- High incidence in Teenage pregnancy
- Smoking mothers induce low birth weight

Data from: National Center for Health Statistics. 2003 final natality data.
Data prepared by March of Dimes Perinatal Data Center; 2005

Birth Weight Changes in a Major City (Guangzhou) Under Rapid Socioeconomic Transition

SCIENTIFIC REPORTS

OPEN

Birth weight changes in a major city under rapid socioeconomic transition in China

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Published online: 21 April 2017

Jian-Rong He[1,2], Wei-Dong Li[1,2], Min-Shan Lu[1,2], Yong Guo[1,2], Fan-Fan Chan[1,2], Jin-Hua Lu[1,2], Li-Fang Zhang[1,2], Song-Ying Shen[1,2], Xiao-Yan Xia[1,2], Ping Wang[2], Wei-Jian Mo[2], Kin Bong Hubert Lam[3], Jane E. Hirst[4], Hui-Min Xia[1] & Xiu Qiu[1,2]

Sci Rep 2017;7(1):1031

Objectives

- **Estimates of trends in birth weight may be useful in evaluating population health.**

Babies with birth weights outside the normal range have higher risks of mortality and morbidity in the perinatal period and later in life.

- **To determine whether temporal changes in birth weight have occurred amongst 2.3 million neonates born in Guangzhou, China, during 2001–2015.**

SGA(birth weight <10th centile) , LGA(birth weight >90th centile)

- **To investigate the socioeconomic determinants of any changes.**

Maternal age, education, residence location, maternal care.

Risk of SGA/LGA

SGA

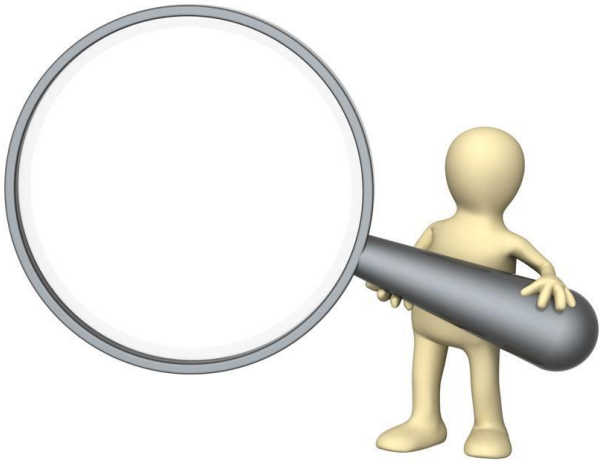
- **During perinatal period**
  - ✓ respiratory complications
  - ✓ hypoglycemia
  - ✓ necrotizing enterocolitis
- **In childhood**
  - ✓ neurological impairment
- **In adulthood**
  - ✓ cardiovascular disease
  - ✓ type 2 diabetes mellitus

LGA

- **During perinatal period**
  - ✓ birth trauma
  - ✓ cesarean section
  - ✓ postpartum hemorrhage
- **In adulthood**
  - ✓ obesity
  - ✓ metabolic syndrome
  - ✓ type 2 diabetes mellitus

Results

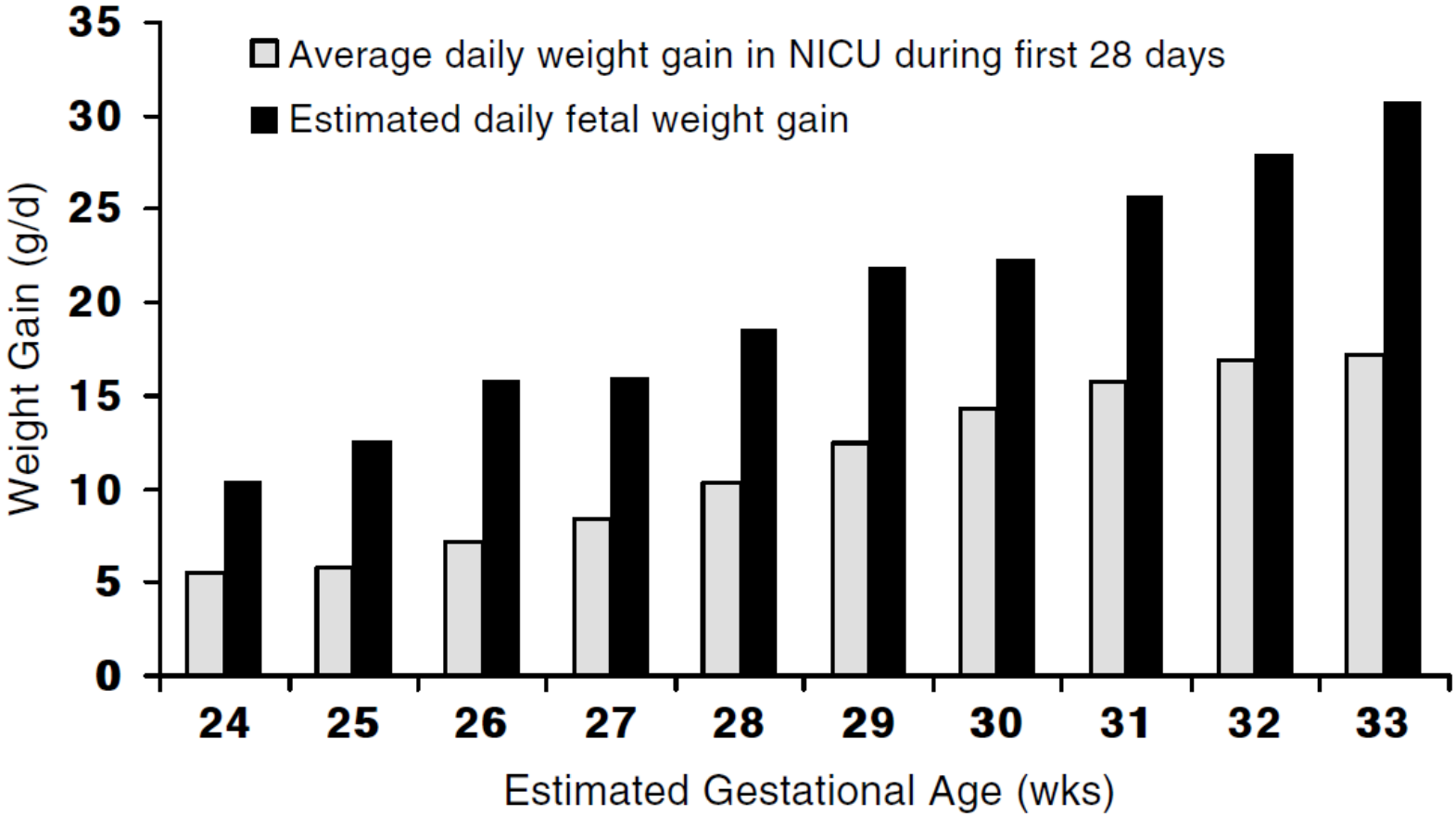
- **After adjustment for gestational length, the decline in birth weight was 0.37 grams/year from 2001 to 2015.**
- **The incidence of both SGA and LGA significantly decreased during the study period.**
- **A narrowing of disparities in SGA and LGA incidence across different maternal educational levels and residence location.**



Conclusion

- **Mean birth weight decreased slightly in Guangzhou during 2001-2015**
- **A substantial improvement in key fetal growth indicators (SGA and LGA) in Guangzhou during 2001–2015**
- **There has been an increase in the proportion of neonates born in the healthy birth weight range in Guangzhou during 2001–2015**

Hospitalized Premature less than Fetus growth in weight gain



Clark RH, Wagner CL, Merritt RJ, et al. Nutrition in the neonatal intensive care unit: how do we reduce the incidence of extrauterine growth restriction? J Perinatol 2003;23:337–44.

Prevalence of EUGR in China

Percentage of EUGR in premature infants	Shanghai (n=1196)	China (n=974)	USA (n=24371)
Wt less than 10th% at discharge	49.7%	60%	28%
Length less than 10th% at discharge	—	59%	34%
Head circumference less than 10th%	23.1%	30%	16%

单红梅,蔡威,孙建华,等. 早产儿宫外生长发育迟缓及相关因素分析.中华儿科杂志 2007; 45(3): 183-188.

早产儿营养调查协作组.新生儿重症监护病房中早产儿营养相关状况多中心调查974例报告. 中华儿科杂志 2009; 47(1):12-17.

Clark RH, Thomas P, Peabody J. Extrauterine growth restriction remains a serious problem in prematurely born neonates. Pediatrics. 2003 May;111(5 Pt 1):986-90.

Faltering Growth Definition for Children

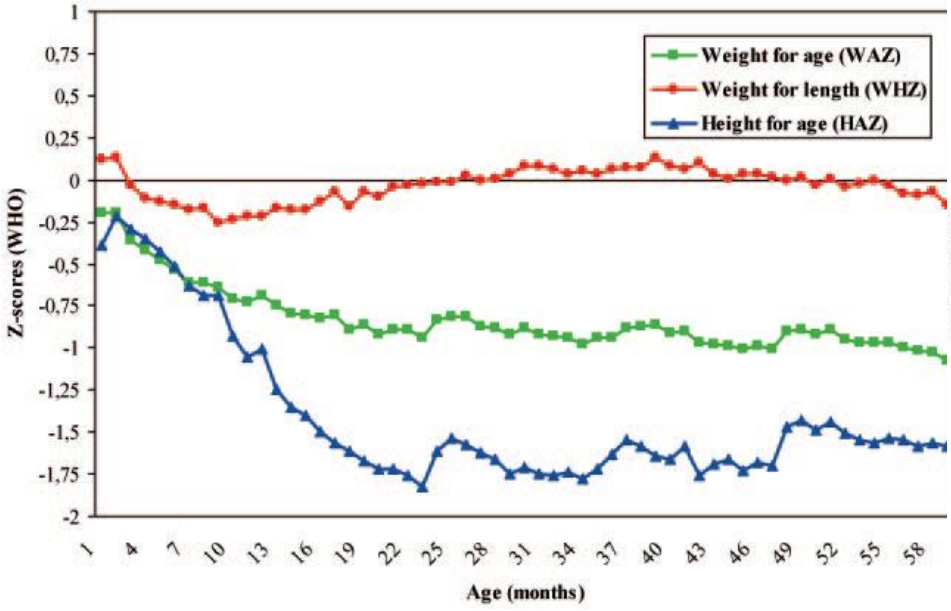
- **Growth less than 3% or 5%**
- **Growth down two percerntage line（from 75% down to 25%）**
- **Chinese Criteria**
- **Commen Sence – “No single measurement can predict only”**

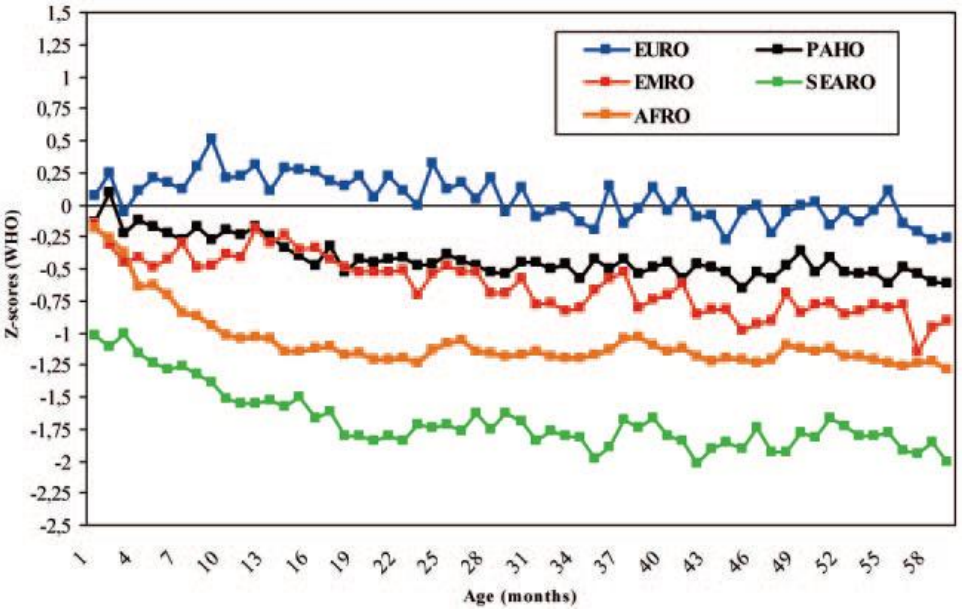
Types	Level	
	moderate	severe
underweight (<-2SD weight-for-age)	≤ -2SD ~ -3SD	<-3SD
stunting (-2SD height-for-age)	≤ -2SD ~ -3SD	<-3SD
wasting (<-2SD weight-for-height)	≤ -2SD ~ -3SD	<-3SD

1)Nelson Pediatrics 2)Child Health Care (version 2)
3)Low-birthweight rates higher among Bangladeshi neonates measured during active birth surveillance compared to national survey data. Klemm RD, Merrill RD, Wu L, Shamim AA, Ali H, Labrique A, Christian P, West KP Jr. Matern Child Nutr. 2013 May 6

Growth Faltering in Middle/Low Income Countries

- Children growth data from 54 Middle/Low income countries





Worldwide timing of growth faltering: revisiting implications for interventions. Pediatrics. 2010; 125(3):e473

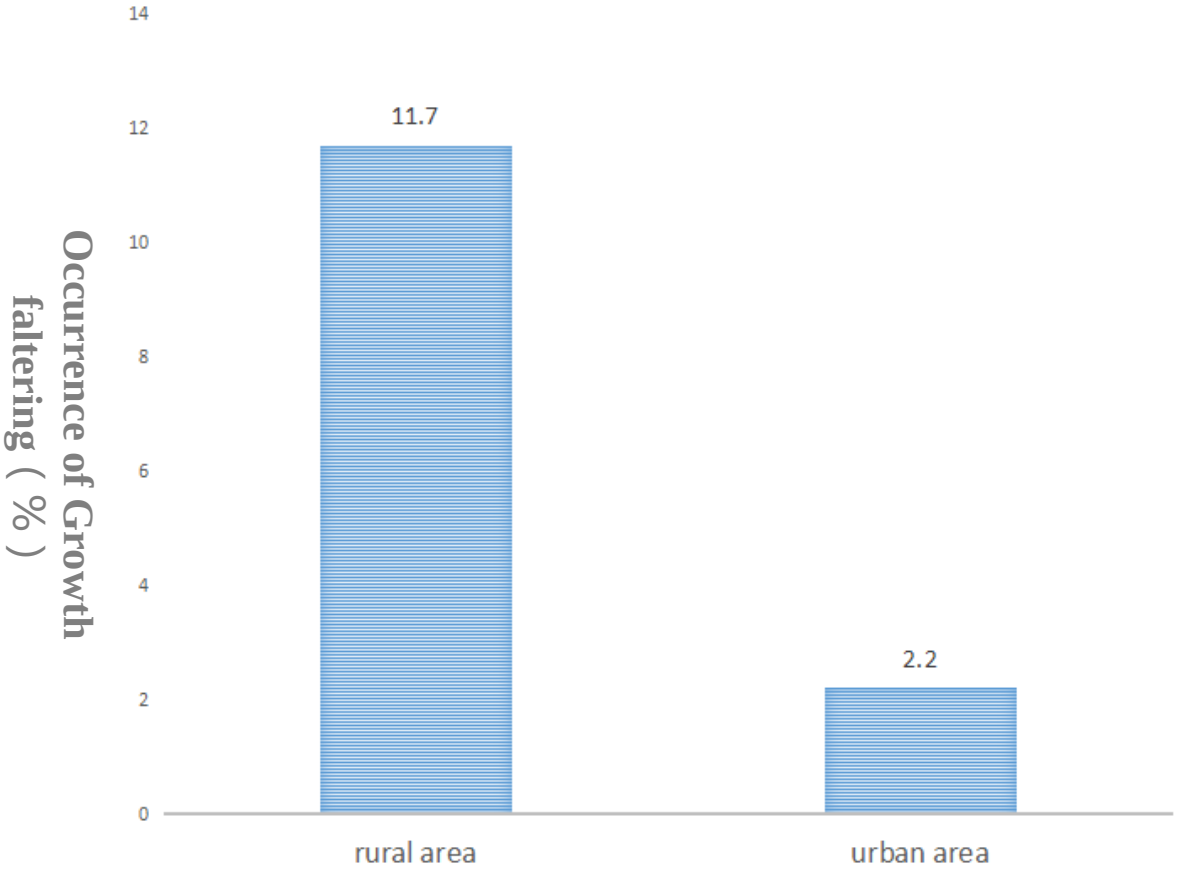
Total Number of Children Growth Faltering

UNICEF reported in 2009

《Nutritional status in children and mothers》

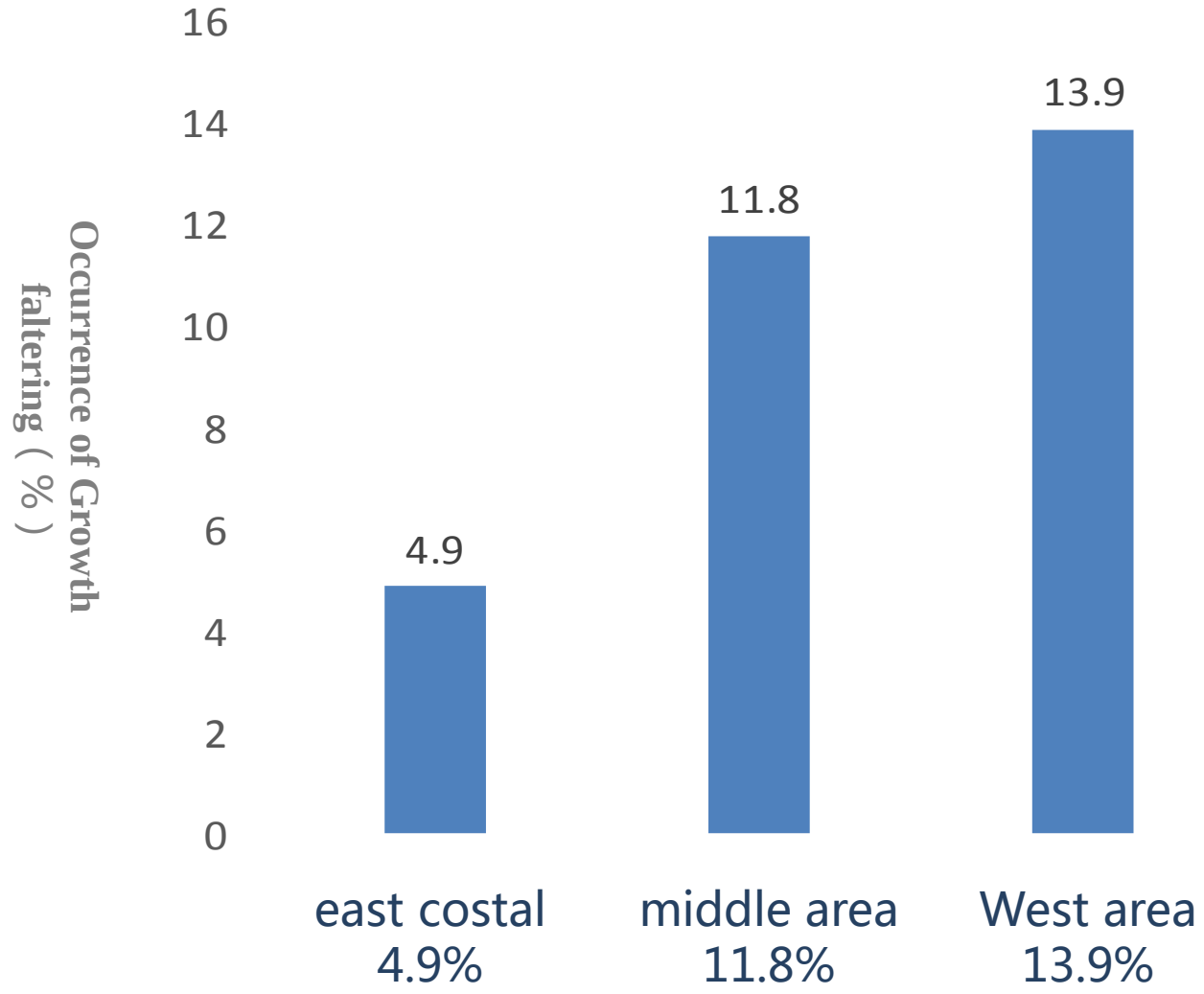
- **Although China make great progress in reducing the prevalence of malnutrition , still 12.70 million children were suffered growth faltering under 5 years old.**
- **Top 2 on the world in total number of Chinese children growth faltering.**

Growth faltering between urban and rural area in China



Rural area (11.7%) : Urban(2.2%)=5.3 times

Prevalence of Growth Faltering in Different Area in China



Nutritional Status of Elementary School Students in South-Western Area

Yearly income < RMB 2300
(national low income county)

- Guangxi：Leye
  719 students from 6 schools
- Yunnan：Xundian
  864 students from 3 schools

Investigators： W Cai, XH Shen,
KF Yang, Linxi Qian

Nutritional Status of Elementary School Students in South-Western Area

Nutritional Status of Elementary School Students in South-Western Area

Malnutrition rate of 6-14 year-old children in Guangxi and Yunnan (%)

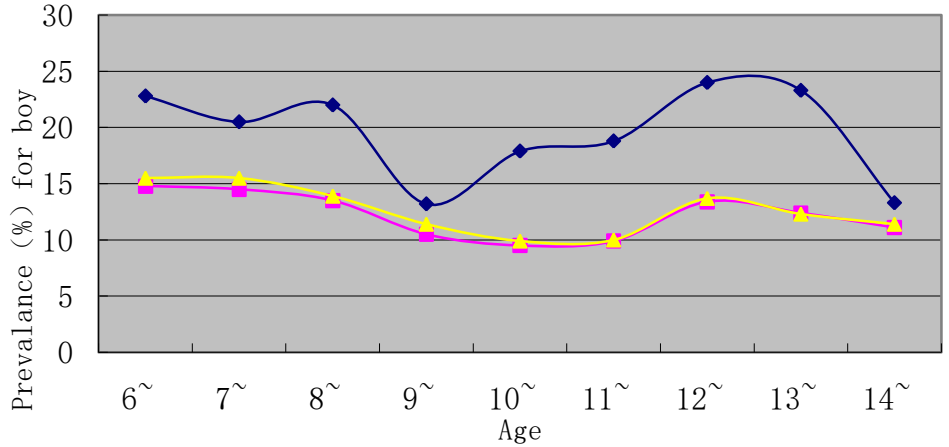
年龄	男						女						合计					
	评价人数	营养不良%	较低体重%	正常体重%	超重%	肥胖%	评价人数	营养不良%	较低体重%	正常体重%	超重%	肥胖%	评价人数	营养不良%	较低体重%	正常体重%	超重%	肥胖%
6~	74	0.0	60.8	35.1	2.7	1.4	63	12.7	57.1	30.2	0.0	0.0	137	5.8	59.1	32.8	1.5	0.0
7~	106	3.8	52.8	40.6	1.9	0.9	122	2.5	50.8	43.4	0.8	2.5	228	3.1	51.8	42.1	1.3	1.8
8~	141	2.8	44.7	48.2	1.4	2.8	122	3.3	47.5	46.7	0.8	1.6	263	3.0	46.0	47.5	1.1	2.3
9~	129	2.3	43.4	49.6	0.8	3.9	117	1.7	43.6	47.0	4.3	3.4	246	2.0	43.5	48.4	2.4	3.7
10~	141	3.5	36.9	51.1	3.5	5.0	138	4.3	39.9	55.1	0.7	0.0	279	3.9	38.4	53.0	2.2	2.5
11~	166	3.0	63.3	32.5	0.0	1.2	166	4.8	29.5	60.2	4.8	0.6	332	3.9	46.4	46.4	2.4	0.9
12~	203	3.9	64.5	27.1	2.5	2.0	169	8.3	67.5	22.5	0.6	1.2	372	5.9	65.9	25.0	1.6	1.6
13~	60	10.0	88.3	1.7	0.0	0.0	52	7.7	44.2	38.5	5.8	3.8	112	8.9	67.9	18.8	2.7	1.8
14~	15	26.7	60.0	13.3	0.0	0.0	8	0.0	37.5	37.5	25.0	0.0	23	17.4	52.2	21.7	8.7	0.0
总计	1035	3.8	55.1	37.2	1.6	2.3	957	5.1	47.1	44.0	2.3	1.5	1992	4.4	51.3	40.5	2.0	1.9

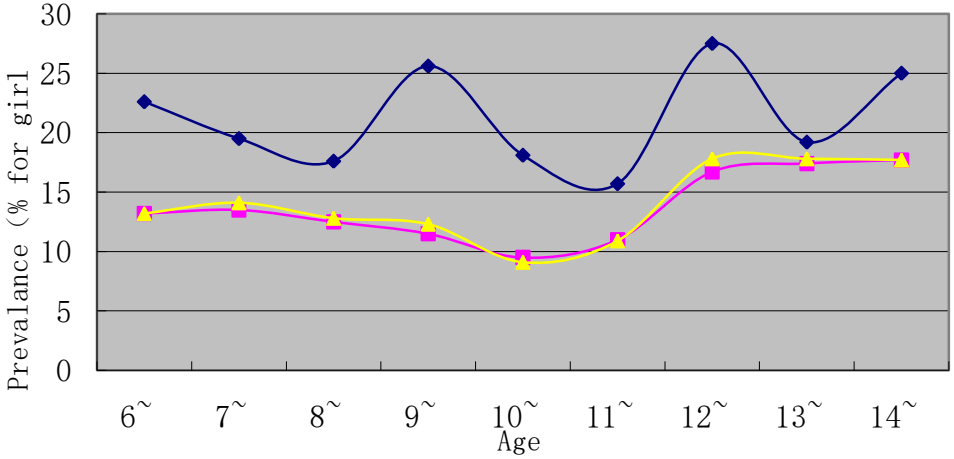
Compare with national students results in 2005

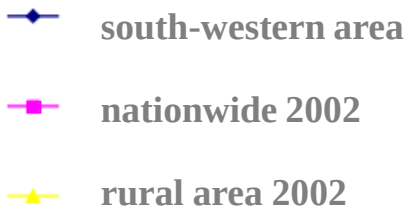
Malnutrition 7.88%， underweight 45.53%

Anemia

Anemia prevalence of 6-14 year-old children in Guangxi and Yunnan (%) compared with national and rural results in 2002

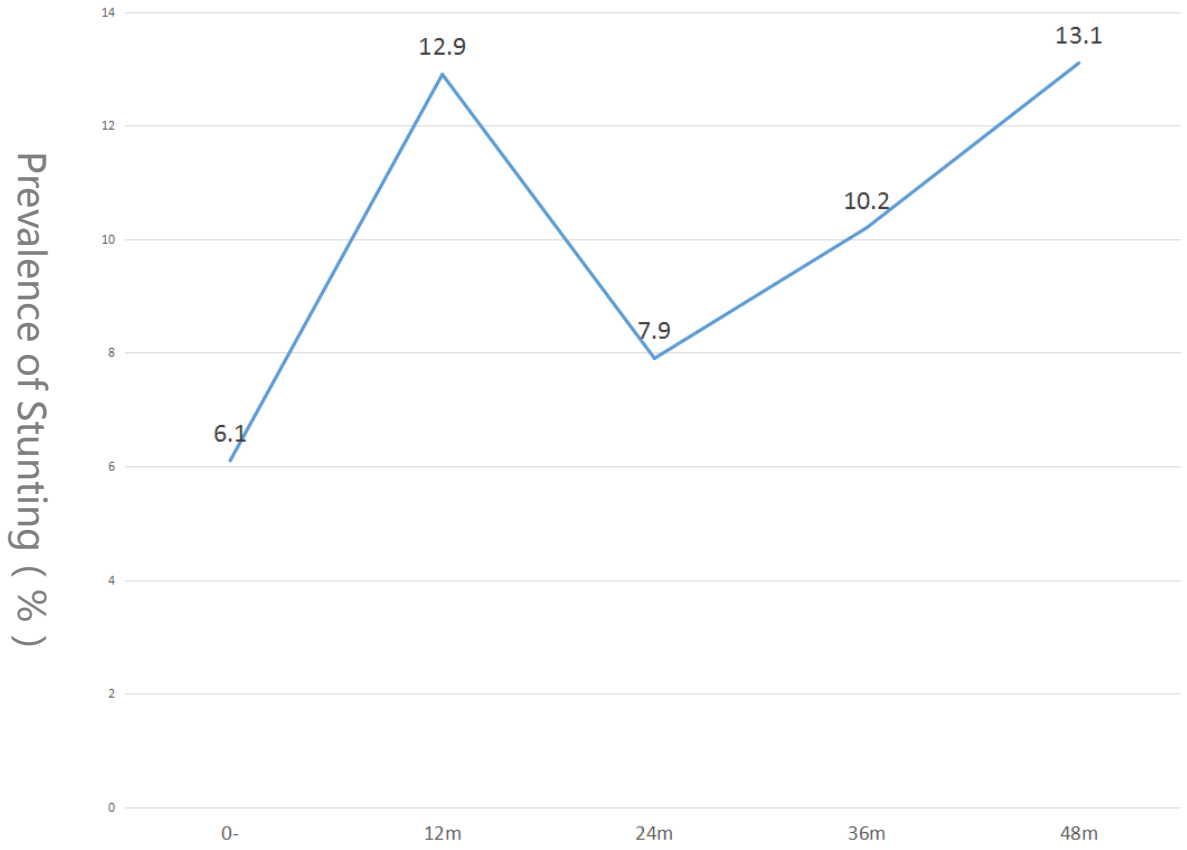






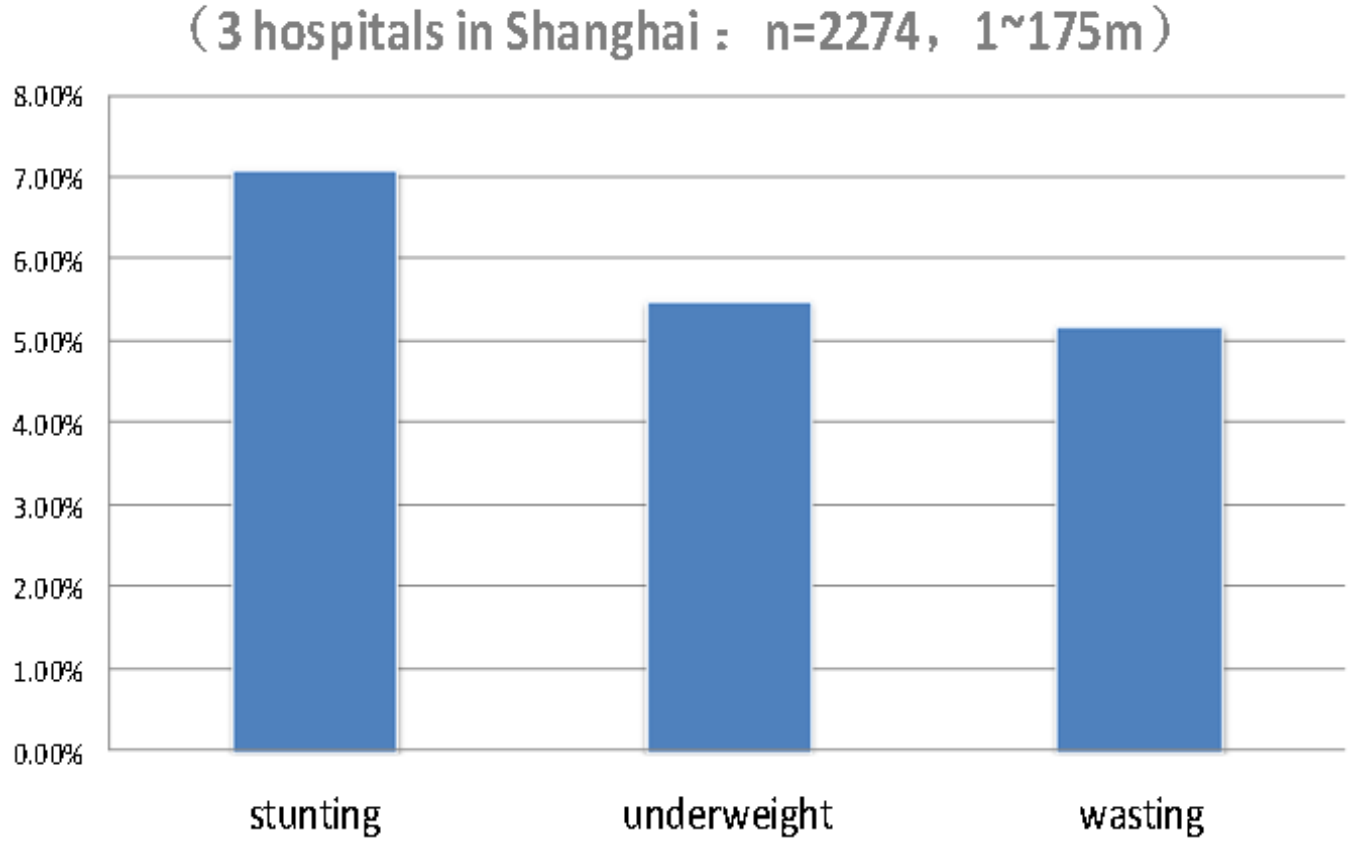
Prevalence	20.5%
Boys	20.1%
Girls	20.9%

Prevalence of Stunting in Ddifferent Age Children in China



Stunting less than 12m 6.1%, 12m to24m going up 12.9%,then down to 8% at 36m and up again to 13.1% at 60m

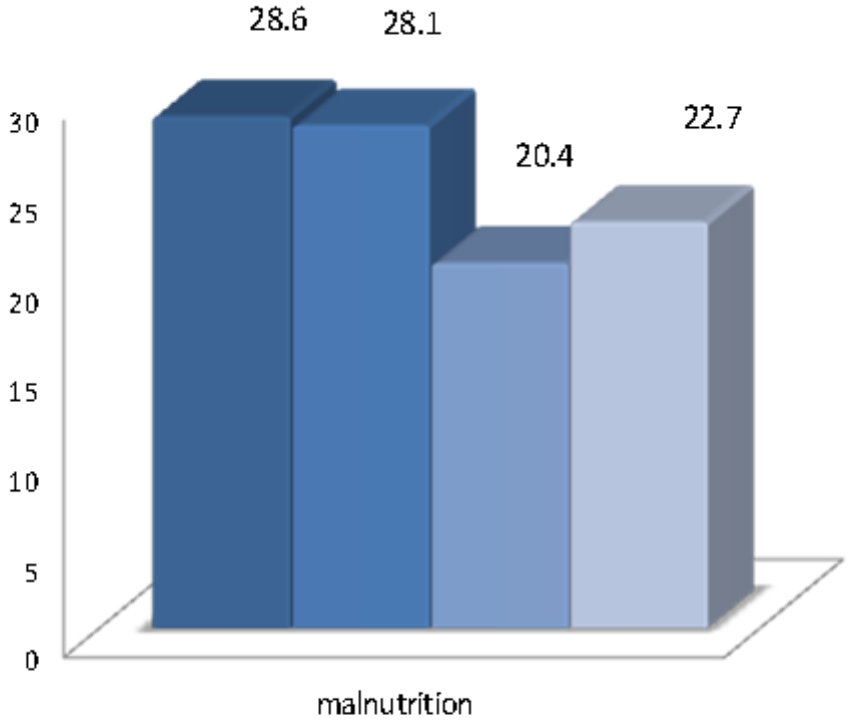
Growth Faltering in Hospitalized Children in Shanghai



1, 陶晔璇,徐远飞,汤庆娅等.中国临床营养杂志.2007,15(4):214-217

2, Pawellek et al, 2008

Prevalence of Growth Faltering in Hospitalized Children



Pawellek et al, 2008

Disease Related Children Growth Faltering

GI	Surgery or Stress	Heart or Lung	Tumor	Nerve System
Diarrhea	Peri-op	CHD	Leukemia	Cerebral palsy
GERD	Trauma	RD	Solid tumor	
Acute Pancreatitis	Burn			
SBS				
IBD				

What's the Problem in China for Overweight or Obese Children

Chronic Diseases Going Up in Different Country in Children

Country	Year	Number	Age	CD	Prevalence(%)
USA	1988-1994	2450	12-18	Fatty Liver	3.0
Italy	2004	3923	6-11	Hypertension	Boy： 9.9 Girl：13.9
Iran	2003-2004	4811	6-18	HDL↓ TG↑	28.0% 20.1%
USA	1988-1994	2430	12-19	Metabolic Syndrome	4.2

Epidemic Obesity and Diabetes Threatens Asia

— REUTERS

China:Affluence Brings Diabetes

— NYT

India, More Wealth and More Diabetes

— IHT

How Asia Got Fat?

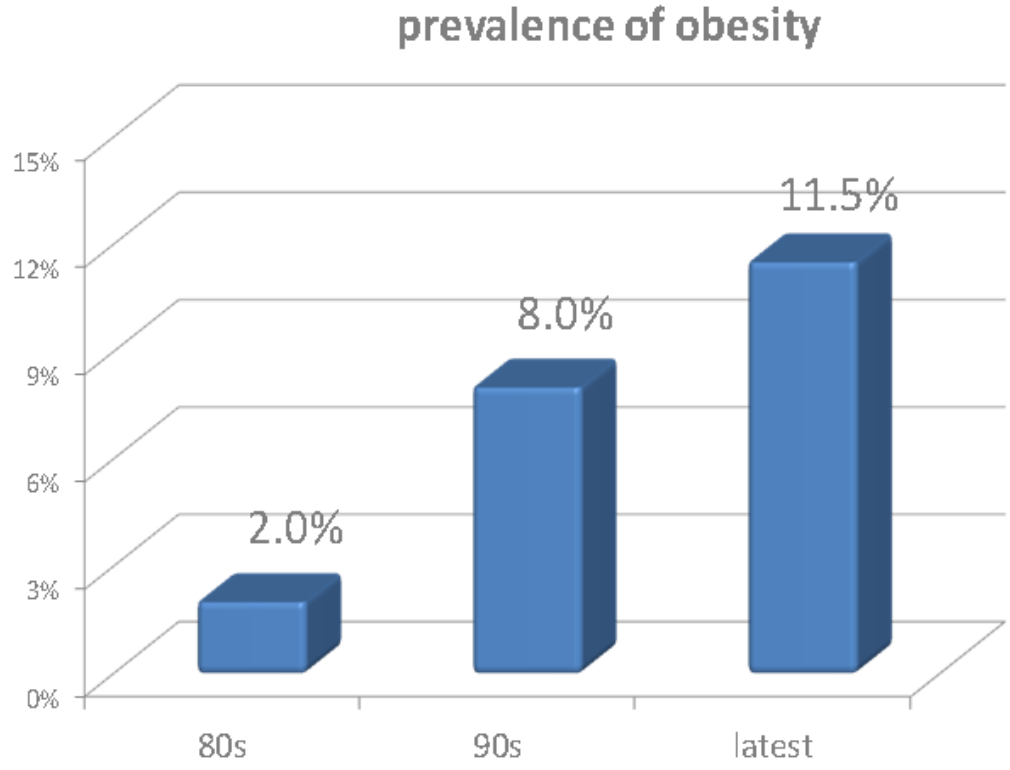
— TIME Asia

Prevalence in Big Cities of China

- 6-8 years old in **Beijing** in 2004（n=10221）
  - ✓ overweight：12.5%；obesity：15.4%

- School children from **Shanghai** survey in 2005
  - ✓ Obesity : 11.5% in 7-22 years old
    up 3.1% compared in 2000
  - ✓ Boys in Downtown 15.1%
    3.1% higher than national lever of the same age group
  - ✓ Girls in Downtown 9.2%
    4.19% higher than national lever of the same age group

Prevalence of Obesity in Past 30 Years in Shanghai



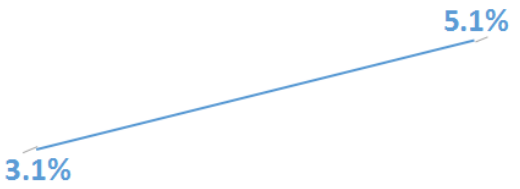
Food Allergy in Infants & Toddlers

- Food allergy is more common in infants and toddlers than in adults
  - ✓ Affects up to 6-8% of children
- Cow's milk proteins (CMPs) are one of the most common food allergens in infancy and early childhood
  - ✓ Majority of children acquire tolerance to cow's milk by age 5
  - ✓ Those with peak CM-IgE >50 kIU/L likely to retain cow's milk allergy until teenage years

1. Sicherer SH, et al. *J Allergy Clin Immunol.* 2010;125;S116-S125.
2. Sicherer SH. *J Allergy Clin Immunol.* 2011;127:594-602.
3. Host A, et al. *Pediatr Allergy Immunol.* 2002;13 Suppl 15:23-28.
4. Skripak JM, et al. *J Allergy Clin Immunol.* 2007;120:1172-1177.

Pediatric food allergies raised

- According to the **Centers for Disease Control**, pediatric food allergies increased from 3.1% in 1998 to 5.1% in 2011.



- According to the **National Institute of Allergy and Infectious Diseases (NIAID)**, CMPs is the most prevalent food allergy in infants and children 0-2 years of age.

Jackson et al 2013
Boyce et al 2010

Common Food Allergens in Infants

HealthNuts Study, n=2,848 infants at 12 months

Allergen	+IgE	Oral Food Challenge
Cow's milk	5.6%	Not performed
Egg white	16.5%	8.9%*
Peanut	8.9%	3.0%
Sesame	2.5%	0.8%
Shellfish	0.9%	Not performed

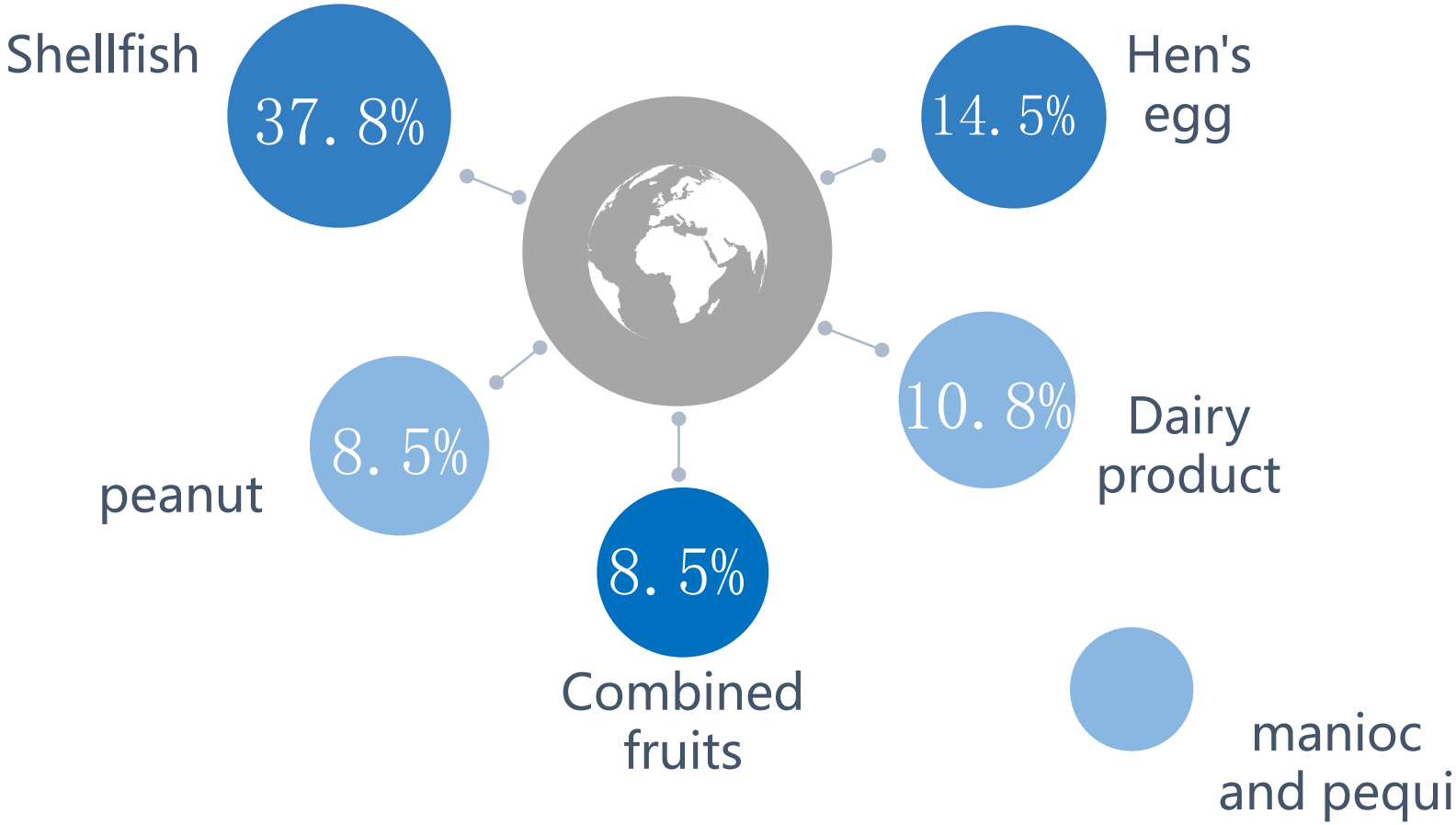
*raw egg; 80% tolerated baked egg




Osborne NJ, et al. J Allergy Clin Immunol. 2011;127:668-676.

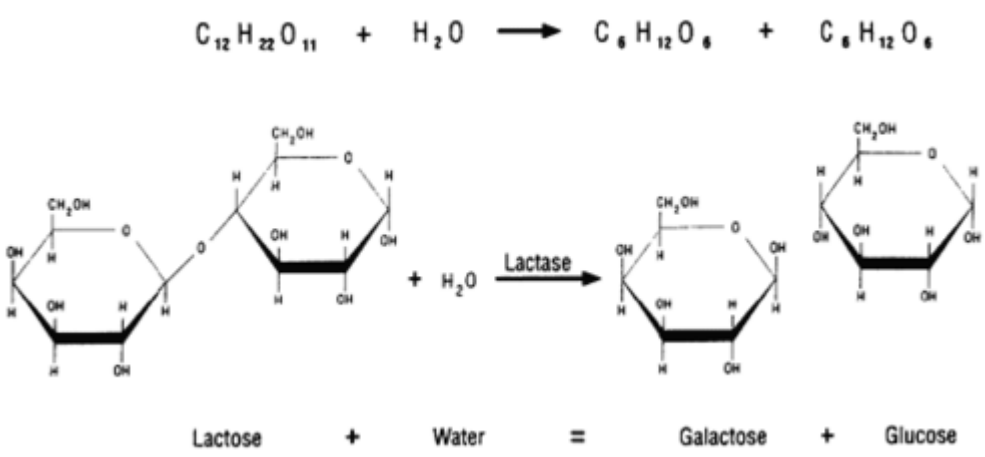
Nutrtion and Food Allergies

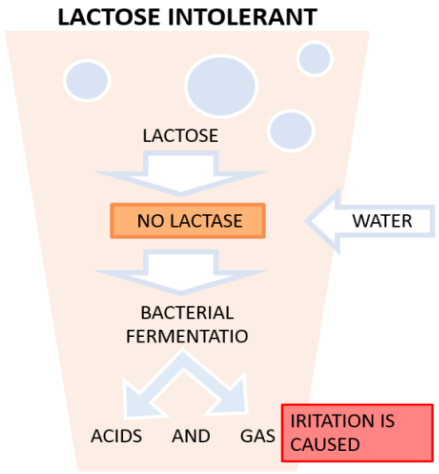
most common allergenic foods



Lactose Intolerance

- Inability to digest lactose, a sugar found in milk and to a lesser extent dairy products, causing side effects
- Congenital lactase deficiency prevents babies from drinking even human milk; extremely rare!
- Lactose-intolerant individuals have insufficient levels of lactase, an enzyme that catalyzes the hydrolysis of lactose into glucose and galactose, in their digestive system





Is Time for ACTION
Double Burden

卫生部文件

卫疾控发〔2007〕214号

卫生部关于认真贯彻落实《中共中央、国务院关于加强青少年体育增强青少年体质的意见》的通知

观念、与时俱进，加强对青少年健康工作的领导，按照党中央、国务院的要求，落实有关措施，维护和促进青少年健康成长。

二、抓好学生常见病和传染病的预防工作。继续将学生常见病防治工作列为我国学校卫生工作的重点，按照分类指导、因地制宜的原则做好学生常见病的防治工作。农村学校要重点抓好视力低下、沙眼、肠道蠕虫感染、营养不良、缺铁性贫血的防治工作。城市学校要重点做好视力低下、沙眼、肥胖、缺铁性贫血的防治工作。指导各级各类学校落实传染病疫情报告、晨检和因病缺勤监测等

用水、厕所加强卫生管理，预防肠道传染病的发生。

三、有效处置学校突发公共卫生事件。各级卫生行政部门要指导各类学校落实突发公共卫生事件报告制度，提高报告的时效性和准确性，制订学校突发公共卫生事件应急预案；一旦收到学校突发公共卫生事件报告要及时赶赴现场，指导、帮助采取相应的应急处置措施。

四、加强青少年营养指导，建立和完善青少年营养干预机制。根据营养监测的结果及其相关影响因素，提出改善学生营养状况的针对性措施。帮助学校普及合理营养、平衡膳食及预防与营养相关的慢性非传染性疾病的科学知识。配合学校推广“学生营养餐”(早餐和午餐)、“学生奶计划”，降低学生蛋白质营养不良和缺铁性贫血的发生。

— 2 —

Low Income Maintain Area

- **Every mountain area student gets 4 yuan RMB per day for nutritional supplement**
- **Cover 32 millions students**
- **Financial support from central government**

Recent progress of NIPRCES in China

- **Nutrition Improvement Program for Rural Compulsory Education Students (NIPRCES)**

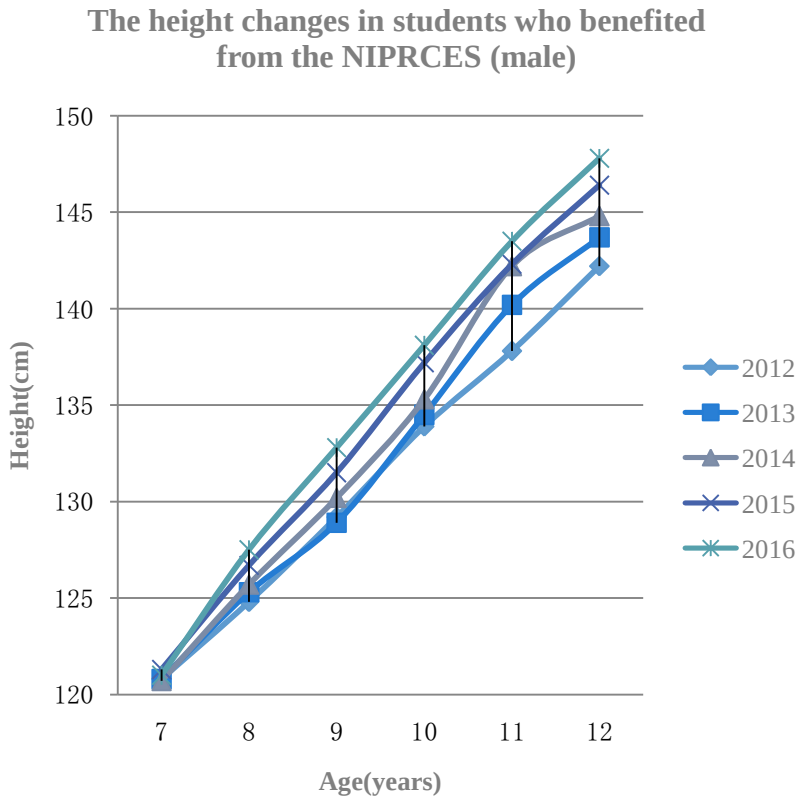
✓ **School feeding mode has become the dominant catering mode in NIPRCES-covered schools**

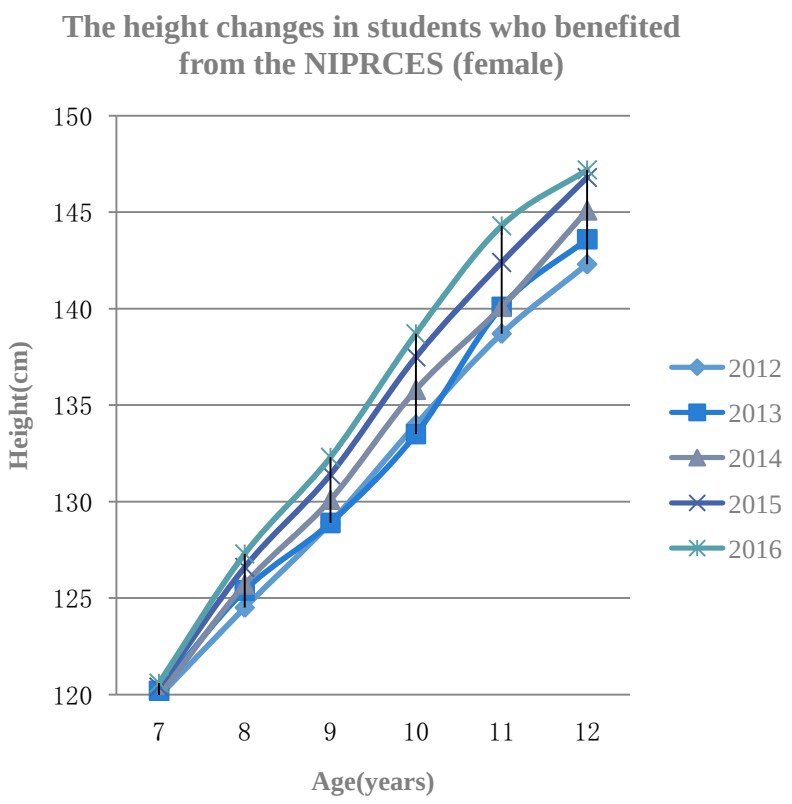
✓ **95% of schools used the school feeding mode**

✓ **52% of the schools manifested that the amount of energy, protein, fat, and two trace elements in school meals met the national recommendation**

Recent Progress of NIPRCES in China

- A study of 1,920,000 students who benefited from NIPRCES found that the physical status of students from impoverished areas has significantly improved.

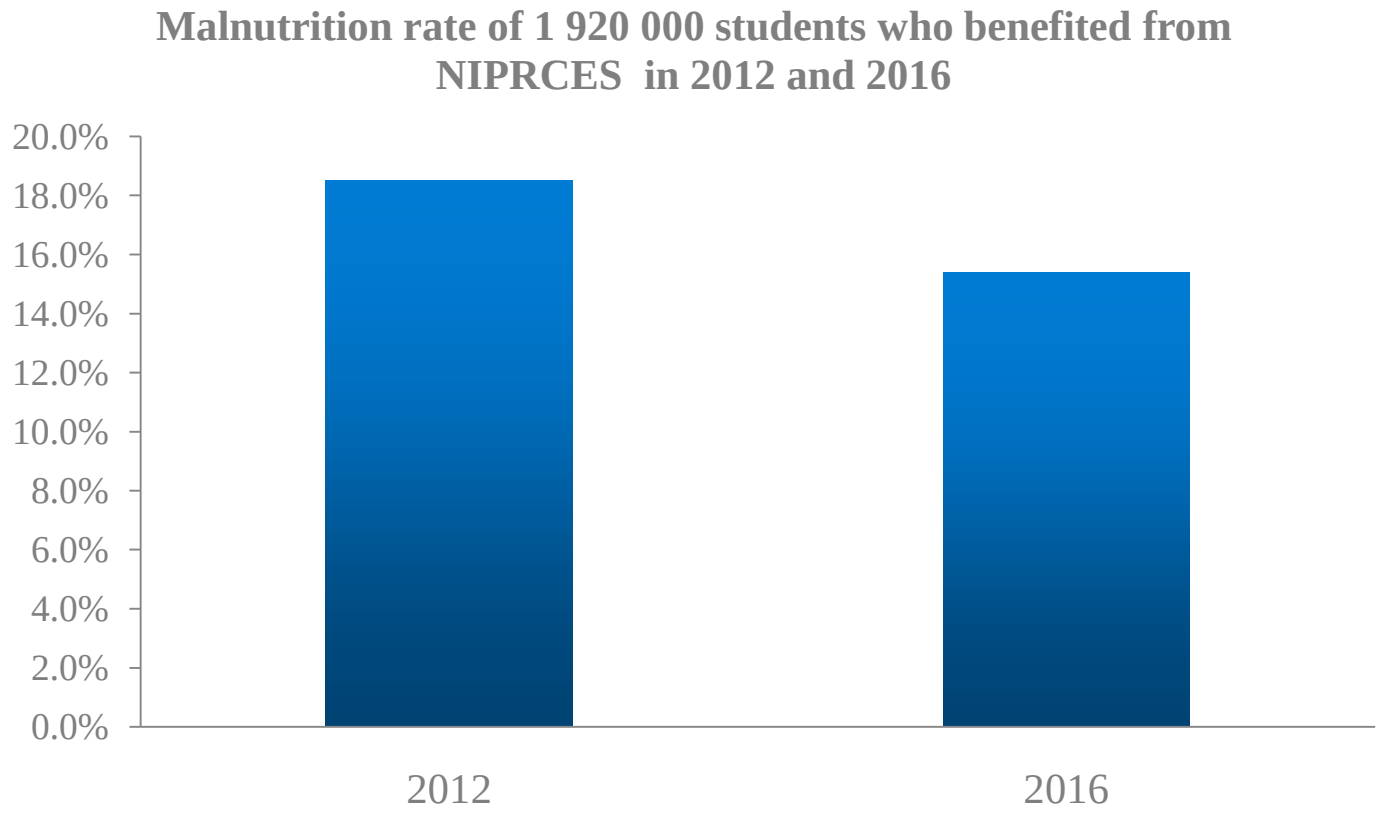




Data from:Report of China Development Research Foundation: progress in nutrition improvement of rural students in poverty-stricken areas

Recent Progress of NIPRCES in China

- Data shows that malnutrition rate decreased from 18.5% in 2012 to 15.4% in 2016.



Data from:Report of China Development Research Foundation: progress in nutrition improvement of rural students in poverty-stricken areas

Obesity in Cities

School based intervention for obesity

NST program in Children’s Hospital of China

Hangzhou

Nanjing

Beijing

Suzhou

Chongqing

Zhongshan


Beijing
Nanjing
Suzhou
Shanghai
Hefei
Chongqing
Changsha
Hangzhou
Guangzhou
Shenzhen

Key Challenges in China

- Education in medical staff in whole country
- Make popular for NST in the hospital
- Make a suitable policy or regulation（RD system）
- Do high quality research
- Join international academic activity
- More contribution in the international lever
  - ✓ Organize international meetings
  - ✓ Peer-review international journal editorial board
  - ✓ Publish more scientific papers

Acknowledgement

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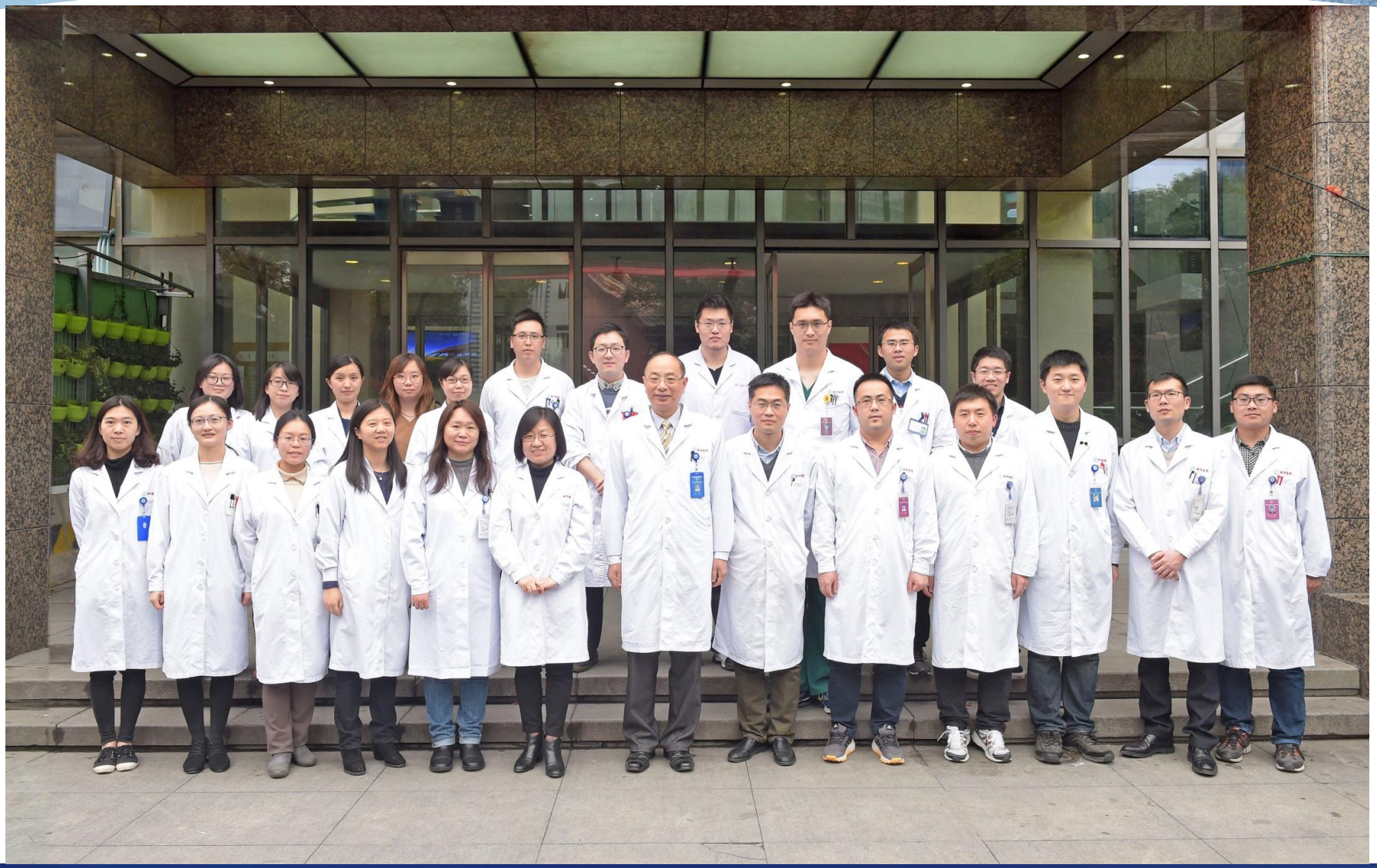
- Faculty from Division of Pediatric GI and Nutrition, Xinhua hospital, School of Medicine, Shanghai Jiao Tong University
- Faculty from Shanghai Key Lab of Pediatric GI and Nutrition
- Faculty from department of nutrition, School of Medicine, Shanghai Jiao Tong University

Acknowledgement




Thank You