Overview and Solution in Refractive Error

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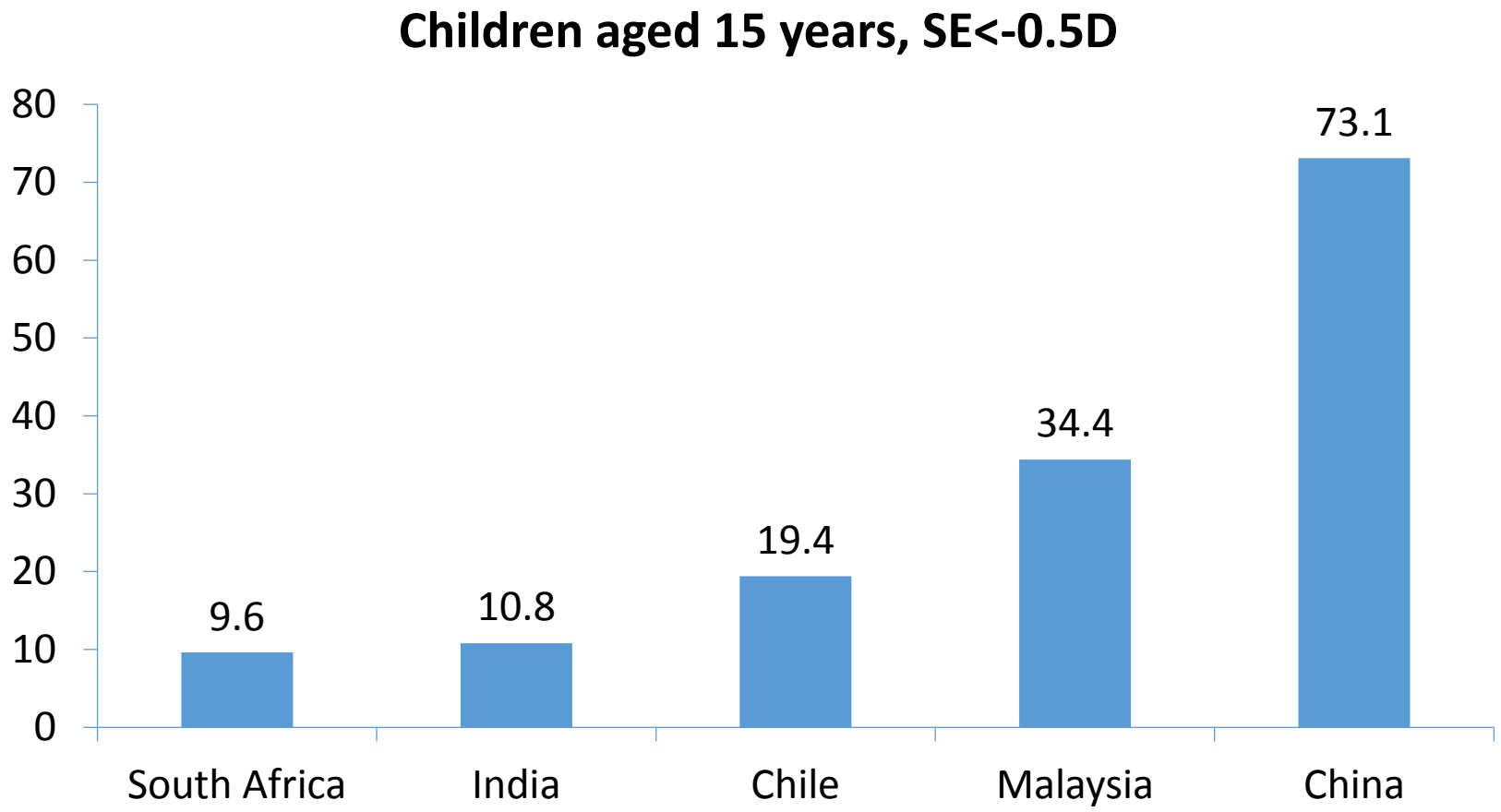
Prevalence of myopia (RESC study)
30-50% uncorrected myopia



Challenges & school-based solutions

- School-based screening
  - Identify children with refractive error & eye diseases
- Referral
  - Refraction service
  - Pediatric ophthalmology service
- Annual follow-up
  - Spectacle updating
- Large scale massive screening
  - Real time management system

How to handle data in massive screening - CHEER project
"real-time" cloud data management

- **C**hildren's **H**ealthy **E**yes bring **E**ducational **R**ewards
- Duration: June 2013 – May 2018
- Shanxi, China
- School-based eye disease screening
- Financial support: Standard Chartered Bank, RMB 30M

- **Screened: 1.5 million students annually**
- Referral: 200,000

Challenges

- Train teacher to perform screening
  - Visual acuity
  - 5 typical pediatric eye diseases
- How?
  - handle massive data
  - Real-time management
  - Link up with the users (parents)

Challenges & solutions

Challenges (pain points)	Solutions?
Massive screening task - Screen 1.5 million students annually - Screening: VA + identification 5 common eye diseases	Train teacher to perform standardized training procedure
Massive training task - Teachers from nearly 1000 schools	• On-site training • Online training (lecture, video on standard procedure, certification)

Online training + certification

Teachers perform simple VA testing + identification 5 common diseases

Over 2000 teachers received online training in 3 months, including:

- video (registry/eye examination/screening system)
- slides
- online exam & certification

Challenges & solutions

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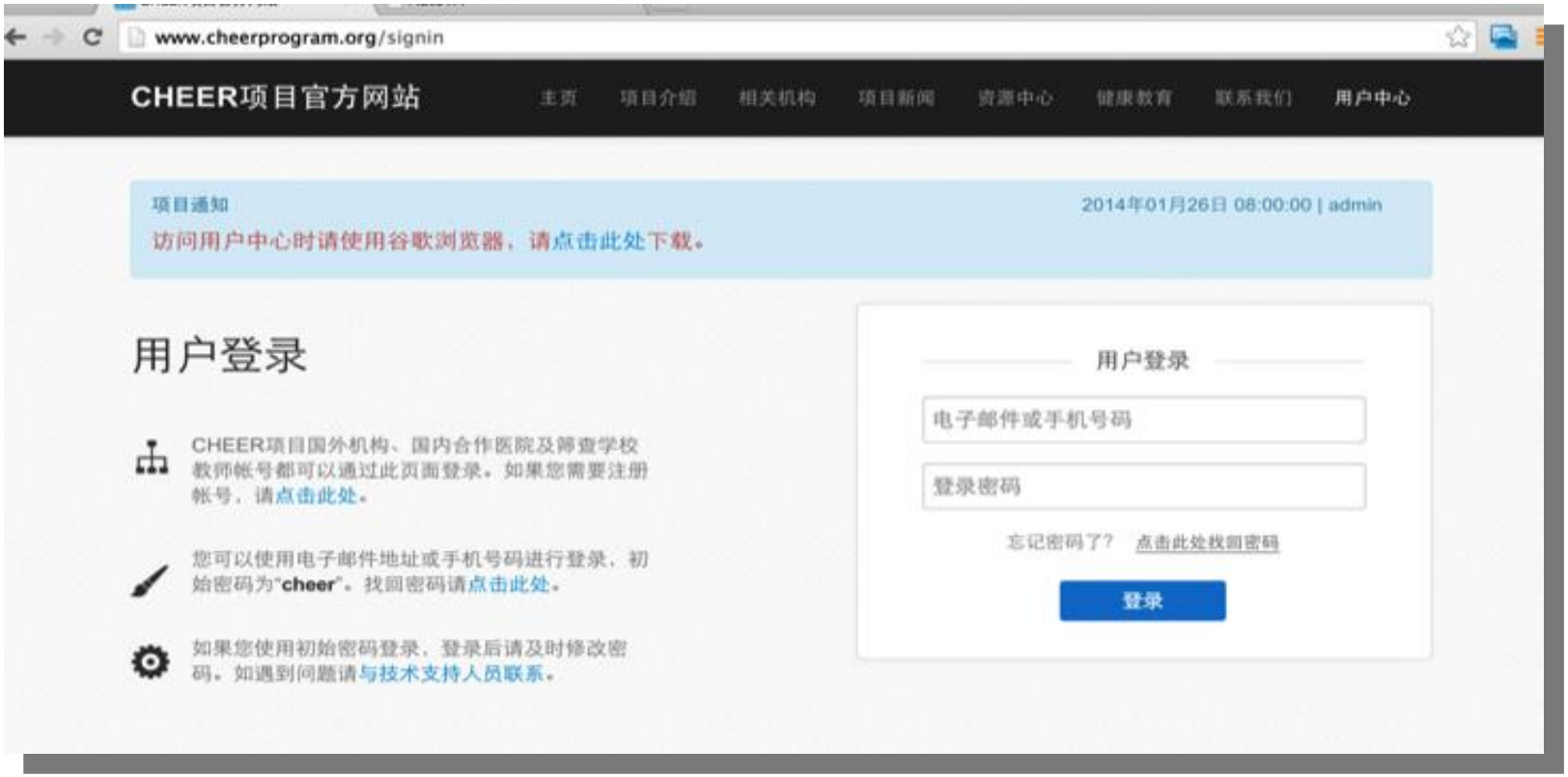
Massive data management - 1.5 million students records - Paper records: transport, data entry, matching, statistics - Timely referral to hospital	• Web-based system • real-time data entry at examination • Cloud-server, mangoDB

System login
web-based management



Account authorization

administrator, teacher, eye clinic, parents, project manager

Screening: real-time data entry

Real-time data entry at screening

Challenges & solutions

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Program management - Progress report - Real-time management	• Web-based system • Real-time statistics

Project manager:
Real time progress supervision

Challenges & solutions

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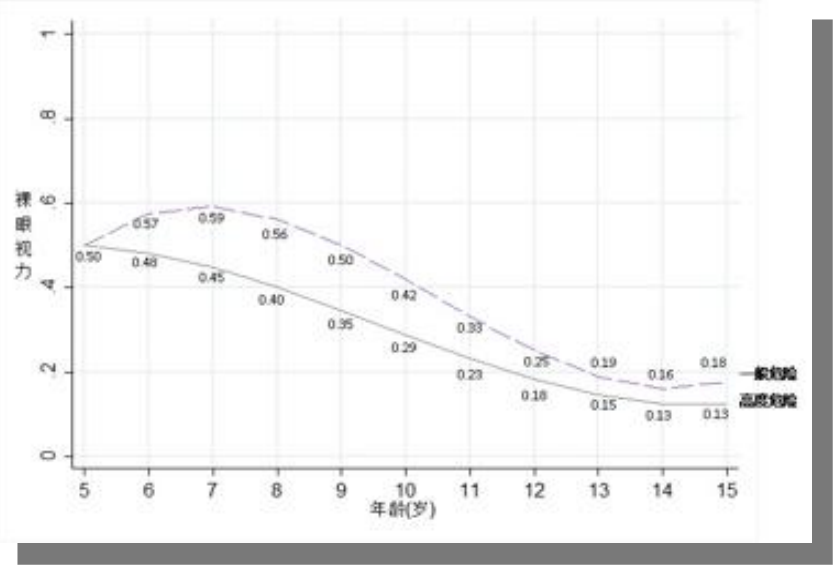
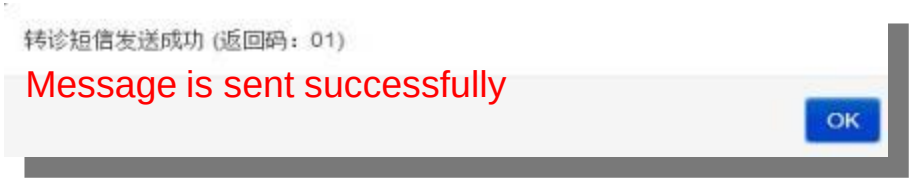
Program management - Progress report - Real-time management	• Web-based system • Real-time statistics
User interaction - Parents willing to know results - Referral to hospitals	• Automatic SMS reminder • GIS data – find the service provider nearby

Real-time SMS to parents

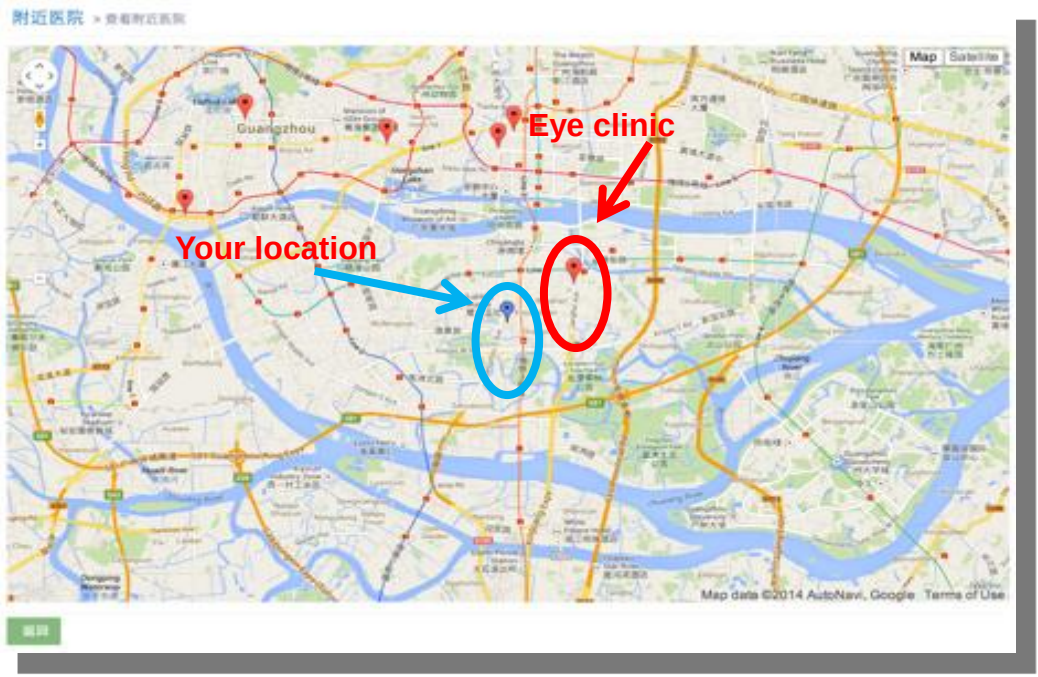
- Impaired VA
  - UCVA < 0.5
  - BCVA < 0.5
- Myopia with rapid progression
  - compare with historic data
  - 2-line drop per year
  - at high risk on percentile plot
- Identified eye diseases
- Send SMS automatically





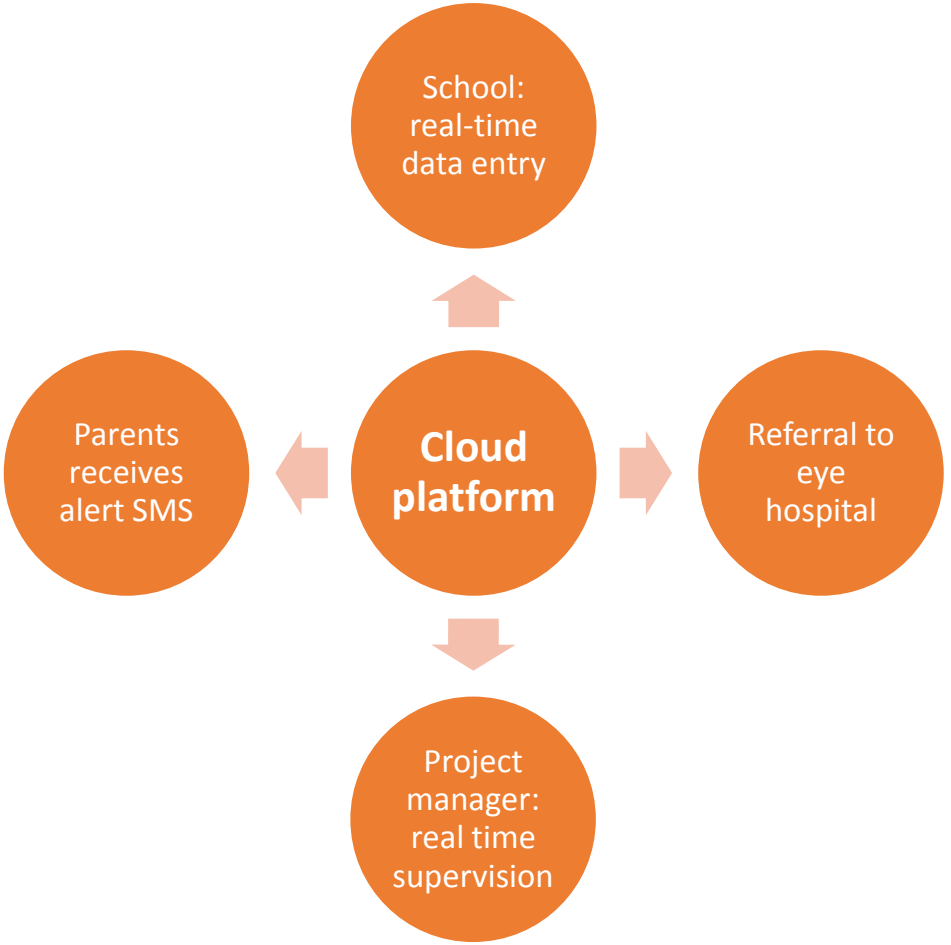
Locating nearby hospitals

- SMS, with URL link
- Parents click to find
  - Screening report
  - Nearest registered eye clinic & maps for referral

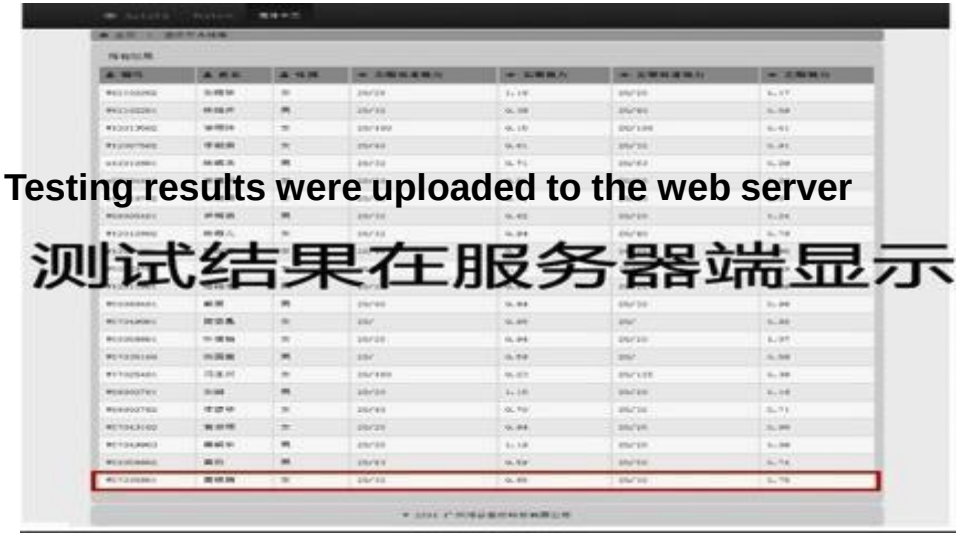


Online management platform

www.cheerprogram.org



Self-testing VA by students
LED + sensor = estimation on distance



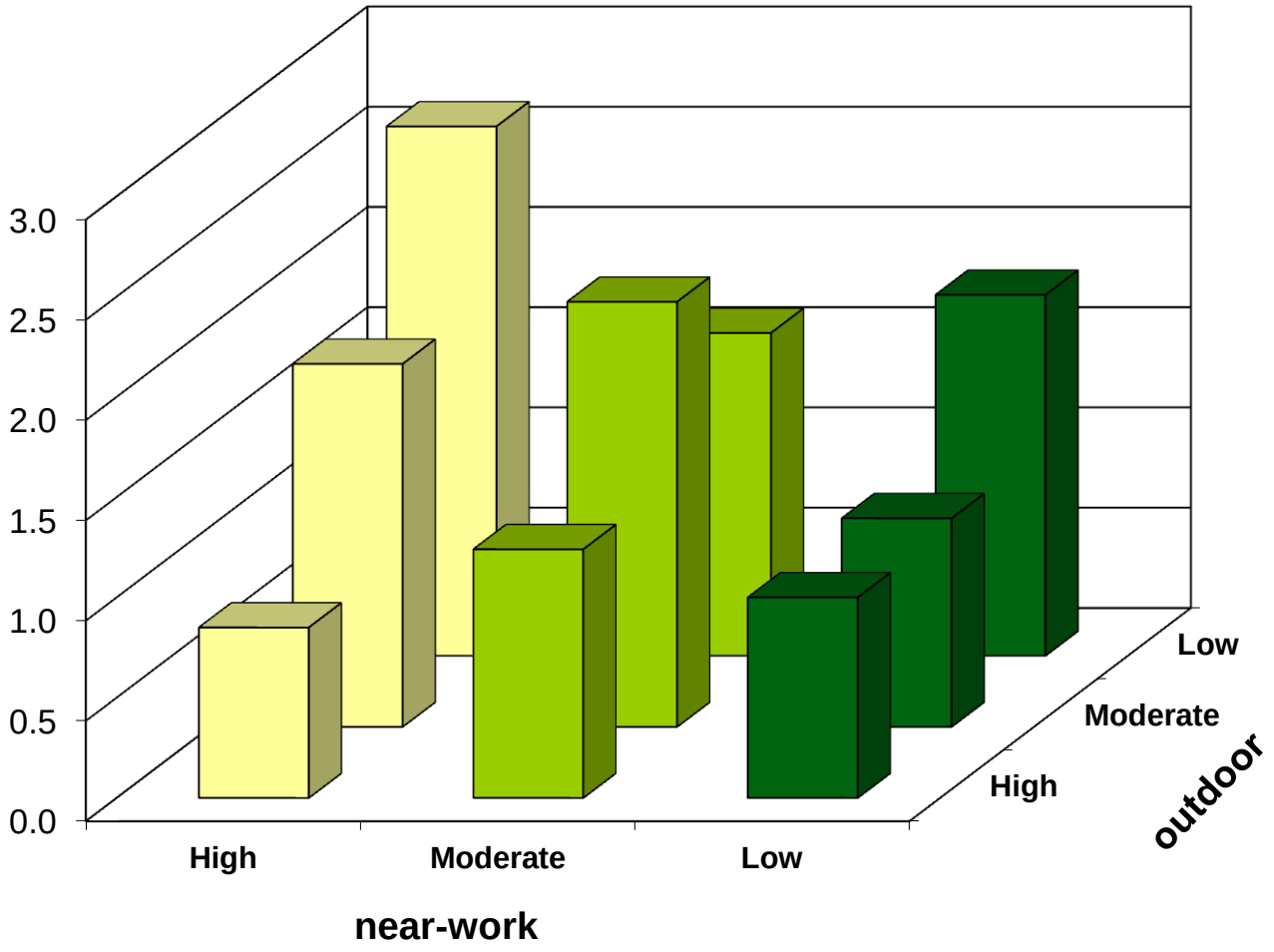
On-site school screening – sponsored by Mantholantum

Online VA testing at home
 - a collaborative project with Mantholatum Rhoto
- Online VA testing + link to health education promotion info

Evidence-based intervention

- Prevention of onset
  - Increased outdoor time
  - Schooling intensity control
- Retardation of progression
  - Spectacle correction
  - Ortho-K
  - Low dose atropine
  - Special design contact lens
    - ➢Peripheral defocus
    - ➢Others
- ➢ Operational research

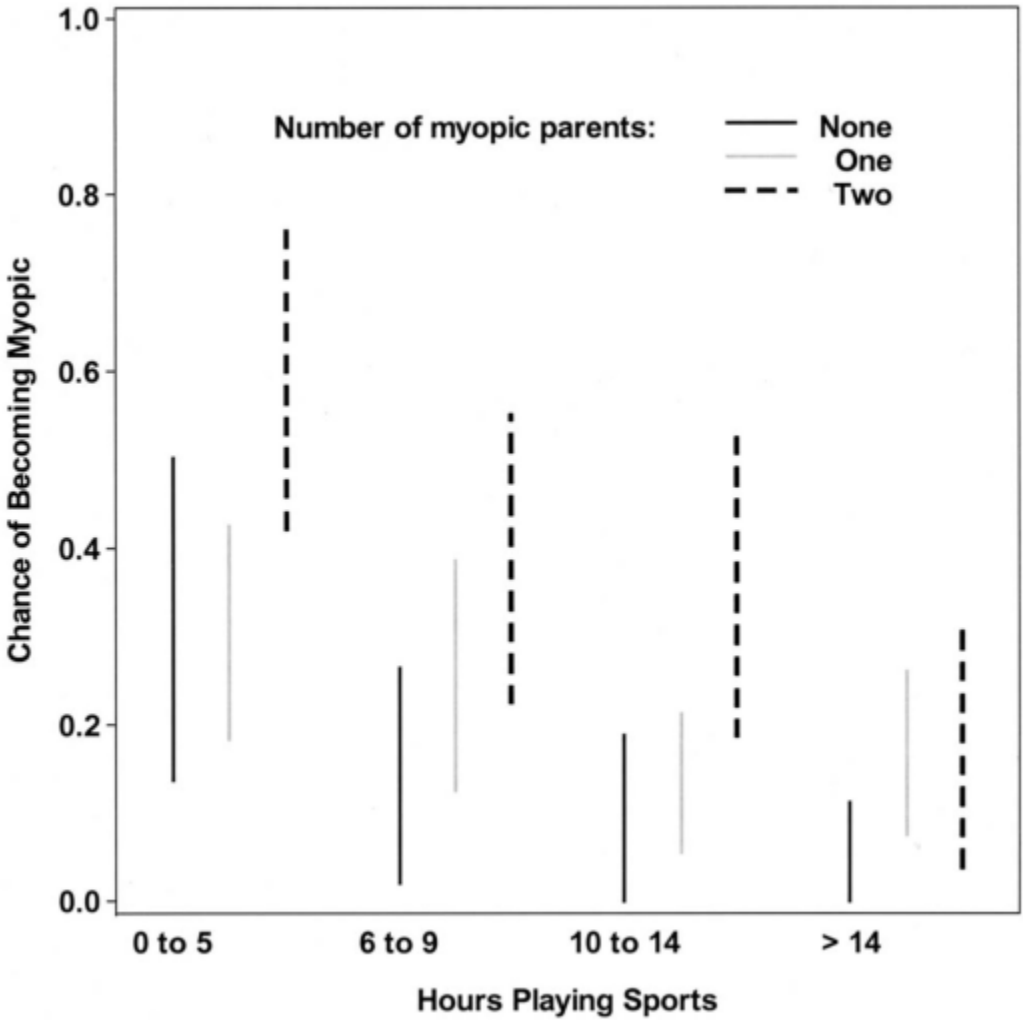
Outdoor Activity: a Protective Factor?



Time outdoors reduces the impact of near work.

Sydney Myopia Study

Outdoor Activity: a Protective Factor?



Time outdoors reduces the impact of parental myopia.

Jones LA, Loraine TS, Mutti DO, et al. Invest Ophthalmol Vis Sci. 2007

Guangzhou Outdoor Activity Longitudinal Study

- Hypothesis
  - Increase of time outdoors reduces 3 year incidence of myopia

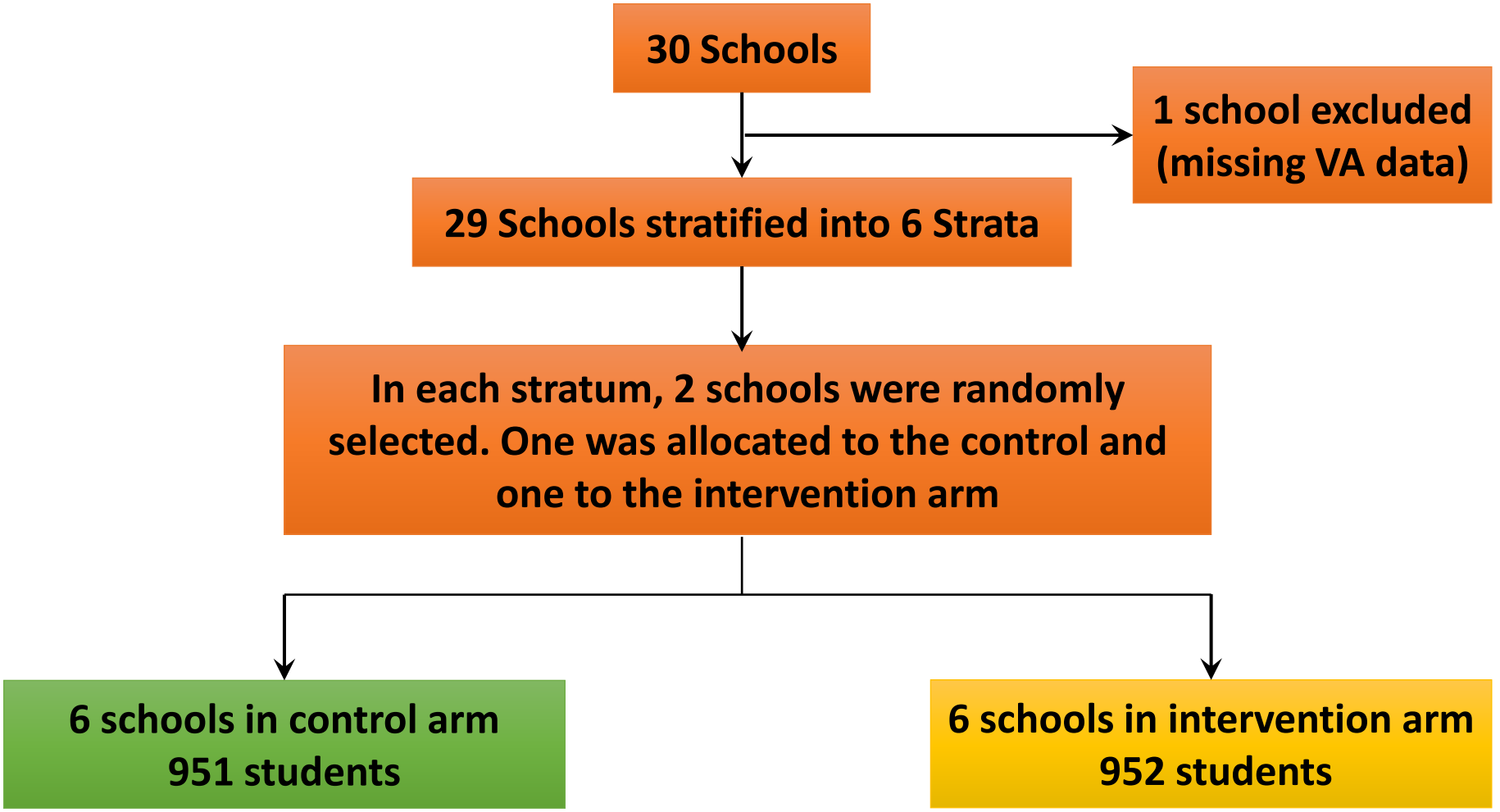
- Study Design
  - A 3 year controlled, cluster-randomized clinical trail
  - Intervention
    - ✓ An additional outdoor class of 45 minutes per day
    - ✓ A parental information campaign

Outdoor Intervention

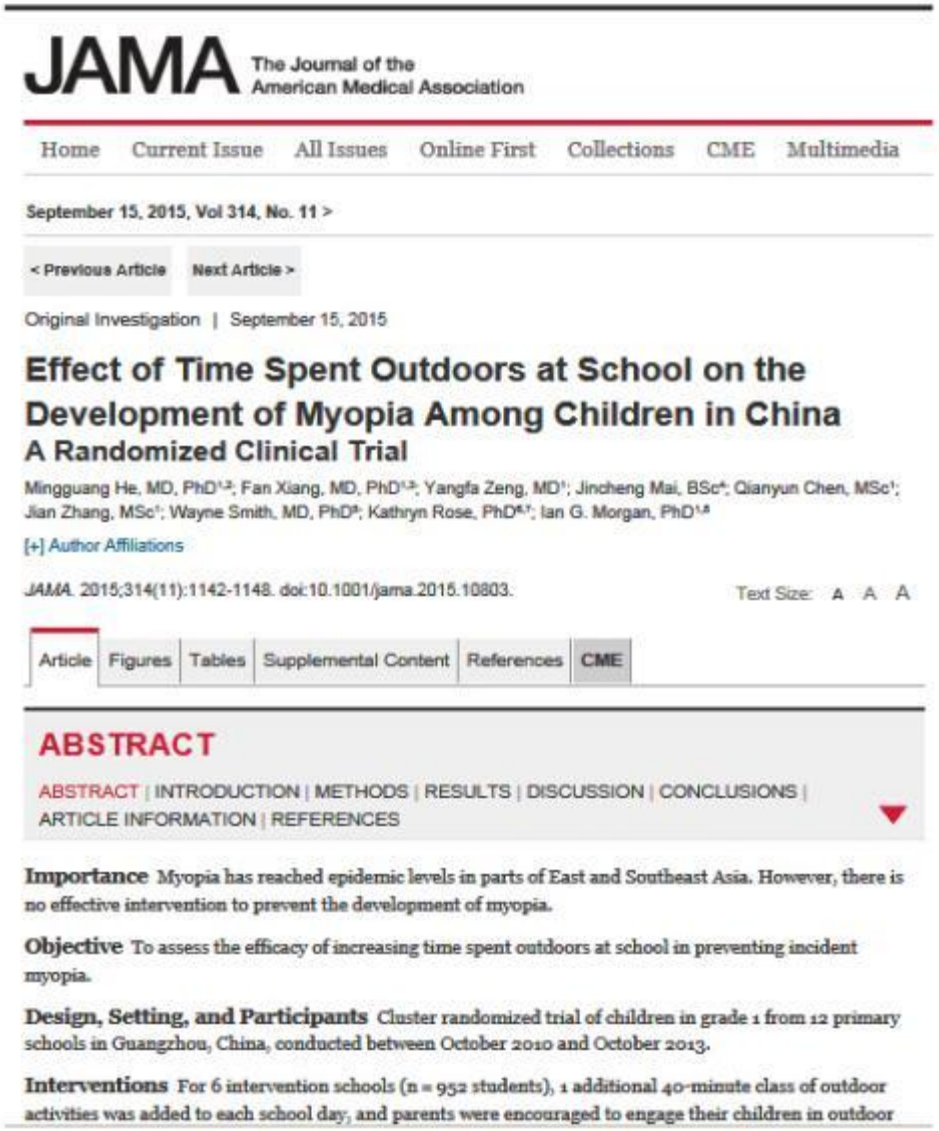




Recruitment



Results were published in JAMA in September 2015



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Original Investigation | September 15, 2015

Effect of Time Spent Outdoors at School on the Development of Myopia Among Children in China

A Randomized Clinical Trial

Mingguang He, MD, PhD[1,2]; Fan Xiang, MD, PhD[1,2]; Yangfa Zeng, MD[1]; Jincheng Mai, BSc[1]; Qianyun Chen, MSc[1]; Jian Zhang, MSc[1]; Wayne Smith, MD, PhD[3]; Kathryn Rose, PhD[4,5]; Ian G. Morgan, PhD[1,6]

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JAMA. 2015;314(11):1142-1148. doi:10.1001/jama.2015.10803.

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Article Figures Tables Supplemental Content References CME

ABSTRACT

ABSTRACT | INTRODUCTION | METHODS | RESULTS | DISCUSSION | CONCLUSIONS | ARTICLE INFORMATION | REFERENCES

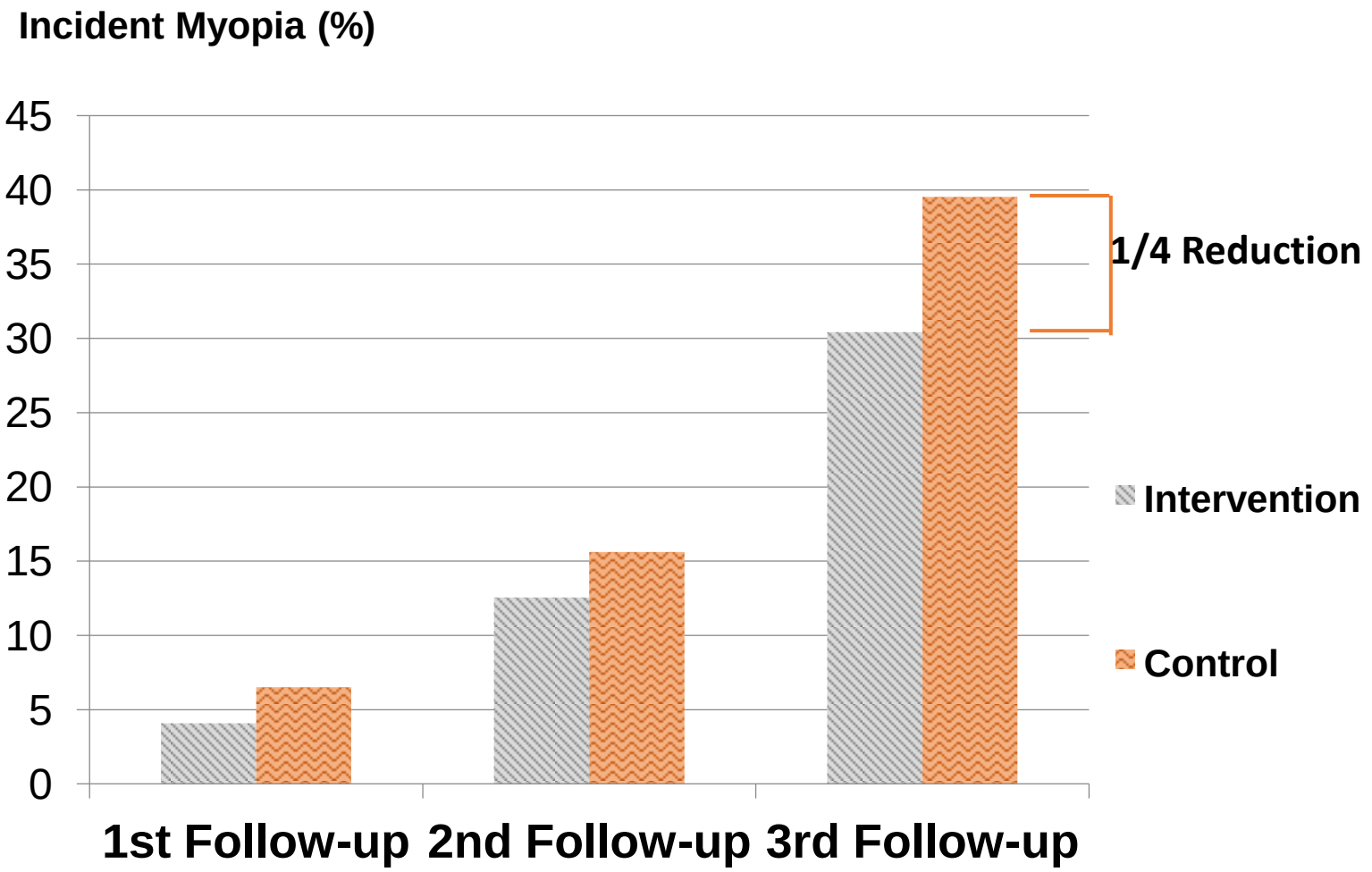
Importance Myopia has reached epidemic levels in parts of East and Southeast Asia. However, there is no effective intervention to prevent the development of myopia.

Objective To assess the efficacy of increasing time spent outdoors at school in preventing incident myopia.

Design, Setting, and Participants Cluster randomized trial of children in grade 1 from 12 primary schools in Guangzhou, China, conducted between October 2010 and October 2013.

Interventions For 6 intervention schools (n = 952 students), 1 additional 40-minute class of outdoor activities was added to each school day, and parents were encouraged to engage their children in outdoor

Cumulative Incidence of myopia



Refractive and biometric outcomes at 3 follow-up years

	Intervention group	Control group	Difference (95% CI)	P value
Cumulative incident myopia , N1/N2 (%)[a]	259/853 (30.4%)	287/726 (39.5%)	-9.1% (-14.1, -4.1)	<0.001
Cumulative change in SER (D), Mean(95%CI)[b]	-1.42 (-1.58, -1.27)	- 1.59 (-1.76, -1.43)	0.17 (0.01, 0.33)	0.037
Cumulative change in AL (mm), Mean(95%CI)[b]	0.95 (0.91, 1.00)	0.98 (0.94, 1.03)	-0.03 (-0.07, 0.003)	0.070

Outdoor time & prevention of myopia

How Long?

- Additional 45 minutes outdoor activities everyday

How to Achieve?

- Add outdoor activities in the school schedule
- School class recess – locking door strategy
- Classroom illumination
- Encourage parents to increase the time for outdoor activities at weekend and holidays.

Acknowledgement

Photos and data provided:

- CHEER Project
- Mantholantum project

Web-based system developer:

Guangzhou Healgoo Interactive Medical Technology Co. Ltd. (www.healgoo.com)