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Prevalence, incidence, and risk factors for myopia among urban and rural children in southern China: protocol for a school-based cohort study

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ABSTRACT

Introduction Myopia is the common cause of reduced uncorrected visual acuity among school-age children. It is more prevalent in urban than in rural areas. Although many myopia studies have focused on the effect of urbanisation, it remains unclear how visual experience in urban regions could affect childhood myopia. This study aims to investigate the incidence and prevalence of myopia among school-age children in urban and rural settings, thereby identifying the environmental factors that affect the onset and progression of myopia.

Methods and analysis A school-based cohort study will be conducted. We will enroll all first-grade students from an urban (10 primary schools) and a rural (10 primary schools) regions of Zhaoqing city, China. Over 3-year follow-up period, students will receive detailed eye examinations annually and complete questionnaires about living habits and environment. In a 5% random subsample of the cohort, physical activity, light intensity and eye-tracking data will be obtained using wearable devices, and high-resolution macular images will be obtained by optical coherence tomography (OCT). The primary outcome is incident myopia, defined as myopia (spherical equivalent refractive of at least −0.5D) detected during follow-up among those without myopia at baseline.

Ethics and dissemination Ethics approval was obtained from the ethics committee of the Zhongshan Ophthalmic Center (number: 2019KYPJ171). Study findings will be published in a peer-reviewed journal.

Trial registration number NCT04219228.

Strengths and limitations of this study

- This is a longitudinal, school-based cohort study to assess the incidence and prevalence of myopia among school-age children in both urban and rural settings.
- Large sample size and the representative study population.
- Light exposure and daily activities will be measured using wearable devices in a random subsample of the cohort.
- A myopia prediction model will be established using a machine learning algorithm based on the collected data.

INTRODUCTION

Myopia is the major cause of reduced uncorrected visual acuity (UCVA) among children and adolescents, particularly in the urban areas of East Asia.[1] Studies from Australia,[2] mainland China[3 4] and other regions[5] have shown a consistent association between geography and myopia. Based on the severe myopia epidemic, there is great interest in understanding the risk factors for myopia children, especially those who may be suitable for intervention. A systematic and comprehensive analysis of the rural-urban differences in the prevalence of myopia may provide new clues for the intervention of myopia.

There is now considerable evidence that increased time outdoors reduces the onset of myopia, ranging from cross-sectional and longitudinal epidemiological studies,[6 7] through to randomised clinical trials.[8–10] In addition, a proposed mechanism based on exposures to brighter light outdoors has been demonstrated in animal models.[11–14] However, not all studies have reported positive effects.[15] Possible factors that could obscure a real association include lack of variation in time outdoors, or in prevalence and incidence of myopia, poor measurement of time outdoors[16–18] and myopia and small sample size.

As urban and rural environments differ in many aspects, this may be complicated by confounding factors. Although population density can partly explain the urban–rural differences in myopia, it is mixed with factors such as living environment, behavioral patterns and visual stimulation.[2 19] The effects of urbanisation may be confounded by factors such as education, socioeconomic status and outdoor exposure. It is still not entirely clear

whether and how these factors in an urban environment could have an impact on the development and progression of myopia.[20]

We, therefore, intend to conduct a school-based cohort study in both urban and rural settings to identify the incidence, prevalence, and environmental risk factors of myopia among school-aged children. All participants will be enrolled from primary schools in Zhaoqing city, China and followed up for 3 years. Our study design overcomes the above-mentioned factors by using the gold standard of cycloplegic refraction and objective measures of time outdoors on a subsample, on a large sample size recruited from a location that covers urban and rural areas where preliminary data indicate that the prevalence and incidence of myopia vary significantly.

METHODS AND ANALYSIS

This study was registered on Clinicaltrials.gov. It is estimated that the study dates would be from 14 December 2019 to 2 February 2023.

Objective

The purpose of this study is to identify the incidence, prevalence, and risk factors of myopia among school-age children in urban and rural regions of southern China.

Study design

We will conduct a 3-year, school-based, longitudinal cohort study. This study adheres to the Declaration of Helsinki and ethics approval will be obtained from the Zhongshan Ophthalmic Center Institutional Review Board.

Eligibility criteria

Inclusion criteria

- All first-grade students in urban (10 primary schools) and rural regions (10 primary schools), Zhaoqing city.

Exclusion Criteria

- No.

Study setting and participants

Zhaoqing is one of the major cities in Guangdong province and has a population of 4 084 600 in 2016. Zhaoqing is chosen because of its relatively stable population covering a broad socioeconomic spectrum. To determine how the environment affects the onset of myopia, first-grade students aged 6–7 will be recruited from both urban (Duanzhou District) and rural regions (Huaiji County). This period precedes the development of myopia in most children. The results on this sample will be compared with those from previous studies (eg, the Sydney Myopia Study).[17] Table 1 shows the sociodemographic variables in different counties of Zhaoqing city. Satellite images for the Huaiji County and Duanzhou District are shown in figure 1.

Recruitment

A database containing the annual examination result of UCVA of students was provided by Zhaoqing Education Bureau. There are 25 primary schools in Duanzhou District and 30 in Huaiji County. Given that most of the primary schools have more than two classes in each grade, we will exclude schools with less than two classes to keep an equal number of participants in each school. To ensure that all schools will be represented in the selected sample, all primary schools in Duanzhou District and Huaiji County will be stratified into five strata, respectively, based on previous results of visual acuity (UCVA≥20/25). We will randomly select two schools from each stratum for our study. In total, 10 schools from Duanzhou District and 10 from Huaiji County will be involved. Independent researchers will complete the randomisation process and communicate the results to the research team. After that, the research team will contact schools to recruit.

Sample size

The average size of each cluster is about 200 persons, that is, about the number of students in the first grade of each school. Assuming the intraclass correlation coefficient

Table 1 Sociodemographic data in Zhaoqing city*

County	Number of inhabitants (thousands)	Land area (sq.km)	Population density (inhabitant per sq.km)	GDP in 2019 (billion RMB)
Huaiji†	860	3573	241	23.0
Gaoyao	800	2071	386	42.0
Duanzhou†	510	152	3355	42.0
Sihui	500	1258	397	58.7
Guangning	450	2459	183	15.9
Fengkai	420	2723	154	15.0
Deqing	360	2258	159	15.0
Dinghu	190	512	371	12.6

*Data are available from The Guangdong Statistical Yearbook 2020.
†Huaiji and Duanzhou districts will be selected as the rural and urban study areas, respectively.
GDP, gross domestic product.

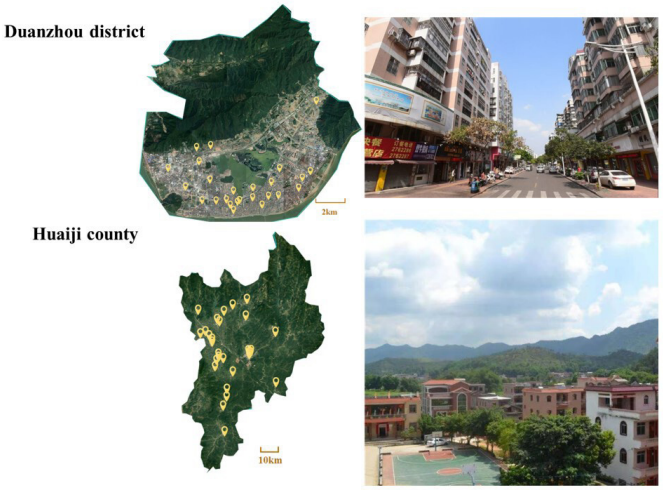

Figure 1 Satellite images for the Huaiji County and Duanzhou District. Most of the Duanzhou District (satellite image scale: 1:53 858) are covered by residential buildings, whereas Huaiji County (satellite image scale: 1:433 701) is mainly covered in greenery with mountains. Satellite images are available from http://wwwbigemapcom/source/tree/satel-244html.

within school is 0.015 with considering the variability of cluster sizes. Based on an cumulative incidence of about 35% of myopia for urban students[11] and 25% for rural students,[21] an estimated 10% loss to follow-up rate due to transfer or drop-out is included, for a total of about 20 schools consisting of 10 for the urban region and 10 for the rural region, which will provide 90% power at a two-sided significant level of 0.05 to detect an approximately 10% difference in the cumulative incidence of myopia between urban and rural students. The sample size is calculated by PASS V.16.0 (NCSS, LLC, USA).

Outcome measures

Primary outcome

The primary outcome is incident myopia, defined as myopia detected during follow-up among those without myopia at baseline. Myopia in this study is defined as either eye's spherical equivalent refractive (SER) error (sphere+1/2 cylinder) of at least −0.5 diopters (D). However, we would also use the right eye data for the definition of myopia in some of the statistical analyses to ensure that our data could be comparable to the previous publications[11] that used 'right eye data' in similar regions in Southern China.

Secondary outcomes

1. Prevalence of myopia (time frame: baseline)
   Myopia is defined as any eye's SER (sphere+1/2 cylinder) of at least −0.5 diopters (D).
2. Change in axial length (time frame: baseline, 3 years)
   Axial length will be measured with a non-contact optical device.
3. Prevalence of amblyopia, strabismus, and other ocular abnormalities (time frame: baseline)
   Cover–uncover test will be performed to detect strabismus. Any ocular abnormalities, including corneal opacities, lens opacities and retinal diseases, will be recorded based on slit lamp, direct ophthalmoscopic, and/or mobile phone video examination. Participants with an UCVA 6/7.5 or worse with undergo subjective refraction to identify amblyopia.
4. Area under the receiver operating characteristic (ROC) curve of the machine learning algorithm for the prediction of incident myopia (time frame: last year)
   The investigators will estimate the area under the ROC curve of the machine learning algorithm for the prediction of incident myopia.
5. Sensitivity and specificity of the machine learning algorithm for the prediction of incident myopia (time frame: last year)
   The investigators will estimate the sensitivity and specificity of the machine learning algorithm for the prediction of incident myopia.
6. Area under the ROC curve of the machine learning algorithm for the prediction of a fast progressing myope (time frame: last year)
   The investigators will estimate the area under the ROC curve of the machine learning algorithm for the prediction of fast progressing myope (a change in SER of 0.75D or more per year).
7. Sensitivity and specificity of the machine learning algorithm for the prediction of fast progressing myope (time frame: last year)
   The investigators will estimate the sensitivity and specificity of the machine learning algorithm for the prediction of fast progressing myope. Cycloplegic spherical refraction changes measured by an autorefractometer will be used as the indicator of myopia progression.
8. Area under the ROC curve of the diagnostic algorithm in identifying abnormal vision screening result (time frame: baseline)
   The investigators will estimate the area under the ROC curve of the diagnostic algorithm in identifying abnormal vision screening result (eg, abnormal eye lid, abnormal cornea and strabismus detected with mobile devices).
9. Sensitivity and specificity of the diagnostic algorithm in identifying abnormal vision screening result (time frame: baseline)
   The investigators will estimate the sensitivity and specificity of the diagnostic algorithm in identifying abnormal vision screening result (eg, abnormal eyelid, abnormal cornea and strabismus detected with mobile devices).
10. Postvision screening referral uptake (time frame: baseline)
    Any referral uptake will be confirmed by telephone follow-up.

Examinations

The children's height will be measured using a wall-mounted scale reading device. Weight will be recorded in kilogram to one decimal place. Ophthalmic examinations will include visual acuity, cover test, and ocular dominance, non-cycloplegic autorefraction, cycloplegia, ocular biometric measurements, cycloplegic autorefraction, subjective refraction and anterior and posterior segment examination. Any ocular abnormalities, including corneal opacities, lens opacities and retinal diseases, will be recorded based on slit lamp and direct ophthalmoscopic examination.

Questionnaires

A family questionnaire[7] regarding educational attainment, occupations, refractive status and history of eye disease will be administered only at baseline. The grade leader teacher or headteacher of each class will be asked to complete a class curriculum questionnaire[7] about the curriculum schedule (eg, school days, school holidays). Sleep quality and quantity will be measured with the Patient-Reported Outcomes Information System (PROMIS) -Sleep Disorder questionnaire.[22] Time (hour) spent in different activities (separately for outdoor activities, near work activities, screen time (separately for smartphone, tablet, TV, computer, games console)) will be measured with a Self-reported Previous Day Activity Recall Questionnaire. These two questionnaires will be collected at baseline.

Subsample study

1. Spectacle-frame mounted distance sensor and eye-tracking.
   Time (hour) spent in different activities will be measured with an eye tracker (time frame: participants will be asked to meet the study investigators at school, and they will be provided with a spectacle-frame eye tracker to be worn for 2 hours or more during the daytime and 2 hours or more during the night time on the next day.
2. Wearable activity tracker
   Physical activity and light intensity will be measured with a wearable activity tracker (time frame: baseline). On each occasion, participants will be asked to meet the study investigators at school, and they will be provided with a wearable activity tracker to be worn on the wrist for 24 hours on the next day.
3. Optical coherence tomography (OCT)
   An OCT Instrument (Moptim Mocean-3500) will be used to obtain high-resolution macular images which could show choroid thickness.[Time frame: baseline].

Workflow

The workflow will follow the order as above mentioned, starting from body measurement and ending with a direct ophthalmoscopic examination (figures 2 and 3). Participants will be followed up to maximise participation in the eye examinations at baseline and annually at years 1, 2, and 3, with the same examiner using the same set of instruments with regular calibration.

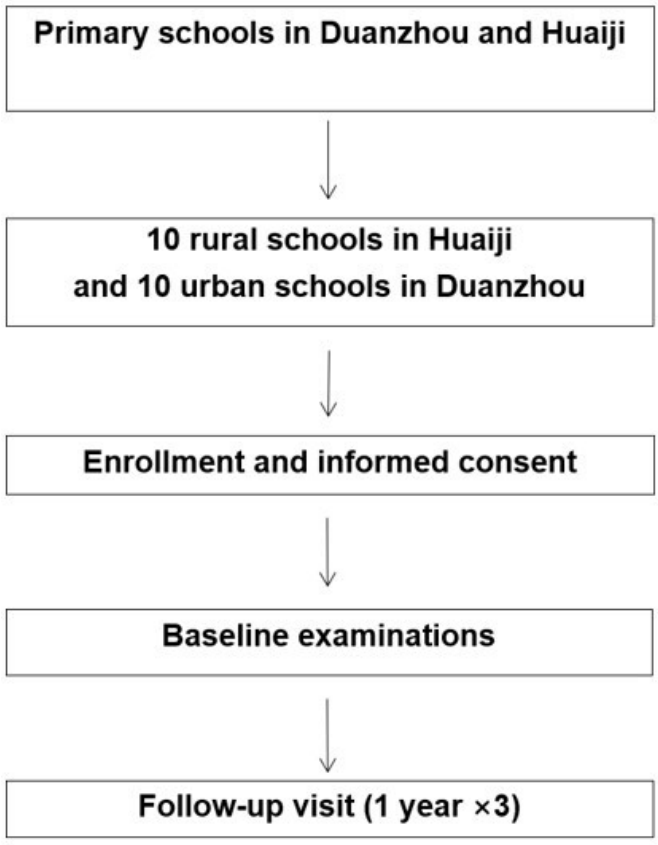

Figure 2 Flowchart of the study.

Data management

The clinical examiner will regularly check the informed consent and eligibility for each participant to guarantee

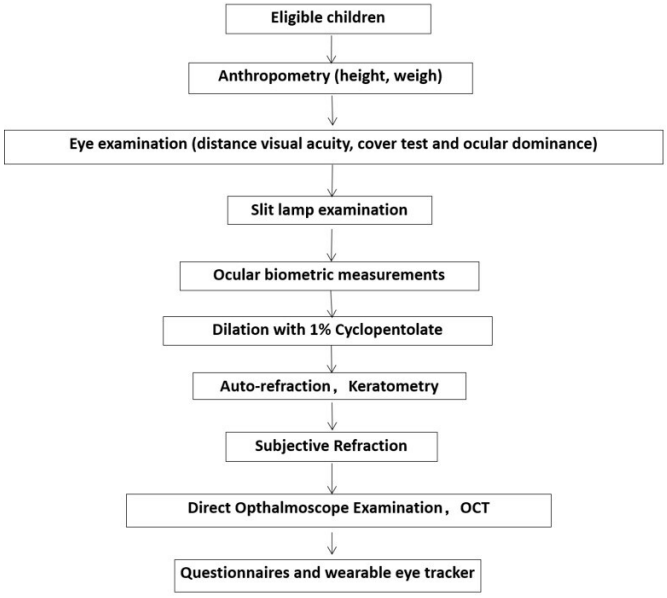

Figure 3 Flowchart of field examinations. OCT, optical coherence tomography.

that all case report form (CRF) forms are correct and in accordance with the original data. All errors and omissions will be noted, and where possible corrected. The examiner will also ensure every participant's withdrawal and loss are recorded and explained in CRF, and all adverse events are recorded.

Results of eye examinations will be recorded on paper, except for those obtained from electronic questionnaires and ocular biometry measurements. To ensure data accuracy, data will be entered by two independent personnel for further data checking. After double data entry, we will select 5% of cases at random to identify any inconsistency between the original document and the final electronic record.

Examination forms and questionnaires will be reviewed and completed before data entry at the Zhongshan Ophthalmic Center. Range of data, frequency distribution, and the consistency among related measurements are checked using data cleaning programs. The right eye of each student will be included in data analysis. If data for the right eye are not available, the left eye will be included in the analysis.

Statistical analysis plan

Statistical analysis will be performed using Stata V.16 software (StataCorp, College Station Texas, USA). The distribution of baseline characteristics will be reported by use of mean (SD) or median (IQR) for continuous variables and frequency (percentage) for categorical variables. Baseline comparisons between the urban groups and the rural groups will be performed by using two-sample t-test for continuous variables, and χ^2 test for categorical variables. Mann-Whitney test will be used when dependent variables are not normally distributed. The normality of the continuous data distribution will be checked by Shapiro-Wilk normality test and histogram. The differences and 95% CI between urban and rural students groups in the mean change of SE andaxial length (AL) will be calculated using the linear regression analysis. The cumulative incidence of myopia and its associated risk factors will be estimated using univariable and multivariable logistic regression models. All variables with $p<0.05$ in the univariable regression analysis will be included in the multivariable regression model. All comparisons and regression analysis will be adjusted for the cluster effect between eyes within the same subject. A two-sided $p<0.05$ will be considered statistically significant.

The data set will include all participants who complete 3 years of follow-up and examination. We divide the data into training sets, cross-validation sets, and test sets in a ratio of 5:2:3. Predictors include a set of baseline data including refractive status, biological parameters, demographic information, family information, daily activity, sleep and screen time. Based on these predictors, we aim to develop a machine learning algorithm to predict participants' SE and to predict whether they have myopia after 3 years. The performance evaluation of regression algorithm for predicting target SE includes three evaluation indexes: coefficient of determination (R2), root mean square error and mean absolute error. The rROC curves and area under the curve values will be used to assess myopia classification performance.[23]

Study monitoring

At the start of the project, the Case Report Form, workflow, quality control procedures, electronic questionnaire, data entry methods and follow-up management will be detailed in the training courses.

Patient and public involvement

Participants are not invited to comment on the study design and aim or to interpret the findings, contribute to the writing or editing of this document.

Ethics and dissemination

This project has obtained ethics approval from the ethics committee of the Zhongshan Ophthalmic Center (number: 2019KYPJ171). Parents (or other authorised surrogates) of participants give informed consent before taking part. The content of scientific research complies with the principles of the Declaration of Helsinki and its regulations applicable to research and human participants. The study investigators should protect participants' privacy and are responsible for the confidentiality of all private information. The principal investigator is responsible for informing the ethics committee of any amendments to the protocol. The baseline and annual results will be published in peer-reviewed journals.

Clinical records and data sets will be kept at the Zhongshan Ophthalmic Center. Any public report of the results will not disclose personal information. Data will be deidentified before being passed to the study statisticians. Data will be kept in strict confidence and will only be assessed by the study investigators and authorised personnel. All data documents will be password protected, stored on a secure server, kept for at least 10 years and destroyed if no longer retention is required. If the project is modified, it will be exposed on Clinicaltrials.gov.

DISCUSSION

It is estimated that the financial burden of myopia-related visual impairment reached US$244 billion in 2015 globally.[24] Since myopia generally develops during the school years, and tends to stabilise in adulthood, interventions to control the development of myopia need to be implemented during the school years.[1] Increasing time spent outdoors is the main protective method to prevent myopia.[25] The efficacy of optical interventions (spectacles, soft lenses and, orthokeratology lenses)[26 27] and pharmacological interventions (low-dose atropine)[28] have been shown to be effective in slowing the progression of myopia. It is, therefore, imperative to explore the risk factors and predict the development of myopia among school-age children. In this current study, we will examine the association between environmental factors

and myopia in urban and rural settings using subjective and objective data collection methods. Also, we will use neural learning algorithm to integrate ocular biological characteristics and environmental variables to establish an artificial intelligence model. In this way, we can effectively predict the occurrence and progression of myopia and lay the foundation for individualised myopia prevention and control in the future.

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Contributors MI, YL and YiZ conceived and designed the study. XC, GY, YuZ, YaZ and YiZ wrote the draft. YaZ, MI, XL and YiZ revised draft. LJ will lead the statistical analysis. YiZ and YuZ will oversee data acquisition and implementation on site. All authors reviewed and approved the final manuscript.

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Competing interests MI has received personal support from Essilor. The other authors have declared that no competing interests exist.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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REFERENCES

1 Morgan IG, Ohno-Matsui K, Saw S-M. Myopia. *Lancet* 2012;379:1739–48.
2 Ip JM, Rose KA, Morgan IG, *et al*. Myopia and the urban environment: findings in a sample of 12-year-old Australian school children. *Invest Ophthalmol Vis Sci* 2008;49:3858–63.
3 He M, Huang W, Zheng Y, *et al*. Refractive error and visual impairment in school children in rural southern China. *Ophthalmology* 2007;114:374–82.
4 Pan C-W, Wu R-K, Li J, *et al*. Low prevalence of myopia among school children in rural China. *BMC Ophthalmol* 2018;18:140.
5 Dandona R, Dandona L, Srinivas M, *et al*. Refractive error in children in a rural population in India. *Invest Ophthalmol Vis Sci* 2002;43:615–22.
6 Li S-M, Liu L-R, Li S-Y, SM L, SY L, *et al*. Design, methodology and baseline data of a school-based cohort study in central China: the anyang childhood eye study. *Ophthalmic Epidemiol* 2013;20:348–59.
7 Ojaimi E, Rose KA, Smith W, *et al*. Methods for a population-based study of myopia and other eye conditions in school children: the Sydney myopia study. *Ophthalmic Epidemiol* 2005;12:59–69.
8 Negrel AD, Maul E, Pokharel GP, *et al*. Refractive error study in children: sampling and measurement methods for a multi-country survey. *Am J Ophthalmol* 2000;129:421–6.
9 Rose KA, Morgan IG, Ip J, *et al*. Outdoor activity reduces the prevalence of myopia in children. *Ophthalmology* 2008;115:1279–85.
10 Read SA, Collins MJ, Vincent SJ. Light exposure and eye growth in childhood. *Invest Ophthalmol Vis Sci* 2015;56:6779–87.
11 He M, Xiang F, Zeng Y, *et al*. Effect of time spent outdoors at school on the development of myopia among children in China: a randomized clinical trial. *JAMA* 2015;314:1142–8.
12 Wu P-C, Chen C-T, Lin K-K, *et al*. Myopia prevention and outdoor light intensity in a school-based cluster randomized trial. *Ophthalmology* 2018;125:1239–50.
13 Zadnik K, Mutti DO. Outdoor activity protects against childhood myopia-let the sun shine in. *JAMA Pediatr* 2019;173:415–6.
14 Ashby R, Ohlendorf A, Schaeffel F. The effect of ambient illuminance on the development of deprivation myopia in chicks. *Invest Ophthalmol Vis Sci* 2009;50:5348–54.
15 Ashby RS, Schaeffel F. The effect of bright light on lens compensation in chicks. *Invest Ophthalmol Vis Sci* 2010;51:5247–53.
16 Smith EL, Hung L-F, Huang J. Protective effects of high ambient lighting on the development of form-deprivation myopia in rhesus monkeys. *Invest Ophthalmol Vis Sci* 2012;53:421–8.
17 Norton TT, Amedo AO, Siegwart JT. Darkness causes myopia in visually experienced tree shrews. *Invest Ophthalmol Vis Sci* 2006;47:4700–7.
18 Ngo CS, Pan C-W, Finkelstein EA, *et al*. A cluster randomised controlled trial evaluating an incentive-based outdoor physical activity programme to increase outdoor time and prevent myopia in children. *Ophthalmic Physiol Opt* 2014;34:362–8.
19 Zhang M, Li L, Chen L, *et al*. Population density and refractive error among Chinese children. *Invest Ophthalmol Vis Sci* 2010;51:4969–76.
20 He M, Zheng Y, Xiang F. Prevalence of myopia in urban and rural children in mainland China. *Optom Vis Sci* 2009;86:40–4.
21 Guo Y, Liu L, Lv Y, *et al*. Outdoor jogging and myopia progression in school children from rural Beijing: the Beijing children eye study. *Transl Vis Sci Technol* 2019;8:2.
22 Buysse DJ, Yu L, Moul DE, *et al*. Development and validation of patient-reported outcome measures for sleep disturbance and sleep-related impairments. *Sleep* 2010;33:781–92.
23 Lin H, Long E, Ding X, *et al*. Prediction of myopia development among Chinese school-aged children using refraction data from electronic medical records: a retrospective, multicentre machine learning study. *PLoS Med* 2018;15:e1002674.
24 Naidoo KS, Fricke TR, Frick KD, *et al*. Potential lost productivity resulting from the global burden of myopia: systematic review, meta-analysis, and modeling. *Ophthalmology* 2019;126:338–46.
25 Sherwin JC, Reacher MH, Keogh RH, *et al*. The association between time spent outdoors and myopia in children and adolescents: a systematic review and meta-analysis. *Ophthalmology* 2012;119:2141–51.
26 Walline JJ, Lindsley K, Vedula SS, *et al*. Interventions to slow progression of myopia in children. *Cochrane Database Syst Rev* 2011;12:Cd004916.
27 Huang J, Wen D, Wang Q, *et al*. Efficacy comparison of 16 interventions for myopia control in children: a network meta-analysis. *Ophthalmology* 2016;123:697–708.
28 Gong Q, Janowski M, Luo M, *et al*. Efficacy and adverse effects of atropine in childhood myopia: a meta-analysis. *JAMA Ophthalmol* 2017;135:624–30.