

**Global variations and time trends in the prevalence of childhood
myopia, a systematic review and quantitative meta-analysis:
implications for aetiology and early prevention**

Alicja R Rudnicka¹, Venediktos V Kapetanakis¹, Andrea K Wathern¹, Nicola S Logan², Bernard Gilmartin², Peter H Whincup¹, Derek G Cook¹, Christopher G Owen¹

1. Population Health Research Institute, St George's, University of London, Cranmer Terrace,
London, UK SW17 0RE

2. School of Life and Health Sciences, Aston University, Aston Triangle, Birmingham, UK B4 7ET

Address for correspondence

Dr Alicja R Rudnicka, Population Health Research Institute, St George's, University of London,
Cranmer Terrace, London, UK SW17 0RE

tel: +44 (0)20 87252799, fax: +44 (0)20 87253584, e-mail: arudnick@sgul.ac.uk

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Supplemental Table S1. Articles contributing to the meta-analysis and accompanying reference list

Supplemental Table S2. Odds ratios for not using cycloplegia vs using cycloplegia by age

Supplemental Table S3: Odds ratio for girls versus boys by ethnic group and age

Supplemental Table S4. Global myopia estimates: age, gender and ethnic specific prevalence estimates applied to UN defined population data for age below 19 years for 2010, 2015 and 2020

Appendix. Prevalence of myopia in childhood search strategy

Statistical Appendix. The underlying fitted model

APPENDIX: Prevalence of myopia in childhood search strategy

MEDLINE and EMBASE databases

Textwords

((Short\$sight*) OR (Myopi?) OR (Myope\$) OR (Refractive error\$) OR (Ocular Refraction)).tw)

AND ((Incident) OR (Incidence) OR (Prevalen*) OR (Population\$) OR (Survey\$)).tw)

AND ((Child) OR (Childhood) OR (Children) OR (Adolescent) OR (Adolescence) OR (Teenage*)).tw)

MESH headings (Medline)

(Myopia/) OR (Refraction, ocular/) OR (Refractive errors/)

AND ((Incidence/) OR (Prevalence/) OR (Population/))

AND ((CHILD/) OR (ADOLESCENT/))

Subject headings (Embase)

((Myopia/) OR (High myopia/) OR (Refractive error/))

AND ((Incidence/) OR (Prevalence/) OR (Population/) OR (Health survey/))

AND ((CHILD/) OR (ADOLESCENT/))

Combine Textword, MESH and Subject headings search within Medline and Embase

Web of Science database

Topic Search TS= ((Myopia) OR (Myopic) OR (Short\$sight*) OR (Refractive error\$) OR (Ocular refraction))

AND ((Incident) OR (Incidence) OR (Prevalen\$) OR (Population) OR (Survey))

AND ((Child) OR (Childhood) OR (Children) OR (Adolescent) OR (Adolescence) OR (Teenage\$))

Table S1. Articles contributing to the meta-analysis

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
Abdi S et al, 2008[89]	216	20	B	6 to 16	W	U	Sweden	2001	Yes	A	NA
Adlergrinberg D, 1986[90]	788	57	B	0 to 9	AIAN	R	USA	1980	No	NA	NA
Aine E, 1984[91]	145	25	B,M,F	6 to 20	W	R	Finland	NA	Yes	H	O
Aldebasi YH, 2014[92]	5176	337	B	6 to 13	MENA	U	Saudi Arabia	2011	Yes	A	C
Almeder LM et al, 1990[93]	326	13	B	3.2 to 8.1	W	U	USA	NA	No	H	O
Anera RG et al, 2006[61]	388	2	B,M,F	5 to 16	BA	R	Burkina Faso	2005	No	H	O
Anera RG et al, 2009[94]	545	33	B,M,F	6 to 16	MENA	U	Morocco	2007	Yes	A	O
Auzemery A et al, 1995[95]	1081	10	B	8 to 14	BA	U	Madagascar	1994	Yes	H	O
Awasthi S et al, 2010[96]	1165	18	B	5 to 19	SA	R	Nepal	2008	NA	H	O
Ayed T et al, 2002[97]	708	64	B	6 to 20	MENA	U	Tunisia	2000	Yes	A	NA
Azizoglu S et al, 2011[98]	353	52	B,M,F	10 to 11	MENA	U	Australia	NA	No	A	O
Boniuk V, 1973[99]	502	234	B	3 to 19	AIAN	R	Canada	NA	Yes	H	O
Brody BL et al, 2007[100]	507	15	B	3 to 5	HL	U	USA	2003	Yes	H	O
Buchner TF et al, 2003[101]	216	1	B	3.5 to 4.5	W	U	Germany	NA	Yes	A	C
Caca I et al, 2013[102]	21062	672	B	6 to 14	MENA	R	Turkey	NA	Yes	A	C
Casson RJ et al, 2012[103]	2842	24	B	6 to 11	SEA	R	Laos	2010	Yes	H	O
Chan OY et al, 1993[104]	570	12	B	3 to 5.5	EA	U	Hong Kong	1991	No	H	O
Chang F et al, 2014[105]	403	21	B, M, F	7 to 15	NHOPI	R	Taiwan	2009	No	H	O
Cheng CY et al, 2013[106]	1894	927	B	6 to 11	EA	U	Taiwan	2010	No	M	O
Cheng HM et al, 2012[107]	694	309	B	6 to 12	EA	R	Taiwan	NA	No	A	C
Chung KM et al, 1996[108]	1873	794	B,M,F	6 to 18	EA	U	Malaysia	1990	No	H	O
Congdon N et al, 2008[109]	1892	1178	B,M,F	11.4 to 17.1	EA	R	China	2007	Yes	A	C
Czepita D et al, 2007[42]	4422	588	B	6 to 18	W	M	Poland	2001	Yes	H	O
Dandona R et al, 1999[21]	599	30	B	0 to 15	SA	U	India	1997	Yes	H	O
Dandona R et al, 2002[22]	4074	166	B	7 to 15	SA	R	India	2001	Yes	H	O
Dirani M et al, 2010[60]	2639	301	B	0.5 to 6	EA	U	Singapore	2008	Yes	A	C

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
Dobson V et al, 2007[110]	963	95	B	3 to 4	AIAN	R	USA	2002	Yes	A	C
Edwards MH, 1999[111]	123	13	B	7 to 12	EA	U	Hong Kong	1991	No	H	O
Fan DS et al, 2011[112]	1424	66	B	2 to 6	EA	U	Hong Kong	1997, 2007	Yes	A	C
Fan DSP et al, 2004[113]	108	5	B	2 to 6	EA	U	Hong Kong	1995	Yes	A	C
Fan DSP et al, 2004[19]	7560	2988	B,M,F	5 to 16	EA	U	Hong Kong	1999	Yes	A	C
Fischbach LA et al, 1993[114]	854	12	B,M,F	6 to 7	W, HL	U	USA	1990	No	H	O
Fotouhi A et al, 2007[41]	4293	398	B,M,F	7 to 18	MENA	M	Iran	2005	Yes	A	C
Gao TY et al, 2014[115]	837	197	B, M, F	6 to 18	EA	R	China	2010	Yes	M	O
Gao Z et al, 2012[116]	5527	322	B	12 to 14	SEA	U, R	Cambodia	2010	Yes	H	O
Garner LF et al, 1985[117]	977	8	B	6 to 17	NHOPI	R	Vanuatu	1983	No	H	O
Garner LF et al, 1990[118]	1657	160	B,M,F	7 to 17	SEA, NHOPI	U, R	Malaysia, Vanuatu	1987, 1986	No	H	O
Garner LF et al, 1995[119]	404	16	B	6 to 16	SA	U	Nepal	1992	Yes	H	O
Garner LF et al, 1999[36]	825	128	B	7 to 18	SA	U, R	Nepal	1998	Yes	A	C
Giordano L et al, 2009[120]	2121	97	B	1 to 6	W, BNA	U	USA	2006	Yes	A	C
Goh P et al, 2005[78]	4634	942	B,M,F	7 to 15	SEA	U	Malaysia	2003	Yes	A	C
Goh WSH et al, 1993[121]	2569	1247	B,M,F	6 to 17	EA	U	Hong Kong	NA	No	A	C
Goldschmidt E et al, 2001[122]	130	6	B,M,F	6	EA	U	Hong Kong	1993	Yes	A	O
Gordon A, 1990[123]	366	48	B	0 to 20	HL	R	Puerto Rico	NA	No	H	O
Gronlund MA et al, 2006[124]	143	9	B	4 to 15	W	U	Sweden	NA	Yes	A	C
Grosvenor T, 1970[125]	973	135	B	12 to 19	W, NHOPI	U	New Zealand	NA	NA	H	O
Guggenheim JA et al, 2012[68]	7520	188	B	7.5	W	U	England	NA	No	A	C
Guo K et al, 2015[126]	1565	939	B	6 to 21	EA	R	China	2012	Yes	A	C
Guo Y et al, 2013[127]	681	194	B,M,F	5 to 13	EA	U, R	China	NA	No	A	C
Gursoy H et al, 2013[128]	709	160	B	7 to 8	MENA	U	Turkey	2010	Yes	A	C
Hashemi H et al, 2004[129]	809	58	B,M,F	5 to 15	MENA	U	Iran	2002	Yes	H	O
Hashemi H et al, 2014[130]	434	128	B, M, F	14 to 18	MENA	U	Iran	2011	No	M	O
He MG et al, 2004[51]	4364	1659	B	5 to 15	EA	U	China	2003	Yes	A	O

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
He MG et al, 2007[77]	2229	944	B,M,F	13 to 17	EA	R	China	2005	Yes	A	O
Hendricks TJW et al, 2007[131]	487	72	B	11 to 13	W	U	Netherlands	2003	No	A	C
Ho CSD et al, 2006[132]	629	441	B	12 to 16	EA	U	Singapore	2005	No	A	C
Hsu SL et al, 2008[133]	371	62	B,M,F	7 to 13	NHOPI	R	Taiwan	2006	Yes	M	O
Ingram RM et al, 1979[134]	148	12	B	3.5	W	U	England	NA	Yes	H	O
Ip JM et al, 2008[15]	2041	252	B,M,F	11.1 to 14.4	W, EA, MENA, SA	U	Australia	NA	Yes	A	C
Jamali P et al, 2009[135]	815	14	B	6	MENA	U	Iran	2005	Yes	H	O
Jimenez R et al, 2012[62]	315	8	B	6 to 16	BA	U	Burkina Faso	NA	No	H	O
Johnstone WW et al, 1963[136]	1817	45	B	8 to 14	BA	U	Tanganyika	1961	Yes	H	O
Junghans B et al, 2002[1]	2697	143	B	3 to 12	W	U	Australia	1992	No	H	O
Junghans BM et al, 2005[137]	1936	162	B,M,F	4 to 12	W	U	Australia	2001	No	H	O
Kalivayayi V et al, 1997[23]	3987	341	B,M,F	3 to 18	SA	U	India	1993	Yes	H	O
Kalogjera T, 1979[138]	583	14	B,M,F	3 to 7	W	U	Yugoslavia	NA	Yes	H	O
Khan AA et al, 2005[40]	1062	214	B,M,F	6 to 16	SA	U, R	India	NA	Yes	H	O
Kleinstei RN et al, 2003[11]	2523	264	B	5 to 17	W, EA,HL, BNA	U	USA	1998	Yes	A	C
Laatikainen L et al, 1980[139]	822	81	B	7 to 15	W	U	Finland	NA	Yes	H	O
Lai YH et al, 2009[140]	584	32	B,M,F	3 to 6	EA	U	Taiwan	2005	Yes	H	O
Lam C et al, 1991[141]	773	417	B,M,F	6 to 17	EA	U	Hong Kong	NA	No	H	O
Lam C et al, 2012[33]	2653	1240	B	6 to 12	EA	U	Hong Kong	2008	No	A	O
Lan W et al, 2013[142]	2478	24	B, M, F	3 to 6	EA	M	China	2009	Yes	A	O
Li S et al, 2013[143]	4861	1528	B	5 to 16	EA	U	China	2011	Yes	A	C
Li Z et at, 2014[144]	1675	84	B, M, F	5 to 18	EA	R	China	2008.5	Yes	M	O
Liang BS et al, 1991[145]	5458	740	B,M,F	7 to 17	EA	R	China	1988	Yes	H	O
Liang YB et al, 2013[146]	395	264	B	6 to 17	EA	U	China	NA	Yes	H	O
Liao CC et al, 2014[147]	687	557	B	12 to 14	EA	U	Taiwan	2010	Yes	A	C
Lin LL et al, 1988 (a)[148]	17411	6436	B,M,F	6 to 18	EA	U, R, M	Taiwan	1986	Yes	H, A	O, C

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
Lin LL et al, 1988 (b)[48]	3000	386	B,M,F	13 to 16	NHOPI	R	Taiwan	1985	Yes	H	O
Lin LLK et al, 1999[74]	11178	5914	B,M,F	7 to 18	EA	M	Taiwan	1995	Yes	M	O
Lin LLK et al, 2001[38]	10878	6421	B,M,F	7 to 18	EA	M	Taiwan	2000	Yes	M	O
Lin LLK et al, 2004[149]	12792	5699	B	7 to 18	EA	M	Taiwan	1983, 1990	Yes	A	C
Logan NS et al, 2011[150]	596	106	B	6 to 13	W, BNA, SA	U	England	NA	Yes	A	O
Ma Q et al, 2014[151]	1219	5	B, M, F	0 to 3	EA	U	China	2013	No	A	O
Macfarlane DJ et al, 1987[152]	877	114	B	6 to 11	W	U	Australia	NA	Yes	H	O
Marasini S et al, 2010[153]	1802	39	B	3 to 22	SA	U	Nepal	NA	NA	H	O
Martinez J et al, 1997[154]	1179	43	B	3 to 6	W	U	Spain	NA	Yes	M	O
Matsumura H et al, 1999[155]	2664	860	B	3 to 17	EA	U	Japan	1984, 1996	NA	A	O
Maul E et al, 2000[81]	5303	362	B,M,F	5 to 15	HL	U	Chile	1998	Yes	H	O
Montes-Mico R et al, 2000[156]	1711	287	B	3 to 19	W	U	Spain	NA	No	H	O
Morgan A et al, 2006[157]	1057	61	B,M,F	7 to 17	EA	R	Mongolia	2003	No	H	O
Multi-ethnic pediatric eye disease study group, 2010[158]	6030	309	B	0.5 to 6	BNA, HL	U	USA	NA	Yes	A	C
Murthy GVS et al, 2002[24]	5696	420	B	5 to 15	SA	U	India	2000	Yes	H	O
Naidoo KS et al, 2003[82]	4890	197	B	5 to 15	BA	U	South Africa	2002	Yes	A	C
Nanthavisit U et al, 2008[159]	2658	313	B	9 to 20	SEA	R	Thailand	2006	NA	H	O
Nepal BP et al, 2003[160]	1100	47	B,M,F	5 to 16	SA	U	Nepal	NA	Yes	H	O
O'Donoghue L et al, 2010[14]	1053	128	B	6 to 13	W	U	Northern Ireland	2007	Yes	A	O
Ogielska E et al, 1967[161]	2368	232	B,M,F	8 to 19	W	U	Poland	1962	NA	H	O
Ojaimi E et al, 2005[162]	1724	26	B,M,F	5 to 8.4	W, EA	U	Australia	2004	Yes	M	C
Ore L et al, 2014[163]	1708	181	B	6 to 14	MENA	U	Israel	2002.5	Yes	H	O
Oscar A et al, 2014[164]	2054	61	B, M, F	6 to 12	W	U	Bulgaria	2014	No	H	O
Ostadimoghaddam H et al, 2011[165]	765	39	B	0 to 15	MENA	U	Iran	2008	Yes	M	O
Padhye AS et al, 2009[44]	12422	268	B	6 to 15	SA	U, R	India	2005	Yes	H	O
Pant M et al, 2014[166]	569	43	B, M, F	6 to 18	SA	U	Nepal	2014	No	H	O

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
Pi L et al, 2010[167]	3070	422	B	6 to 15	EA	U	China	2007	Yes	H	O
Pokharel GP et al, 2000[80]	5067	60	B,M,F	5 to 15	SA	R	Nepal	1998	Yes	H	O
Quek TPL et al, 2004[20]	946	699	B,M,F	15 to 19	EA,SA, SEA	U	Singapore	2002	No	A	C
Resvan F et al, 2012[168]	1548	64	B	6 to 16	MENA	U	Iran	2010	Yes	A	O
Richler A et al, 1980[32]	448	179	B,M,F	15 to 19	W	R	Canada	1974	NA	H	O
Rodriguez MA et al, 1995[169]	17697	257	B	5 to 14	HL	U	Colombia	1994	NA	NA	NA
Rose KA et al, 2008[59]	752	187	B	6 to 7	EA	U	Australia, Singapore	NA	Yes	A	C
Rudnicka AR et al, 2010[13]	755	100	B,M,F	10 to 11	W, BNA, SA	U	England	2008	No	A	O
Saw SM et al, 2001[170]	127	11	B,M,F	3 to 7	EA	U	Singapore	1998	Yes	A	C
Saw SM et al, 2006[18]	1962	712	B,M,F	7 to 9	EA	U	Singapore	2000	Yes	A	C
Saw SM et al, 2007[171]	740	460	B	10 to 12	EA	U	Singapore	1999	Yes	A	C
Shrestha RK et al, 2006[172]	1816	183	B	5 to 16	SA	U	Nepal	NA	Yes	H	O
Shrestha RK et al, 2012[173]	4228	405	B	12.3	SA	U	Nepal	NA	Yes	H	O
Shrestha GS et al, 2013[174]	366	24	B, M, F	0 to 16	SA	U	Nepal	2010	Yes	H	O
Sorsby A et al, 1961[175]	386	24	B,M,F	3 to 15	W	U	England	NA	Yes	H	O
Tan G et al, 2000[176]	414	119	B	3 to 6	EA	U	Singapore	1999	No	A	C
Villamor Roldan E, 1980 [177]	2853	134	B	6 to 14	HL	U	Mexico	1976	NA	H	O
Villarreal GM et al, 2003[178]	1035	455	B,M,F	13	HL	U	Mexico	1999	Yes	H	O
Villarreal MG et al, 2000[179]	1045	519	B	12 to 13	W	U	Sweden	1997	Yes	H	O
Virgili G;Angi M et al, 2007[180]	1591	46	B	5 to 6	HL	M	Ecuador	NA	No	A	C
Wang X et al, 2014[181]	2255	20	B	2 to 7	EA	U	China	2011	Yes	H	O
Watanabe S et al, 1999[182]	350	1	B	6	EA	U	Japan	1989	Yes	A	O
Wen G et al, 2013[183]	3008	78	B	0.5 to 6	W, EA	U	USA	2010	Yes	A	C
Williams C et al, 2008[12]	7554	113	B	7	W	U	England	1999	No	A	C
Williams SM et al, 1988[184]	503	23	B,M,F	11	W	U	New Zealand	1983	NA	H	O
Woodruff ME, 1986[185]	8085	97	B	6	W	U	Canada	1982	NA	H	O

Authors	N	x	Gender	Age range	Ethnicity	Urbanicity	Country	Survey year	Cycloplegia	Method of refraction	Field
Wu JF et al, 2013[47]	6025	2221	B, M, F	4 to 18	EA	M	China	2013	Yes	A	C
Wu P et al, 2010[67]	144	45	B,M,F	7 to 12	EA	R	Taiwan	2007	Yes	A	C
Xiang F et al, 2012[186]	3631	1311	B	5 to 15	EA	U	China	2002	Yes	A	C
Yekta A et al, 2010[187]	1854	92	B,M,F	5 to 15	MENA	U	Iran	2009	Yes	H	O
Yingyong P, 2010[188]	2340	175	B	6 to 12	SEA	U, R	Thailand	2009	Yes	M	O
Yoon K-C et al, 2011[189]	2989	1906	B	8 to 15	EA	M	South Korea	2008	Yes	A	C
You QS et al, 2012[190]	15066	8588	B	7 to 18	EA	M	China	NA	No	A	C
Young FA et al, 1970[191]	204	54	B,M,F	9 to 12	AIAN	R	USA	NA	Yes	H	O
Zhang M et al, 2011[79]	1979	621	B	7 to 11	EA	U	Singapore	1999	Yes	A	C
Zhang MZ et al, 2000[37]	382	34	B	6 to 7	EA	U, R	China, Singapore	1998	Yes	A	C
Zhao J et al, 2000[192]	5884	958	B,M,F	5 to 15	EA	R	China	1998	Yes	H	O
Zylbermann R et al, 1993[193]	870	377	B	14 to 18	MENA	U	Israel	NA	No	H	O

N: Total number of participants (published or estimated).

x: Total number of cases of myopia -0.50D or less. When more than one definition were reported the one with spherical equivalent refraction /sphere refraction closest to -0.50D was used.

Gender: B=Both genders combined, M=Male, F=Female.

Ethnicity: W=White, EA=East Asian, SA=South Asian, SEA=Southeast Asian, BA=Black in Africa, BNA=Black not in Africa, MENA=Middle Eastern or North African, HL=Hispanic or Latino, NHOPI=Native Hawaiian or other Pacific Islander. AIAN=American Indian or Alaska native.

Urbanicity: U=Urban or semi-rural, R=Rural, M=Mixed.

Cycloplegia: NAI=No available information.

Method: A=Automatic refraction, H=Human assessment (retinoscopy and/or subjective refraction), M= Mixture of automatic refraction and human assessment. NA=Not available.

Field: refers to whether method of refraction was classified as O=Open, C=Closed, NA=Not available.

Table S2. Odds ratios for not using cycloplegia vs using cycloplegia by age

Age	OR (95% CrI)
5	4.21 (3.18, 5.65)
6	3.90 (2.98, 5.17)
7	3.62 (2.79, 4.74)
8	3.35 (2.61, 4.34)
9	3.10 (2.45, 3.99)
10	2.87 (2.29, 3.66)
11	2.66 (2.14, 3.37)
12	2.47 (2.00, 3.10)
13	2.29 (1.86, 2.86)
14	2.12 (1.73, 2.63)
15	1.96 (1.61, 2.43)
16	1.82 (1.49, 2.25)
17	1.69 (1.39, 2.09)
18	1.56 (1.28, 1.94)

Numbers correspond to median odds ratio of myopia for no cycloplegia use vs cycloplegia use (95% CrI) by age after adjusting for urbanicity of living environment (all ethnic groups, except for native Hawaiian or other Pacific Islanders) and year of survey (White, East Asian, and South Asian children, only).

Table S3. Odds ratios for girls versus boys by ethnic group and age

Age	White	East Asian	South Asian	Hispanic or Latino
5	0.99 (0.59, 1.61)	0.97 (0.86, 1.09)	0.23 (0.09, 0.66)	0.69 (0.38, 1.25)
6	1.05 (0.72, 1.50)	1.00 (0.91, 1.09)	0.37 (0.18, 0.74)	0.93 (0.61, 1.42)
7	1.12 (0.85, 1.43)	1.04 (0.97, 1.11)	0.54 (0.35, 0.84)	1.18 (0.85, 1.64)
8	1.19 (0.97, 1.41)	1.09 (1.04, 1.14)	0.75 (0.57, 0.97)	1.40 (1.03, 1.90)
9	1.26 (1.06, 1.45)	1.14 (1.10, 1.19)	0.98 (0.81, 1.16)	1.57 (1.16, 2.12)
10	1.34 (1.13, 1.56)	1.21 (1.16, 1.25)	1.19 (0.99, 1.44)	1.65 (1.23, 2.22)
11	1.41 (1.19, 1.68)	1.28 (1.24, 1.33)	1.37 (1.10, 1.70)	1.63 (1.25, 2.13)
12	1.48 (1.24, 1.80)	1.37 (1.32, 1.43)	1.48 (1.16, 1.86)	1.51 (1.22, 1.89)
13	1.56 (1.31, 1.90)	1.47 (1.41, 1.54)	1.49 (1.16, 1.92)	1.32 (1.10, 1.59)
14	1.65 (1.38, 2.00)	1.59 (1.52, 1.67)	1.42 (1.05, 1.94)	1.08 (0.85, 1.38)
15	1.74 (1.45, 2.11)	1.73 (1.64, 1.83)	1.27 (0.82, 1.95)	0.84 (0.55, 1.26)
16	1.84 (1.48, 2.27)	1.89 (1.76, 2.03)	1.07 (0.57, 2.00)	0.61 (0.31, 1.16)a
17	1.93 (1.46, 2.53)	2.08 (1.88, 2.29)	0.84 (0.34, 2.06)a	0.42 (0.16, 1.06)a
18	2.03 (1.40, 2.93)	2.30 (2.01, 2.61)	0.62 (0.18, 2.13)a	0.27 (0.07, 0.95)a

Numbers correspond to median odds ratio of myopia for girls as compared with boys (95% CrI) by age after adjusting for environmental setting (urban, rural or mixed) and year of survey (White, East Asian, and South Asian children, only).

a: Estimate obtained by extrapolation.

Table S4. Global myopia trends: age, gender and ethnic specific prevalence estimates applied to UN defined population data for age below 19 years for 2015 and 2025

UN population	Total population (≤19 years)		Myopia cases (95% CrI)		Population prevalence (%)		% of global prevalence	
	2015	2025	2015	2025	2015	2025	2015	2025
Europe	155.1	157.2	13.2 (8.4, 19.4)	14.0 (8.9, 20.5)	8.5	8.9	4.2	4.3
Africa	593.9	719.3	18.1 (10.7, 28.0)	22.1 (13.1, 34.1)	3.0	3.1	5.8	6.8
Asia	1,418.9	1,410.4	248.4 (206.5, 301.5)	256.3 (213.7, 309.8)	17.5	18.2	79.6	79.1
Western Asia	96.9	101.8	11.9 (8.1, 17.0)	12.9 (8.7, 18.4)	12.3	12.7	3.8	4.0
Central Asia	24.9	26.9	8.3 (7.1, 9.6)	9.5 (8.1, 11.0)	33.2	35.3	2.7	2.9
Eastern Asia	384.2	379.9	133.9 (114.6, 154.9)	139.8 (119.5, 161.9)	34.9	36.8	42.9	43.1
Southern Asia	690.4	683.7	60.3 (33.8, 102.4)	60.1 (33.7, 102.0)	8.7	8.8	19.3	18.5
South-Eastern Asia	222.4	218.1	31.6 (15.3, 58.6)	31.6 (15.3, 58.4)	14.2	14.5	10.1	9.7
Northern America	92.7	97.5	8.1 (5.2, 11.9)	8.4 (5.4, 12.4)	8.8	8.7	2.6	2.6
Latin America and the Caribbean	220.4	211.6	20.7 (9.4, 42.4)	19.8 (9.0, 40.6)	9.4	9.4	6.6	6.1
Central America	66.6	64.8	6.1 (2.5, 13.1)	5.9 (2.4, 12.8)	9.2	9.2	2.0	1.8
Southern America	139.4	133.0	12.9 (5.2, 27.6)	12.2 (5.0, 26.3)	9.2	9.2	4.1	3.8
Caribbean	14.4	13.8	1.7 (1.4, 2.1)	1.6 (1.3, 2.0)	11.8	11.8	0.5	0.5
Oceania	12.3	13.6	1.1 (0.7, 2.0)	1.3 (0.8, 2.3)	9.2	9.3	0.4	0.4
Australia and New Zealand	7.3	8.2	0.6 (0.4, 0.9)	0.7 (0.5, 1.0)	8.5	8.7	0.2	0.2
Melanesia	4.5	4.9	0.4 (0.1, 1.2)	0.5 (0.1, 1.4)	9.7	10.1	0.1	0.2
Micronesia	0.2	0.2	0.02 (0.01, 0.06)	0.02 (0.01, 0.06)	10.6	10.0	0.01	0.01
Polynesia	0.3	0.3	0.03 (0.01, 0.08)	0.03 (0.01, 0.07)	9.3	9.0	0.01	0.01
Global	2,493	2,610	312 (265, 369)	324 (276, 382)	12.5	12.4	100.0	100.0

Total population and numbers of myopia cases are reported in millions.

In Europe and North America the predominant ethnicity was assumed to be White.

In Africa the predominant ethnicity was assumed to be Black in Africa.

Asia includes Western Asia (Middle Eastern or North African), Central Asia (East Asian), Eastern Asia (East Asian), Southern Asia (South Asian) and South-Eastern Asia (South-East Asian).

Latin America and the Caribbean include the Caribbean (Black not in Africa), Central America (Hispanic or Latino) and South America (Hispanic or Latino).

Oceania includes Australia and New Zealand (White), Melanesia (Native Hawaiian or other Pacific Islander), Micronesia (Native Hawaiian or other Pacific Islander) and Polynesia (Native Hawaiian or other Pacific Islander).

Statistical Appendix: Bayesian models for the estimation of myopia prevalence

Prevalence of myopia for both genders combined, adjusted for multiple risk factors

Let K be the total number of estimates of myopia prevalence identified in the literature review, refined by the exclusion criteria described in the statistical analysis Section. For each $k = 1, \dots, K$, let p_k , and n_k denote the prevalence of myopia and the number of myopic children within a population of size N_k , respectively. Let $C_W, C_{EA}, C_{SA}, C_{SEA}, C_{BA}, C_{BNA}, C_{MENA}, C_{HL}, C_{NHOPI}, C_{AIAN}$ be the subset of indexes $k \in \{1, \dots, K\}$ corresponding to white, East Asian, South Asian, South-East Asian, black living in Africa, black living not in Africa, Middle Eastern or North African, Hispanic or Latino, native Hawaiian or other Pacific Islander, and American Indian or Alaska native children, respectively. Note that $C_W \cup C_{EA} \cup C_{SA} \cup C_{SEA} \cup C_{BA} \cup C_{BNA} \cup C_{MENA} \cup C_{HL} \cup C_{NHOPI} \cup C_{AIAN} = \{1, \dots, K\}$ and $C_W, C_{EA}, C_{SA}, C_{SEA}, C_{BA}, C_{BNA}, C_{MENA}, C_{HL}, C_{NHOPI}, C_{AIAN}$ are mutually exclusive. **Let i denote a distinct study population group defined by its ethnicity, examined at a fixed point in time and specific geographical location.** Furthermore, let $I_W, I_{EA}, I_{SA}, I_{SEA}, I_{BA}, I_{BNA}, I_{MENA}, I_{HL}, I_{NHOPI}, I_{AIAN}$ be the total number of clusters defined in white, East Asian, South Asian, South-East Asian, black living in Africa, black living not in Africa, Middle Eastern or North African, Hispanic or Latino, native Hawaiian or other Pacific Islander, and American Indian or Alaska native children, respectively. The fitted model is described by the following formulas:

$$n_k \sim \text{Bin}(p_k, N_k) \quad \text{for } k = 1, \dots, K,$$

where,

$$\begin{aligned} \text{logit}(p_k) &= \beta_0^W + \beta_A^W A + \beta_{A^2}^W A^2 + \beta_{R_1} R_1 + \beta_{R_2} R_2 + \beta_Y^W Y + U_{i_W}^W && \text{if } k \in C_W, \\ \text{logit}(p_k) &= \beta_0^{EA} + \beta_A^{EA} A + \beta_{A^2}^{EA} A^2 + \beta_{R_1} R_1 + \beta_{R_2} R_2 + \beta_Y^{EA} Y + U_{i_{EA}}^{EA} && \text{if } k \in C_{EA}, \\ \text{logit}(p_k) &= \beta_0^{SA} + \beta_A^{SA} A + \beta_{A^2}^{SA} A^2 + \beta_{R_1} R_1 + \beta_Y^{SA} Y + U_{i_{SA}}^{SA} && \text{if } k \in C_{SA}, \\ \text{logit}(p_k) &= \beta_0^{SEA} + \beta_A^{SEA} A + \beta_{A^2}^{SEA} A^2 + \beta_{R_1} R_1 + U_{i_{SEA}}^{SEA} && \text{if } k \in C_{SEA}, \\ \text{logit}(p_k) &= \beta_0^{BA} + \beta_A^{BA} A + \beta_{A^2}^{BA} A^2 + \beta_{R_1} R_1 + U_{i_{BA}}^{BA} && \text{if } k \in C_{BA}, \\ \text{logit}(p_k) &= \beta_0^{BNA} + \beta_A^{BNA} A + \beta_{A^2}^{BNA} A^2 + U_{i_{BNA}}^{BNA} && \text{if } k \in C_{BNA}, \\ \text{logit}(p_k) &= \beta_0^{MENA} + \beta_A^{MENA} A + \beta_{A^2}^{MENA} A^2 + \beta_{R_1} R_1 + \beta_{R_2} R_2 + U_{i_{MENA}}^{MENA} && \text{if } k \in C_{MENA}, \\ \text{logit}(p_k) &= \beta_0^{HL} + \beta_A^{HL} A + \beta_{A^2}^{HL} A^2 + \beta_{R_1} R_1 + \beta_{R_2} R_2 + U_{i_{HL}}^{HL} && \text{if } k \in C_{HL}, \\ \text{logit}(p_k) &= \beta_0^{NHOPI} + \beta_A^{NHOPI} A + \beta_{A^2}^{NHOPI} A^2 + \beta_{R_1} R_1 + U_{i_{NHOPI}}^{NHOPI} && \text{if } k \in C_{NHOPI}, \\ \text{logit}(p_k) &= \beta_0^{AIAN} + \beta_A^{AIAN} A + \beta_{A^2}^{AIAN} A^2 + U_{i_{AIAN}}^{AIAN} && \text{if } k \in C_{AIAN}, \end{aligned}$$

$$\begin{aligned} U_{i_W}^W &\sim N(0, \sigma_W^2) && \text{for } i_W \in \{1, \dots, I_W\}, \\ U_{i_{EA}}^{EA} &\sim N(0, \sigma_{EA}^2) && \text{for } i_{EA} \in \{1, \dots, I_{EA}\}, \\ U_{i_{SA}}^{SA} &\sim N(0, \sigma_{SA}^2) && \text{for } i_{SA} \in \{1, \dots, I_{SA}\}, \\ U_{i_{SEA}}^{SEA} &\sim N(0, \sigma_{SEA}^2) && \text{for } i_{SEA} \in \{1, \dots, I_{SEA}\}, \\ U_{i_{BA}}^{BA} &\sim N(0, \sigma_{BA}^2) && \text{for } i_{BA} \in \{1, \dots, I_{BA}\}, \end{aligned}$$

$$\begin{aligned}
U_{i_{BNA}}^{BNA} &\sim N(0, \sigma_{BNA}^2) && \text{for } i_{BNA} \in \{1, \dots, I_{BNA}\}, \\
U_{i_{MENA}}^{MENA} &\sim N(0, \sigma_{MENA}^2) && \text{for } i_{MENA} \in \{1, \dots, I_{MENA}\}, \\
U_{i_{HL}}^{HL} &\sim N(0, \sigma_{HL}^2) && \text{for } i_{HL} \in \{1, \dots, I_{HL}\}, \\
U_{i_{NHOPI}}^{NHOPI} &\sim N(0, \sigma_{NHOPI}^2) && \text{for } i_{NHOPI} \in \{1, \dots, I_{NHOPI}\}, \\
U_{i_{AIAN}}^{AIAN} &\sim N(0, \sigma_{AIAN}^2) && \text{for } i_{AIAN} \in \{1, \dots, I_{AIAN}\}
\end{aligned}$$

where the U_i take account of the hierarchical structure of the data according to which estimates of prevalence are nested within a study population group, and where A is age; R_1 and R_2 are indicator variables for a rural and a mixed environment (as compared with urban), respectively; and Y is year of survey. Non-informative normal priors were for log odds and log odds ratios, and non-informative Gamma priors for the corresponding variances.

The model allows a different quadratic association between age and prevalence of myopia by ethnicity. The association with an urban living environment is assumed to be equal across the ethnic groups and it is estimated when data are available (e.g. there were no estimates of prevalence on mixed urbanity environments for South Asians, and all estimates of prevalence were from rural environments for American Indians or Alaska natives). Finally, a linear association between year of survey and prevalence of myopia is estimated for white, East Asian, and South Asian populations allowing a different trend over time for each of these three ethnic groups.

Reference List (including additional references in Suppl Table 1)

1. Junghans B, Kiely PM, Crewther DP, Crewther SG. Referral rates for a functional vision screening among a large cosmopolitan sample of Australian children. *Ophthalmic and Physiological Optics* 2002; 22(1):10-25.
2. Kleinstejn RN, Jones LA, Hullett S, Kwon S, Lee RJ, Friedman NE et al. Refractive error and ethnicity in children. *Archives of Ophthalmology* 2003; 121(8):1141-1147.
3. Lam CS, Goldschmidt E, Edwards MH. Prevalence of myopia in local and international schools in Hong Kong. *Optom Vis Sci* 2004; 81(5):317-322.
4. Cumberland PM, Peckham CS, Rahi JS. Inferring myopia over the lifecourse from uncorrected distance visual acuity in childhood. *Br J Ophthalmol* 2007; 91(2):151-153.
5. Foster PJ, Jiang Y. Epidemiology of myopia. *Eye (Lond)* 2014; 28(2):202-208.
6. Congdon NG, Friedman DS, Lietman T. Important causes of visual impairment in the world today. *JAMA* 2003; 290(15):2057-2060.
7. Gilmartin B. Myopia: precedents for research in the twenty-first century. *Clin Experiment Ophthalmol* 2004; 32(3):305-324.
8. Kempen JH, Mitchell P, Lee KE, Tielsch JM, Broman AT, Taylor HR et al. The prevalence of refractive errors among adults in the United States, Western Europe, and Australia. *Arch Ophthalmol* 2004; 122(4):495-505.
9. Morgan IG, Ohno-Matsui K, Saw SM. Myopia. *Lancet* 2012; 379(9827):1739-1748.
10. Rudnicka AR, Owen CG, Richards M, Wadsworth ME, Strachan DP. Effect of breastfeeding and sociodemographic factors on visual outcome in childhood and adolescence. *Am J Clin Nutr* 2008; 87(5):1392-1399.
11. Kleinstejn RN, Jones LA, Hullett S, Kwon S, Lee RJ, Friedman NE et al. Refractive error and ethnicity in children. *Archives of Ophthalmology* 2003; 121(8):1141-1147.
12. Williams C, Miller LL, Gazzard G, Saw SM. A comparison of measures of reading and intelligence as risk factors for the development of myopia in a UK cohort of children. *British Journal of Ophthalmology* 2008; 92(8):1117-1121.
13. Rudnicka AR, Owen CG, Nightingale CM, Cook DG, Whincup PH. Ethnic differences in the prevalence of myopia and ocular biometry in 10- and 11-year-old children: The child heart and health study in England (CHASE). *Invest Ophthalmol Vis Sci* 2010; 51(12):6270-6276.
14. O'Donoghue L, McClelland JF, Logan NS, Rudnicka AR, Owen CG, Saunders KJ. Refractive error and visual impairment in school children in Northern Ireland. *British Journal of Ophthalmology* 2010; 94(9):1155-1159.
15. Ip JM, Huynh SC, Robaei D, Kifley A, Rose KA, Morgan IG et al. Ethnic differences in refraction and ocular biometry in a population-based sample of 11-15-year-old Australian children. *Eye* 2008; 22(5):649-656.

16. Logan NS, Shah P, Rudnicka AR, Gilmartin B, Owen CG. Childhood ethnic differences in ametropia and ocular biometry: the Aston Eye Study. *Ophthalmic & Physiological Optics* 2011; 31(5):550-558.
17. Saw SM. A synopsis of the prevalence rates and environmental risk factors for myopia. *Clin Exp Optom* 2003; 86(5):289-294.
18. Saw SM, Goh PP, Cheng A, Shankar A, Tan DTH, Ellwein LB. Ethnicity-specific prevalences of refractive errors vary in Asian children in neighbouring Malaysia and Singapore. *British Journal of Ophthalmology* 2006; 90(10):1230-1235.
19. Fan DSP, Lam DSC, Lam RF, Lau JTF, Chong KS, Cheung EYY et al. Prevalence, incidence, and progression of myopia of school children in Hong Kong. *Investigative Ophthalmology & Visual Science* 2004; 45(4):1071-1075.
20. Quek TPL, Chua CG, Chong CS, Chong JH, Hey HW, Lee J et al. Prevalence of refractive errors in teenage high school students in Singapore. *Ophthalmic and Physiological Optics* 2004; 24(1):47-55.
21. Dandona R, Dandona L, Naduvilath TJ, Srinivas M, McCarty CA, Rao GN. Refractive errors in an urban population in southern India: The Andhra Pradesh Eye Disease Study. *Investigative Ophthalmology & Visual Science* 1999; 40(12):2810-2818.
22. Dandona R, Dandona L, Srinivas M, Sahare P, Narsaiah S, Munoz SR et al. Refractive error in children in a rural population in India. *Investigative Ophthalmology & Visual Science* 2002; 43(3):615-622.
23. Kalikivayi V, Naduvilath TJ, Bansal AK, Dandona L. Visual impairment in school children in Southern India. *Indian Journal of Ophthalmology* 1997; 45(2):129-134.
24. Murthy GVS, Gupta SK, Ellwein LB, Munoz SR, Pokharel GP, Sanga L et al. Refractive error in children in an urban population in New Delhi. *Investigative Ophthalmology and Visual Science* 2002; 43(3):623-631.
25. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000; 283(15):2008-2012.
26. Morgan I, Rose K. How genetic is school myopia? *Prog Retin Eye Res* 2005; 24(1):1-38.
27. Pan CW, Ramamurthy D, Saw SM. Worldwide prevalence and risk factors for myopia. *Ophthalmic Physiol Opt* 2012; 32(1):3-16.
28. Lunn D, Spiegelhalter D, Thomas A, Best N. The BUGS project: Evolution, critique and future directions. *Stat Med* 2009; 28(25):3049-3067.
29. R Core Team. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Vienna, Austria. 2014. 21-4-2015.
30. United Nations. World Population Prospects: The 2012 Revision. [Accessed September 2014] Available from: URL:http://esa.un.org/wpp/unpp/panel_indicators.htm

31. Kapetanakis VV, Chan MP, Foster PJ, Cook DG, Owen CG, Rudnicka AR. Global variations and time trends in the prevalence of primary open angle glaucoma (POAG): a systematic review and meta-analysis. *Br J Ophthalmol* 2015.
32. Richler A, Bear JC. The distribution of refraction in 3 isolated communities in Western Newfoundland. *American Journal of Optometry and Physiological Optics* 1980; 57(11):861-871.
33. Lam CS, Lam CH, Cheng SC, Chan LY. Prevalence of myopia among Hong Kong Chinese schoolchildren: changes over two decades. *Ophthalmic & Physiological Optics* 2012; 32(1):17-24.
34. Ip JM, Rose KA, Morgan IG, Burlutsky G, Mitchell P. Myopia and the urban environment: findings in a sample of 12-year-old Australian school children. *Invest Ophthalmol Vis Sci* 2008; 49(9):3858-3863.
35. Yingyong P. Refractive errors survey in primary school children (6-12 year old) in 2 provinces: Bangkok and Nakhonpathom (one year result). *J Med Assoc Thai* 2010; 93(10):1205-1210.
36. Garner LF, Owens H, Kinnear RF, Frith MJ. Prevalence of myopia in Sherpa and Tibetan children in Nepal. *Optometry & Vision Science* 1999; 76(5):282-285.
37. Zhang MZ, Saw SM, Hong RZ, Fu ZF, Yang H, Shui YB et al. Refractive errors in Singapore and Xiamen, China: a comparative study in school children aged 6 to 7 years. *Optometry & Vision Science* 2000; 77(6):302-308.
38. Lin LLK, Shih YF, Hsiao CK, Chen CJ, Lee LA, Hung PT. Epidemiologic study of the prevalence and severity of myopia among school children in Taiwan in 2000. *Journal of the Formosan Medical Association* 2001; 100(10):684-691.
39. Saw SM, Hong RZ, Zhang MZ, Fu ZF, Ye M, Tan D et al. Near-work activity and myopia in rural and urban schoolchildren in China. *J Pediatr Ophthalmol Strabismus* 2001; 38(3):149-155.
40. Khan AA, Nasti AR, Ayoub DM, Lone SA. Prevalence of refractive errors in school children. *JK Practitioner* 2005; 12(3):156-159.
41. Fotouhi A, Hashemi H, Khabazkhoob M, Mohammad K. The prevalence of refractive errors among schoolchildren in Dezful, Iran. *British Journal of Ophthalmology* 2007; 91(3):287-292.
42. Czepita D, Zejmo M, Mojsa A. Prevalence of myopia and hyperopia in a population of Polish schoolchildren. *Ophthalmic and Physiological Optics* 2007; 27(1):60-65.
43. Uzma N, Kumar BS, Khaja Mohinuddin Salar BM, Zafar MA, Reddy VD. A comparative clinical survey of the prevalence of refractive errors and eye diseases in urban and rural school children. *Canadian Journal of Ophthalmology* 2009; 44(3):328-333.
44. Padhye AS, Khandekar R, Dharmadhikari S, Dole K, Gogate P, Deshpande M. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. *Middle East Afr J Ophthalmol* 2009; 16(2):69-74.

45. Zhang M, Li L, Chen L, Lee J, Wu J, Yang A et al. Population density and refractive error among Chinese children. *Invest Ophthalmol Vis Sci* 2010; 51(10):4969-4976.
46. Gao Z, Meng N, Muecke J, Chan WO, Piseth H, Kong A et al. Refractive error in school children in an urban and rural setting in Cambodia. *Ophthalmic Epidemiology* 2012; 19(1):16-22.
47. Wu JF, Bi HS, Wang SM, Hu YY, Wu H, Sun W et al. Refractive error, visual acuity and causes of vision loss in children in Shandong, China. The Shandong children eye study. *PLoS one* 2013; 8(12):e82763.
48. Lin LLJ, Hung P-T, Ko L-S, Hou P-K. Study of myopia among aboriginal school children in Taiwan. *Acta Ophthalmologica* 1988; 66(Suppl 185):34-36.
49. Au Eong KG, Tay TH, Lim MK. Race, culture and Myopia in 110,236 young Singaporean males. *Singapore Med J* 1993; 34(1):29-32.
50. Wu HM, Seet B, Yap EP, Saw SM, Lim TH, Chia KS. Does education explain ethnic differences in myopia prevalence? A population-based study of young adult males in Singapore. *Optom Vis Sci* 2001; 78(4):234-239.
51. He MG, Zeng JW, Liu YZ, Xu JJ, Pokharel GP, Ellwein LB. Refractive error and visual impairment in urban children in southern China. *Investigative Ophthalmology & Visual Science* 2004; 45(3):793-799.
52. Shih YF, Chiang TH, Hsiao CK, Chen CJ, Hung PT, Lin LL. Comparing myopic progression of urban and rural Taiwanese schoolchildren. *Jpn J Ophthalmol* 2010; 54(5):446-451.
53. Tay MT, Au Eong KG, Ng CY, Lim MK. Myopia and educational attainment in 421,116 young Singaporean males. *Ann Acad Med Singapore* 1992; 21(6):785-791.
54. Williams KM, Bertelsen G, Cumberland P, Wolfram C, Verhoeven VJ, Anastasopoulos E et al. Increasing Prevalence of Myopia in Europe and the Impact of Education. *Ophthalmology* 2015; 122(7):1489-1497.
55. Saw SM, Chua WH, Hong CY, Wu HM, Chan WY, Chia KS et al. Nearwork in early-onset myopia. *Invest Ophthalmol Vis Sci* 2002; 43(2):332-339.
56. Mutti DO, Mitchell GL, Moeschberger ML, Jones LA, Zadnik K. Parental myopia, near work, school achievement, and children's refractive error. *Invest Ophthalmol Vis Sci* 2002; 43(12):3633-3640.
57. Ip JM, Saw SM, Rose KA, Morgan IG, Kifley A, Wang JJ et al. Role of near work in myopia: findings in a sample of Australian school children. *Invest Ophthalmol Vis Sci* 2008; 49(7):2903-2910.
58. Lu B, Congdon N, Liu XJ, Choi K, Lam DSC, Zhang MZ et al. Associations Between Near Work, Outdoor Activity, and Myopia Among Adolescent Students in Rural China The Xichang Pediatric Refractive Error Study Report No. 2. *Archives of Ophthalmology* 2009; 127(6):769-775.

59. Rose KA, Morgan IG, Smith W, Burlutsky G, Mitchell P, Saw SM. Myopia, lifestyle, and schooling in students of Chinese ethnicity in Singapore and Sydney. *Archives of Ophthalmology* 2008; 126(4):527-530.
60. Dirani M, Chan Y-H, Gazzard G, Hornbeak DM, Leo S-W, Selvaraj P et al. Prevalence of refractive error in Singaporean Chinese children: The Strabismus, Amblyopia, and Refractive Error in young Singaporean Children (STARS) study. *Investigative Ophthalmology and Visual Science* 2010; 51(3):1348-1355.
61. Anera RG, Jimenez JR, Soler M, Perez MA, Jimenez R, Cardona JC. Prevalence of refractive errors in school-age children in Burkina Faso. *Japanese Journal of Ophthalmology* 2006; 50(5):483-484.
62. Jimenez R, Soler M, Anera RG, Castro JJ, Perez MA, Salas C. Ametropias in school-age children in Fada N'Gourma (Burkina Faso, Africa). *Optometry & Vision Science* 2012; 89(1):33-37.
63. Khader YS, Batayha WQ, Abdul-Aziz SM, Shiekh-Khalil MI. Prevalence and risk indicators of myopia among schoolchildren in Amman, Jordan. *East Mediterr Health J* 2006; 12(3-4):434-439.
64. Saw SM, Shankar A, Tan SB, Taylor H, Tan DT, Stone RA et al. A cohort study of incident myopia in Singaporean children. *Invest Ophthalmol Vis Sci* 2006; 47(5):1839-1844.
65. Jones LA, Sinnott LT, Mutti DO, Mitchell GL, Moeschberger ML, Zadnik K. Parental history of myopia, sports and outdoor activities, and future myopia. *Invest Ophthalmol Vis Sci* 2007; 48(8):3524-3532.
66. Dirani M, Tong L, Gazzard G, Zhang X, Chia A, Young TL et al. Outdoor activity and myopia in Singapore teenage children. *British Journal of Ophthalmology* 2009; 93(8):997-1000.
67. Wu P-C, Tsai C-L, Hu C-H, Yang Y-H. Effects of outdoor activities on Myopia among rural school children in Taiwan. *Ophthalmic Epidemiology* 2010; 17(5):338-342.
68. Guggenheim JA, Northstone K, McMahon G, Ness AR, Deere K, Mattocks C et al. Time outdoors and physical activity as predictors of incident myopia in childhood: a prospective cohort study. *Investigative Ophthalmology & Visual Science* 2012; 53(6):2856-2865.
69. Jones-Jordan LA, Mitchell GL, Cotter SA, Kleinstejn RN, Manny RE, Mutti DO et al. Visual activity before and after the onset of juvenile myopia. *Invest Ophthalmol Vis Sci* 2011; 52(3):1841-1850.
70. Li SM, Li H, Li SY, Liu LR, Kang MT, Wang YP et al. Time Outdoors and Myopia Progression Over 2 Years in Chinese Children: The Anyang Childhood Eye Study. *Invest Ophthalmol Vis Sci* 2015; 56(8):4734-4740.
71. Sherwin JC, Reacher MH, Keogh RH, Khawaja AP, Mackey DA, Foster PJ. The association between time spent outdoors and myopia in children and adolescents: a systematic review and meta-analysis. *Ophthalmology* 2012; 119(10):2141-2151.
72. Deere K, Williams C, Leary S, Mattocks C, Ness A, Blair SN et al. Myopia and later physical activity in adolescence: a prospective study. *Br J Sports Med* 2009; 43(7):542-544.

73. Rose KA, Morgan IG, Ip J, Kifley A, Huynh S, Smith W et al. Outdoor activity reduces the prevalence of myopia in children. *Ophthalmology* 2008; 115(8):1279-1285.
74. Lin LLK, Shih YF, Tsai CB, Chen CJ, Lee LA, Hung PT et al. Epidemiologic study of ocular refraction among schoolchildren in Taiwan in 1995. *Optometry and Vision Science* 1999; 76(5):275-281.
75. Zadnik K, Manny RE, Yu JA, Mitchell GL, Cotter SA, Quiralte JC et al. Ocular component data in schoolchildren as a function of age and gender. *Optom Vis Sci* 2003; 80(3):226-236.
76. He M, Xu J, Yin Q, Ellwein LB. Need and challenges of refractive correction in urban Chinese school children. *Optometry and Vision Science* 2005; 82(4):229-234.
77. He MG, Huang WY, Zheng YF, Huang L, Ellwein LB. Refractive error and visual impairment in school children in rural southern China. *Ophthalmology* 2007; 114(2):374-382.
78. Goh P-P, Abqariyah Y, Pokharel GP, Ellwein LB. Refractive error and visual impairment in school-age children in Gombak District, Malaysia. *Ophthalmology* 2005; 112(4):678-685.
79. Zhang M, Gazzard G, Fu Z, Li L, Chen B, Saw SM et al. Validating the accuracy of a model to predict the onset of myopia in children. *Investigative Ophthalmology & Visual Science* 2011; 52(8):5836-5841.
80. Pokharel GP, Negrel AD, Munoz SR, Ellwein LB. Refractive error study in children: results from Mechi Zone, Nepal. *American Journal of Ophthalmology* 2000; 129(4):436-444.
81. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: results from La Florida, Chile. *American Journal of Ophthalmology* 2000; 129(4):445-454.
82. Naidoo KS, Raghunandan A, Mashige KP, Govender P, Holden BA, Pokharel GP et al. Refractive error and visual impairment in African children in South Africa. *Investigative Ophthalmology & Visual Science* 2003; 44(9):3764-3770.
83. Rahi JS, Cumberland PM, Peckham CS. Myopia over the lifecourse: prevalence and early life influences in the 1958 British birth cohort. *Ophthalmology* 2011; 118(5):797-804.
84. Wong TY, Foster PJ, Hee J, Ng TP, Tielsch JM, Chew SJ et al. Prevalence and risk factors for refractive errors in adult Chinese in Singapore. *Invest Ophthalmol Vis Sci* 2000; 41(9):2486-2494.
85. Farhood QK. Cycloplegic refraction in children with cyclopentolate versus atropine. *J Clin Exp Ophthalmol* 2012; 3(7):239.
86. Williams C, Miller L, Northstone K, Sparrow JM. The use of non-cycloplegic autorefraction data in general studies of children's development. *Br J Ophthalmol* 2008; 92(5):723-724.
87. Zhao J, Mao J, Luo R, Li F, Pokharel GP, Ellwein LB. Accuracy of noncycloplegic autorefraction in school-age children in China. *Optom Vis Sci* 2004; 81(1):49-55.
88. Choong YF, Chen AH, Goh PP. A comparison of autorefraction and subjective refraction with and without cycloplegia in primary school children. *Am J Ophthalmol* 2006; 142(1):68-74.

89. Abdi S, Lennerstrand G, Pansell T, Rydberg A. Orthoptic findings and asthenopia in a population of Swedish schoolchildren aged 6 to 16 years. *Strabismus* 2008; 16(2):47-55.
90. Adlergrinberg D. Need for Eye and Vision Care in An Underserved Population - Refractive Errors and Other Ocular Anomalies in the Sioux. *American Journal of Optometry and Physiological Optics* 1986; 63(7):553-558.
91. Aine E. Refractive Errors in A Finnish Rural-Population. *Acta Ophthalmologica* 1984; 62(6):944-954.
92. Aldebasi YH. Prevalence of correctable visual impairment in primary school children in Qassim Province, Saudi Arabia. *Journal of optometry* 2014; 7(3):168-176.
93. Almeder LM, Peck LB, Howland HC. Prevalence of anisometropia in volunteer laboratory and school screening populations. *Investigative Ophthalmology and Visual Science* 1990; 31(11):2448-2455.
94. Anera RG, Soler M, de la Cruz CJ, Salas C, Ortiz C. Prevalence of refractive errors in school-age children in Morocco. *Clinical & Experimental Ophthalmology* 2009; 37(2):191-196.
95. Auzemery A, Andriamanamihaja R, Boisier P. A survey of the prevalence and causes of eye disorders in primary school children in Antananarivo. *Sante* 1995; 5(3):163-166.
96. Awasthi S, Pant BP, Dhakal HP. Reduced vision and refractive errors, results from a school vision screening program in Kanchanpur district of far western Nepal. *Kathmandu University Medical Journal* 2010; 8(32):October-December.
97. Ayed T, Sokkah M, Charfi O, El Matri L. Epidemiologic study of refractive errors in schoolchildren in socioeconomically deprived regions in Tunisia. *Journal Francais D Ophthalmologie* 2002; 25(7):712-717.
98. Azizoglu S, Junghans BM, Barutchu A, Crewther SG. Refractive errors in students from Middle Eastern backgrounds living and undertaking schooling in Australia. *Clinical & Experimental Optometry* 2011; 94(1):67-75.
99. Boniuk V. Refractive problems in native peoples (the Sioux Lookout Project). *Can J Ophthalmol* 1973; 8(2):229-233.
100. Brody BL, Roch-Levecq AC, Klonoff-Cohen HS, Brown SI. Refractive errors in low-income preschoolers. *Ophthalmic Epidemiology* 2007; 14(4):223-229.
101. Buchner TF, Schnorbus U, Grenzebach UH, Stupp T, Busse H. Examination of preschool children for refractive errors. First experiences using a handheld autorefractor. *Ophthalmologie* 2003; 100(11):971-978.
102. Caca I, Cingu AK, Sahin A, Ari S, Dursun ME, Dag U et al. Amblyopia and refractive errors among school-aged children with low socioeconomic status in southeastern Turkey. *Journal of Pediatric Ophthalmology & Strabismus* 2013; 50(1):37-43.
103. Casson RJ, Kahawita S, Kong A, Muecke J, Sisaleumsak S, Visonnavong V. Exceptionally low prevalence of refractive error and visual impairment in schoolchildren from Lao People's Democratic Republic. *Ophthalmology* 2012; 119(10):2021-2027.

104. Chan OY, Edwards M. Refractive errors in Hong Kong Chinese pre-school children. *Optometry & Vision Science* 1993; 70(6):501-505.
105. Chang F-L, Lee Y-C, Chen N, Hsieh H-P, Li Y-H, Yang Y-Y et al. The prevalence of ocular diseases in primary and junior high school students on Orchid Island. *Tzu Chi Medical Journal* 2014; 26(4):166-169.
106. Cheng CY, Huang W, Su KC, Peng ML, Sun HY, Cheng HM. Myopization factors affecting urban elementary school students in Taiwan. *Optometry and vision science : official publication of the American Academy of Optometry* 2013; 90(4):400-406.
107. Cheng HM, Sun HY, Lin DPC, Chang HH, Chen ST, Yeh SM et al. Characterising visual deficits in children of an urban elementary school in Taiwan. *Clinical and Experimental Optometry* 2012; 95(5):531-537.
108. Chung KM, Mohidin N, Yeow PT, Tan LL, O'Leary D. Prevalence of visual disorders in Chinese schoolchildren. *Optom Vis Sci* 1996; 73(11):695-700.
109. Congdon N, Wang YF, Song Y, Choi K, Zhang MZ, Zhou ZX et al. Visual disability, visual function, and myopia among rural Chinese secondary school children: The Xichang Pediatric Refractive Error Study (X-PRES) - Report 1. *Investigative Ophthalmology & Visual Science* 2008; 49(7):2888-2894.
110. Dobson V, Harvey EM, Miller JM. Spherical equivalent refractive error in preschool children from a population with a high prevalence of astigmatism. *Optometry and Vision Science* 2007; 84(2):124-130.
111. Edwards MH. The development of myopia in Hong Kong children between the ages of 7 and 12 years: a five-year longitudinal study. *Ophthalmic and Physiological Optics* 1999; 19(4):286-294.
112. Fan DS, Lai C, Lau HH, Cheung EY, Lam DS. Change in vision disorders among Hong Kong preschoolers in 10 years. *Clinical & Experimental Ophthalmology* 2011; 39(5):398-403.
113. Fan DSP, Cheung EYY, Lai RYK, Kwok AKH, Lam DSC. Myopia progression among preschool Chinese children in Hong Kong. *Annals Academy of Medicine Singapore* 2004; 33(1):39-43.
114. Fischbach LA, Lee DA, Englehardt RF, Wheeler N. The prevalence of ocular disorders among Hispanic and Caucasian children screened by the UCLA Mobile Eye Clinic. *Journal of Community Health* 1993; 18(4):201-211.
115. Gao TY, Zhang P, Li L, Lin Z, Jhanji V, Peng Y et al. Rationale, Design, and Demographic Characteristics of the Handan Offspring Myopia Study. *Ophthalmic Epidemiology* 2014; 21(2):124-132.
116. Gao Z, Meng N, Muecke J, Chan WO, Piseth H, Kong A et al. Refractive error in school children in an urban and rural setting in Cambodia. *Ophthalmic Epidemiology* 2012; 19(1):16-22.
117. Garner LF, Kinnear RF, Klinger JD, McKellar MJ. Prevalence of myopia in school children in Vanuatu. *Acta Ophthalmologica* 1985; 63(3):323-326.

118. Garner LF, Meng CK, Grosvenor TP, Mohidin N. Ocular dimensions and refractive power in Malay and Melanesian children. *Ophthalmic & Physiological Optics* 1990; 10(3):234-238.
119. Garner LF, Yap MK, Kinnear RF, Frith MJ. Ocular dimensions and refraction in Tibetan children. *Optometry & Vision Science* 1995; 72(4):266-271.
120. Giordano L, Friedman DS, Repka MX, Katz J, Ibranke J, Hawes P et al. Prevalence of refractive error among preschool children in an urban population: the Baltimore Pediatric Eye Disease Study. *Ophthalmology* 2006; 113(4):739-746.
121. Goh WS, Lam CS. A visual survey of school children in Hong Kong. *Clinical and Experimental Optometry* 1993; 76(3):101-108.
122. Goldschmidt E, Lam CS, Opper S. The development of myopia in Hong Kong children. *Acta Ophthalmologica Scandinavica* 2001; 79(3):228-232.
123. Gordon A. Refractive error in a Puerto Rican rural population. *J Am Optom Assoc* 1990; 61(11):870-874.
124. Gronlund MA, Andersson S, Aring E, Hard AL, Hellstrom A. Ophthalmological findings in a sample of Swedish children aged 4-15 years. *Acta Ophthalmologica Scandinavica* 2006; 84(2):169-176.
125. Grosvenor T. Refractive error distribution in New Zealand's Polynesian and European children. *Am J Optom Arch Am Acad Optom* 1970; 47(9):673-679.
126. Guo K, Yang dY, Wang Y, Yang XR, Jing XX, Guo YY et al. Prevalence of myopia in schoolchildren in Ejina: the Gobi Desert Children Eye Study. *Invest Ophthalmol Vis Sci* 2015; 56(3):1769-1774.
127. Guo Y, Liu LJ, Xu L, Lv YY, Tang P, Feng Y et al. Outdoor activity and myopia among primary students in rural and urban regions of Beijing. *Ophthalmology* 2013; 120(2):277-283.
128. Gurses H, Basmak H, Yaz Y, Colak E. Vision screening in children entering school: Eskisehir, Turkey. *Ophthalmic Epidemiology* 2013; 20(4):232-238.
129. Hashemi H, Fotouhi A, Mohammad K. The age- and gender-specific prevalences of refractive errors in Tehran: the Tehran Eye Study. *Ophthalmic Epidemiology* 2004; 11(3):213-225.
130. Hashemi H, Rezvani F, Beiranvand A, Papi OA, Hoseini Yazdi H, Ostadimoghaddam H et al. Prevalence of Refractive Errors among High School Students in Western Iran. *Journal of Ophthalmic & Vision Research* 2014; 9(2):232-239.
131. Hendricks TJW, De Brabander J, Van der Horst FG, Hendrikse F, Knottnerus JA. Relationship between habitual refractive errors and headache complaints in schoolchildren. *Optometry and Vision Science* 2007; 84(2):137-143.
132. Ho CSD, Ng CBC, Chan E, Ngeow A, Wijaya R, Ashok V et al. Uncorrected refractive error in Singapore teenagers. *British Journal of Ophthalmology* 2006; 90(2):202-207.

133. Hsu SL, Chang C-H, Lai YH, Wen M-H, Cheng KC, Ho CK. Refractive status of mountain aborigine schoolchildren in southern Taiwan. *Kaohsiung Journal of Medical Sciences* 2008; 24(3):120-125.
134. Ingram RM, Barr A. Changes in Refraction Between the Ages of 1 and 3-1/2 Years. *British Journal of Ophthalmology* 1979; 63(5):339-342.
135. Jamali P, Fotouhi A, Hashemi H, Younesian M, Jafari A. Refractive errors and amblyopia in children entering school: Shahrood, Iran. *Optometry and Vision Science* 2009; 86(4):364-369.
136. Johnstone WW, McLaren DS. Refraction anomalies in Tanganyikan children. *British Journal of Ophthalmology* 1963; 47:95-108.
137. Junghans BM, Crewther SG. Little evidence for an epidemic of myopia in Australian primary school children over the last 30 years. *BMC Ophthalmol* 2005; 5:1.
138. Kalogjera T. Refractive error in Yugoslav urban children aged between 3 and 7 years. *Child Care Health Dev* 1979; 5(6):439-445.
139. Laatikainen L, Erkkila H. Refractive errors and other ocular findings in school children. *Acta Ophthalmol (Copenh)* 1980; 58(1):129-136.
140. Lai YH, Hsu HT, Wang HZ, Chang SJ, Wu WC. The visual status of children ages 3 to 6 years in the vision screening program in Taiwan. *Journal of Aapos: American Association for Pediatric Ophthalmology & Strabismus* 2009; 13(1):58-62.
141. Lam C, Goh W. The incidence of refractive errors among school children in Hong Kong and its relationship with the optical components. *Clinical and Experimental Optometry* 1991; 74(3):97-103.
142. Lan W, Zhao F, Lin L, Li Z, Zeng J, Yang Z et al. Refractive errors in 3-6 year-old Chinese children: a very low prevalence of myopia? *PloS one* 2013; 8(10):e78003.
143. Li S-M, Liu L-R, Li S-Y, Ji Y-Z, Fu J, Wang Y et al. Design, methodology and baseline data of a school-based cohort study in central china: The anyang childhood eye study. *Ophthalmic Epidemiology* 2013; 20(6):348-359.
144. Li Z, Xu K, Wu S, Lv J, Jin D, Song Z et al. Population-based survey of refractive error among school-aged children in rural northern China: The Heilongjiang eye study. *Clinical and Experimental Ophthalmology* 2014; 42(4):379-384.
145. Liang BS, Et AL. The measurement of visual refraction of pupils. *Zhonghua Yufang Yixue Zazhi* 1991; 25(2):99-101.
146. Liang YB, Lin Z, Vasudevan B, Jhanji V, Young A, Gao TY et al. Generational difference of refractive error in the baseline study of the Beijing Myopia Progression Study. *British Journal of Ophthalmology* 2013; 97(6):765-769.
147. Liao CC, Chen LJ, Yu JH, Lin JC. Refractive error change and its association with ocular and general parameters in junior high school students in Taiwan. *Japanese Journal of Ophthalmology* 2014; 58(4):375-380.

148. Lin LL, Chen CJ, Hung PT, Ko LS. Nation-wide survey of myopia among schoolchildren in Taiwan, 1986. *Acta Ophthalmol* 1988; 185(Suppl):29-33.
149. Lin LLK, Shih YF, Hsiao CK, Chen CJ. Prevalence of myopia in Taiwanese schoolchildren: 1983 to 2000. *Annals Academy of Medicine Singapore* 2004; 33(1):27-33.
150. Logan NS, Shah P, Rudnicka AR, Gilmartin B, Owen CG. Childhood ethnic differences in ametropia and ocular biometry: the Aston Eye Study. *Ophthalmic & Physiological Optics* 2011; 31(5):550-558.
151. Ma Q, Xu W, Zhou X, Cui C, Pan C-W. The relationship of season of birth with refractive error in very young children in eastern China. *PloS one* 2014; 9(6):e100472.
152. Macfarlane DJ, Fitzgerald WJ, Stark DJ. The prevalence of ocular disorders in 1000 Queensland primary schoolchildren. *Australian & New Zealand Journal of Ophthalmology* 1987; 15(3):161-174.
153. Marasini S, Sharma R, Sthapit PR, Sharma D, Koju U, Thapa G et al. Refractive errors and visual anomalies in schoolchildren in the Kavrepalanchowk District. *Kathmandu University Medical Journal* 2010; 8(32):October-December.
154. Martinez J, Canamares S, Saornil MA, Almaraz A, Pastor JC. Prevalence of amblyogenic diseases in a preschool population sample of Valladolid, Spain. *Strabismus* 1997; 5(2):73-80.
155. Matsumura H, Hirai H. Prevalence of myopia and refractive changes in students from 3 to 17 years of age. *Survey of Ophthalmology* 1999; 44:S109-S115.
156. Montes-Mico R, Ferrer-Blasco T. Distribution of refractive errors in Spain. *Documenta Ophthalmologica* 2000; 101(1):25-33.
157. Morgan A, Young R, Narankhand B, Chen S, Cottrill C, Hosking S. Prevalence rate of myopia in schoolchildren in rural Mongolia. *Optometry and Vision Science* 2006; 83(1):53-56.
158. Prevalence of Myopia and Hyperopia in 6- to 72-Month-Old African American and Hispanic Children: The Multi-Ethnic Pediatric Eye Disease Study. *Ophthalmology* 2010; 117(1):140-147 e3.
159. Nanthavisit U, Sornchai J, Jenchitr W. Survey of refractive errors among Buddhist scripture, Dhamma-Bali and regular school of Buddhist novices in the Bangkok metropolitan area. *J Med Assoc Thai* 2008; 91(Suppl 1):S24-S29.
160. Nepal BP, Koirala S, Adhikary S, Sharma AK. Ocular morbidity in schoolchildren in Kathmandu. *British Journal of Ophthalmology* 2003; 87(5):531-534.
161. Ogielska E, Czerek-Jaguczanska H, Pacynska J. [Problem of refraction anomalies in school children and students]. *Klin Oczna* 1967; 37(5):721-728.
162. Ojaimi E, Rose KA, Morgan IG, Smith W, Martin FJ, Kifley A et al. Distribution of ocular biometric parameters and refraction in a population-based study of Australian children. *Investigative Ophthalmology & Visual Science* 2005; 46(8):2748-2754.

163. Ore L, Garzozzi HJ, Schwartz N, Cohen-Dar M. Factors Influencing Prevalence of Vision and Ocular Abnormalities among Jewish and Arab Israeli Schoolchildren. *Israel Medical Association Journal* 2014; 16(9):553-558.
164. Oscar A, Cherninkova S, Haykin V, Aroyo A, Levi A, Marinov N et al. Amblyopia Screening in Bulgaria. *Journal of Pediatric Ophthalmology & Strabismus* 2014; 51(5):284-288.
165. Ostadimoghaddam H, Fotouhi A, Hashemi H, Yekta A, Heravian J, Rezvan F et al. Prevalence of the refractive errors by age and gender: the Mashhad eye study of Iran. *Clinical & Experimental Ophthalmology* 2011; 39(8):743-751.
166. Pant M, Shrestha GS, Joshi ND. Ocular Morbidity among Street Children in Kathmandu Valley. *Ophthalmic Epidemiology* 2014; 21(6):356-361.
167. Pi L-H, Chen L, Liu Q, Ke N, Fang J, Zhang S et al. Refractive status and prevalence of refractive errors in suburban school-age children. *International Journal of Medical Sciences* 2010; 7(6):342-353.
168. Rezvan F, Khabazkhoob M, Fotouhi A, Hashemi H, Ostadimoghaddam H, Heravian J et al. Prevalence of refractive errors among school children in Northeastern Iran. *Ophthalmic & Physiological Optics* 2012; 32(1):25-30.
169. Rodriguez MA, Castro Gonzalez M. Visual health of schoolchildren in Medellin, Antioquia, Colombia. *Bol Oficina Sanit Panam* 1995; 119(1):11-14.
170. Saw SM, Chan B, Seenyen L, Yap M, Tan D, Chew SJ. Myopia in Singapore kindergarten children. *Optometry* 2001; 72(5):286-291.
171. Saw SM, Cheng A, Fong A, Gazzard G, Tan DT, Morgan I. School grades and myopia. *Ophthalmic Physiol Opt* 2007; 27(2):126-129.
172. Shrestha RK, Joshi MR, Ghising R, Pradhan P, Shakya S, Rizyal A. Ocular morbidity among children studying in private schools of Kathmandu valley: A prospective cross sectional study. *Nepal Medical College Journal: NMCJ* 2006; 8(1):43-46.
173. Shrestha RK, Joshi MR, Ghising R, Rizyal A. Ocular morbidity among children attending government and private schools of Kathmandu valley. *Journal of the Nepal Medical Association* 2012; 51(4):October-December.
174. Shrestha GS, Manandhar S, Joshi ND, Shrestha JK. Ocular morbidity among the children of squatter settlements in Kathmandu. *Optom Vis Sci* 2013; 90(9):1012-1018.
175. Sorsby A, Benjamin B, Sheridan M, Stone J, Leary GA. Refraction and its components during the growth of the eye from the age of three. *Memo Med Res Counc* 1961; 301(Special):1-67.
176. Tan G, Ng Y, Lim Y, Ong P, Snodgrass A, Saw S. Cross-sectional study of near-work and myopia in kindergarten children in Singapore. *Annals Academy of Medicine Singapore* 2000; 29(6):740-744.
177. Villamor RE. Study of refraction in schoolchildren in Guadalajara. *Rev Sanid Hig Publica (Madr)* 1980; 54(5-6):547-554.

178. Villarreal GM, Ohlsson J, Cavazos H, Abrahamsson M, Mohamed JH. Prevalence of myopia among 12- to 13-year-old schoolchildren in Northern Mexico. *Optometry and Vision Science* 2003; 80(5):369-373.
179. Villarreal MG, Ohlsson J, Abrahamsson M, Sjoström A, Sjöstrand J. Myopisation: The refractive tendency in teenagers. Prevalence of myopia among young teenagers in Sweden. *Acta Ophthalmologica Scandinavica* 2000; 78(2):177-181.
180. Virgili G, Angi M, Heede S, Rodriguez D, Bottega E, Molinari A. PowerRefractor versus Canon R-50 autorefractometer to assess refractive error in children: A community-based study in Ecuador. *Optometry and Vision Science* 2007; 84(2):144-148.
181. Wang X, Liu D, Feng R, Zhao H, Wang Q. Refractive error among urban preschool children in Xuzhou, China. *International Journal of Clinical and Experimental Pathology* 2014; 7(12):8922-8928.
182. Watanabe S, Yamashita T, Ohba N. A longitudinal study of cycloplegic refraction in a cohort of 350 Japanese schoolchildren. *Cycloplegic refraction. Ophthalmic Physiol Opt* 1999; 19(1):22-29.
183. Wen G, Tarczy-Hornoch K, McKean-Cowdin R, Cotter SA, Borchert M, Lin J et al. Prevalence of myopia, hyperopia, and astigmatism in non-hispanic white and Asian children: Multi-ethnic pediatric eye disease study. *Ophthalmology* 2013; 120(10):2109-2116.
184. Williams SM, Sanderson GF, Share DL, Silva PA. Refractive error, IQ and reading ability; a longitudinal study from age seven to 11. *Developmental Medicine and Child Neurology* 1988; 30(6):735-742.
185. Woodruff ME. Vision and refractive status among grade-1 children of the province of New-Brunswick. *American Journal of Optometry and Physiological Optics* 1986; 63(7):545-552.
186. Xiang F, He M, Morgan IG. The impact of parental myopia on myopia in Chinese children: population-based evidence. *Optometry & Vision Science* 2012; 89(10):1487-1496.
187. Yekta A, Fotouhi A, Hashemi H, Dehghani C, Ostadimoghaddam H, Heravian J et al. Prevalence of refractive errors among schoolchildren in Shiraz, Iran. *Clinical and Experimental Ophthalmology* 2010; 38(3):242-248.
188. Yingyong P. Refractive errors survey in primary school children (6-12 year old) in 2 provinces: Bangkok and Nakhonpathom (one year result). *J Med Assoc Thai* 2010; 93(10):1205-1210.
189. Yoon KC, Mun GH, Kim SD, Kim SH, Kim CY, Park KH et al. Prevalence of eye diseases in South Korea: data from the Korea National Health and Nutrition Examination Survey 2008-2009. *Korean J Ophthalmol* 2011; 25(6):421-433.
190. You QS, Wu LJ, Duan JL, Luo YX, Liu LJ, Li X et al. Factors associated with myopia in school children in China: the Beijing childhood eye study. *PLoS ONE [Electronic Resource]* 2012; 7(12):e52668.
191. Young FA, Leary GA, Baldwin WR, West DC, Box RA, Goo FJ et al. Refractive errors, reading performance, and school achievement among Eskimo children. *Am J Optom Arch Am Acad Optom* 1970; 47(5):384-390.

192. Zhao J, Pan X, Sui R, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: Results from Shunyi District, China. *American Journal of Ophthalmology* 2000; 129(4):427-435.
193. Zylbermann R, Landau D, Berson D. The influence of study habits on myopia in Jewish teenagers. *Journal of Pediatric Ophthalmology and Strabismus* 1993; 30(5):319-322.