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An epidemiological study of vision disorders in the women, infants and children (W.I.C.) population in Multnomah and Washington counties, Oregon

Anthony P. Stout
Pacific University

Kathy C. Kim
Pacific University

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Abstract

The Woman, Infants, and Children program is a federally funded program founded in 1974 to improve the health and nutrition of women of reproductive age and young children in at-risk populations. Because early detection and management of ocular conditions may enhance the life success of many children, Pacific University College of Optometry (PUCO) in Forest Grove, Oregon established WIC Eye Care Program to serve the eye and vision care needs of pediatric patients in WIC. This paper evaluates the epidemiology of vision disorders from a sample of the pediatric WIC population in the communities of Multnomah and Washington Counties, Oregon. The WIC data collected included vision screenings and examination data from three Pacific University clinics: The Northeast Eye Center and Southeast Eye Center in Portland, and the Family Vision Center in Forest Grove. Prevalence data includes both screening and examination results. Refractive error was of highest prevalence in all cases regardless of whether a screening or examination was performed, with hyperopia occurring at the highest rate (12.8% in exams and 4.3% in screenings). Myopia was found in 2 examinations (2.3%) and in 1 screening (0.5%) in our study. Both hyperopia and myopia in our study population appears to be lower than the prevalence rates cited in other epidemiological studies. Of refractive conditions, anisometropia (2.3% of examinations) and astigmatism (1.2% of exams and 0.5% of screenings) were of the lowest prevalence. Health problems were seen in 7% of the examined population and 1.6% of screenings; a rate of ocular health problems that is higher than prevalences reported in other studies. Though results of this study were inconclusive in determining prevalence for the population, this pilot study will serve as a foundation for more future extensive visual ocular prevalence studies in the WIC population.

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AN EPIDEMIOLOGICAL STUDY OF VISION DISORDERS IN THE WOMEN, INFANTS AND CHILDREN (W.I.C.) POPULATION IN MULTNOMAH AND WASHINGTON COUNTIES, OREGON

By

ANTHONY P. STOUT

and

KATHY C. KIM

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Faculty Advisors:

John P. Lowery, O.D., M.Ed.

Lorne Yudcovitch, O.D., M.S., F.A.A.O.

Faculty Advisors:

John P. Lowery, O.D., M.Ed.

Lorne Yudcovitch, O.D., M.S., F.A.A.O.

Authors:

Kathy C. Kim, B.S.

Anthony P. Stout, B.S.

Pacific University College of Optometry

2043 College Way

Forest Grove, Oregon 97116

Biographies

Kathy C. Kim

Kathy graduated from The University of Kansas with a Bachelor of Science Degree. Upon receiving her Doctor of Optometry Degree, Kathy plans to practice optometry on the West Coast.

Anthony P. Stout

Anthony graduated Cum Laude with a Bachelor of Science degree in Biology from Utah State University of Logan, Utah. While completing his B.S., he served as a non-commissioned officer of a medical unit in the United States Army Reserve. During optometry school, he worked as an outdoor leader for Pacific University's outdoor program. Upon graduation, he is considering a career with Indian Health Services, serving the Native American population of the desert Southwest.

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Abstract

The Woman, Infants, and Children program is a federally funded program founded in 1974 to improve the health and nutrition of women of reproductive age and young children in at-risk populations. Because early detection and management of ocular conditions may enhance the life success of many children, Pacific University College of Optometry (PUCO) in Forest Grove, Oregon established WIC Eye Care Program to serve the eye and vision care needs of pediatric patients in WIC. This paper evaluates the epidemiology of vision disorders from a sample of the pediatric WIC population in the communities of Multnomah and Washington Counties, Oregon.

The WIC data collected included vision screenings and examination data from three Pacific University clinics: The Northeast Eye Center and Southeast Eye Center in Portland, and the Family Vision Center in Forest Grove.

Prevalence data includes both screening and examination results. Refractive error was of highest prevalence in all cases regardless of whether a screening or examination was performed, with hyperopia occurring at the highest rate (12.8% in exams and 4.3% in screenings). Myopia was found in 2 examinations (2.3%) and in 1 screening (0.5%) in our study. Both hyperopia and myopia in our study population appears to be lower than the prevalence rates cited in other epidemiological studies. Of refractive conditions, anisometropia (2.3% of examinations) and astigmatism (1.2% of exams and 0.5% of screenings) were of the lowest prevalence. Health problems were seen in 7% of the examined population and 1.6% of screenings; a rate of ocular health problems that is higher than prevalences reported in other studies. Though results of this study were inconclusive in determining prevalence for the population, this pilot study will serve as a foundation for more future extensive visual ocular prevalence studies in the WIC population.

Introduction

The federally funded WIC program was founded in 1974 to improve the health and nutrition of women of reproductive age and young children in at-risk populations[1]. WIC provides nutritious foods, nutrition counseling, and referrals to health and other social services (such as immunizations) to participants at no charge[2]. To participate in the WIC program, applicants must (1) live in an area served by a WIC clinic (2) be an infant or child, or a pregnant, postpartum, or breastfeeding woman, (3) have a household income less than 185% of poverty guidelines and (4) have a nutritional risk including anemia, teen pregnancy teen, poor growth or other health needs[1]. WIC is available in all 50 states, 33 Indian Tribal Organizations, American Samoa, District of Columbia, Guam, Puerto Rico and the Virgin Islands[2].

The WIC program has proven effective in improving and protecting the health and nutritional status of low-income women, infants, and children. A twenty-year review of the effects of the WIC program in the Journal of the American Dietetic Association[3] states that infants born to women who participate in WIC during pregnancy tend to have a slightly greater mean birth weight than those born to women who were eligible but did not participate. Increased birth weight has been associated with a greater mean gestational age and a lower prevalence of iron deficiency anemia among toddlers and preschool children[3].

The Oregon WIC program provides service to all people who can prove they are certified as fully eligible, regardless of citizenship. Individuals covered by Medicaid (the Oregon Health Plan), Temporary Assistance for Needy Families (TANF), Food Stamps or the Food Distribution Program on Indian Reservations are automatically eligible for WIC[1]. In the year 2000, Multnomah County in Northwest Oregon had 18,309 WIC participants, 89 authorized WIC vendors, four clinic sites, six participating farmers markets, and 34 full-time employed WIC

staff. Thirty-five percent of women in Multnomah County were enrolled in WIC during their pregnancy[4].

In August of 1998, Pacific University College of Optometry (PUCO) in Forest Grove, Oregon established the Women, Infants, and Children Eye Care Program to serve the eye and vision care needs of pediatric patients in WIC[5]. Many health factors can affect ocular status of children and newborns. Children of premature birth, poor nutrition, low birth weight or had distressed births are at a higher risk for visual problems. For example, a study based on the Swedish Register of Visually Impaired Children found that optic nerve hypoplasia is associated with signs of general disturbances in fetal development. Young maternal age, maternal smoking, and pre-term birth factors put newborns at higher risk for optic nerve hypoplasia[6]. It has also been documented that ocular signs of vitamin A deficiency are associated with increased mortality among children aged 6 months or older[7]. The risk of retinopathy of prematurity is also well-documented with premature birth and low birth weight.

Currently, no nationwide studies have investigated the prevalence of ocular disorders in the WIC population. According to the American Optometric Association, vision disorders in the general pediatric population of the United States are estimated at nearly 25% of school-aged children. A survey conducted by Vision Service Plan (VSP) revealed that 40% of children needed glasses, 3% had a treatable disease, and 4% had either allergies, scratched cornea, or amblyopia[12]. As only about 33% of all children in the United States have had an eye exam or vision care prior to entering school, it is likely that many disorders go undetected[8-11].

Early detection may lead to more effective and time efficient treatment modalities enhancing the overall success of many children. Convergence insufficiency is one of the largest binocular problems in the world, affecting 5% of the children and adults in the United States[13]. Amblyopia is a vision disorder that can be addressed at any age, yet it is well known that early

intervention yields the most improved results. Children treated for amblyopia are four times less likely to remain amblyopic if they are screened and treated between 8 and 37 months, rather than if they screened only at 37 months. As compared to children screened then treated after 37 months, amblyopic children screened and treated early can see an average of one line more with their amblyopic eye[14].

This study was done to evaluate the epidemiology of vision disorders of the pediatric WIC population in Portland and Forest Grove communities in Multnomah and Washington Counties. We hope to increase the amount of consistent and reliable information regarding this population, and indicate further studies that will allow this population to be better served in the future.

Methods

Data Collection

The WIC data collected included vision screenings from two Portland, Oregon locations: the Northeast Eye Center and Southeast Eye Center. Data was also colleted from the Family Vision Center in Forest Grove, Oregon. Using Pacific Universities Eyecare Advantage computer database, a list of patients participating in the WIC program was generated. From this list, screening and examination forms were collected for infant and children WIC patient's ages 1 month to 6 years. Data collected from screening forms included gender, ages, location of most recent eye exam/screening, date of birth, pass/ fail of screening test, and reason for failures. It was initially assumed that many screening failures would have accompanying examinations, however, we found that of 86 total patients that received an examination, only 4 received both a screening and an exam. Examination files for majority of patients with failed screenings were not obtainable. Reasons for this included lack of insurance or personal finances to obtain an eye examination, or an eye exam was obtained at another clinic. Conversely, many patients' entering the clinic with intentions of having vision screenings, may have instead received examinations if the examiner detected an obvious and emergent problem. Data collected from examination forms included the same as that for screening, in addition to a diagnosis. If diagnosis was for a refractive condition, data was only recorded if there was significant enough error to necessitate treatment.

Screenings

During the screening, the patient's name, date of birth, address, gender, phone number and date of screening are initially collected. The examiner then takes a case history, and lastly evaluates ocular health and visual skills considered necessary for efficient visual function by eye

care professionals. The screening is not a complete eye exam and does not guarantee that the examined patient is free from visual dysfunction or disease. Any part of the screening that was failed indicated a potential need for a comprehensive eye exam by a licensed professional.

The case history consists of the chief visual complaint, and on the screening form is a checklist of visual complaints that can be chosen and noted by the patient or caregiver: blur, double images, ghost images, itch, burn, redness, secretion or crust, pain, fatigue, light sensitivity, squinting, halos, flashes, floaters, or headaches. The case history also documents occupation, date of last eye exam, last medical exam, hobbies and glasses/contact lenses. Specific information regarding patient and family ocular history include: infection or disease, injury, surgery, glaucoma, lazy eye, turned eye, blindness, and other. Patient and family medical information is collected regarding high blood pressure, heart problems, stroke, respiratory problems, diabetes, thyroid problems, arthritis, and other. Patient medications and allergies are also noted in the case history portion of the screening.

The testing portion consists of visual acuity, cover test, eye movements, retinoscopy, pupils, ophthalmoscopy and optional testing. Visual acuity was taken at far and near, OD, OS and OU. Visual acuity testing methods that could be used were Snellen, Tumbling E, Child's Recognition and Preferential Looking. The cover test was quantified at near and far when possible. Eye movements were evaluated based on extraocular movement testing, NPC with break and recovery and stereo tests using Lang, Stereo Butterfly, Stereo Fly, Random Dot, Wirt Dot or other methods. Retinoscopy was done on both OD and OS. Pupils were evaluated using PERRLA method and presence or absence of Marcus Gunn. Ophthalmoscopy was used to obtain C/D ratio, A/V ratio and FLR. Optional testing included tonometry (OD, OS and time of testing), confrontation fields, color vision, blood pressure and accommodation/vergence. Any

collected data not meeting the criteria to pass was noted that the criteria was not met and was considered a failed screening.

The last portion of the screening form indicates whether the patient passed or failed and any additional comments from the screener. A passed screening indicates that all test criteria have been met or exceeded and the patient will likely experience no visual problems presently. A failed screening indicates that a comprehensive vision exam by a professional eye care practitioner is needed. A failed screening can also indicate that a physical examination by a family physician is needed.

Copies of the screening form were given to the patient, sponsor, and Pacific University College of Optometry. If further examination was needed, a copy was also sent to the appropriate health care practitioner to assist in their evaluation.

Data Analysis

Because of the differing visual characteristic of children based on age, previous authors[15, 16] have subdivided the pediatric population into three different categories: infants and toddlers, preschool children, and school aged children. As the oldest children in this study were 6 years old, children in this study were divided into two categories: (1) infants and toddlers (birth to 2 years of age) and (2) preschool age children (3-6 years of age). Additionally, the patients were subdivided by clinical population: Forest Grove, Northeast, and Southeast Vision clinics. Data were analyzed first as one large group, and then again by ages, and by clinical population. Prevalence rates of conditions from both screening and examination data from the combined clinical population are presented in the results and discussion.

Results

All Subjects

Screenings were conducted on a total of 186 patients. The population of children screened was composed of 55.4% male and 44.6% female patients, with an average age of 2.54 years. Of all screenings, there was an overall failure rate of 12%. Reasons for screening failure included refractive conditions, strabismus, health conditions, and other. Refractive conditions affected 5.4% of the screened clinical population, with significant hyperopia at the top of the list (4.3%). Next was myopia (0.5%) and astigmatism (0.5%). Strabismus was found in 2.2% of the screenings, with 1.1% being hyperopic esotropes and another 1.1% being unspecified strabismus. Of health conditions (1.6%), 0.5% failed for blepharitis, 0.5% for a large C/D ratio, and 0.5% for an unspecified red eye. Other reasons for failure (2.7%) included inadequate acuity, lack of cooperation, and unknown.

A total of 86 patients had examinations, of which 32% were remarkable. The average age of patients examined was 3.09 years, and 52.3% were female, while 47.7% were male. Again, refractive conditions (17.4%) topped the list with hyperopia being the most prevalent (12.8%). Myopia and astigmatism were also found in the population at 2.3% and 1.2%, respectively. Health conditions inflicted 7% of the examined population; conditions included bleparitis, congenital cataract, chalazion, follicular reaction, lacrimal duct occlusion, and subconjunctival hemorrhage. Strabismus was found in 2.3% of the examined population, and was followed by combined conditions (2.3%), than other conditions (1.2%).

Comparison of screening and examination results reveals a higher percentage of ocular disorders in the examined population than in the screened population. Refractive conditions, notably hyperopia was of highest prevalence in both exams and screenings. Strabismus rates

were similar between the two populations, while health conditions were higher in the examined population. Conditions in the "other" category were of higher prevalence in the screening results. However, this is because many items in this category were not actual conditions, but reasons for failure (ie. Visual acuity, lack of child cooperation during the screening, ect).

Table 1: Total prevalence rates of vision conditions found the combined Forest Grove, Northeast, and Southeast Pacific University clinical WIC populations.

	Screenings		Exams	
	#	%	#	%
Total Number	186		86	
Male	103	55.4%	45	52.3%
Female	83	44.6%	41	47.7%
Avg Age	2.54		3.09	
Unremarkable (Includes Screen Passes)	164	88.2%	59	68.6%
Remarkable	22	11.8%	27	31.4%
Refractive	**10**	**5.4%**	**15**	**17.4%**
Anisometropia	0	0.0%	2	2.3%
Astigmatism	1	0.5%	1	1.2%
Hyperopia (w or w/o astigmatism)	8	4.3%	11	12.8%
Myopia (w or w/o astigmatism)	1	0.5%	2	2.3%
Strabismus	**4**	**2.2%**	**2**	**2.3%**
Hyperopic ET	0	0.0%	1	1.2%
Myopia with XT	2	1.1%	0	0.0%
Alt ET with myopia	0	0.0%	1	1.2%
Unspecified Strabismus	2	1.1%	0	0.0%
Health	**3**	**1.6%**	**6**	**7.0%**
Blepharitis	1	0.5%	1	1.2%
Congenital Cataract	0	0.0%	1	1.2%
Chalazion	0	0.0%	1	1.2%
Follicular Reaction	0	0.0%	1	1.2%
Lacrimal Duct Occlusion	0	0.0%	1	1.2%
Large C/D	1	0.5%	0	0.0%
Red Eye	1	0.5%	0	0.0%
Subconjunctival Heme	0	0.0%	1	1.2%
Combined Conditions	**0**	**0.0%**	**2**	**2.3%**
Hyperopia/Amblyopia/ ET	0	0.0%	1	1.2%
Hyperopia with Amblyopia	0	0.0%	1	1.2%
Other (Totals)	**5**	**2.7%**	**1**	**1.2%**
Acuity (unequal or not adequate OU)	2	1.1%	0	0.0%
R/G Color Deficiency	0	0.0%	1	1.2%
Uncooperative	2	1.1%	0	0.0%
Unknown	1	0.5%	0	0.0%

Table 2: Screening and examination results for each clinic population.
S = screening, E = examination.

	Northeast		Southeast		Forest Grove		Combined	
	S	**E**	**S**	**E**	**S**	**E**	**S**	**E**
Total Number	112	20	58	64	16	2	186	86
Male	60	12	34	31	9	2	103	45
Female	52	8	24	33	7	0	83	41
Avg Age	2.5	3.6	2.9	3	2	1	2.57	3
Unremarkable (Includes Screen Passes)	94	11	56	47	14	1	164	59
Remarkable	18	9	2	17	2	1	22	27
Refractive (Totals)	**10**	**6**	**0**	**9**	**0**	**0**	**10**	**15**
Anisometropia	0	0	0	1	0	1	0	2
Astigmatism	1	1	0	0	0	0	1	1
Hyperopia (w or w/o astigmatism)	8	3	0	8	0	0	8	11
Myopia (w or w/o astigmatism)	1	2	0	0	0	0	1	2
Strabismus	**3**	**1**	**1**	**1**	**0**	**0**	**4**	**2**
Hyperopic ET	0	1	0	0	0	0	0	1
Myopia with XT	2	0	0	0	0	0	2	0
Alt ET with myopia	0	0	0	1	0	0	0	1
Unspecified Strabismus	1	0	1	0	0	0	2	0
Health (Totals)	**0**	**1**	**1**	**5**	**2**	**0**	**3**	**6**
Blepharitis	0	0	1	1	0	0	1	1
Congenital Cataract	0	1	0	0	0	0	0	1
Chalazion	0	0	0	1	0	0	0	1
Follicular Reaction	0	0	0	1	0	0	0	1
Lacrimal Duct Occlusion	0	0	0	1	0	0	0	1
Large C/D	0	0	0	0	1	0	1	0
Red Eye	0	0	0	0	1	0	1	0
Subconjunctival Heme	0	0	0	1	0	0	0	1
Combined Conditions	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**2**
Hyperopia/Amblyopia/ ET	0	1	0	0	0	0	0	1
Hyperopia with Amblyopia	0	0	0	1	0	0	0	1
Other (Totals)	**5**	**0**	**0**	**1**	**0**	**0**	**5**	**1**
Acuity (unequal or not adequate OU)	2	0	0	0	0	0	2	0
R/G Color Deficiency	0	0	0	1	0	0	0	1
Uncooperative	2	0	0	0	0	0	2	0
Unknown	1	0	0	0	0	0	1	0

Birth to two years of age

Screenings were completed on 80 children between birth and two years of age. The average age of the screened population between birth and two was 1.2 years old, and the population was composed of 58.8% male and 41.3% female. The failure rate of this age group was 11.3%. As with the previous age group, refractive error topped the list of reasons for failure (5%), which was followed by strabismus (2.5%), other (2.5%), and health (1.3%).

A total of 35 patients within this age group received examinations, of which 42.9% were male and 57.1% were female. The average age was 1.5 and 20% of the examinations were remarkable. Of highest prevalence were refractive conditions (11.4), with hyperopia (2.9%) being second to anisometropia (5.7%). Health conditions were reported in 8.6% of the examinations.

Both screening and examination results showed that refractive error was the most prevalent ocular condition in the population, at 4%, and 11.4% respectively. Hyperopia was at the top in screening results (3.8%), while anisometropia was the highest in the examination results. Many more health and refractive conditions were found in examinations than found in screenings, while more strabismus was found in screenings.

Table 3: Combined screening and examination results for children from birth to two years of age

	Screenings		Examinations	
	#	%	#	%
Total Number	80		35	
Male	47	58.8%	15	42.9%
Female	33	41.3%	20	57.1%
Avg Age	1.2		1.5	
Unremarkable	71	88.8%	28	80.0%
(Includes Screen Passes)				
Remarkable	9	11.3%	7	20.0%
Refractive	**4**	**5.0%**	**4**	**11.4%**
Anisometropia	0	0.0%	2	5.7%
Hyperopia (w or w/o astigmatism)	3	3.8%	1	2.9%
Myopia (w or w/o astigmatism)	1	1.3%	1	2.9%
Strabismus	**2**	**2.5%**	**0**	**0.0%**
Myopia with XT	2	2.5%	0	0.0%
Unspecified Strabismus	1	1.3%	0	0.0%
Health	**1**	**1.3%**	**3**	**8.6%**
Follicular Reaction	0	0.0%	1	2.9%
Lacrimal Duct Occlusion	0	0.0%	1	2.9%
Red Eye	1	1.3%	0	0.0%
Subconjunctival Heme	0	0.0%	1	2.9%
Other	**2**	**2.5%**	**0**	**0.0%**
Acuity (unequal or not adequate OU)	1	1.3%	0	0.0%
Uncooperative	1	1.3%	0	0.0%

Table 4: Screening and exam results for children birth to age two by clinic

	Northeast		Southeast		Forest Grove		Combined	
	S	E	S	E	S	E	S	E
Total Number	47	8	21	25	12	2	80	35
Male	28	5	13	8	6	2	47	15
Female	19	3	8	17	6	0	33	20
Avg Age	1.1	1.8	1.5	1.4	1.4	1.0	1.2	1.5
Unremarkable (Includes Screen Passes)	39	7	21	20	11	1	71	28
Remarkable	8	1	0	5	1	1	9	7
Refractive	**4**	**1**	**0**	**2**	**0**	**1**	**4**	**4**
Anisometropia	0	0	0	1	0	1	0	2
Hyperopia (w or w/o astigmatism)	3	0	0	1	0	0	3	1
Myopia (w or w/o astigmatism)	1	1	0	0	0	0	1	1
Strabismus	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**
Myopia with XT	2	0	0	0	0	0	2	0
Unspecified Strabismus	1	0	0	0	0	0	1	0
Health (Totals)	**0**	**0**	**0**	**3**	**1**	**0**	**1**	**3**
Follicular Reaction	0	0	0	1	0	0	0	1
Lacrimal Duct Occlusion	0	0	0	1	0	0	0	1
Red Eye	0	0	0	0	1	0	1	0
Subconjunctival Heme	0	0	0	1	0	0	0	1
Other	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**
Acuity (unequal or not adequate OU)	1	0	0	0	0	0	1	0
Uncooperative	1	0	0	0	0	0	1	0

Three to Six years of age

In this age group a total number of 88 children received screenings, 59.1% of who were male and 40.9% were female. The average age was 3.7 years, and the failure rate was 12.5%. As before, refractive conditions (4.5%) were of highest prevalence with hyperopia being most notable (3.4%). Strabismus was found in 3.4% of the screenings, health conditions in 2.3%, and other reasons for failure were cited in 2.3%.

There were 50 patients in this age group that received examinations, of which the average age was 4.06 years. Female patients comprised 42%, while 58% were male. This age group showed a higher proportion of remarkable examinations that the others (38%). As in previous age groups, refractive conditions (24%) was at the top, and hyperopia was the most prevalent. This was followed by strabismus (4%), health conditions (6%), and combined conditions (2%), and other conditions (2%).

In comparison of screening and examination results, there is a higher prevalence of all disorders in population of patients that received full examinations. It is also notable that there is a higher amount of hyperopia and astigmatism, and less myopia than in the birth to two-year-old population.

Table 5: Combined screening and examination results for children three to six years of age

	Screenings		Examination		Combined	
	#	%	#	%	#	%
Total Number	88		50		138	
Male	52	59.1%	29	58.0%	81	58.7%
Female	36	40.9%	21	42.0%	57	41.3%
Avg Age	3.7		4.06		3.8	
Unremarkable (Includes Screen Passes)	77	87.5%	31	62.0%	108	78.3%
Remarkable	11	12.5%	19	38.0%	30	21.7%
Refractive	**4**	**4.5%**	**12**	**24.0%**	**16**	**11.6%**
Astigmatism	0	0.0%	2	4.0%	2	1.4%
Hyperopia (w or w/o astigmatism)	3	3.4%	10	20.0%	13	9.4%
Myopia (w or w/o astigmatism)	1	1.1%	0	0.0%	1	0.7%
Strabismus	**3**	**3.4%**	**2**	**4.0%**	**5**	**3.6%**
Hyperopic ET	0	0.0%	1	2.0%	1	0.7%
Myopia with XT	2	2.3%	0	0.0%	2	1.4%
Alt ET with myopia	0	0.0%	1	2.0%	1	0.7%
Unspecified Strabismus	2	2.3%	0	0.0%	2	1.4%
Health	**2**	**2.3%**	**3**	**6.0%**	**5**	**3.6%**
Blepharitis	1	1.1%	1	2.0%	2	1.4%
Congenital Cataract	0	0.0%	1	2.0%	1	0.7%
Chalazion	0	0.0%	1	2.0%	1	0.7%
Large C/D	1	1.1%	0	0.0%	1	0.7%
Combined Conditions	**0**	**0.0%**	**1**	**2.0%**	**1**	**0.7%**
Hyperopia with Amblyopia	0	0.0%	1	2.0%	1	0.7%
Other	**2**	**2.3%**	**1**	**2.0%**	**3**	**2.2%**
Acuity (unequal or not adequate OU)	1	1.1%	0	0.0%	1	0.7%
R/G Color Deficiency	0	0.0%	1	2.0%	1	0.7%
Uncooperative	1	1.1%	0	0.0%	1	0.7%

Table 6: Screening and examination results for children three to six by clinic.

	Northeast		**Southeast**		**Forest Grove**		**Combined**	
	S	E	S	E	S	E	S	E
Total Number	47	11	37	39	4	0	88	50
Male	28	6	21	23	3	0	52	29
Female	19	5	16	16	1	0	36	21
Avg Age	1.1	5.0	3.7	3.8	3.8		3.7	4.1
Unremarkable (Includes Screen Passes)	39	4	35	27	3	0	77	31
Remarkable	8	7	2	12	1	0	11	19
Refractive	**4**	**5**		**7**	**0**	**0**	**4**	**12**
Astigmatism	0	1	0	0	0	1	0	2
Hyperopia (w or w/o astigmatism)	3	3	0	7	0	0	3	10
Myopia (w or w/o astigmatism)	1	0	0	0	0	0	1	0
Strabismus	**2**	**1**	**1**	**1**	**0**	**0**	**3**	**2**
Hyperopic ET	0	1	0	0	0	0	0	1
Myopia with XT	2	0	0	0	0	0	2	0
Alt ET with myopia	0	0	0	1	0	0	0	1
Unspecified Strabismus	1	0	1	0	0	0	2	0
Health	**0**	**1**	**1**	**2**	**1**	**0**	**2**	**3**
Blepharitis	0	0	1	1	0	0	1	1
Congenital Cataract	0	1	0	0	0	0	0	1
Chalazion	0	0	0	1	0	0	0	1
Large C/D	0	0	0	0	1	0	1	0
Combined Conditions	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**
Hyperopia with Amblyopia	0	0	0	1	0	0	0	1
Other	**2**	**0**	**0**	**1**	**0**	**0**	**2**	**1**
Acuity (unequal or not adequate OU)	1	0	0	0	0	0	1	0
R/G Color Deficiency	0	0	0	1	0	0	0	1
Uncooperative	1	0	0	0	0	0	1	0

Discussion

We hope that our preliminary assessment of vision disorders in the WIC program will provide a useful foundation for the development of further studies of this population. Before discussing the results, it is important to emphasize some study limitations that may affect their validity. We believe that concluding prevalence based examination results alone gives rise to a selection bias; many of the patients that received examinations may have initially presented for a screening, and would have not received an examination if unremarkable for ocular problems. In that process, a screening form may not have been filed for the patient. For this reason, it may overestimate the prevalence of conditions in this population. In addition, the population sample size of examinations and screenings were not high enough to conclude prevalence.

There is also a limit to basing prevalence on screening results, because actual diagnosis cannot be concluded. Though we believe that few vision disorders are missed in screenings, it is likely that screenings result in over-referral. Thus, it is likely that there are a high number of false positives, and a low number of false negatives, making screening sensitivity high, but specificity low. Because of these reasons, both screening and examination results will be discussed.

To date, the most comprehensive study regarding the prevalence of vision disorders and ocular disease was published by Scheiman and others[15], and focused on a clinical population of children between the ages of 6 months and 18 years. We compare our results with those of this study, as well as a few others.

Of the entire WIC sample, refractive error was of the highest prevalence in all cases regardless of how the patient was examined. Hyperopia was at the top of this list in all cases, and much higher in the preschool age group (3-6) than in the infant and toddler (birth-2) group.

This is not surprising, since the condition for including it as significant was treatment. Children at these ages are more likely to be treated as they enter kindergarten and preschool than are children of younger ages. Though few studies could be found documenting specific prevalence rates of hyperopia, it is well known that it is in a high majority of the pediatric population. Our study found that the prevalence of hyperopia in our examined sample was 12.8%. When considered in combination with strabismus and amblyopia, the rate of hyperopia in our study increases to 15.1%. In contrast, Scheiman and others[15, 16] reported a prevalence rate of 33.0% in a clinical population between the ages of 6 months to 5 years 11 months. The diagnostic criterion for Scheiman's classification was that it must be +1.50D for consideration.

Despite these results, we do not believe that it can be concluded that the prevalence of hyperopia is actually lower in our study population than that of the general population. The study by Scheiman et al used specific cut-off factors when describing the condition, while our criterion was only if it required treatment or not. We used this criterion due to the fact that it is well documented that the overwhelming majority of the population is born with hyperopia and progresses toward emmetropia with age.

Myopia was found in two patients who received an examination (2.3%) and in one patient who received a screening in our study. Scheiman[15] reported myopia at a prevalence rate of 7.9% in children aged 6 months to 5 years 11 months in his study. The study criteria for inclusion was –0.50 D or greater. This again contrasts with our treatment based study criterion. Most other studies found regarding myopia prevalence focus on its occurrence in high-risk children, such as premature and low birth weight children, in which the incidence is much higher than that of the general population [17-21]. This fact makes it surprising that the prevalence of myopia in our population was so low since many children in the WIC population are considered at high risk due to prematurity and low birth weight. However, it is also known that myopic

infants tend to emmetropize the same as hyperopic infants. Therefore, since our inclusion criterion was treatment, it is likely that many who were myopic were not included in our results.

Two of the myopia cases in our study were in the preschool aged group and one in the infant and toddler group. Though limitation by sample size makes these results inconclusive, it is not surprising that there would be a higher proportion of myopia in the preschool aged group, since it would be more likely to be compensated for at this age.

Of refractive conditions, anisometropia and astigmatism were of the lowest prevalence in our study. Scheiman[15] reports anisometropic amblyopia at a prevalence rate of 3.7% in his study population. Their study makes no mention of anisometropia in the absence of amblyopia, as was the case of 2 patients in our study. Their study reports astigmatism at a prevalence rate of 22.4%. In our study astigmatism was considered only if it was not combined with myopia or hyperopia, making it difficult to compare with Scheiman's results.

Amblyopia was found in 2.3% of our examined patients, or two cases within our study population, and was combined with esotropia in one case, and with hyperopic esotropia in another case. Both cases were detected in the preschool age group of children. Scheiman[15] reported amblyopia to exist in 7.9% of his clinical population between the ages of 6 months and 5 years 11 months. Moore[17] reports that the prevalence of amblyopia is estimated to be at 2-3% in the general population. The annual incidence of amblyopia is reported to be approximately 0.4% in preschool years[17]. Given the range of estimates between studies, and the limitation of our study based on sample size, the prevalence of amblyopia in our study compared to that in the general population is inconclusive.

Strabismus was detected in 2.3% of examinations children, and 2.2% of screened cases. This number moved up to 4.6% of examinations when considered with combined conditions. Scheiman[15] reports a much higher prevalence: 21.1% in their clinical population between ages of

6 months and 5 years 11 months. However, Moore[17] estimates the prevalence of strabismus in the general population to be about 4.5%, or 3% esotropia and 1.5% exotropia. A study conducted as part of the Health Examination Surveys of 1963-65 reported a rate of approximately 2.4% constant strabismus in non-institutionalized children between the ages of 6 and 11 years[22]. These results more closely resemble our study results (Examinations: 2.4% esotropia; screenings 1.1% exotropia, and 1.1% unspecified strabismus).

Ocular disease conditions are more rare in the pediatric population than in the adult population. Severe ocular disease processes causing marked vision loss in children, when considered all together, account for only about 1/10,000 births[17]. Our study found that 7.0% of patients who had an examination and 1.6% of children having a screening had an ocular health problem. However, none of the health issues were particularly vision threatening, aside from 1 examined case of congenital cataracts. It is unknown if this case was mild or of enough significance to cause deprivation amblyopia. Specific prevalence rates of ocular health conditions were difficult to find in the literature. Blepharitis was found in two individuals (1 screened and 1 examined), which is similar to the rate of occurrence found in Scheiman's[15] study (0.8%). Other conditions found in examinations were chalazion (1 case), follicular reaction (1 case), lacrimal duct occlusion (1 case) and subconjunctival hemorrhage (1 case). There were two screening failures that were marked for health concerns, one being a large C/D ratio, and one unspecific red eye. Though these were significant enough to cause screening failure, it is unknown whether they were vision threatening.

As this is the first study that has been undertaken for the WIC population on prevalence of ocular conditions, results can indicate the need for continuation, discontinuation, or expansion of the program. Unfortunately, the results of this study are inconclusive due to small sample size and limitations in the initial planning phase of the study. For example, no data were taken

regarding risk factors that existed in the population in order to link this information with risk of visual conditions. Thus, although speculation can be made that the WIC population is at higher risk than the normal population, no data regarding risk factors such as low birth weight, rate of prematurity, or other factors, could be obtained for sample population that we were working with. Some of these risk factors were indicated in the screening forms; however, this was likely inconsistent, as explicit indications to investigate these risk factors were not included due to the retrospective nature of this study.

Additionally, there were problems in determining whether certain individuals were WIC patients in the first place. Though most of the screening files at the Southeast clinic were WIC patients, we did not assume that every patient would be. In order to guarantee that patients were from the WIC population, we took patients names that were specified as WIC from the Eyecare Advantage computer system. These names were likely much lower than the actual number of WIC patients due to inconsistent designation of WIC in the newly-implemented clinical computer system.

Recommendations for future studies

Suggestions for improvement in future WIC studies include, first, developing a consistent and reliable method of tracking each WIC patient that enters the clinic. This method should be computer based and entry should be consistent among staff members. The computer information should be reliable and specify whether the patient received only a screening, an examination, or both. This would result in less focus on attempting to locate vision records that may not exist in one form or the other. In our case, we searched for both screening and examination charts for

each WIC patient that existed in the computer database. In terms of filing screening forms, WIC files should be clearly specified as such, and placed aside in a different file than other screenings.

Additionally, a more specific guideline should be considered when classifying certain ocular conditions. For example, hyperopia and astigmatism are much more prevalent in the literature results than what was found in this study. This is likely because most literature based these conditions on specific cut of rates, while this study only considered them if they required treatment. Also, astigmatism was only considered if it was not concurrent with myopia or hyperopia.

It may be helpful to use a specific WIC based screening form that includes a checklist of risk factors such as: race, prematurity, alcohol consumption, smoking, or drug use during pregnancy, age of mother, and illnesses or complications during pregnancy. This would allow for easier data collection and an objective assessment of risk in this population. This could then allow a better assessment of risk as compared to that of the general population.

Finally, since such a great deal of this study was based on vision screenings, an assessment of PUCO's screenings would be helpful. A high correlation between screening and examination results would allow us to make better conclusions based on the data we have; epidemiology could likely be more accurately assessed from screening data. As previously discussed, is thought the screenings result in a high number of false positives (possibly due to an overly cautious procedure/examiners), but a low number of false negatives, giving it high sensitivity and low specificity. However, since only about 5% of patients who had examinations also had screenings, neither sensitivity nor specificity information can be accurately determined.

This study may be considered a "first step" for development of further investigations of vision disorders in the Women, Infant, and Children's population. We are hopeful that these investigations will be continued.

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