



Original Research

Rates of Preschool Vision Exams in Toronto and the Effects of Immigration and Socioeconomic Status

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Abstract

Vision exams can detect eye abnormalities in young children. There is scant data about the proportion of Canadian children receiving vision exams and the barriers to preventive vision care. We surveyed the parents of 355 children from one large Canadian city (Toronto, ON) between the ages of four and six years to identify the proportion of children who had received a vision exam. We found that 41% of parents in our sample reported that their child had received a previous vision exam. Parental immigration to Canada and a lower socioeconomic status were associated with a decreased rate of vision exams whereas parental education was not. Using a Cochran-Mantel-Haenszel analysis, we controlled for the independent effect of immigration and socioeconomic status and found that only low socioeconomic status was associated with a decreased rate of vision exams. We hope this research will contribute to better-targeted interventions to increase the rate of vision exams in children.

🔑 vision exams, amblyopia, socioeconomic status

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Introduction

Vision plays a key role in the academic and social development of children. Proper visual acuity is critical to the acquisition of skills such as reading, memory, impulse regulation, and social integration (1). As a result, the Canadian Pediatrics Society (CPS) recommends that all children receive a vision exam (VE) by three to five years of age (2). However, fewer than 14% of Canadian children undergo a VE before the age of six (3). In contrast, in the United States, one 2011 study found 65% of children between the age of three and six had received a VE (4).

The most common cause of reduced vision in children is simple refractive errors, which are under-recognized and often remain untreated (5). Another vision disorder of particular importance in childhood is amblyopia, a condition in which one eye is under-stimulated, which can lead to permanent vision loss if not treated early in life (6, 7). The most common underlying causes of amblyopia include strabismus, specifically ocular malalignment, and anisometropia, defined as the blurring of one eye due to refractive error (8). Unidentified amblyopia may be associated with reduced psychosocial functioning and educational attainment in adulthood (7, 9, 10). Moreover, patients with amblyopia can be excluded from certain occupations, such as aviation or dentistry (11). Unfortunately, amblyopia often goes unidentified because the dominant eye permits near-normal binocular function so that the deficiency in the fellow eye is not detected. VEs can detect the majority of childhood vision problems, including amblyopia (12). Despite a paucity of clinical trial evidence describing the impact of early VEs on rates of amblyopia, an evidence-based Public Health approach using the best available evidence favours universal VEs for amblyopia screening in early childhood (13).

The barriers to children receiving timely VE in Canada are not yet fully understood. Many Canadian provinces, including Ontario, do not provide universal vision screening (13), although the cost of VEs is publicly covered by the Ontario Health Insurance Plan. One study found that parental knowledge and awareness of vision health played a role in determining whether children had received a VE (14). Low socioeconomic status (SES) has also been correlated with a higher prevalence of ophthalmic diseases (15). Another important social determinant of health, particularly in Canada, is immigration, which may be associated with lower SES (16). To date, no study has evaluated the impact of both immigration and SES on rates of VE.

The aim of this study was to provide an estimate of the proportion of Canadian children receiving a VE and determine the importance of SES and immigration on receiving a VE. We hope that an enhanced understanding of barriers to receiving a VE will allow primary care physicians to target interventions to those in need and allow for better systematic approaches to reducing the burden of pediatric visual defects in Canada.

Methods

The Kids2See program is a medical student-run initiative that conducts vision screening for three to six year-olds attending kindergarten in model schools in downtown Toronto. The model schools are comprised of 150 inner city schools in the Toronto District School Board (TDSB) that have a significant proportion of students living in poverty. A convenience sample of thirteen participating schools in Toronto's downtown core were chosen to participate in our study. These schools distributed a voluntary survey to parents of children who agreed to participate in screening between October, 2014 and April, 2016. All research activities, as well as the overarching Kids2See program, were approved by Research Ethics Boards at the University of Toronto and the TDSB.

The survey inquired about demographic data, including highest level of parental education attained by each spouse (elementary, high school, or university/college), household income, and subjects' medical and ophthalmic history. Specifically, parents were asked: "Has your child ever had an eye exam?" and "Has your child been diagnosed with eye problems?" Parents who did not respond to these questions were excluded from the present analysis. We analyzed the data by creating a 2x2x2 table, based on: (a) combined parental income, dichotomized at \$40,000 as a measure of SES, (b) whether the parent indicated they were born in Canada, as a measure of immigration, and (c) whether the child had had a prior VE. We then performed a Cochran-Mantel-Haenszel test to evaluate the independent odds ratio (OR) and 95% confidence interval (CI) for each category of SES and immigration with respect to VE rates. We also analyzed the effect of these variables, the school children were attending, the proportion of systemic disease present in the population, and parental education on VE rates using a chi-squared test.

Results

We received survey results from families of 355 children between the ages of 3 and 6 years, with an average age of 4.47 years. This represents a 27% response rate (from a total of 1314 surveys distributed). Fifty respondents were excluded from further analysis because of incomplete data. Of the remaining 305 respondents, 41% reported having received a VE, 6% wore glasses, 4% had a known vision disease as classified by the parents (most frequently astigmatism or myopia, but no vision-threatening disease), and 6% had a known systemic disease (most frequently asthma). 56% of parents who completed the survey were not born in Canada. Of those parents not born in Canada, 69% had lived in Canada for more than 6 years. With regards to income, 23% of respondents reported an annual household income of less than \$20,000, 22% reported between \$20,000-40,000, 14% reported between \$40,000-60,000, and 42% reported an annual household income greater than \$60,000.

Chi-squared tests showed that SES and immigration were each associated with a lower rate of VE ($p \leq 0.005$) (Table 1), while parental education was not ($p = 0.1$). Using a Cochran-Mantel-Haenszel test, we found that immigration was not a predictor for the rate of VE when we controlled for income (OR = 1.27, 95% CI = 0.8-2.1, $p = 0.4$), but a higher income was associated with a higher rate of VE, even when controlling for immigration to Canada (OR = 1.86, 95% CI = 1.11-3.11, $p = 0.027$).

Table 1. Rates of vision exam in kindergarten children at selected schools in Toronto, Ontario, Canada by household income and immigration status, as reported on parent surveys.

		No vision exam	Vision exam
Parent born outside of Canada	Household income <\$40,000	72 (24%)	34 (11%)
	Household income >\$40,000	35 (11%)	27 (9%)
Canadian-born parent	Household income <\$40,000	19 (6%)	9 (3%)
	Household income >\$40,000	52 (17%)	57 (19%)

Discussion

Our study found that kindergarten children in families of lower socioeconomic status were less likely to have received a VE than children from families of higher SES. Conversely, immigration and parental education were not predictors of having received a VE. Although a larger proportion of our cohort had received a VE than previous Canadian estimates (3), the observed rate is still lower than those identified in other countries, such as the United States (4). One factor contributing to a higher rate may be that the sampled population resides in an urban environment, typically living in close proximity to optometrist and ophthalmologist offices. Nevertheless, even in this

setting, there were still many children in our cohort who were not benefiting from preventive vision care. The lack of an association between identified systemic disease and the rate of VE suggests that this is not directly related to a lack of general primary care. Despite the association between families of lower SES and lower rates of VEs, the difference cannot be fully attributed to cost since fees for VEs are universally covered for children by Ontario provincial health care. Future research should be done to characterize other potential barriers to receiving a vision exam.

It is worth noting that the survey design imposed some limitations to data interpretation. Specifically, our survey captured immigration history from one parent only, allowing for a child's parents to be potentially categorized as "born in Canada" when one of two parents was an immigrant, or categorized as "immigrant families" when one of two parents was born in Canada. However, previous literature has classified families with one immigrant parent as having an "immigrant background," thus supporting our assignment of families with at least one immigrant parent in to this category (17). Furthermore, we have still captured a majority of immigrant families (>58%), meaning only a minority of immigrant families would have been missed if the Canadian parent responded. Another limitation of the current study is a relatively low response rate (27%), potentially due to the use of a written survey distributed by teachers, as opposed to direct contact with parents by a research assistant. We are not aware of any differing characteristics between responders and non-responders, however we acknowledge that factors such as literacy (both language and health literacy) may have contributed.

We postulate that a city-wide or province-wide universal screening program may help to overcome some barriers to vision care identified in this study. Smaller, independent programs, such as Eye See Eye Learn (ESEL), are currently operating in Ontario, but a recent report estimates that only 7% of kindergarten children in Toronto have used this program (18). Previous Canadian studies have also advocated for the development of universal school-based screenings, acknowledging that a proportion of children from disadvantaged backgrounds are not receiving a formal assessment prior to entering school (13, 19). Future studies need to ascertain how to best target interventions to detect visual impairment in the pediatric population.

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