Parental Education Level and the Impact on Child Vaccine Status

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Introduction

Though vaccines are considered to be the single greatest public health achievement of the 20th century, not all parents of U.S. children adhere to vaccination recommendations. The U.S. has one of the higher child immunization rates compared to other countries (93% vaccinated for polio, 91% for MMR, and 83% for DtaP) (CDC), but herd immunity and complete eradication of disease can only be complete with greater participation. Both the media and social discussion has increased the public focus on reasons why parents may not vaccinate their children, such as combination vaccines "overloading" the child's immune system, mercury in vaccines, short-term side effects such as pain and fever, and the notoriously popular myth about vaccines causing autism. Physicians may aim to target and alleviate some of these concerns in parents, but are they targeting the wrong factors? Are these "common" reasons that parents refuse vaccines for their children really why vaccination coverage is low, or are there other factors to blame? Several studies have examined how demographics such as race and SES affect child vaccination rates, but parental education levels may be commonly overlooked or obscured by these confounding variables. We aim to look at parental education as its own variable in influencing beliefs towards child vaccination, and how that alone may contribute to the general lack of knowledge, and therefore lack of utilization, of childhood vaccines.

PICO Question

P= parents of children in need of vaccinations

I= low parental education level

C= high parental education level

O= child vaccination status

Among parents of children in need of vaccination, does low education level (compared to high education level) affect the child's vaccination status?

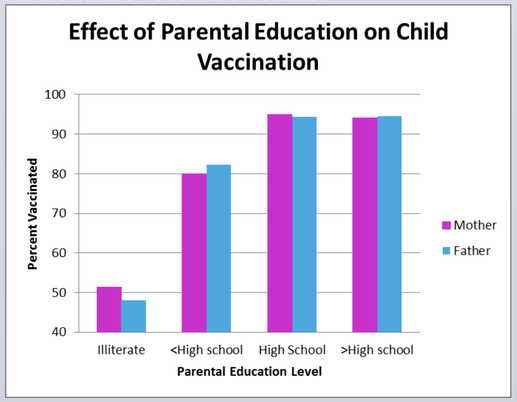

Figure 1. Effect of Parental Education on Child Vaccination. Maternal and paternal education were measured as illiterate, less than a high school level education, a high school education, or education beyond high school. Increased levels of maternal education had an adjusted OR (95% CI) of 3.56. (Vassiliki, et al.)

Methods

A literature search via NCBI PubMed was performed for studies involving parental education level in relation to child vaccination status. Search terms included *pediatric vaccination rates, childhood vaccination, unvaccinated children, parental education, maternal education*, and *paternal education*. Results were limited to articles published in English, availability of full text, and articles free of cost. Articles were then individually searched for parental education as an independent variable in predicting childhood vaccination status. 12 articles were found to meet the criteria for childhood vaccination as a factor of parental socioeconomic status. Of these 12, 8 articles were found to relate directly to parental education level and were reviewed. Recent vaccination statistics were obtained from the CDC website.

Results

Authors /title	Study design	Population studied	Key findings	Limitations
Racine & Joyce[2]	Retrospective descriptive study	pooled data from NIS from 1995-2003 > national probability sample of children ages 19-35 mos in all 50 states & 28 selected metropolitan areas	Monotonically increasing trend in maternal education and vaccine series adherence. Children of women with less than a high school education were 7.8% less likely to have children that were up-to-date on vaccine schedules compared with college-educated women (p<0.05). Maternal education was found to be a factor independent of race/ethnicity and income. At all levels of education, living in a Universal state (a state with VFC & pooled funds to provide all children with vaccines for free) increased the likelihood of having a child with up-to-date vaccination status.	Does not factor in other vaccine initiatives or funds besides VFC NIS strengths: large sample size, follow-up with provider for accuracy NIS weaknesses: sample size for each state is not big; only looks at number of doses, not accuracy of schedule
Nankabirwa et al[3]	Community-based prospective cohort study	Mbale district of Eastern Uganda, 1 urban county & 1 rural; pregnant women who reside & stay in study area, singleton children	This study analyzed the differences between maternal primary school education and maternal secondary school education and the effects on child vaccination status; less than half (46%) of the primary-school-educated women had their children adequately vaccinated, while 65% of those with a secondary education had their children adequately vaccinated. The secondary-school-educated mothers were 50% less likely to miss certain schedules of series of shots (RR 0.5, 95% CI 0.4-0.7, p<0.25). The study suggests that resources to increase vaccination coverage in children should be targeted at women with lower levels of formal education.	Other associations that possibly increase the likelihood to get vaccines: delivery at hospital or health center, use of mosquito bed nets Data is from a low-income country
Vassiliki et al[4]	Cross sectional study	Infants 2-24 months in Attica, Greece at the P&A Kyriakou Children's Hospital between 2009-2011	Full immunization was defined as adherence to the Greek National Immunization Programme. Parent's age, occupational status, and educational status were independently analyzed for vaccination coverage. Infants were less likely to be vaccinated if their parents were illiterate, unemployed, or were younger than 20 years old. Only 51.4% of children of illiterate mothers received full immunization, while >90% of children from mothers with an education of high school or beyond were fully immunized (OR 3.56, 95% CI, 1.95-6.49, p<0.01). 48.3% of children from mothers younger than 20 received full immunizations while 90% of children of parents 21 and older were fully immunized. "Blue collar worker" parents had the lowest immunization rates (73-76%) of all occupational statuses (OR 0.14, 95% CI, 0.03-0.6, p<0.001).	Small sample size Population not equally representative of US citizens Study was performed during a period of socioeconomic instability and may not be representative of similar factors during a period of social stability.
Angelillo et al[5]	Cross-sectional survey	839 mothers from 24 public kindergartens in Italy	Lack of knowledge prevents Italian mothers from being able to identify all the mandatory vaccines for infants. Level of knowledge about mandatory vaccinations for infants correlated significantly with the mother's age and level of education.	Study conducted in Italy (different culture)
Vikram et al[6]	Descriptive study	India Human Development Survey of 2004-5	This study acknowledged the pre-existing correlation between maternal education level and child immunization rates and sought to explain reasons for that correlation. These reasons were identified as being human capital advantage (better knowledge of medical care), social capital (more contacts that enable access to care), cultural capital (education leads to skills, which lead to social value, which leads to status & confidence, which leads to easier social interaction with providers), & empowerment (assertive role in insisting on better healthcare). Human & cultural capitals seem to be the most influential factors in determining maternal education & childhood immunization.	Excludes polio because of successful intervention efforts in India
Lopreiato & Ottolini[7]	Cross-sectional survey	Parents of 1977 children (age 2mo-18yr) from 7 military health care facilities filled out questionnaires	Parental education & SES were not significantly associated with immunization delay, but incorrect parental perception of immunization status was (among parents of kids whose immunizations were delayed, 79% thought they were up-to-date).	Sample demographics (90% of military parents= HS graduates) do not represent total population
Rammohan et al[8]	National survey data (Demographic and Health Survey)	6 countries w/ the highest #'s of children missing the measles vaccine in 2008 (⅔ of the 22.7 mill kids who missed measles vaccinations lived in these countries)	Within each level of maternal education (even if a mother is illiterate), there is a large, statistically significant (p<0.05), positive correlation between measles vaccination and a father having secondary or higher education level. The proportion of children who were vaccinated w/ measles increased as the father's education increased, regardless of mother's education levels.	Countries studied not necessarily same cultures/ values as in US (India, Nigeria, China, DR of Congo, Pakistan, Ethiopia, Indonesia)
Scheiber & Halfon[9]	Descriptive study (retrospective)	CA Dept of Health Services Selective Review & Kindergarten Survey	SES correlates with the type of clinic at which children receive their vaccines: children who received all their vaccines in public health clinics were less adequately immunized than children who received immunizations in the private sector. This discrepancy becomes significant at certain ages; at 7 months, only 32% of children that received vaccines at public clinics were adequately immunized, while children utilizing private physicians was twice that.	Old data Strengths of kindergarten surveys: schools keep vaccine records so there's a lot of data, high completion rate Weaknesses: not timely, labor intensive

Conclusion

Results: In all but one study, lower education level of at least one parent was correlated with lower vaccination rates in children.

Conclusion: Often, the media tends to sensationalize the anti-vaccine debate in the context of a factitious correlation with autism, mercury poisoning, and vaccine "overload." However, according to the literature we identified, an important group of patients who are not vaccinating their children are parents with a lower level of education. This group of parents tend to have a greater lack of knowledge of schedules and lack of information from care providers than their higher educated counterparts. Lower levels of education are also correlated with lower socioeconomic status, low health literacy, and decreased access to care[6, 10]. This specific population presents an opportunity to improve vaccination rates through education & targeted immunization programs. Our analysis was limited by the lack of data originating in the United States, the cross-cultural applicability to the US population and healthcare system, and the study designs themselves (cross sectional, cohort, retrospective, and descriptive studies).

Recommendations for Action

- Target lower-educated populations in an effort to increase vaccination
- Work to identify which patients are less educated than others via patient intake questionnaires
- Educate parents and increase health literacy in an effort to increase likelihood of adherence to vaccination schedules
- Incorporate and provide information about vaccine programs like VFC to target populations that may not be able to afford vaccines
- Work to achieve "Universal Statehood" for all states where VFC and other funds are utilized to provide all vaccines to all children for free
- Track child immunization schedules and adherence to that schedule, both at the provider's office and at home; send periodic reminders to parents about maintaining that schedule

References

1. Immunization data for U.S. http://www.cdc.gov/nchs/fastats/immunize.htm. 2013. Accessed April 23, 2015.
2. Racine AD, Joyce TJ. Maternal education, child immunizations, and public policy: Evidence from the US National Immunization Survey. *Social Science & Medicine*. 2007 October; 65(8): 1765-1772
3. Nankabirwa V, Tylleskär T, Tumwine JK, Sommerfelt H. Maternal education is associated with vaccination status of infants less than 6 months in Eastern Uganda: a cohort study. *BMC Pediatrics*. 2010;10:92. doi:10.1186/1471-2431-10-92.
4. Vassiliki P, Ioanna K, Artemis V, et al. Determinants of vaccination coverage and adherence to the Greek national immunization program among infants aged 2-24 months at the beginning of the economic crisis (2009-2011). *BMC Public Health*. 2014;14:1192. doi:10.1186/1471-2458-14-1192.
5. Rammohan A, Awofeso N, Fernandez RC. Paternal education status significantly influences infants' measles vaccination uptake, independent of maternal education status. *BMC Public Health*. 2012;12:336. doi:10.1186/1471-2458-12-336.
6. Angelillo IF, Ricciardi G, Rossi P, Pantisano P, Langiano E, Pavia M. Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. *Bulletin of the World Health Organization*. 1999;77(3):224-229.
7. Vikram K, Vanneman R, Desai S. Linkages between maternal education and childhood immunization in India. *Social Science & Medicine*. 2012 July; 75(2): 331-339
8. J. O. Lopreiato, M. C. Ottolini. Assessment of immunization compliance among children in the Department of Defense health care system. *Pediatrics*. 1996 March; 97(3): 308–311
9. Scheiber M, Halfon N. Immunizing California's children. Effects of current policies on immunization levels. *Western Journal of Medicine*. 1990;153(4):400-405.
10. Immunization & Health Disparities. Minnesota Department of Health. http://www.health.state.mn.us/divs/idepc/immunize/stats/immreport.pdf. Accessed April 23, 2015.