User fee exemption does not affect lower rates of hospital admission of girls in Vietnam

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In many countries, girls have been reported to be less often admitted to hospital than boys. We studied the influence of socio-economic factors, education and access to health care on girls’ and boys’ admission rates for pneumonia, diarrhoea and dengue fever in south-central Vietnam. We explored whether the user fee exemption for children under 6 years introduced in 2005 had an impact on girls’ admission rates.

In a cohort analysis, we used data from a large census in Khanh Hoa Province conducted in 2006, linked to hospital admission records at individual level. We further analysed a cross-sectional health care utilization survey in a sample of children reported ill at the census. There were 38 731 children under 6 years among a total census population of 353 891. Overall, girls under the age of 6 years were 29% less likely to be admitted to hospital than boys. The gender differences in admission rates in children under 6 years were similar for diarrhoea, pneumonia and dengue. None of the socio-economic and educational factors appeared to affect the gender difference. The user fee exemption for children under 6 was found to have no impact on the girls/boys rate ratio of admission. In conclusion, the higher hospital admission rates of boys compared with girls in Vietnam are independent of socio-economic factors and user fees. Higher susceptibility of boys to severe disease could explain part of the gender gap, but profound cultural norms and beliefs may also have contributed to the findings.

Keywords Gender, willingness to pay, dengue, girls’ health

KEY MESSAGES

- This study in Vietnam shows that for major childhood infections boys are admitted to hospital more often than girls.
- A user fee exemption for children under 6 was found to have no impact on the girls/boys rate ratio of admission.
- Differences in susceptibility to severe disease may explain part of the gender difference, but profound cultural norms and beliefs may also play a role.
Introduction

In many Asian countries with a low average income, girls have been shown to benefit less from advances in health care and child survival than boys (Claeson et al. 2000; Mitra et al. 2000). In India and Bangladesh, girls with severe disease are brought to the hospital less often than boys (Claeson et al. 2000; Mitra et al. 2000), and have a higher mortality (Koenig and D’Souza 1986; Claeson et al. 2000).

The effect of socio-economic status and education on gender differences in health care utilization favouring boys remains poorly understood. Population-based studies suggest that higher socio-economic status and better education may not necessarily reduce the female disadvantage (Koenig and D’Souza 1986; Ahmed et al. 2000; Bhan et al. 2005).

From the health policy perspective, a key question is whether lower admission rates in girls are due to immediate economic causes that could be mitigated in the short or medium term by economic development, subsidies or education. If on the other hand, gender differences are a consequence of deeply rooted cultural factors (which may have arisen due to long-standing economic pressure in the past), socio-economic and educational improvements may fail, at least in the short term.

It is unclear whether user fees (an immediate economic factor) worsen the difference in health care utilization between girls and boys. The World Bank has in the past favoured the implementation of user fees, which in some cases have been shown to improve services (Lagarde and Palmer 2008), although adverse health effects due to under-use of health care in poor populations cannot be excluded (Stanton and Clemens 1989; Jacobs and Price 2004; Lagarde and Palmer 2008). Studies from Asia and Africa suggest that user fees may reduce girls’ admission rates more than those of boys (Stanton and Clemens 1989; Malama et al. 2002).

In Vietnam, user fees for health services were introduced in 1989 (Dao et al. 2008). In 2005, a user fee exemption for children under the age of 6 years was implemented (Ekman et al. 2008). The country has made progress in many areas of public health, but some gender issues in health care appear to persist. Maternal mortality is still relatively high (WHO Representative Office in Viet Nam 2011), and it has been shown that the diagnosis of tuberculosis takes longer in women compared with men (Long et al. 1999). Vietnam is a country with a high male/female ratio at birth, similar to other countries in the region such as China. Prevention of pregnancies after the birth of the first son and targeted abortion are regarded as the main reasons for the recent rise in the sex ratio at birth in Vietnam to about 110 boys over 100 girls (105 being regarded as the norm) (UNFPA 2009). The apparently higher value couples confer on boys poses the question whether Vietnamese girls are subject to underuse of health care compared with boys, which could perhaps be aggravated by user fees (Witter 1996).

In this analysis we used data from a large census in Khanh Hoa Province conducted in 2006, which we linked to hospital admission records. We explored: (1) the gender differences in hospital admission rates of pneumonia, dengue fever and diarrhoea between 2005 and 2008, and their socio-economic and educational determinants; (2) temporal changes following the user fee exemption for children in late 2005, a ‘natural experiment’, allowing the study of the short-term effect of this intervention on gender differences in health care utilization. In addition, we analysed data from a cross-sectional health care utilization survey conducted in the study area in a subsample of the 2006 census.

Methods

Study area and population

The study area comprised 33 rural and urban communes in the districts Nha Trang and Ninh Hoa, both in Khanh Hoa Province in south-east coastal Vietnam. In mid-2006 a census was carried out in the study communes as part of the Khan Hoa Health Project (Yanai et al. 2007). The interviews covered household demographics, socio-economic factors and occupation. Clusters of 1 to 5 neighbouring households were geo-referenced using GPS receivers.

The questionnaire also covered presence of diarrhoea, fever or cough in children under the age of 15 within 2 weeks before the census visit. Families reporting a child with any of these symptoms were asked to answer an additional health-care utilization questionnaire. This questionnaire covered duration of symptoms and health care facilities used during the illness (Yanai et al. 2007).

Government regulation specifies that two public hospitals, Khanh Hoa General Hospital and Ninh Hoa District Hospital, treat all hospitalized pneumonia, diarrhoea and dengue cases in the area. Data of patients admitted to the hospitals are continuously entered into a database, including diagnosis (ICD-10) and clinical outcome, while allowing linkage with the census data (Yanai et al. 2007). The Khan Hoa Health Project was approved by the Institutional Review Board at the National Institute of Hygiene and Epidemiology, Hanoi, and the Ethics Committee of the Institute of Tropical Medicine at Nagasaki University. Anonymized data were used for this analysis.

Hospital admissions study

We included in the analysis admissions to the two hospitals in the study area between 1 January 2005 and 30 June 2008 if they could be linked to the census data (72%). We focused on pneumonia and diarrhoea as major causes of childhood morbidity and mortality in resource-limited settings. Since it cannot be excluded that boys may be biologically more susceptible in particular to respiratory infections (Gold et al. 1993; Zimmerman et al. 1998; Geyer et al. 2002), and possibly diarrhoea (Agtini et al. 2005), we included admission rates of dengue fever as a ‘control disease’, not shown to affect young boys and girls differently (Halstead 2008). The user fee exemption policy was implemented in Vietnam step-wise throughout 2005. In Khanh Hoa Province, the policy change came into effect in October 2005. We treated all admissions prior to 1 October as admissions occurring before the policy change and all admissions after 31 October as occurring after the policy change, disregarding admissions in between. Distance to hospital was calculated as a straight line based on
GPS-derived co-ordinates. Rural and urban residence was defined based on local government information.

We used the highest level of education in any household member as a household-level variable. Household economic status was modelled as a wealth index based on principal component analysis of durable assets used previously (Suzuki et al. 2009).

**Health care utilization study**

We included in the health care utilization survey children <6 years who were reported to have suffered from fever, cough or diarrhoea at any time during the 2 weeks preceding the census visit. Due to logistical constraints, the sample size of this survey was restricted to 2000 children; a convenience sample of the first 2000 children included in the census who were reported ill (the census was done in parallel across communes).

At each level of health care (pharmacy, traditional healer, private clinic, commune health centre, polyclinic, hospital), we compared the proportion of boys and girls receiving health care.

**Statistical analysis**

The dataset arising from linking the cross-sectional census data with the hospital admission records was treated as an open cohort since children were born into the cohort between January 2005 and mid 2006 (the time of the census). We had no information on outmigration or death after the time of the census. We considered the whole population at risk throughout the study period between January 2005 and June 2008. Age was included as age bands to allow for aging, by splitting the dataset according to current age. For comparison, we also analysed the differences in admission rates in older children and adults. The dataset was further split into calendar time bands (01/2005–09/2005; 11/2005–12/2006; 2007; 2008).

We calculated Mantel–Haenzel rate ratios to explore differences in hospital admission rates between males and females.

The analyses were stratified by age, socio-economic factors and education. Differences between strata were tested using the Mantel-Haenzel test for homogeneity of rate ratios.

We also tested Poisson regression models adjusted for over-dispersion due to repeat admissions and household-level variables. The adjusted confidence intervals were only slightly wider than those obtained from the simple Mantel-Haenzel analysis used throughout the analysis.

The health care utilization data were analysed using simple descriptive statistics, chi-square and t-tests. All calculations were done in STATA 10 (Statacorp, Texas, USA).

**Results**

There were 38,731 children (51% boys) in the age band of under 6 years over the study period between January 2005 and June 2008, among a total census population of 353,891. Thirty-five per cent of households were involved in farming. Fifty-five per cent of households had four or fewer members. The vast majority of households (90%) lived in solid houses made of brick or cement, and relied on tap water (47%) or open wells (47%) for water supply. Sanitation coverage was near complete.

**Hospital admission study**

Between January 2005 and June 2008, 2885 cases of pneumonia, 5635 cases of diarrhoea and 3128 cases of dengue of all ages required hospital admission during 1,219,025 person-years (PY). The all-age admission rates were 2.4, 4.6 and 2.6 per 1000 PY, respectively. In children under 6 years the overall admission rate (all three diseases combined) was 54.8 per 1000 PY (pneumonia: 19.5; diarrhoea: 31.9; dengue: 3.4 per 1000 PY).

The female-to-male rate ratio for hospital admissions in children under 6 was 0.71 (=29% fewer admissions, Table 1). The rate ratio of female-to-male admissions decreased with age (Figure 1A); there were 30% fewer female than male admissions in the under 2 year olds, and 24% fewer female admissions in children aged 2 to under 6 years. This gap narrowed to 14% in children aged 6 to 10 years. For comparison, there were more female than male hospital admissions in those above 18 years (test for heterogeneity among all age groups: P < 0.001).

We observed a similar pattern for pneumonia, diarrhoea and dengue fever (Figure 1B-D), in each case with strong evidence for effect modification by age (P < 0.001).

We restricted all further analysis to children under the age of 6 years, and, in the absence of clear differences between them (Figure 1B–D), combined all three diseases. There was no evidence that the female to male ratio changed after the implementation of fee exemption for children in October 2005 for any of the diseases under study (Figure 2A–D).

Distance to the nearest hospital did not modify the gender difference in admission rates, and the difference was nearly identical in rural and urban areas (Table 1). There was no evidence that the female to male rate ratio was modified by socio-economic factors such as the asset index, education, occupation or availability of tap water. Likewise, the total number of children under the age of 18 living in a household did not systematically impact on the female/male difference.

**Health care utilization study**

In the population census, 3893 children under 6 years were reported to have shown signs of cough, fever or diarrhoea in the past 2 weeks. 3072 had cough (period prevalence = 10%), 2722 (8.9%) had fever and 527 (1.7%) had diarrhoea. The female-to-male ratio in 2-week illness prevalence in these children was 0.93 (95% CI 0.87–0.99) for cough, 0.91 (0.85–0.98) for fever and 0.90 (0.76–1.06) for diarrhoea (overall prevalence ratio 0.93, 95% CI 0.88–0.99).

Health care utilization data were available for 1322 of 3893 caregivers of children with reported symptoms (34%). There was no evidence that symptoms duration prior to seeking health care differed between girls and boys (1.4 vs 1.3 days for cough, P = 0.1; 1.3 vs 1.3 days for fever, P = 0.7; 1.1 vs 1.3 for diarrhoea, P = 0.3). Among caregivers of the 1322 children, 810 (38.8%) sought health care at the local pharmacy. 491 children
(23.5%) were seen at a private clinic, 583 (27.9%) at a commune health centre or public polyclinic and 69 (3.3%) at a hospital. In contrast to the analysis of hospital admissions, we found no evidence that in children under the age of 6 the child’s gender influenced caregivers’ health seeking pattern (Figure 3A). We also found no clear evidence for gender differences in health care seeking when stratified by symptom (Figure 3B–D). There was no evidence that wealth or education level influenced the boys/girls ratio for the different levels of health care utilization.

Table 1 Ratio of female to male admission rates for pneumonia, dengue and diarrhoea combined by demographic and socio-economic factors (children under 6 years)

<table>
<thead>
<tr>
<th>Household variable</th>
<th>Children &lt;6 years (%)</th>
<th>Rate ratio girls /boys</th>
<th>95% CI</th>
<th>P-value (test for homogeneity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>38 731 (100)</td>
<td>0.71</td>
<td>0.67–0.76</td>
<td>–</td>
</tr>
<tr>
<td><strong>Distance to hospital</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.80</td>
</tr>
<tr>
<td>0–2km</td>
<td>4793 (13)</td>
<td>0.65</td>
<td>0.56–0.76</td>
<td></td>
</tr>
<tr>
<td>&gt;2km–4km</td>
<td>11 100 (31)</td>
<td>0.74</td>
<td>0.66–0.82</td>
<td></td>
</tr>
<tr>
<td>&gt;4km–6km</td>
<td>10 321 (28)</td>
<td>0.73</td>
<td>0.65–0.81</td>
<td></td>
</tr>
<tr>
<td>&gt;6km–8km</td>
<td>4213 (12)</td>
<td>0.71</td>
<td>0.60–0.84</td>
<td></td>
</tr>
<tr>
<td>&gt;8km–10km</td>
<td>2748 (8)</td>
<td>0.67</td>
<td>0.54–0.84</td>
<td></td>
</tr>
<tr>
<td>&gt;10km</td>
<td>3217 (9)</td>
<td>0.76</td>
<td>0.60–0.96</td>
<td></td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.89</td>
</tr>
<tr>
<td>Urban</td>
<td>15 380 (42)</td>
<td>0.72</td>
<td>0.65–0.79</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>21 405 (58)</td>
<td>0.71</td>
<td>0.66–0.77</td>
<td></td>
</tr>
<tr>
<td><strong>Asset index (quintiles)</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.73</td>
</tr>
<tr>
<td>1 (lowest)</td>
<td>10 123 (28)</td>
<td>0.75</td>
<td>0.67–0.85</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7056 (19)</td>
<td>0.69</td>
<td>0.6–0.79</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6274 (17)</td>
<td>0.67</td>
<td>0.58–0.77</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5901 (16)</td>
<td>0.72</td>
<td>0.62–0.82</td>
<td></td>
</tr>
<tr>
<td>5 (highest)</td>
<td>7085 (19)</td>
<td>0.72</td>
<td>0.63–0.83</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum education level</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>Primary not completed</td>
<td>2227 (6)</td>
<td>0.75</td>
<td>0.56–1.00</td>
<td></td>
</tr>
<tr>
<td>Primary completed</td>
<td>13 716 (38)</td>
<td>0.76</td>
<td>0.68–0.84</td>
<td></td>
</tr>
<tr>
<td>Secondary completed</td>
<td>11 860 (33)</td>
<td>0.73</td>
<td>0.66–0.81</td>
<td></td>
</tr>
<tr>
<td>High school completed</td>
<td>6657 (18)</td>
<td>0.61</td>
<td>0.53–0.69</td>
<td></td>
</tr>
<tr>
<td>University completed</td>
<td>1979 (5)</td>
<td>0.79</td>
<td>0.61–1.03</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation of male household head</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.89</td>
</tr>
<tr>
<td>Farmer</td>
<td>11 745 (32)</td>
<td>0.68</td>
<td>0.61–0.75</td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>3705 (10)</td>
<td>0.76</td>
<td>0.62–0.92</td>
<td></td>
</tr>
<tr>
<td>Unskilled manual worker</td>
<td>9539 (26)</td>
<td>0.77</td>
<td>0.68–0.87</td>
<td></td>
</tr>
<tr>
<td>Skilled manual worker</td>
<td>1578 (4)</td>
<td>0.76</td>
<td>0.57–1.00</td>
<td></td>
</tr>
<tr>
<td>Office worker</td>
<td>2001 (5)</td>
<td>0.67</td>
<td>0.53–0.86</td>
<td></td>
</tr>
<tr>
<td>Small business</td>
<td>1350 (4)</td>
<td>0.75</td>
<td>0.54–1.04</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>605 (2)</td>
<td>0.50</td>
<td>0.32–0.79</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6262 (17)</td>
<td>0.70</td>
<td>0.60–0.82</td>
<td></td>
</tr>
<tr>
<td><strong>Water source</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.11</td>
</tr>
<tr>
<td>Tap water</td>
<td>16 605 (45)</td>
<td>0.75</td>
<td>0.69–0.83</td>
<td></td>
</tr>
<tr>
<td>No tap water</td>
<td>20 180 (55)</td>
<td>0.68</td>
<td>0.63–0.74</td>
<td></td>
</tr>
<tr>
<td><strong>Number of children &lt;18 years in household</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.74</td>
</tr>
<tr>
<td>1</td>
<td>7223 (20)</td>
<td>0.75</td>
<td>0.66–0.85</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>16 065 (44)</td>
<td>0.71</td>
<td>0.65–0.78</td>
<td></td>
</tr>
<tr>
<td>3–4</td>
<td>10 921 (30)</td>
<td>0.69</td>
<td>0.62–0.77</td>
<td></td>
</tr>
<tr>
<td>5+</td>
<td>2230 (6)</td>
<td>0.67</td>
<td>0.52–0.86</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1  Female to male hospital admission rate ratios by age; test for heterogeneity of rate ratios showed $P < 0.001$ for all three conditions.

Figure 2  Female to male hospital admission rate ratios before and after policy change (children under 6 years); $P$-value: test for heterogeneity of rate ratios.
Discussion
This large population-based study in Vietnam shows that for major childhood infections boys are admitted to hospital more often than girls. The user fee exemption for children under the age of 6 introduced in October 2005 had no impact on gender differences in admission rates, despite user fees being proposed as an important obstacle for health care use in Vietnam (Dao et al. 2008).

We found no obvious explanation for the gender difference in admission rates. None of the socio-economic or geographic factors available to us appeared to modify the gender rate ratio of admissions. In contrast, the health care utilization survey did not reveal a systematic bias towards more health care being sought for boys than girls, although this finding was limited by the small number of hospital visits in the health care utilization survey.

The lower admission rates for girls identified in this study may best be explained by one of the following two factors, or a combination thereof. First, differences in susceptibility to severe disease between boys and girls have been suggested for a wide range of conditions, mainly based on studies from high-income settings (Gissler et al. 1999; Geyer et al. 2002; Hon and Nelson 2006). It is not uncommon for such studies to show conflicting results for single diseases. In Hong Kong, there were few differences in admission rates for pneumonia and diarrhoea between boys and girls (Hon and Nelson 2006), while a large difference of 20% fewer girls’ admissions was found in a German study (Geyer et al. 2002). In the UK, no difference was found in health care use for respiratory infections, but the analysis was restricted to general practice visits, not hospital admissions (Fleming and Charlton 1998). A US study on emergency department visits showed 20% lower numbers for girls with upper respiratory or gastrointestinal infections (Zimmerman et al. 1998). It is also possible that respiratory and diarrhoeal diseases occur with similar frequency in boys and girls, but that disease severity is greater in boys. In our hospital records data, boys’ duration of hospital stay for pneumonia, diarrhoea and dengue combined was slightly longer compared with girls (4.5 days vs 4.3 days, P = 0.03).

Second, as indicated by the high sex ratio at birth in Vietnam, boys appear to be regarded as more valuable than girls. After birth, girls may continue to be subject to gender bias, including with regard to health care utilization. It is possible that gender bias occurs when major decisions regarding health care are made, such as visiting a hospital requiring a long journey. A study from Pakistan provides data not unlike our findings. Despite a substantially higher mortality in girls compared with boys under the age of 5, there were no clear differences between boys and girls with regard to illness reporting by caregivers, reported visits to basic health facilities and health expenditure (Nuruddin et al. 2009). Of note, girls under 5 in the Pakistan study were admitted to hospital about 30% less frequently compared with boys, similar to our study, although statistical support for this estimate was low since few admissions occurred.

Our analysis of hospital admissions is restricted to inpatients (outpatient data were unavailable). The health care utilization data do not differ between inpatient and outpatient hospital
treatment, which account around for 90% of cases seen at the two hospitals. The diverging findings of the hospital admission and the health care utilization analysis could indicate that gender bias may occur at the point where a child is seen at a hospital, and is either sent home or kept overnight. Especially for young children, mothers have to stay in the ward to give food and clean the child. This can be a significant financial loss for families as many Vietnamese mothers have jobs. Further, gender bias may not be limited to parents. Doctors and nurses may urge parents of boys more often than those of girls to consent to hospital admission, perhaps for fear of causing harm to a family’s only son. They may also show less resistance when urged by parents to allow admission of a boy. The reasons for the decline in the gender difference of hospital admissions with increasing age are unclear, but could, for example, be related to older girls and young women being able to demand health care for themselves, or to them being seen as more valuable. Also, hospital admission of older girls does not necessarily require that the mother stays in the hospital.

It is not clear whether boys benefit from more frequent hospital admissions in this Vietnamese study population. In a broadly well-educated population where signs of severe poverty like malnutrition or lack of access to water and sanitation are rare, and where health care for children under 6 years is free, it cannot be excluded that boys are subject to unnecessary admissions and that the consequences of the gender bias identified in this population may be less severe than in poorer settings.

A major limitation of this analysis is the inability to distinguish between gender bias and higher disease susceptibility of boys (Gold et al. 1993; Agtini et al. 2005; Falagas et al. 2007) as a cause for the gender differences in admission rates. Given that 30% fewer girls were admitted across quite different conditions, it is not clear whether biological susceptibility alone can account for the findings. Severe respiratory infections and pneumonia appear to affect boys more than girls, perhaps due to developmental, anatomic and immunological factors. The main mechanism remains to be elucidated (Falagas et al. 2007). We are unaware of studies demonstrating a difference in susceptibility for dengue fever. In general, gender differences in disease susceptibility are not easy to quantify in observational studies, since gender bias is difficult to exclude.

The non-random selection of subjects in the health care utilization survey is unlikely to be a severe problem for validity, since included children came from all 33 study communes in which the census was carried out. The health care utilization survey included too few hospital admissions to explore in detail at which point in the referral chain gender bias may occur, especially since outpatient data were unavailable for the much larger hospital admissions cohort analysis.

The large census survey conducted in 2006 covered basic information on socio-economic, occupational and geographic factors, but lacked an in-depth description of additional socio-economic parameters of potential interest for gender bias analyses. Few data on general child care practices, cultural or religious beliefs were collected. Including such issues in the analysis might have identified factors affecting the gender difference.

In conclusion, the absence of socio-economic factors explaining the gender differences in admission rates and the lack of effect of the user fee exemption on the whole could suggest that profound social and cultural norms may be at play that our survey did not capture. It is possible, that differences in susceptibility to severe disease explain part of the gender difference and that the role of gender bias is smaller than the raw data suggest. Based on this analysis, however, it seems safe to exclude user fees as a cause for the gender difference.

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Conflict of interest

None declared.

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