Gender disparities in child development in the east Asia-Pacific region: a cross-sectional, population-based, multicountry observational study

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Summary
Background Gender differences in child development have been extensively studied in high-income countries, but few data are available from low-income and middle-income countries. Our objective was to assess gender disparities in child development that might arise from differential investment in child health, nutrition, and education in six countries across the east Asia-Pacific region.

Methods In this cross-sectional, population-based study we quantified the magnitude of gender differences in child development using the East Asia-Pacific Early Child Development Scales (EAP-ECDS) in six countries (Cambodia, China, Mongolia, Papua New Guinea, Timor-Leste, and Vanuatu). We used stratified random sampling (according to age, residence [urban vs rural], and sex) in all countries to recruit eligible children aged 3–5 years from non-ethnic minority populations with no identified or suspected special educational needs for whom EAP-ECDS scores for five or more of seven domains and urban-rural residence information were available. Gender differences in development associated with four national indicators of gender equality (sex ratio at birth, Gender Development Index, Gender Inequality Index, and Gender Parity Index for primary school enrolment) were also examined. We used generalised estimating equation regression to study moderation of differences by family socioeconomic status and wealth, and structural equation models with maximum likelihood to test mediation through health, nutrition, and education.

Findings Between June 1, 2013, and Dec 13, 2013, 7582 eligible children were included from Cambodia (n=1189), China (n=1618), Mongolia (n=1230), Papua New Guinea (n=1639), Timor-Leste (n=1176), and Vanuatu (n=730). Girls had significantly higher development scores than boys in Cambodia (difference in composite score: β=1.87 points, 95% CI 0.29 to 3.45; p=0.0374), China (2.66 points, 1.20 to 4.13; p=0.0004), Vanuatu (3.10 points, 1.65 to 4.55; p<0.0001), and Mongolia (3.94 points, 2.67 to 5.21; p<0.0001), but not Papua New Guinea (0.43 points, –1.19 to 0.33; p=0.272) or Timor-Leste (0.09 points, –0.96 to 1.14; p=0.861). Differences in favour of girls were the largest for language skills in Mongolia (5.30 points, 3.25 to 7.35; p<0.0001), and differences in language skills were smallest in the two poorest countries, Timor-Leste (–0.07 points, –1.03 to 0.88) and Papua New Guinea (0.05 points, –0.92 to 1.02). Greater differences in composite scores for girls compared with boys—in favour of girls—were associated with higher national Gender Development Index values (R²=0.2790). In Mongolia, smaller gender differences in development were associated with increased household wealth (6.07 points [95% CI 3.22 to 8.92] in the lowest wealth quartile vs 2.27 points [1.38 to 3.15] in the highest wealth quartile), whereas in Timor-Leste, girls only outperformed boys when living in households with higher socioeconomic status (2.87 points [0.27 to 5.47] in the highest wealth quartile and 3.74 points [2.17 to 5.31] in the highest quartile of parental socioeconomic status). Mediating pathways explained up to 37% (in Vanuatu) of the association between gender and development, controlling for family socioeconomic status.

Interpretation Girls aged 3–5 years generally outperformed boys on tests of development, and increasing levels of gender equality across six countries in the east Asia-Pacific region were associated with improved performance of young girls relative to boys. Greater opportunities for economic development are anticipated to result from improvements in gender equality and in the development of girls. Further study is warranted to understand family-level processes and societal norms that lead to gender differences in child development in the early years.

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Introduction Little is known about gender differences in child development in low-income and middle-income countries, where gender inequalities in health and education might result in disparities in early development and subsequent school achievement. Historically, studies in the USA showed that girls outperformed boys in language and reading, whereas boys performed better than girls in mathematics and spatial ability. However, these gaps are closing, with girls reaching parity with boys in mathematics and problem solving, and girls’ advantage in verbal skills reduced to very low levels. In this study, we used a new holistic measure of child development validated for use in the east Asia-Pacific region.
Research in context

Evidence before this study
Internationally validated direct assessments of child development have yet to be established for use among children aged 3–5 years in low-income and middle-income settings. Between Nov 8, 2016, and May 5, 2017, we searched Google Scholar and PubMed for references from studies on gender differences in child development in the USA and Europe, and for studies on child learning outcomes in published papers or non-governmental reports from the countries included in our study, as well as middle-income and low-income countries more broadly, with no language or date restrictions. The search terms we used included: “gender differences”, “gender inequality”, “gender disparities”, “child development”, “low and middle income”, “international”, “global”, “preschool”, “achievement”, “early math”, and “early literacy”. No previous evidence was found for direct assessments of gender disparities in child development for children aged 3–5 years in the east Asia-Pacific region.

Added value of this study
Children were assessed using the East Asia-Pacific Early Child Development Scales—a new holistic child development measure developed and validated for the region—that covers seven domains including early literacy, cognition, and motor skills. These developmental data were supplemented with family demographic and child health information and country contextual data, including measures of gender equality. To the best of our knowledge, the current study is the first to show that young girls’ performance on a holistic test of development was higher than that of boys in countries with evidence of greater gender equality based on national indices, but differences within countries varied by family socioeconomic status. Up to 37% of the gender gaps reported could be explained by mediating pathways through child education and health and nutrition.

Implications of all the available evidence
In our study of children aged 3–5 years in the east Asia-Pacific region, considerable gender disparities in development, which favour girls, exist in the east Asia-Pacific countries with the highest gender equality and, generally, in households with higher socioeconomic status. These findings are similar to historical differences reported in the USA, which have since disappeared or been reduced to low levels. US-based data on the remaining gender differences and evidence from this study about children living in the east Asia-Pacific region, suggest that further research is warranted on the family-level processes and possible gendered social norms that lead to gender differences in the development of young children worldwide.

Methods
Study design and participants
We did this population-based, observational, cross-sectional study between June 1, 2013, and Dec 13, 2013, to assess child development in children living in Cambodia, China, Mongolia, Papua New Guinea, Timor-Leste, and Vanuatu.7 With the exception of China, the samples of children were identified in conjunction with each country’s national census department or statistics institute, with the aim of attaining a nationally representative sample using multistage sampling with the last stage at the community level. The study was approved by the human ethics committee of The University of Hong Kong (Hong Kong, China).

We used stratified random sampling by place of residence (urban vs rural location), gender, and age in years (≥3 to <4 years, ≥4 to <5 years, and ≥5 to <6 years) in all countries to achieve a minimum sample of 100 children in each of the 12 strata. Sampling differed in China, where stratified random sampling was done in only five (Guizhou, Hei Long Jiang, Jiang Su, Shanghai and Zhejiang) of the 27 provinces, which were chosen by our partners in China to reflect the wide variation in economic development across the country. We included an additional stage of sampling in China whereby preschools within urban and rural communities were randomly sampled to identify age-eligible children who were representative of most children in the community, considering that the proportion of preschool-aged children enrolled in preschool in China was 82% in 2014.9 Children with identified or suspected special education needs were excluded from assessment. At the analysis stage, we excluded children aged younger than 36 months and older than 71 months, children from ethnic minority populations (the instrument was not validated for minority languages), and children with...
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