The global birth prevalence of clubfoot: a systematic review and meta-analysis

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Summary

Background Estimates of the birth prevalence of clubfoot in low and middle income settings range from 0.5 to 2 per 1000 births. However, there is currently no estimate of global birth prevalence of clubfoot.

Methods We conducted a systematic review of studies reporting the birth prevalence of clubfoot across all countries and regions worldwide in the last 10 years. Africa Wide Information, EMBASE, CINAHL, Global Health, LILACS and Medline databases were searched for relevant studies from January 1st 2012 to February 9th 2023. Pooled prevalence estimates were calculated using the inverse variance method, and a random effects model was applied to account for heterogeneity between studies. Quality appraisal was performed using a modified Newcastle–Ottawa Quality Assessment Scale for Cohort studies. This review was registered with PROSPERO, CRD42023398410.

Findings The search generated 757 studies. Thirty-five studies from 36 countries and five WHO regions were included. The pooled prevalence of clubfoot was 1.18 per 1000 births (95% CI: 1.00–1.36) based on data from 44,818,965 births. The highest prevalence rates were observed in low- and middle-income countries, particularly in the South-East Asia Region (1.80, 95% CI: 1.32–2.28) and the Africa Region (1.31, 95% CI: 0.86–1.77). We estimate that 176,476 (95% CI: 126,126–227,010) children will be born with clubfoot globally each year.

Interpretation This study provides a comprehensive estimate of the global prevalence of clubfoot and highlights the significant burden of this condition, particularly in low- and middle-income countries. The findings underscore the need for improving access to effective treatment and prevention strategies in resource-limited settings.

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Keywords: Clubfoot; Congenital talipes equinovarus; Birth defects; Congenital anomalies; Birth prevalence; Global; Meta-analysis; Systematic review

Introduction

Congenital conditions were the 10th most important cause of loss of health globally in 2019. Clubfoot, also known as congenital talipes equinovarus, is one of the common congenital conditions that causes mobility impairment in children. The structure and position of the foot are affected and the foot is fixed in a downward and inward position, leading to pain and reduced mobility if left untreated. This can result in limitations in participating in activities and overall disability. However, the Ponseti method is widely recognized as an effective conservative treatment approach for clubfoot that avoids corrective surgery in over 90% of cases. It involves a series of gentle manipulations and the application of plaster casts to gradually correct the foot deformity. Subsequently, a percutaneous Achilles tenotomy is usually performed to correct the downward position of the foot, followed by the use of a foot abduction brace to maintain the corrected position and prevent relapse.

The causes of clubfoot, in most cases, are unknown, although literature on clubfoot is increasingly linked to genetic and environmental factors. Epidemiological studies show higher birth prevalence of clubfoot in

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Research in context

Evidence before this study
We conducted a search on PubMed on January 15th, 2023, which yielded one meta-analysis published in 2015 by two of the current study authors, focusing on the birth prevalence of clubfoot in low and middle-income countries (LMICs). The meta-analysis found that the birth prevalence of clubfoot varied between 0.51 and 2.03 per 1000 live births in LMICs. However, this study did not evaluate the risk of bias in the included studies, or provide an overall assessment of the certainty of the evidence. Furthermore, we found no published estimations of the global prevalence of clubfoot. Subsequent primary research articles on clubfoot have been published since the meta-analysis, in both high and low income settings.

Added value of this study
This study advances the existing literature on the birth prevalence of clubfoot by integrating new global research. By conducting a comprehensive systematic review, we identified opportunities for standardising data collection and reporting in this field. Additionally, the research uncovered additional studies that couldn’t be included in the meta-analysis due to limited information on birth denominators or inadequate measures of birth incidence. The robust methodology included risk of bias assessments and meta-analyses, revealing higher birth prevalence of clubfoot in the SEARO and AFRO regions, while highlighting the research gap in the EMRO and WPRO (excluding China) regions, where no studies on clubfoot birth prevalence were available.

Implications of all the available evidence
The analysis of data from 35 studies encompassing 36 countries and five WHO regions revealed a global birth prevalence of clubfoot of 1.18 per 1000 births, with a higher rate in LMICs, particularly in the South-East Asia and Africa regions. The findings emphasise the urgent need for improved access to effective treatment and prevention strategies, especially in resource-limited settings, to reduce long-term disability. Standardised data collection, the establishment and strengthening of birth registry databases, ensuring comprehensive coverage and accurate data collection, and, expanding research to underrepresented regions like EMRO or in countries outside of China in WRPO are vital for informed policy making to ensure that we ‘leave no one behind’.

Methods
Study design
The systematic review was performed following MOOSE guidelines and aimed to estimate the global birth prevalence of clubfoot in the last 10 years. The study was registered with PROSPERO number CRD42023398410. We followed PRISMA reporting guidelines. Institutional ethics and informed consent were not required due to the nature of the study design.

Search strategy and selection criteria
We systematically searched Africa Wide Information, EMBASE, CINAHL, Global Health, LILACS and Medline on February 9th 2023. We included the period from January 1st 2012 to February 9th 2023 to identify available evidence on clubfoot birth prevalence. Studies in all languages were included. We included published prospective and retrospective cohort studies and cross-sectional studies, with a baseline assessment of live births and assessment of the outcome (clubfoot). The article titles and abstracts returned from the search were screened independently by two reviewers, and references from the included studies were also checked for relevance. The full texts were reviewed independently by two reviewers, with any differences resolved through discussion. The search strategy is

males and first-born children. It is estimated that 80% of children born with clubfoot each year reside in low- and middle-income countries (LMICs). To address this growing inequity, prioritising functioning from birth through early identification and intervention has been recommended as a strategic focus to strengthen rehabilitation systems and policies, particularly in countries with fragmented health systems. Early detection through screening programmes is critical, not only for developmental outcomes but in determining whether children have access to early intervention and rehabilitation at all. Valid, reliable and timely data on the birth prevalence of congenital conditions is therefore essential for effective healthcare planning, resource allocation, and delivery of high-quality early intervention services. It allows healthcare systems to tailor services to meet the specific population needs, detect trends and patterns in congenital conditions for timely interventions, and address disparities in healthcare provision. Yet, there are no global estimates for clubfoot birth prevalence.

An improved understanding of the global birth prevalence of clubfoot is needed to inform public policy, health planning, and allocation of limited healthcare resources for early intervention and treatment. Global estimates may be used to identify disparities in access to care and the distribution of healthcare resources, as well as to gain insights into the burden of this condition. We therefore undertook an updated systematic review and meta-analysis to assess the extent and quality of data for children with clubfoot worldwide.

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summarised in Supplementary Table S1, and the internet-based systematic review management software Raayan.ai was used.

Data screening and extraction
Two authors independently selected articles to identify relevant evidence. TS and SR screened all titles and abstracts using predetermined eligibility criteria, and independently evaluated full-text articles for inclusion. Any discrepancies were discussed and resolved at each stage until consensus was reached.

The definition of clubfoot was established as a rigid abnormality where the foot is positioned in a plantar-flexed, supinated, and adducted manner. To be eligible for this systematic review, the study had to meet the following requirements: (1) original research on clubfoot, (2) investigation conducted to determine of birth prevalence of clubfoot, (3) screening of all children for clubfoot, and (4) published between 2012 and 2023. Exclusion criteria included: (1) unavailability of the full text, (2) unclear screening of all children for clubfoot, (3) unclear definition of the source population and the denominator, and (4) duplication of reports from the same study.

A structured data extraction tool was developed and pilot-tested in MS Excel, to systematically record relevant information from the included studies. The extracted information included: publication characteristics (author, title, year of publication, and setting/country), study design (data source and sample size), participant characteristics, population comparator characteristics and outcomes (birth prevalence of clubfoot). When a study was eligible for inclusion in the review, the numerator and denominator were verified and the prevalence estimate was recalculated, where necessary (i.e., converted from per 10,000 live births to per 1000 live births). For studies that did not include 95% confidence intervals, the Wilson Score was calculated using the population and number of clubfoot cases. The data extraction was conducted independently by the two reviewers, with any discrepancies discussed and resolved. Studies that were excluded at full text stage were assigned reasons for exclusion.

Risk of bias assessment
The two investigators graded the overall certainty of the evidence using the Newcastle–Ottawa Quality Assessment Scale (NOQAS) for Cohort studies (Supplementary Table S2), and compared scores to reach an agreement. Included studies were graded as low, medium and high risk of bias. Since the NOQAS tool focuses on cohort studies and most studies included were descriptive, we modified the checklist to exclude the comparability criteria. This modification aligns with previous studies that have followed a similar approach. Total scores range from 0 to 7. For the total score grouping, studies were judged to be of low risk of bias (≥6 points), medium risk (5 points) or high risk of bias (<5 points). Results are summarized in Supplementary Table S3.

Data synthesis and meta-analysis
The data were assumed to report the number of live births per 1000 unless otherwise specified as including stillbirths. The birth prevalence of clubfoot was calculated based on the number of babies born with clubfoot and the total population in each study. Pooled prevalence was estimated in Review Manager (version 5.4) software using the inverse variance method. Due to the high heterogeneity between studies (I² > 95%, p < 0.05) the meta-analysis was conducted using a random-effects model to estimate the weighted summary measures for different WHO regions. The p-value is from the chi-squared test. The weight assigned to each study was based on its effect size, determined by its inverse variance. The results were displayed on a forest plot.

Change to the prospero registered strategy
The estimated number of cases born per million total population per year was calculated in R (version 4.2.3) using the regional clubfoot birth prevalence and the population at age 0 data from UN data for births.

Role of the funding source
The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results
Search results
The search identified 757 articles, and an additional 3 studies were identified in the screening process through reference checking. After 229 duplicates were removed, 528 abstracts were screened and 471 articles were excluded at the title/abstract screening stage as they did not meet eligibility criteria. The remaining 57 full texts were evaluated for eligibility, of which 32 were found to be eligible for inclusion (Fig. 1). The reasons for the exclusion of the other 25 full texts are detailed in Supplementary file S4.

Study characteristics
In total there were 44,818,965 births. The largest study comprised of 9,152,674 births, whilst the smallest study had 1551 births. Of the 35 eligible studies, 13 (37%) were conducted in high income countries (Canada, France, Netherlands, Norway, Sweden, Canada, UK, USA and a subset of 21 countries from the EUROCAT database) and 22 (63%) were undertaken in low and middle income countries (India, China, Italy, Argentina, Thailand, Uganda, Nigeria, South Africa and LAC countries). No studies meeting our inclusion criteria were found for the Eastern Mediterranean...
Region. The Western Pacific Region was solely represented by China (n = 9), while the South East Asia region was represented by studies from India (n = 5) and Thailand (n = 1). Half of the studies utilised birth defect monitoring databases, with the remaining studies being undertaken in hospital or clinic settings (n = 17, 47%) and the community (n = 1, 3%). Over half of the studies did not provide a definition of clubfoot (n = 18, 51%). Clinical examination was the primary method for case ascertainment and was supplemented by ultrasound investigations in 2 studies. The majority of studies (n = 33, 94%) were assessed as having a low risk of bias (Tables 1 and 2).

Birth prevalence of clubfoot

Of the 44,818,965 births registered globally, there were 35,554 children identified with clubfoot in the included studies. The pooled prevalence of clubfoot was 1.18 per 1000 births (95% CI: 1.00–1.36). The highest prevalence rates were observed in low- and middle-income countries, particularly in the South East Asia Region (1.80, 95% CI: 1.32–2.28) and the Africa Region (1.31, 95% CI: 0.86–1.77) (Fig. 2).

The estimated figures for clubfoot management planning in different populations, considering the birth rate per million population and accounting for the specific birth rates within each population in the respective WHO regions, are presented in Fig. 3. In the case where region-specific estimates for clubfoot birth prevalence in the Eastern Mediterranean Region Office were unavailable, global prevalence estimates were utilised as the regional estimate instead. The meta-analysed studies from China were taken as representative of WPRO, though we note that this may not be fully representative of the situation across the region.

We estimate that 176,476 (95% CI: 126,126–227,010) children will be born with clubfoot globally each year. Approximately 60,307 children with clubfoot will be born in the South East Asia Region and 51,874 in the Africa Region. To facilitate effective planning, we
<table>
<thead>
<tr>
<th>Primary author (date)</th>
<th>Country</th>
<th>WHO Region</th>
<th>Study time</th>
<th>Setting</th>
<th>Method of case ascertainment</th>
<th>Clubfoot definition</th>
<th>Population (n)</th>
<th>Clubfoot (n)</th>
<th>Female (%)</th>
<th>Birth prevalence</th>
<th>Risk of bias</th>
</tr>
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<tr>
<td>Agrawal (2014)</td>
<td>India</td>
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<tr>
<td>Besselaar (2013)</td>
<td>Netherlands</td>
<td>EURO</td>
<td>2013-2014</td>
<td>Accredited clubfoot treatment centres</td>
<td>Medical records</td>
<td>Not reported</td>
<td>346,522</td>
<td>377</td>
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<td>Chen (2018)</td>
<td>China</td>
<td>WPRO</td>
<td>2011-2015</td>
<td>Hospital</td>
<td>ICD-10 criteria</td>
<td>Not reported</td>
<td>260,722</td>
<td>315</td>
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<td>EURO</td>
<td>1995-2005</td>
<td>Surveillance network</td>
<td>Medical records</td>
<td>Database-defined</td>
<td>6,300,000</td>
<td>5063</td>
<td>0.8 (0.78-0.83)</td>
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<td>Groisman (2017)</td>
<td>Argentina</td>
<td>PAHO</td>
<td>2009-2012</td>
<td>Hospital-based surveillance system</td>
<td>Physical exam</td>
<td>Not reported</td>
<td>703,322</td>
<td>484</td>
<td>1.09 (1.01-1.2)</td>
<td>Low</td>
<td></td>
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<td>PAHO</td>
<td>2016</td>
<td>National hospital-based database</td>
<td>Physical exam (birth until discharge)</td>
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<td>0.64 (0.55-0.74)</td>
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<td>SEARO</td>
<td>2009-2013</td>
<td>Birth register</td>
<td>Physical exam</td>
<td>ICD-10 definition</td>
<td>186,393</td>
<td>187</td>
<td>1.07 (1.02-1.13)</td>
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<td>Kumari (2018)</td>
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<td>SEARO</td>
<td>2014-2016</td>
<td>Hospital</td>
<td>Physical exam</td>
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<td>10,126</td>
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<td>Lane (2017)</td>
<td>Canada</td>
<td>PAHO</td>
<td>1988-2013</td>
<td>Database</td>
<td>Physical exam after birth or at the time of discharge</td>
<td>Not reported</td>
<td>258,147</td>
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<td>2.4 (2.20-2.60)</td>
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<td>Li (2013)</td>
<td>China</td>
<td>WPRO</td>
<td>2008-2010</td>
<td>4 Counties in Hengyang Province, survey</td>
<td>Physical exam, cluster sampling survey</td>
<td>Not reported</td>
<td>5,186,504</td>
<td>6756</td>
<td>1.69 (1.27-2.13)</td>
<td>Low</td>
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<td>Mai (2019)</td>
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<td>PAHO</td>
<td>2010-2014</td>
<td>Surveillance network</td>
<td>Discharge diagnostic exam</td>
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<td>1.69 (1.27-2.13)</td>
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<td>Marengo (2013)</td>
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<td>PAHO</td>
<td>2005-2008</td>
<td>Surveillance network</td>
<td>Physical exam at time of delivery</td>
<td>Not reported</td>
<td>1,597,541</td>
<td>2272</td>
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<td>Morris (2018)</td>
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<td>EURO</td>
<td>2003-2012</td>
<td>Surveillance network</td>
<td>Medical records</td>
<td>ICD-10 definition</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>1.08 (1.06-1.11)</td>
<td>Low</td>
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<td>Murrpe-Mwanja (2019)</td>
<td>8 ReLAMC countries</td>
<td>AFRO</td>
<td>2015-2017</td>
<td>Birth defects surveillance system</td>
<td>Physical exam by trained midwife</td>
<td>ICD-10 definition</td>
<td>9,376</td>
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<td>1.40 (1.35-1.71)</td>
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<td>Uganda</td>
<td>AFRO</td>
<td>2017-2019</td>
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<td>9,152,674</td>
<td>2341</td>
<td>0.26 (0.25-0.28)</td>
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<td>Orimolade (2014)</td>
<td>Nigeria</td>
<td>AFRO</td>
<td>2012</td>
<td>Hospital</td>
<td>Physical exam</td>
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<td>1551</td>
<td>5</td>
<td>50% (7/22 with CBDs)</td>
<td>3.22 (1.38-7.52)</td>
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<td>Pavone (2012)</td>
<td>Italy</td>
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<td>1991-2004</td>
<td>Register</td>
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<td>Not reported</td>
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<td>32.30%</td>
<td>1.03 (0.8-1.2)</td>
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<td>Pullinger (2014)</td>
<td>UK</td>
<td>EURO</td>
<td>2007-2012</td>
<td>Hospital</td>
<td>Ultrasound scan and clinical history after birth</td>
<td>Not reported</td>
<td>34,373</td>
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<td>Rittler (2021)</td>
<td>Latin American Countries</td>
<td>PAHO</td>
<td>2005-2018</td>
<td>Hospital surveillance</td>
<td>Diagnosis at birth or at discharge</td>
<td>ICD8 and ECLAM codes</td>
<td>965,473</td>
<td>1274</td>
<td>1.32 (1.30-1.4)</td>
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<td>India</td>
<td>SEARO</td>
<td>2010</td>
<td>Hospital</td>
<td>Physical exam</td>
<td>Not reported</td>
<td>8</td>
<td>43.90%</td>
<td>2.79</td>
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(Table 2 continues on next page)
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<th>Primary author (date)</th>
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<th>Setting</th>
<th>Method of case ascertainment</th>
<th>Clubfoot definition</th>
<th>Population (n)</th>
<th>Clubfoot (n)</th>
<th>Female (%)</th>
<th>Birth prevalence</th>
<th>Risk of bias</th>
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<td>Sinha (2022)</td>
<td>India</td>
<td>SEARO</td>
<td>Not reported</td>
<td>Hospital</td>
<td>Physical exam</td>
<td>ICD-10 definition</td>
<td>8047</td>
<td>34</td>
<td>Not reported</td>
<td>4.23 (3.03-5.90)</td>
<td>Low</td>
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<td>Sirsikar (2015)</td>
<td>India</td>
<td>SEARO</td>
<td>2011-2014</td>
<td>Hospital</td>
<td>Not described</td>
<td>Not reported</td>
<td>118,654</td>
<td>98</td>
<td>37%</td>
<td>0.8 (0.68-1.00)</td>
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<td>Stoll (2020)</td>
<td>France</td>
<td>EURO</td>
<td>1979-2007</td>
<td>Congenital malformation register</td>
<td>Physical exam and genetic testing</td>
<td>ICD-10, code Q66.0</td>
<td>387,047</td>
<td>504</td>
<td>35%</td>
<td>1.03 (1.2-1.4)</td>
<td>Low</td>
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<td>Thiart (2022)</td>
<td>South Africa</td>
<td>AFRO</td>
<td>2014-2018</td>
<td>Hospital</td>
<td>Not described</td>
<td>Not reported</td>
<td>159,348</td>
<td>162</td>
<td>36.50%</td>
<td>1.02 (0.87-1.19)</td>
<td>Low</td>
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<td>Toufaily (2014)</td>
<td>United States</td>
<td>PAHO</td>
<td>1972-2012</td>
<td>Hospital</td>
<td>Physical exam</td>
<td>ICD-10 code Q66</td>
<td>311,480</td>
<td>208</td>
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<td>0.67 (0.58-0.77)</td>
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<td>Wang (2014)</td>
<td>China</td>
<td>WPRO</td>
<td>2011-2013</td>
<td>Hospital surveillance system</td>
<td>Review birth defects registry forms and perinatal infants quarterly report</td>
<td>Not reported</td>
<td>118,199</td>
<td>62</td>
<td>Not reported</td>
<td>0.52 (0.41-0.67)</td>
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<td>China</td>
<td>WPRO</td>
<td>2011-2013</td>
<td>Hospital surveillance</td>
<td>Data from monitoring institutions</td>
<td>Not reported</td>
<td>87,059</td>
<td>53</td>
<td>Not reported</td>
<td>0.61 (0.47-0.80)</td>
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<td>Xie (2021)</td>
<td>China</td>
<td>WPRO</td>
<td>2016-2019</td>
<td>Hospital surveillance</td>
<td>Prenatal screening</td>
<td>Maternal and Child Health Monitoring Scheme</td>
<td>2,883,890</td>
<td>32</td>
<td>Not reported</td>
<td>0.012 (0.007-0.016)</td>
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<td>Yang (2015)</td>
<td>China</td>
<td>WRPO</td>
<td>2003-2009</td>
<td>Database</td>
<td>Review of birth defects surveillance network</td>
<td>Not reported</td>
<td>192,017</td>
<td>137</td>
<td>Not reported</td>
<td>0.72 (0.61-0.85)</td>
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<td>Yi (2013)</td>
<td>China</td>
<td>WRPO</td>
<td>2001-2010</td>
<td>Database</td>
<td>Birth defects monitoring programme</td>
<td>Not reported</td>
<td>8,273,382</td>
<td>4233</td>
<td>Not reported</td>
<td>0.51 (0.50-0.53)</td>
<td>Low</td>
</tr>
<tr>
<td>Zhou (2020)</td>
<td>China</td>
<td>WPRO</td>
<td>2014-2018</td>
<td>Database</td>
<td>Physical exam</td>
<td>ICD-10</td>
<td>28,040</td>
<td>100</td>
<td>Not reported</td>
<td>3.57 (2.93-4.34)</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 2: Study characteristics and estimated birth prevalence.

*EUROCAT: European network of population-based registries for the epidemiologic surveillance of congenital anomalies.
†ReLAMC: Latin American network of congenital malformation surveillance.
recommend applying regional estimates of clubfoot birth prevalence to the specific birth rates of each country, ensuring a more accurate and tailored approach to clubfoot management.

Discussion
This is the first systematic review to estimate the global prevalence of clubfoot. The results from 35 studies included 36 countries, five WHO regions, and 44,818,965 births. The pooled prevalence of clubfoot was 1.18 per 1000 births (95% CI: 1.00–1.36) and showed a range of birth prevalence from 0.86 per 1000 live births in the Western Pacific Region to 1.80 per 1000 births in the South-East Asia Region. Pooled estimates of birth prevalence rates appeared to be similar in the European and Pan American Regions. We estimate that 176,476 (95% CI: 126,126–227,010) children will be born with clubfoot globally each year.

Multiple factors may explain the variation in birth prevalence estimates observed between countries and regions in this study. All of the included studies were conducted in different populations, with varying methodologies and definitions of clubfoot. Further research is needed to better understand the factors influencing clubfoot prevalence.
reported case definitions of clubfoot, however, not consistently. For example, some relied exclusively on ICD-10 code Q66.0, while others included Q66.1 or physical exams, rather than diagnostic codes. Therefore, despite individual study approaches to ensure comparable clubfoot definitions, there may have been incomplete data included. There were also differences in study design and data collection methods. Some countries lack rigorous congenital anomaly surveillance programs, which makes calculation of birth prevalence difficult, and there was a discrepancy according to country income level and region, with most of the studies from these types of sources being higher income countries. Estimates from LMICs range from 1 in 555 births to 1 in 1162 births, and these are likely underestimated due to stigma and exclusion, as well as variability in case definition and screening methods. This systematic review suggests some variation in the birth prevalence of clubfoot, but the range of birth prevalence rate of clubfoot is similar to those reported in low- and middle-income countries. Our global estimates are therefore likely to be under-estimated. However, readers need to interpret the prevalence of clubfoot within their particular context because of the variation in how congenital conditions are identified and integrated into the health care system, which may not be uniform across and even within settings. For instance, many site-based analyses included only hospital-based births, but this may omit other facility or home-based births, depending on the sophistication of the surveillance system. This has substantial implications for the health system, as these children may have delayed identification and access to early intervention. When results show heterogeneity among included studies, as ours do, it can be concluded that effect size varies between studies, either due to methodological diversity or a true variation in birth prevalence. In this situation it is prudent to consider potential causes of heterogeneity and whether study differences are of a magnitude that does not support combining global birth prevalence. In our study, variation found between studies might arise from differences in practice between study settings resulting in higher or lower rates of reporting cases and the overall number of births (denominator) among studies. For example, complete medical records may be more or less available dependent on setting. It may also relate to population characteristics. We used the random effects approach to combine the effect sizes among studies to reflect these potential differences in study populations. Despite I² values indicating substantial heterogeneity in point estimates between studies, we are confident in our systematic review results. Reasons for this confidence include careful study selection based on inclusion criteria, consistent direction of effect, robust statistical methods, high quality of individual studies, and contextual considerations. These factors contribute to a comprehensive evidence assessment, allowing for nuanced interpretation of results and increased confidence, despite observed heterogeneity.

In 2020, the WHO published guidelines on standards for improving quality of care for newborns in health facilities recommending assessing and
Clubfoot is a relatively common condition that should be detected at birth to optimise intervention and outcomes. When comparing prevalence figures for congenital malformations from different parts of the world, it is important to have clear case definitions and comparable methods of data collection. The published data on clubfoot prevalence globally over the last 10 years is similar to estimates in low- and middle-income countries (LMICs) from the previous 55 years. The global pooled prevalence of clubfoot was found to be 1.18 per 1000 births (95% CI: 1.00–1.36), with a range of 0.9–1.8 cases per 1000 live births in different world regions.

Contributors
TS performed the search, reviewed the articles for screening, extracted the data and reviewed the quality appraisal. SR reviewed the articles for screening, the extracted data and lead the quality appraisal. TS and SR verified the underlying data. This extracted data was used for meta-analyses performed, and TS was responsible for this data that was used to perform the statistical analysis and wrote the first draft of the manuscript with input from SR and CL. All authors provided input on the writing of the manuscript. All authors read and approved the final version of the manuscript.

Data sharing statement
All data used for the study has been included in the manuscript and Supplementary materials.

Editor note
The Lancet Group takes a neutral position with respect to territorial claims in published maps and institutional affiliations.

Declaration of interests
SR received funds from the Global Clubfoot Initiative and the Rhodes Trust. TS and CL declare no competing interests.

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Appendix A. Supplementary data
Supplementary data related to this article can be found at https://doi.org/10.1016/eclinm.2023.102178.

References