

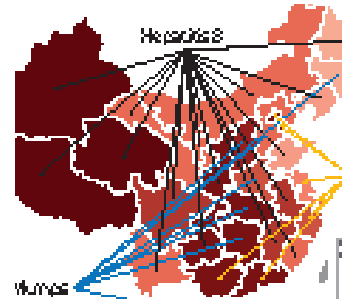
research



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ORIGINAL RESEARCH Systematic review

Use of electronic medical records in development and validation of risk prediction models of hospital readmission

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Study question How did risk prediction models of 30 day hospital readmission that used electronic medical records (EMRs) perform?

Methods This systematic review used searches of Ovid Medline, Ovid Embase, CINAHL, Web of Science, and Scopus for studies of predictive models for 30 day hospital readmission that used EMR data, published between 1 January 2015 and 1 January 2019. Of 4442 citations reviewed, 41 studies met the inclusion criteria. Characteristics of included studies, methods of prediction, predictive features, and performance of predictive models were extracted.

Study answer and limitations 17 of 41 studies reported C statistics of 0.75 or greater. Using EMRs enabled final predictive models to use a wide variety of clinical measures such as laboratory results and vital signs, but use of socioeconomic features or functional status was scarce. 26 studies used logistic regression; the rest used one or more machine learning methods. No statistically significant difference was seen between average C statistics of models developed using regression methods and machine learning (difference 0.03, 95% confidence interval –0.0 to 0.07). Use of centre specific EMRs decreased the generalisability of the reviewed predictive models, and most reviewed models lacked assessment of clinical utility and implementation of the developed tools. Most of the studies examined lacked inclusion of socioeconomic

C statistics of predictive models		
Model characteristic	C statistic (95% CI)	Difference (95% CI)
Method:		
Regression	0.71 (0.68 to 0.73)	0.03 (−0.0 to 0.07)
Machine learning	0.74 (0.71 to 0.77)	
Population:		
All patients	0.76 (0.72 to 0.79)	0.03 (−0.01 to 0.07)
Patient specific	0.72 (0.70 to 0.75)	

features, failed to calibrate the models, neglected to conduct rigorous diagnostic testing, and did not consider clinical impact.

What this study adds Prediction models using EMRs have better predictive performance than those using administrative data, but this improvement remains modest.

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Injuries in children of parents living with mental illness

ORIGINAL RESEARCH Nationwide register based cohort study in Sweden

Association between maternal and paternal mental illness and risk of injuries in children and adolescents

Nevriana A, Pierce M, Dalman C, et al

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Study question What is the risk of injuries among children of parents with mental illness?

Methods Cohort study that used Swedish population based registers to obtain data on children born in 1996-2011 (n=1 542 000) and their parents (893 334 mothers, 873 935 fathers). The main outcome measure was risk of injuries (transport injury, fall, burn, drowning and suffocation, poisoning, violence) at ages 0-1, 2-5, 6-9, 10-12, and 13-17 years in children of parents with or without mental illness. Maternal or paternal mental illnesses included non-affective psychosis, affective psychosis, alcohol or drug misuse, mood disorders, anxiety and stress related disorders, eating disorders, and personality disorders. Injury

risks were compared by calculating rate differences and rate ratios, adjusted for confounders.

Study answer and limitations Children of parents living with mental illness contributed to 201 670.5 person years of follow-up, whereas children of parents without mental illness contributed to 2 434 161.5 person years. Children of parents with mental illness had higher rates of injuries than children of parents without mental illness (at age 0-1 years, 2088 additional injuries were recorded per 100 000 person years among children; number of injuries for children of parents with and without mental illness was 10 235 and 72 723, respectively). At age 0-1, the additional injuries among children of parents with mental illness ranged from 18 additional transport injuries to 1716 additional fall injuries per 100 000 person years. A higher adjusted rate ratio for injuries was observed from birth through adolescence, and the risk was highest during the first year of life (adjusted rate ratio for the overall association between any parental mental illness that has been

recorded in the registers and injuries 1.30, 95% confidence interval 1.26 to 1.33). Adjusted rate ratios at age 0-1 ranged from 1.28 (1.24 to 1.32) for fall injuries to 3.54 (2.28 to 5.48) for violence related injuries. Common and serious maternal and paternal mental illness was associated with increased risk of injuries in children. Estimates were slightly higher for common mental disorders and for maternal exposure. By using population based registers, however, less severe mental illnesses might not have been captured in parents not treated in secondary care, and information on quality of parenting and parental supervision was not available.

What this study adds Exposure to any type of parental mental illness is associated with increased risk of injuries among children up to 17 years of age, and the risk peaks during the first year of life.

Funding, competing interests, and data sharing This work was supported by the European Research Council (reference GA682741), National Institute for Health Research (reference 111905), Stockholm Region, and Swedish Research Council (grant No 523-2010-1052 for data linkages). No competing interests reported. No additional data available.

COMMENTARY Excess risk is greatest in the first year of life

In this issue, Nevriana and colleagues report a large analysis of preventable injuries in children whose parents were living with mental illness.² This large retrospective cohort study used national Swedish longitudinal health and administrative registers to examine associations between all types of maternal and paternal mental illness and risk of injuries from birth to adolescence.

Such analyses help to strengthen our understanding of healthcare delivery and patient outcomes, provide datasets that prompt many further research questions, and support the development of evidence based personalised medicine.³ This real world evidence is now increasingly being used to inform clinical practice and guidelines.⁴

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The authors report that children of parents who experienced mental health problems (especially depression and substance misuse) were at a higher risk of injury throughout their childhood and adolescence than those of parents with no diagnosis of mental illness. The greatest risk recorded was during the first year of life, linked in particular to violence, poisoning, and burns. These findings are in line with previous studies conducted elsewhere, address some of the previous limitations in the evidence base, and should bring extra weight to inform preventative practice.

Environmental context

On the other hand, observational studies like this have no easy way of capturing the wider context of people's lives, which affects their behaviours and outcomes. Although the authors have adjusted for a range of individual level socioeconomic

Families where parental mental illness exists are more likely to live in less affluent, more violent, and potentially more dangerous areas

factors, they acknowledge that these are unlikely to be an entirely accurate reflection of those families' environments. For example, some structural risk factors for violence at community and societal levels (such as experiencing toxic stress, living in impoverished neighbourhoods, or experiencing racism) are more fundamental than a diagnosis of mental illness.⁵ Indeed the prevalence of both mental illness and violence is distributed according to a social gradient, which means that these problems are already more common further down the social ladder.⁶ Families where parental mental illness exists are more likely to live in less affluent, more violent, and potentially more dangerous areas with poor housing conditions, which could contribute to

Number of injuries (rate of injuries), rate differences, and risk of various injury types at age 0-1 years (n=1 351 683) in children of parents with any mental illness recorded in registers

Variables	Children of parents with mental illness (n=10 345)	Children of parents without mental illness (n=1 248 238)	Rate difference (95% CI)	Crude rate ratio (95% CI)	Adjusted rate ratio* (95% CI)
Person years	201 670.5	2 434 161.5	—	—	—
Any injury	10 235 (5075.1)	72 723 (2987.6)	2087.5 (1987.4 to 2188.8)	1.70 (1.66 to 1.73)	1.30 (1.26 to 1.33)
Transport injury	157 (77.9)	1460 (60.0)	17.9 (5.9 to 31.0)	1.30 (1.10 to 1.53)	1.09 (0.86 to 1.38)
Fall	8447 (4188.5)	60 195 (2472.9)	1715.6 (1624.7 to 1807.7)	1.69 (1.65 to 1.73)	1.28 (1.24 to 1.32)
Burn	966 (479.0)	6944 (285.3)	193.7 (163.4 to 225.3)	1.68 (1.56 to 1.81)	1.30 (1.18 to 1.43)
Drowning	166 (82.3)	1278 (52.5)	29.8 (17.6 to 43.3)	1.57 (1.32 to 1.86)	1.24 (0.99 to 1.54)
Poisoning	459 (227.6)	2902 (119.2)	108.4 (87.7 to 130.3)	1.91 (1.73 to 2.11)	1.79 (1.56 to 2.04)
Violence	88 (43.6)	167 (6.9)	36.8 (28.2 to 46.6)	6.23 (4.52 to 8.59)	3.54 (2.28 to 5.48)

Number of injuries=summary number of injuries; rate of injuries=number of injuries per 100 000 person years; rate difference=injury rates in exposed children – injury rates in unexposed children (per 100 000 person years).

*Adjusted for sex, birth year, parental country of birth (missing excluded), living arrangements, parental education, parental employment status, and household income. Additionally number of siblings, maternal age at birth, and paternal age at birth (variables squared in statistical model).

the excess risk of injuries seen in these children.⁷

Thus we are led yet again to the million dollar question on violence and mental health. How can we use data and evidence that are uncomfortable, and have in the past been misunderstood, to inform policy and practice that protects those who are most vulnerable? It is a difficult balance to strike. If we are to implement measures and care that are more likely to be successful in these families, we need greater understanding and action at many levels. Doctors and practitioners should understand that a one size fits all approach does not work in public health. For people who are at high risk or live very challenging lives, simply increasing access to universal programmes is often not effective. Targeted solutions should be designed in coproduction with patients.⁸

Patients should be ready, with support, to offer their voice in any safeguarding

conversations. Discussing the strategies that people living with mental illness feel might assist them in their parenting role, and understanding which support networks are helpful will add nuance to the data and could improve outcomes.⁹ Additionally, societies everywhere must continue efforts to reduce mental health stigma. The structural drivers of mental illness are fundamental and shared across communities globally.¹⁰

This study adds timely weight to what we already know about the need for person centred and early interventions in mental health. To achieve sustainable change we need to place the lived experience of citizens at the core of research, decisions, and interventions in mental health across sectors, disciplines, and countries..

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Infectious diseases in children and adolescents in China

Dong Y, Wang L, Burgner DP, et al

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Study question What are the detailed changing patterns of infectious diseases in Chinese children and adolescents aged 6-22 years in the pre-covid-19 era?

Methods Multiple successive national surveillance studies were conducted across 31 provinces of mainland China from 2008 to 2017. Diagnoses of, and deaths from, 44 notifiable infectious diseases in students aged 6 to 22 years, with more than 200 million population passing through the surveillance system, were categorised into seven groups: quarantinable; vaccine preventable; gastrointestinal and enteroviral; vectorborne; zoonotic; bacterial; and sexually transmitted and bloodborne.

Study answer and limitations Across the 44 notifiable infectious diseases there were 4 959 790 patients and 2532 deaths. Mortality from infectious diseases decreased from 0.21 per 100 000 population in 2008 to 0.07 per 100 000 in 2017. The incidence of notifiable infectious diseases decreased from 280 per 100 000 in 2008 to 162 per 100 000 in 2015, but increased again to 242 per 100 000 in 2017. Quarantinable diseases with high lethality have effectively disappeared. Excluding mumps and influenza, the incidence of vaccine preventable diseases decreased from 96 per 100 000 in 2008 to 7 per 100 000 in 2017. Gastrointestinal and enterovirus disease incidence has remained

constant, but all vectorborne diseases have declined, with a particularly noticeable reduction in malaria. Zoonotic infections remained at a low incidence. Tuberculosis continues to be the most common bacterial infection, although cases of scarlet fever doubled between 2008 and 2017. Sexually transmitted diseases and bloodborne infections increased substantially, particularly from 2011 to 2017, among which HIV/AIDS increased fivefold, a trend particularly pronounced in adolescent males. Seasonal variation in respiratory infections and in gastrointestinal and enterovirus diseases reflect the high vulnerability of children and adolescents.

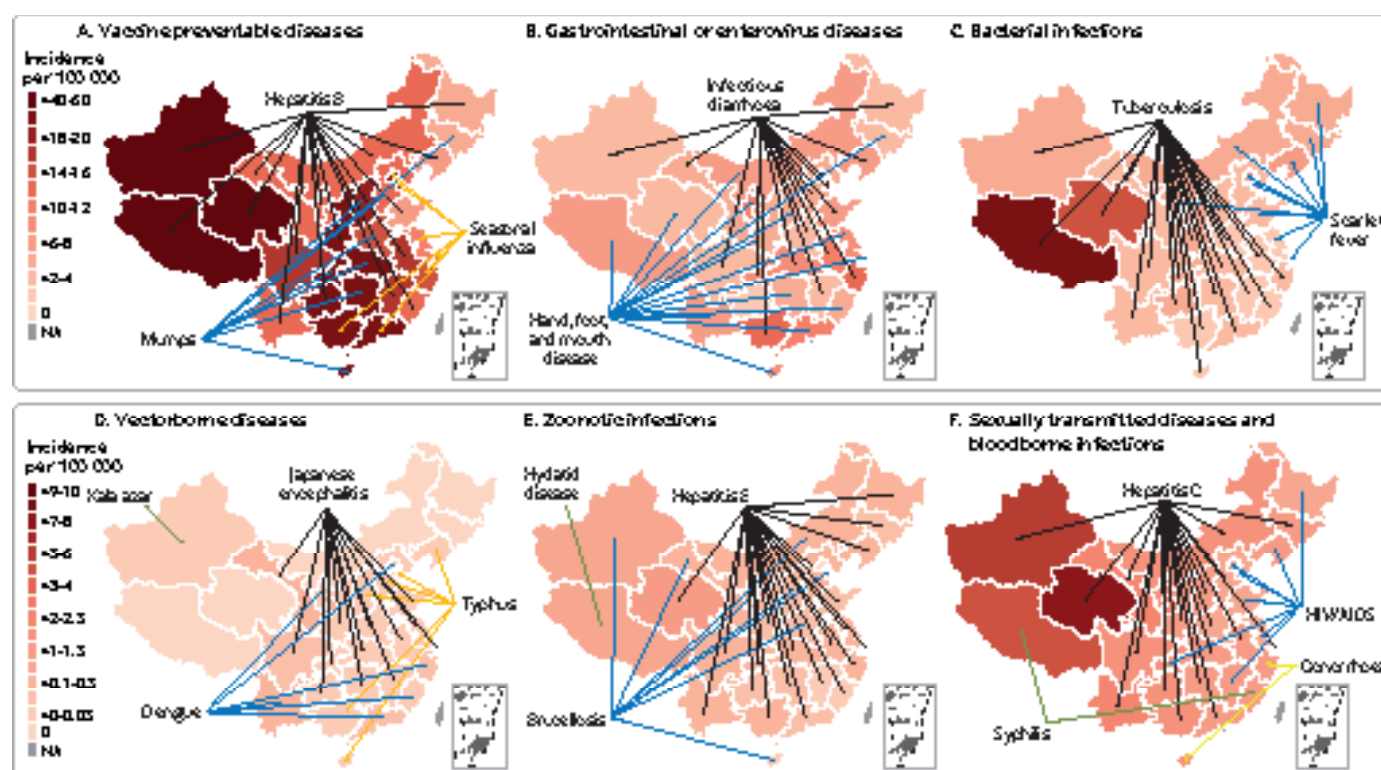
What this study adds This study reports on the changing patterns of 44 notifiable infectious diseases in Chinese children and adolescents in the pre-covid-19 era. The incidence of, and deaths from, infectious diseases in children and adolescents in China continues to decrease. Quarantinable diseases with high lethality have virtually disappeared, sexually transmitted diseases and bloodborne infections pose an increasing problem, and HIV is now the leading cause of death. The incidence of zoonotic infections and vectorborne diseases has been low since the epidemic of severe acute respiratory syndrome (SARS), but there is potential for major outbreaks, such as covid-19 caused by the novel SARS-CoV-2 virus.

Funding, competing interests, and data sharing

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No competing interests.

Data are available from www.phsciencedata.cn/Share/index.jsp; and www.nhc.gov.cn/jkj/s3578/201802/de926bdb046749abb7b0a8e23d929104.shtml.



Subnational distribution of 44 notifiable infectious diseases in 2017, according to seven categories but excluding quarantinable diseases. The keys vary owing to large difference in incidence of 44 notifiable infectious diseases by category. Quarantinable diseases are not presented because haemorrhagic fever dominated all the provinces without regional variations. Lines indicate the leading infectious disease in each province. Publisher's note: Published maps are provided without any warranty of any kind, either express or implied. BMJ remains neutral with regard to jurisdictional claims in published maps