Exploring the Birthday Week Effect on Hand, Foot and Mouth Disease in Yunnan Province, China from 2008 to 2022: Surveillance Data Analysis

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Pei Jiang[1] MM; Longxin Huang[2]; Zhenzhong Liu[1] MD; Linhui Hao[3]; Tian Huang[3]; Haijun Yang[4]; Ming Xu[5]; Wenhui Shi[6]; Tongjian Cai[7]; Xiangyu Yan[8]; Tiejun Shui[3]

[1]School of Public Health, North Sichuan Medical College Nanchong CN
[2]School of Clinical Medicine, North Sichuan Medical College Nanchong CN
[3]Yunnan Center for Disease Control and Prevention Kunming CN
[4]Yan'An Hospital of Kunming City Kunming CN
[5]Men Tsee Khang&Hospital of XiZang Medicine Lhasa CN
[6]Lanke Medical Technology Nanjing Research Institution Nanjing CN
[7]Department of Epidemiology, College of Preventive Medicine, Army Medical University (Third Military Medical University) Chongqing CN
[8]Tianjin University Tianjin CN

Corresponding Author:
Tiejun Shui
Yunnan Center for Disease Control and Prevention
90 meters east of No. 157 Jinbi Road, Kunming City, Yunnan Province
Kunming
CN

Abstract

Background: Hand, Foot and Mouth Disease (HFMD) is a notable infectious disease predominantly affecting infants and children worldwide. Previous studies on HFMD have primarily focused on natural patterns, such as seasonality, but research on the influence of important social time points is lacking. Several studies have indicated correlations between birthdays and certain disease outcomes.

Objective: To explore the association between birthdays and HFMD.

Methods: Surveillance data on HFMD from 2008 to 2022 in Yunnan Province, China, were collected. We defined the period from six days before the birthday to the exact birthday as the “birthday week”. The effect of the birthday week was measured by the proportion of cases occurring during this period, termed the “birthday week proportion”. We conducted subgroup analyses to present the birthday week proportions across sexes, age groups, months of birth, and reporting years. Additionally, we employed a modified Poisson regression model to identify conditional subgroups more likely to contract HFMD during the birthday week.

Results: Among the total 973,410 cases, 116,976 (12.02%) occurred during the birthday week, which is 6.27 times the average weekly proportion (7/365, 1.92%). While the birthday week proportions were similar between males and females (12.19% vs. 11.78%, ?2=153.25, P<0.001), significant differences were observed among different age groups (?2=47,145, P<0.001) and months of birth (?2=16,942, P<0.001). Compared to other age groups, the infant group aged 0-1 year had the highest birthday week proportion (33.67%), which is 17.57 times the average weekly proportion. Compared to other months, patients born from April to July and October to December, the peak months of the HFMD epidemic, had higher birthday week proportions (13.51%, 20.06%, 19.69%, 15.60%, 10.60%, 11.63%, 11.85%). Additionally, a decreasing trend in birthday week proportions from 2008 to 2022 was observed, dropping from 33.74% to 2.77% (Cochran-Armitage Trend Test, Z=-102.53, P<0.001). The results of the modified Poisson regression model further supported the findings from subgroup analyses. Compared with children aged over 7 years, infants aged 0-1 year were more likely to contract HFMD during the birthday week (RR: 1.182, 95% CI: 1.177-1.185, P<0.001). Those born during peak epidemic months exhibited a higher propensity for contracting HFMD during their birthday week. Compared with January, the highest RR was observed in May, at 1.087 (95% CI: 1.084-1.090, P<0.001).

Conclusions: This study identified a novel “birthday week effect” of HFMD, particularly notable for infants approaching their first birthday and those born during peak epidemic months. Improvements in surveillance quality may explain the declining trend of the birthday week effect over the years. Higher exposure risk during the birthday period and potential biological mechanisms might also account for this phenomenon. Raising public awareness of the heightened risk during the birthday week could benefit HFMD prevention and control.

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1. School of Public Health, North Sichuan Medical College, Nanchong, Sichuan, China

2. School of Clinical Medicine, North Sichuan Medical College, Nanchong, Sichuan, China

3. Yunnan Center for Disease Control and Prevention, Kunming, Yunnan, China

4. Yan'An Hospital of Kunming City, Kunming, China

5. Men Tsee Khang, Hospital of XiZang Medicine, Xizang, China

6. Lanke Medical Technology Nanjing Research Institution, Nanjing, China

7. Department of Epidemiology, College of Preventive Medicine, Army Medical University (Third Military Medical University), Chongqing, China

8. Institute of Disaster and Emergency Medicine, Tianjin University, Tianjin, China

* Correspondence: shuitiejunynjkedu@163.com (J.T.S.)

yanxiangyu@tju.edu.cn (X.Y.Y.)

ctjcsl@netease.com (J.T.C.)

Abstract

Background: Hand, Foot and Mouth Disease (HFMD) is a notable infectious disease predominantly affecting infants and children worldwide. Previous studies on HFMD have primarily focused on natural patterns, such as seasonality, but research on the influence of important social time points is lacking. Several studies have indicated correlations between birthdays and certain disease outcomes.

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were more likely to contract HFMD during the birthday week (RR: 1.182, 95% CI: 1.177-1.185, P<0.001). Those born during peak epidemic months exhibited a higher propensity for contracting HFMD during their birthday week. Compared with January, the highest RR was observed in May, at 1.087 (95% CI: 1.084-1.090, P<0.001).

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Keywords

Hand, foot and mouth disease (HFMD); Birthday week effect; Infants; Surveillance

Introduction

Hand, Foot and Mouth Disease (HFMD) is a globally prevalent infectious disease caused by various enteroviruses, including Coxsackievirus A16 and Enterovirus 71 [1]. While most patients exhibit benign and self-limiting clinical symptoms, some may develop severe complications, such as central nervous system damage, cardiopulmonary failure, and even death [2]. Over the past decades, HFMD outbreaks have occurred frequently in the Asia-Pacific region [3]. In 2008, HFMD was classified as a Class C infectious disease for surveillance in China, with annual incidence number exceeding 1 million [4, 5]. Among HFMD cases, children under 5 years old are the most affected, with those aged between 6 months and 2 years exhibiting the highest incidence and severe illness rates [6].

HFMD is predominantly transmitted through the fecal-oral route via direct person-to-person contact as well as indirect contact with surfaces and objects contaminated with excretions, such as oral secretions and vesicular fluid from infected individuals [7]. HFMD is highly contagious and previous studies have reported numerous infections associated with high concentrations of people, such as at family gatherings and in kindergartens [8-10].

Previous studies have shown that the incidence of HFMD is influenced by various factors, including region and season [6]. HFMD exhibits seasonality. In South China, HFMD has two peaks: the main peak from April to July and a secondary peak from October to December [11, 12]. This seasonality is related to the increased prevalence of HFMD viruses in the natural environment during these periods, influenced by climatic and meteorological changes [13, 14]. In addition to natural factors, diseases occurrence is also related to social factors, with birthday being an important social time point. In recent years, several studies have reported positive associations between birthdays and various health and disease outcomes, including suicide [15, 16], average excess death rate [17], mortality after surgery (if performed on the surgeon’s birthday) [18], vascular events [19], medical emergency department attendance [20]and COVID-19 infections [21]. However, no studies have examined the relationship between birthdays and HFMD, an infectious disease that primarily affects infants and

children.

In China, the national infectious disease surveillance system records the date of onset and date of birthday of patient, providing an opportunity to study the birthday rhythm phenomenon in major infectious diseases such as HFMD. Previous studies on HFMD have treated age merely as a basic demographic characteristic, reporting incidence and other measures of interest by age groups according to convention [22, 23]. This approach misses the opportunity to show the possible birthday rhythm phenomenon by not presenting age in days. In this study, we used HFMD surveillance data from 2008 to 2022 in Yunnan Province to explore the birthday rhythm phenomenon of HFMD.

Methods

Study Setting

Yunnan Province is situated on China's southwestern border, between longitude 97.31°E and 106.11°E and latitude 21.80°N and 29.15°N, within the Greater Mekong Subregion (GMS) [24]. It has a population of approximately 47 million and covers 394,000 km^2 (as of 2021) [25]. Due to its unique geographical and climatic environment, Yunnan has consistently exhibited a high incidence of infectious diseases, including HFMD [22]. Consequently, the study of infectious diseases in Yunnan Province is of great significance.

Data Sources

HFMD surveillance data from January 1, 2008, to December 31, 2022, were collected from the National Surveillance of Notifiable Infectious Disease Program (NSNIDP) established by the China Centers for Disease Control and Prevention (China CDC). Since 2008, HFMD has been classified as a notifiable infectious disease, requiring reported to the NSNIDP [4]. The system recorded the sex, date of birth and date of onset of HFMD cases.

Statistics Analysis

In this study, "age in days" was calculated for each HFMD case to serve as the basis for subsequent

statistics analyses. The "age in days" was calculated as follows:

$$age \in days = the\ difference \in years\ between\ the\ onset\ date \wedge last\ birthday * 365 + the\ difference \in days\ between\ the\ o$$

(1)

where “last birthday” refers to the date of the last birthday before the HFMD onset. We presented the number of HFMD cases with “age in days” as the abscissa in plotting. The "age in days" calculation method differs from the simpler and more common way (the difference in days between the onset date and birth date) because our method is more accurate and convenient for plotting. By using 365 days as a fixed period, we can determine the floor function of “age in years” and the number of days deviating from the birthday. In contrast, the other calculation method is more complicated as it requires accounting for the number of leap years between the birth date and onset date, especially for older individuals.

We defined the “birthday week” as the period spanning from six days before the birthday to the exact birthday (namely, difference in days of 359-365 between the onset date and last birthday). We also calculated the proportion of cases occurring during the birthday week, termed the “birthday week proportion”, to quantitatively access the birthday week effect.

We calculated the birthday week proportions across different sex and age groups (0-1 year, 1-3 years, 3-7 years, and above 7 years). We also conducted analyses stratified by months of birth and reporting years. The classifications of age groups were based on the activity characteristics of children. Children aged 0-3 years are usually cared for at home, with those aged 0-1 year classified as infants. Children aged 3-7 years usually attend kindergartens, with those over 7 years go to school. Pearson's Chi-squared Test was used to analyze the differences in “birthday week proportions” among different age groups, sexes, and months of birth. The Cochran Armitage Trend Test was used to perform trend analyses of birthday week proportions overall and within different age groups.

In addition, we conducted a modified Poisson regression model to identify conditional subgroups by sex, age group, month of birth, and reporting year that were more likely to contract HFMD during

the birthday week. In the model, the dichotomous outcome variable is “whether the incidence date falls within the birthday week” [26]. All analyses in this study were conducted using R version 4.3.0.

Ethical Considerations

The study was approved by the Research Ethics Committee of the Yunnan Center for Disease Control and Prevention (No. 2023-19) with a waiver of informed consent because the data were de-identified.

Results

Demographic Characteristics of HFMD Cases

Between 2008 and 2022, the cumulative number of HFMD cases was 973,410, of which 564,725 were males and 408,685 were females. The males-to-females sex ratio was 1.38. In terms of age distribution, cases aged 0-7 years accounted for 95.71% (Table 1).

Table 1. Cumulative HFMD cases, cases during the birthday week and birthday week proportions by sex and age group in Yunan Province, China (2008-2022).

Age groups	Total (%)	Males	Females	Males-to-females sex ratio
Cumulative cases (No.)				
(0,1]	90,709(9.32)	53,428	37,281	1.43
(1,3]	485,871(49.91)	280,236	205,635	1.36
(3,7]	355,075(36.48)	207,990	147,085	1.41
>7	41,755(4.29)	23,071	18,684	1.23
Total	973,410(100.00)	564,725	408,685	1.38
Cases during the birthday week (No.)				
(0,1]	30,539	18,061	12,478	1.45
(1,3]	55,057	32,395	22,662	1.43
(3,7]	26,856	15,906	10,950	1.45
>7	4,524	2,487	2,037	1.22
Total	116,976	68,849	48,127	1.43
Birthday week proportions (%)				
(0,1]	33.67	33.80	33.47	_
(1,3]	11.33	11.56	11.02	_
(3,7]	7.56	7.65	7.44	_
>7	10.83	10.78	10.90	_
Total	12.02	12.19	11.78	_

Birthday Week Effect

Overview

Figure 1A demonstrates an obvious "pulse and rhythm-type" surge in the cumulative HFMD cases number from 2008 to 2022 on and around birthdays for all ages, across both males and females. For the 365 days in a year, on the eve of the birthday, the case numbers increased day by day as the birthday approached, peaking the day before the birthday and significantly decreasing after the birthday (Table S1 and Figure 1B). The cumulative case numbers (and their proportions) from the

sixth day before the birthday to the exact birthday were 3,308 (0.34%), 4,442 (0.46%), 8,028 (0.82%), 14,982 (1.54%), 25,945 (2.67%), 41,930 (4.31%), and 18,341 (1.89%), respectively. Correspondingly, the ratios relative to the average daily proportion (1/365, 0.27%) of these 7 days were 1.24, 1.67, 3.01, 5.62, 9.73, 15.72, and 6.88, respectively. In total, the cumulative case number during the birthday week was 116,976, accounting for 12.02% of the total cases, which is 6.27 times the average weekly proportion (7/365, 1.92%) (Table S1 and Figure 1B).

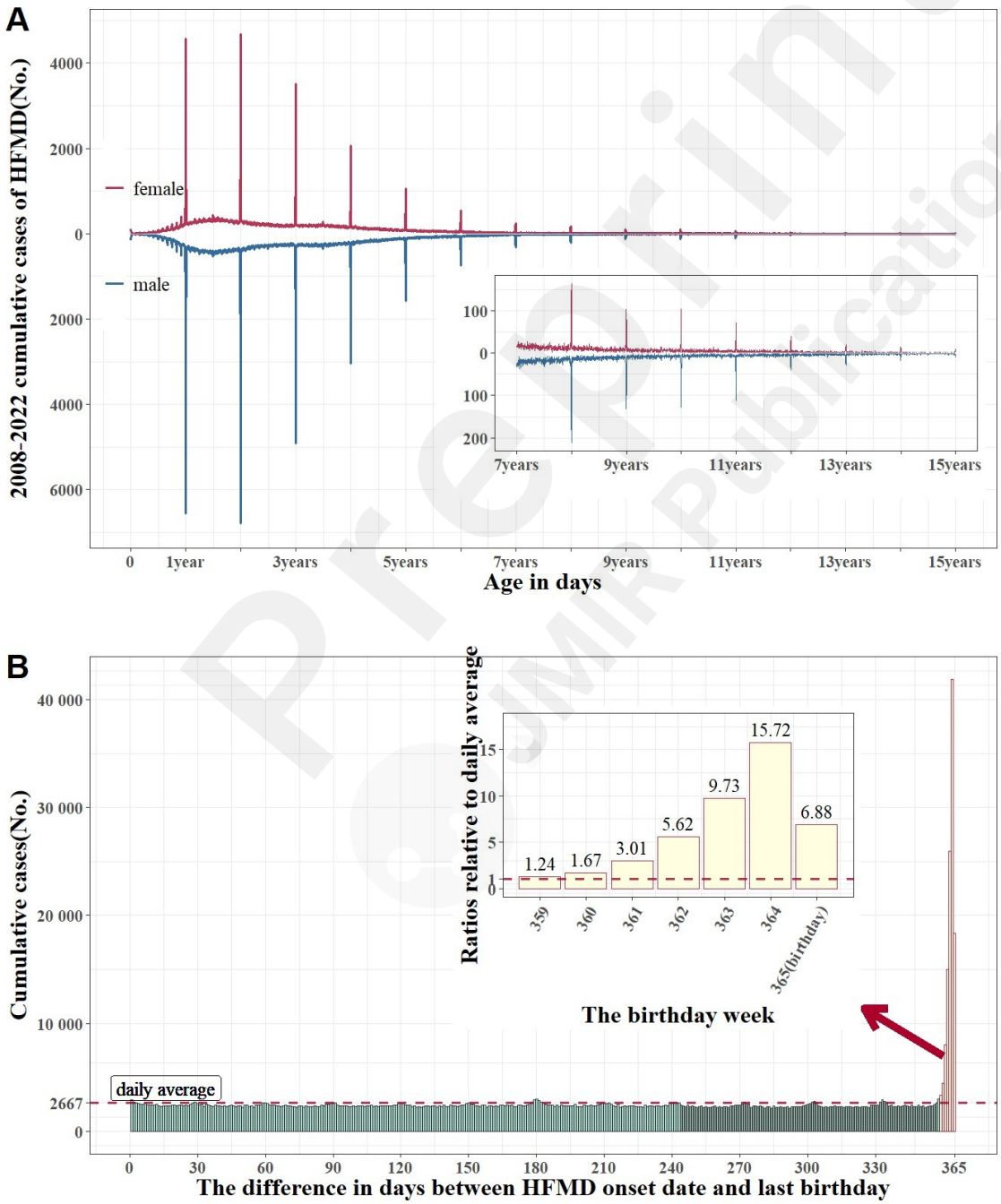

Figure 1. The "pulse and rhythm-type" surge in cumulative HFMD cases during the birthday week in Yunnan Province, China (2008-2022). A: Cumulative cases by age (measured in days) and sex among children aged 0-15 years. B: Cumulative cases based on the difference in days between onset date and birthday, along with ratios relative to the average daily proportion (1/365, 0.27%) for each day of the birthday week.

Table 1 also shows the cumulative case numbers during the birthday week and birthday week proportions across different age groups and sexes. Significant differences in birthday week proportions among different age groups were observed (χ^2=47,145, P<0.001). Compared to other age groups, the infants group aged 0-1 year had the highest birthday week proportions (33.67%), which is 17.57 times the average weekly proportion. In the 1-3 and 3-7 year-old groups, birthday week proportions decreased to 11.33% and 7.56%, respectively. For male and female groups, there was a minimal difference in overall birthday week proportions (12.19% vs 11.78%, χ^2=153.25, P<0.001).

Stratified by Months of Birth

Analyses across age groups stratified by months of birth (Figure 2, Figure 3 and Table S2) illustrated that there were differences in birthday week proportions among different months of birth (χ^2=16,942, P<0.001). Patients born during the main peak of April to July had the highest birthday week proportions, with overall birthday week proportions of 13.51%, 20.26%, 19.69%, and 15.60%, respectively. Among them, the infant group (0-1 year) had the highest birthday week proportions from April to July compared to other age groups, with values of 43.54%, 51.85%, 48.10%, and 39.42%, respectively. During the second peak from October to December, the overall birthday week proportion were 10.60%, 11.63%, and 11.85%, and birthday week proportions in the infant group were 28.56%, 27.40%, and 28.64%, respectively. In the trough periods of January to March and August to September, the overall birthday week proportions were lower than those in peak periods.

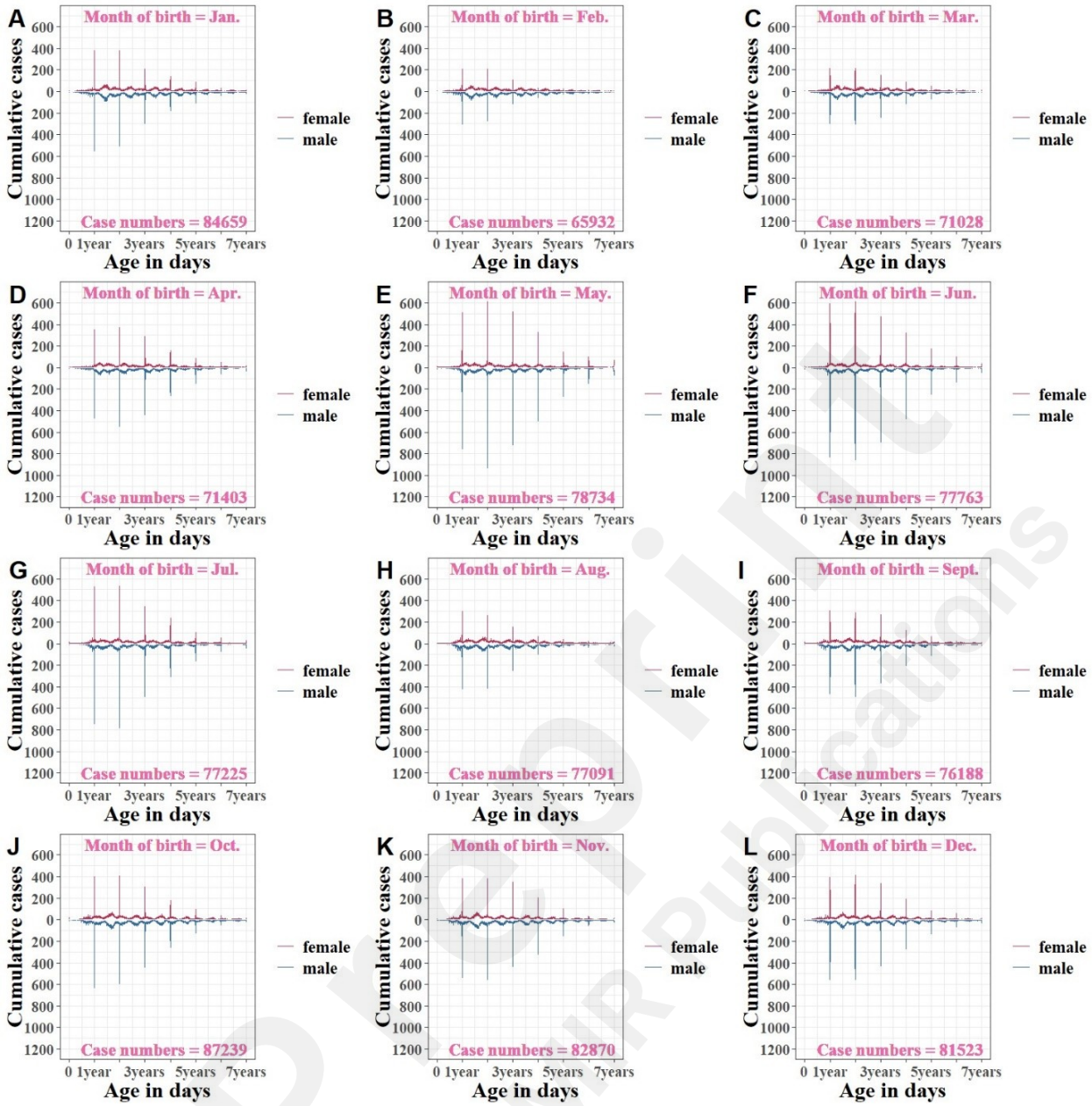

Figure 2. Cumulative HFMD cases by age (measured in days) and sex among children aged 0-7 years, stratified by months of birth in Yunnan Province, China (2008-2022).

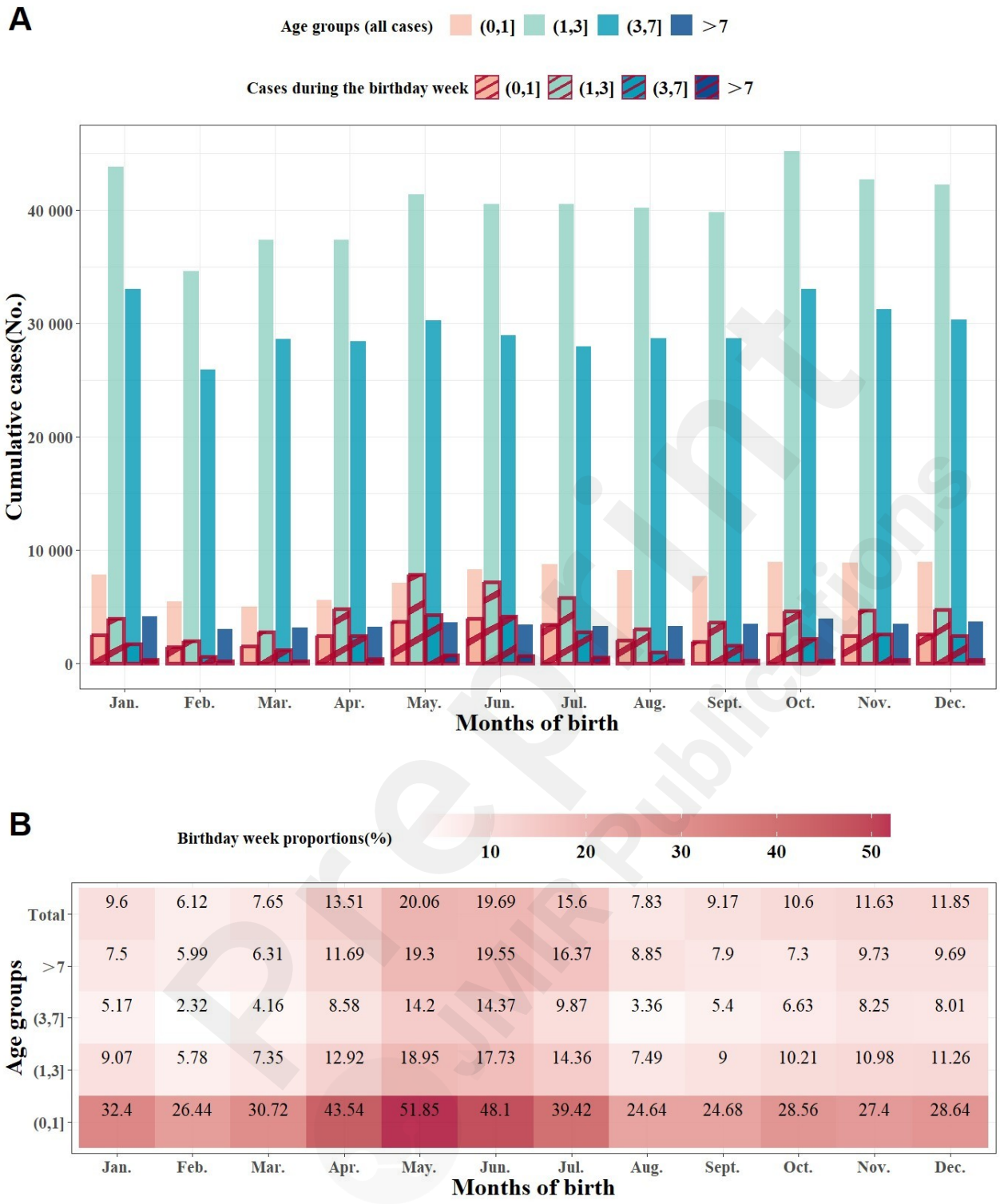

Figure 3. Bar graph of cumulative HFMD cases and cases during the birthday week, and heatmap of birthday week proportions, across different age groups, stratified by months of birth in Yunnan Province, China (2008-2022).

Stratified by Reporting Years

By conducting analyses across age groups stratified by reporting years (Figure 4, Figure 5 and Table

S3), we found a declining trend of overall birthday week proportions from 33.74% in 2008 to 2.77% in 2022 (Cochran-Armitage Trend Test Z=-102.53, P<0.001). This trend was observed across four different age groups, from 61.06% to 8.65% in 0-1 year group, from 32.36% to 2.71% in 1-3 years group, from 26.63% to 2.23% in 3-7 years group and from 37.50% to 2.24% in above 7 years group, respectively (Z=-44.71, - 69.79, -48.16, -25.57, respectively, and all the P<0.001). There was a significant point of large declines: birthday week proportion in 2017 was approximately half of this in 2015.

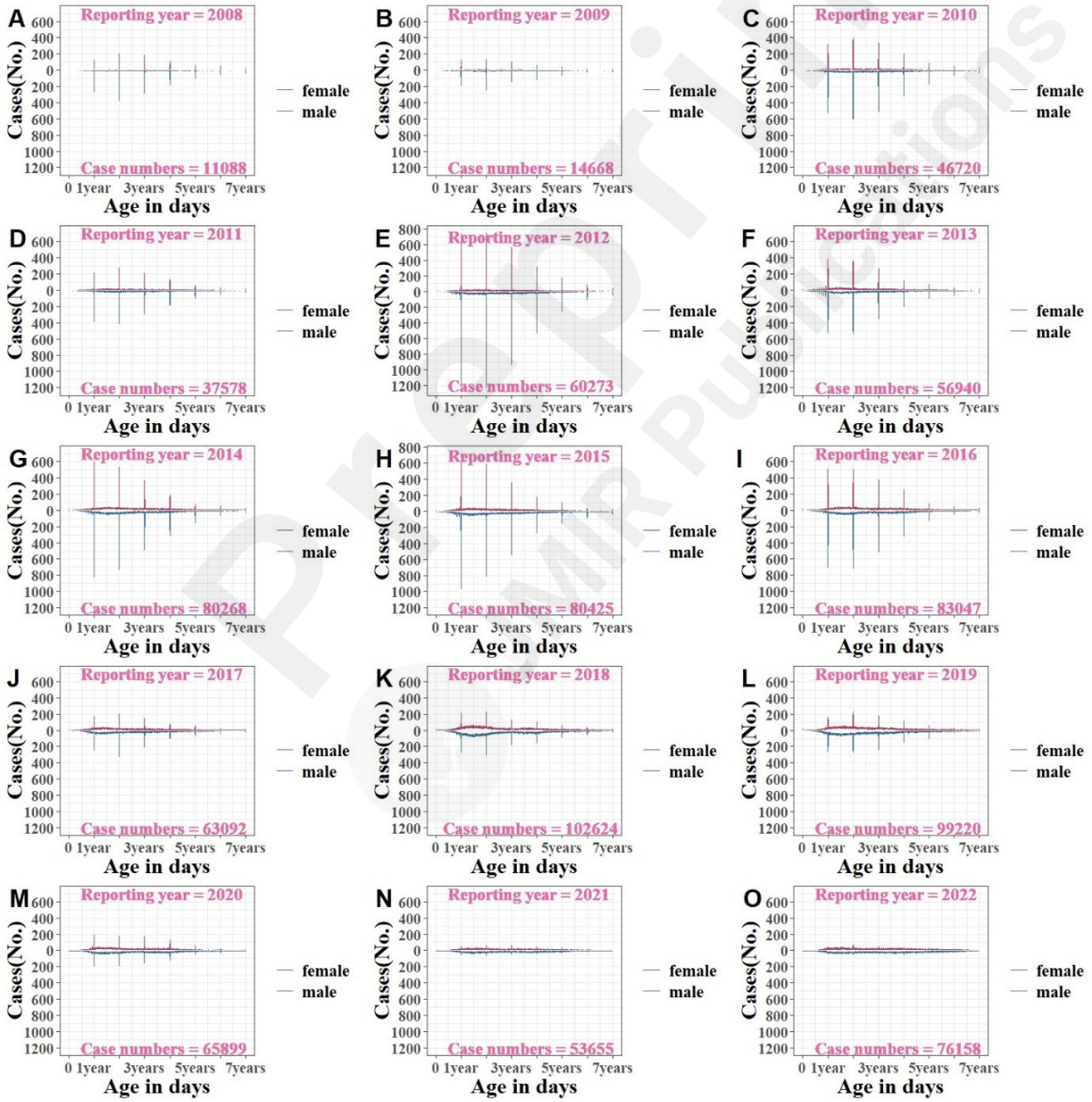

Figure 4. HFMD cases by age (measured in days) and sex among children aged 0-7 years,

stratified by reporting years (2008-2022) in Yunnan Province, China.

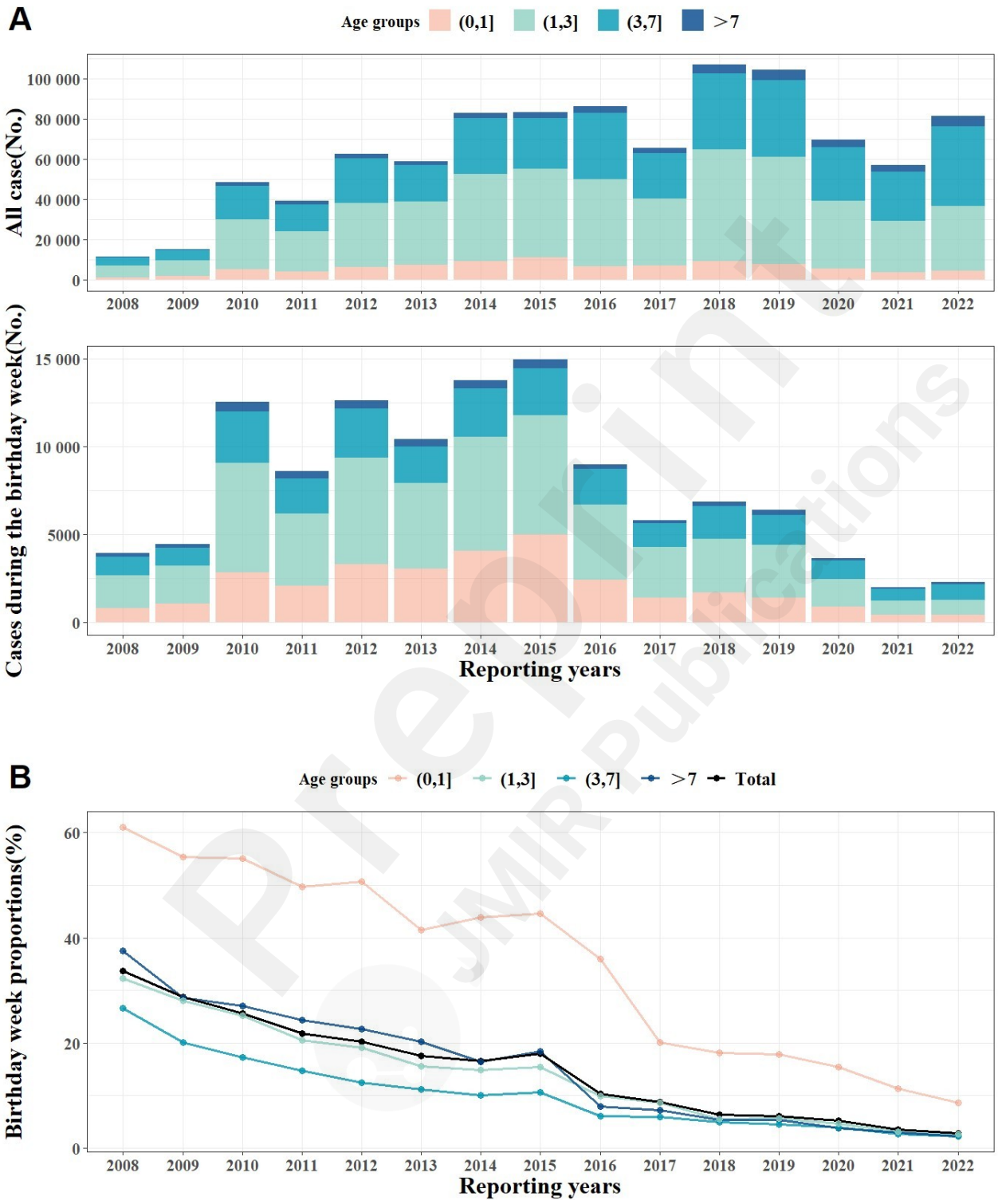

Figure 5. The age group composition of cumulative HFMD cases and cases during the birthday week, and birthday week proportions, with reporting years (2008-2022) in Yunnan Province, China.

The Results of Modified Poisson Regression

The modified Poisson regression model further supported the results of the simple subgroup descriptions. Compared to children aged over 7 years, infants aged 0-1 year were more likely to be infected with HFMD during their birthday week (RR: 1.182, 95%CI: 1.177-1.185, P<0.001). Compared to January, those born during the peak months of the HFMD epidemic-April (RR: 1.037, 95%CI: 1.035-1.040, P<0.001), May (RR: 1.087, 95%CI: 1.084-1.090, P<0.001), June(RR: 1.084, 95%CI:1.081,1.087, P<0.001), July(RR: 1.048, 95%CI: 1.045,1.051, P<0.001) and October to December exhibited a higher propensity for contracting HFMD during their birthday week. Additionally, there was a decreasing trend in risks over the years, with a relatively significant decline from 2015 to 2017 (Table 2).

Table 2. Modified Poisson regression by conditional subgroups using HFMD surveillance data from Yunnan Province, China (2008-2022).

Variables	Subgroups	Relative Risk (RR)	Confidence Interval (CI)	P-value
Sex	Female	1.000	(0.998,1.001)	0.408
Age group	(0,1]	1.182	(1.177,1.185)	<0.001
	(1,3]	0.994	(0.992,0.997)	<0.001
	(3,7]	0.968	(0.965,0.970)	<0.001
Month of birth	Feb.	0.972	(0.970,0.975)	<0.001
	Mar.	0.989	(0.987,0.991)	<0.001
	Apr.	1.037	(1.035,1.040)	<0.001
	May.	1.087	(1.084,1.090)	<0.001
	Jun.	1.084	(1.081,1.087)	<0.001
	Jul.	1.048	(1.045,1.051)	<0.001
	Agu.	0.982	(0.980,0.985)	<0.001
	Sept.	0.995	(0.992,0.997)	<0.001
	Oct.	1.007	(1.005,1.010)	<0.001
	Nov.	1.017	(1.014,1.019)	<0.001
	Dec.	1.016	(1.013,1.018)	<0.001
Reporting year	2009	0.970	(0.962,0.977)	<0.001

2010	0.952	(0.946,0.958)	<0.001
2011	0.923	(0.917,0.929)	<0.001
2012	0.914	(0.908,0.919)	<0.001
2013	0.888	(0.883,0.894)	<0.001
2014	0.884	(0.878,0.889)	<0.001
2015	0.890	(0.885,0.896)	<0.001
2016	0.844	(0.839,0.849)	<0.001
2017	0.827	(0.822,0.832)	<0.001
2018	0.812	(0.807,0.816)	<0.001
2019	0.812	(0.807,0.817)	<0.001
2020	0.805	(0.799,0.809)	<0.001
2021	0.794	(0.789,0.799)	<0.001
2022	0.792	(0.787,0.796)	<0.001

Discussion

Principal Findings

By analyzing the surveillance data of 973,410 HFMD cases in Yunnan Province, China and presenting the age of cases by days, we found that 12.02% of cases occurred during the birthday week, which is 6.27 times the average weekly proportion of 1.92% in a year. Subgroup analyses demonstrated that the birthday week proportions were similar between males and females. Significant differences in birthday week proportions among different age groups and months of birth were observed. Compared to other age groups, the infant group aged 0-1 year had the highest birthday week proportions (33.67%), which is 17.57 times the average weekly proportion. Compared to other months, patients born from April to July and October to December, the peak months of the HFMD epidemic, had higher birthday week proportions. Additionally, there was a decreasing trend in birthday week proportions from 2008 to 2022, dropping from 33.74% to 2.77%. The results of the modified Poisson regression model further supported the findings of these subgroup analyses.

Although the higher proportion of the case numbers during the birthday week in infants compared to

other age groups was partly due to the additive effect of loss of maternal antibodies with the increasing age in infancy [23, 27], this combined result implied a relatively obvious practical significance for HFMD prevention and control. The larger birthday week proportions in those born during the peak months of the HFMD epidemic had larger birthday week proportions were due to the combined effect of the birthday week effect and the seasonality of HFMD. HFMD viruses are more prevalent in the natural environment during peak periods due to climatic and meteorological changes [13, 14]. For the decreasing trends in birthday week proportions over the years, our assumption was that this might be related to the improvements in reporting quality due to the annual routine HFMD-related supervision, training and assessment activities [28, 29]. In the early years, the quality of reporting might not have been high. Notably, the significant drops from 2015 to 2017 coincided with events that likely improved reporting quality. From October 1, 2015, to September 30, 2016, to strengthen HFMD prevention and control in the country and improve surveillance, the General Office of the National Health and Family Planning Commission launched a pilot HFMD surveillance program, with Yunnan Province as one of the pilot provinces [30]. The improvements in reporting and surveillance might account for much of the decreasing trend in birthday week proportions. However, the heterogeneity in the decreasing rate among different age groups (e.g., the birthday week proportions for the infant group aged 0-1 year in 2022 was 14.10% of that in 2008, whereas for the groups aged 1-3 years and 3-7 years, the birthday week proportions in 2022 were 8.37% of that in 2008, and for the group above 7 years, it was 5.97%) suggests that the phenomenon of birthday week effect cannot not be completely explained by date-entry errors or inaccuracies in the data collection process. Additionally, analyzing the data in 2022 alone showed that all age groups had higher birthday week proportions than the average of 1.92%, especially the 0-1 year infant group and 1-3 years group, with 8.65% and 2.71% of cases occurring during the birthday week, respectively. Furthermore, we noticed that the increased risk of HFMD spanned the week including the six days before the birthday, particularly the three days before, not just the exact birthday. This observation

does not align well with the possible errors made by health care providers for convenience when entering patients' information. Therefore, the birthday week effect phenomenon is indeed related to other factors.

The higher exposure risk may explain why the incidence of HFMD was higher during the patients' birthday week. First, on the birthday, compared to other days of the year, family members, teachers, classmates and friends might engage in celebration activities such as having meals together and going to playgrounds, which could increase the risk of exposure to and infection with HFMD [31]. It has been reported that birthday parties are associated with a higher risk of children contracting Salmonella enteritidis phage type (PT) 6 [32]and Microsporum canis [33]. Second, they might consume foods deviating from their usual diet, including birthday cakes, which could impact their gastrointestinal function and increase the risks of enterovirus infection [34, 35].

Previous studies [15-21] that reported a positive correlation between birthdays and certain health and disease outcomes have also attributed their findings to birthday gatherings. For instance, birthday gatherings might serve as the distracting life events, patients who underwent surgery on a surgeon's birthday exhibited higher mortality compared to those who had surgery on other days [18]. These studies also considered some psychosomatic mechanisms. For example, a birthday may represent an acute psychosocial stressor for some individuals, inducing various emotional, physical, and mental changes. Stressful life events can trigger vascular events such as acute stroke, myocardial infarction, and sudden cardiac death [19]. Additionally, some studies explained the birthday rhythm of diseases or death using concepts such as suicide [17] or "birthday blue" [16] ("birthday pressure"). The "postponement of death" phenomenon suggests that an approaching birthday or holiday might provide critically ill patients an extra incentive to live until that day [17]. The "birthday blues" phenomenon suggests that a birthday or holiday might remind individuals of traumatic experiences, causing anxiety and other negative feelings that could lead to suicide [16]. These mechanisms, however, do not seem to appropriately explain our findings. However, previous studies

found that the higher risk occurred around the birthday [17, 21], which is consistent with this study.

These mechanisms discussed above reveal some relatively apparent explanatory factors that have been widely discussed and partially accepted, however, they might not comprehensively explain our finding. We boldly hypothesize that the birthday week effect might also be related to the body's biological rhythms. The birthday week effect appears to be synchronized with geophysical cycles. Many previous studies [36-38] have found that the circadian and circannual cycles of all organisms, including humans, are mainly regulated by their reaction to sun light (such as photoperiod), and many of their behaviors and physiological activities (including immunity [39, 40]) exhibit obvious rhythmicity in response to light. Presumably, experiencing a birthday is equivalent to experiencing a complete Earth's revolution cycle, with the same accumulated light and heat effects from the Earth's revolution. However, the birthday week, situated at the junction of two accumulated cycles, might make individuals more susceptible to disease, possibly due to lowered immunity.

Limitations

There were limitations to this study. We only revealed the phenomenon of birthday week effect and provided possible explanations from several different angles; However, we lack certain experiments or practical evidence to verify these mechanisms. In the future, more studies are needed to investigate and explain this phenomenon. For example, research can be conducted to quantitatively assess the improvements in surveillance systems and reporting quality, as well as the exposure risks of HFMD during the birthday week. Additionally, data on other diseases could be analyzed to explore whether this phenomenon exists. Furthermore, related animal experiments could be carried out to verify possible biological mechanisms.

Conclusion

In conclusion, this was an interesting study that reported a novel birthday week effect of HFMD, particularly for infants who were about to celebrate their first birthday and those born during the peak months of the HFMD epidemic. Improvements in surveillance systems and case reporting

quality might explain the decreasing trend of birthday week effect over the years. Additionally, high exposure risks during the birthday period might also account for the occurrence of this phenomenon. Though potential causes and physiological mechanisms need to be verified, our study provides theoretical evidence for the prevention and control of HFMD, especially for susceptible subgroups. To some extent, raising public awareness of the increased HFMD risk during this personally significant time and reducing unnecessary social activities during the birthday period will benefit HFMD's prevention and control.

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Data and Code Availability

The datasets supporting the findings of this study are available from the corresponding author on reasonable request.

Codes for conducting the main analysis is available on the https://github.com/xinxinran01/birthday-week/blob/main/hfmd_birthday-week.R#L72C10-L72C10.

Authors' Contributions

Concept and design: Pei Jiang, Xiangyu Yan, Tiejun Shui, Longxin Huang, and Tongjian Cai. Data collection: Ming Xu, Linhui Hao, and Tian Huang. Data analysis of and interpretation of data: Pei Jiang, Xiangyu Yan, and Tiejun Shui. Drafting of the manuscript: Pei Jiang, Xiangyu Yan, and Longxin Huang. Critical revision of the manuscript for important intellectual content: Tiejun Shui, Xiangyu Yan and Tongjian Cai. Administrative, technical, or material support: Zhengzhong Liu and Ming Xu. All authors read and approved the final version of this manuscript.

Conflicts of Interests

No conflicts of interest are declared.

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Abbreviations

HFMD: Hand Foot and Mouth Disease

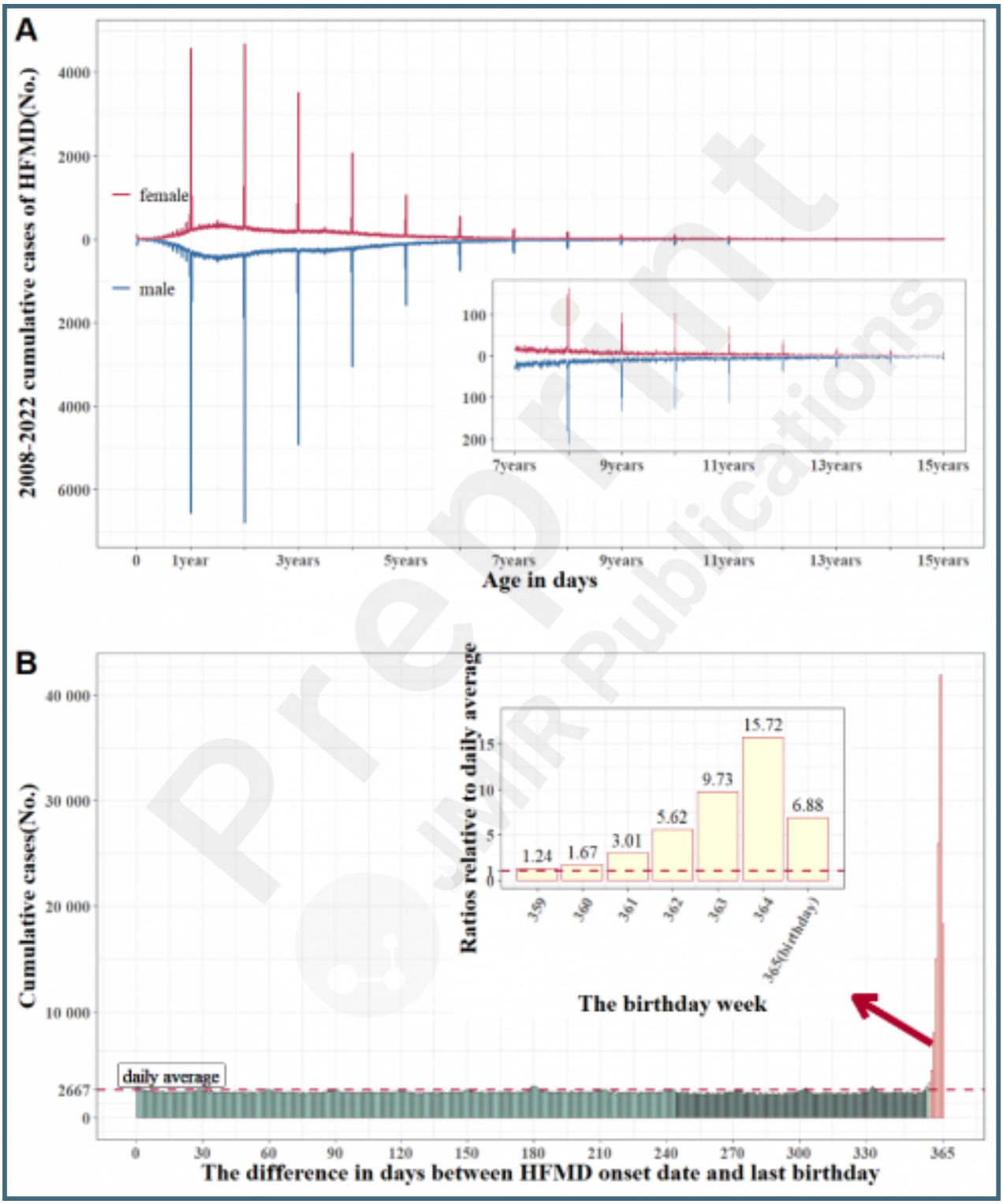
NSNIDP: National Surveillance of Notifiable Infectious Disease Programmer

CDC: Centers for Disease Control and Prevention

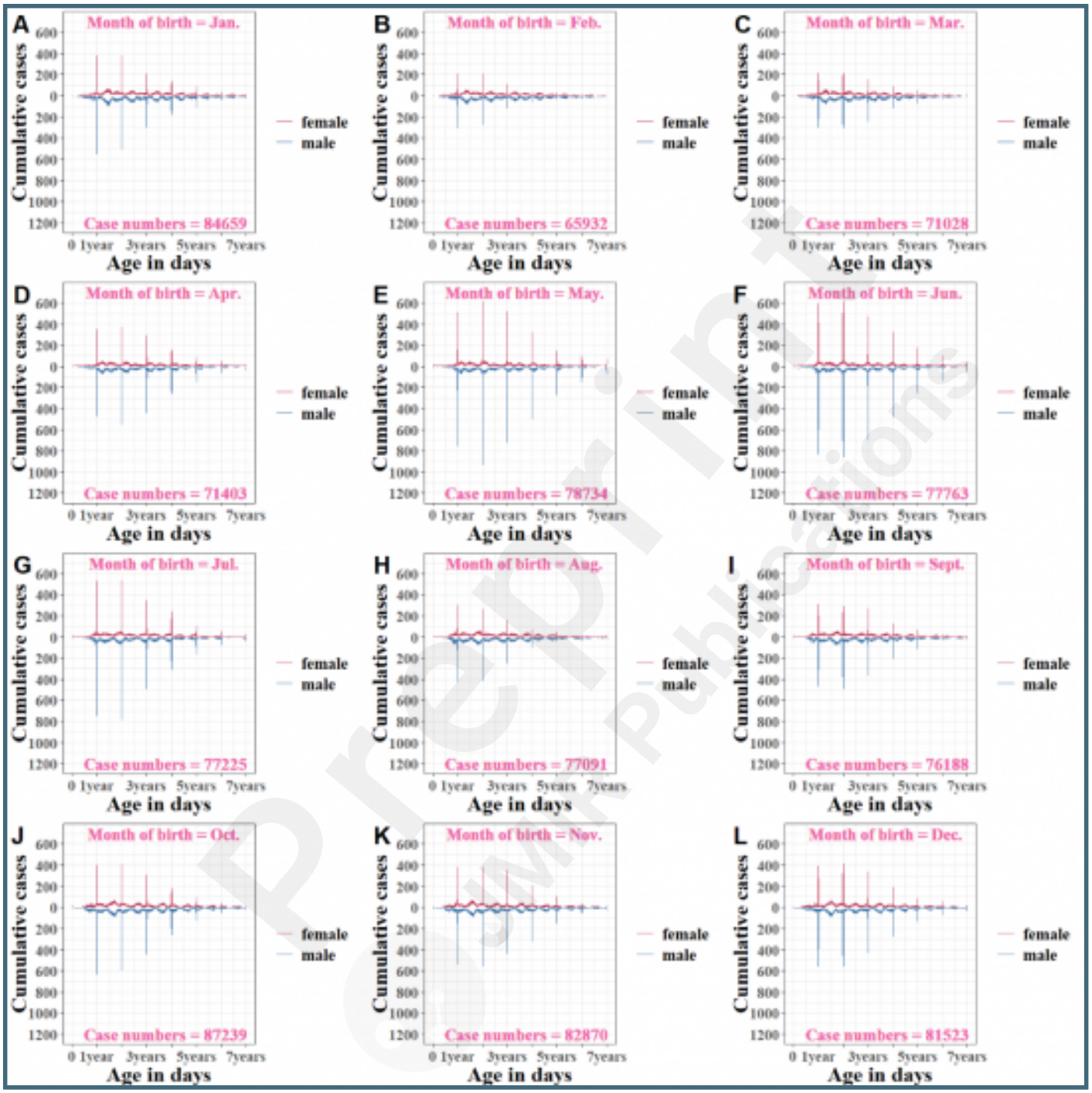
Supplementary Files

Figures

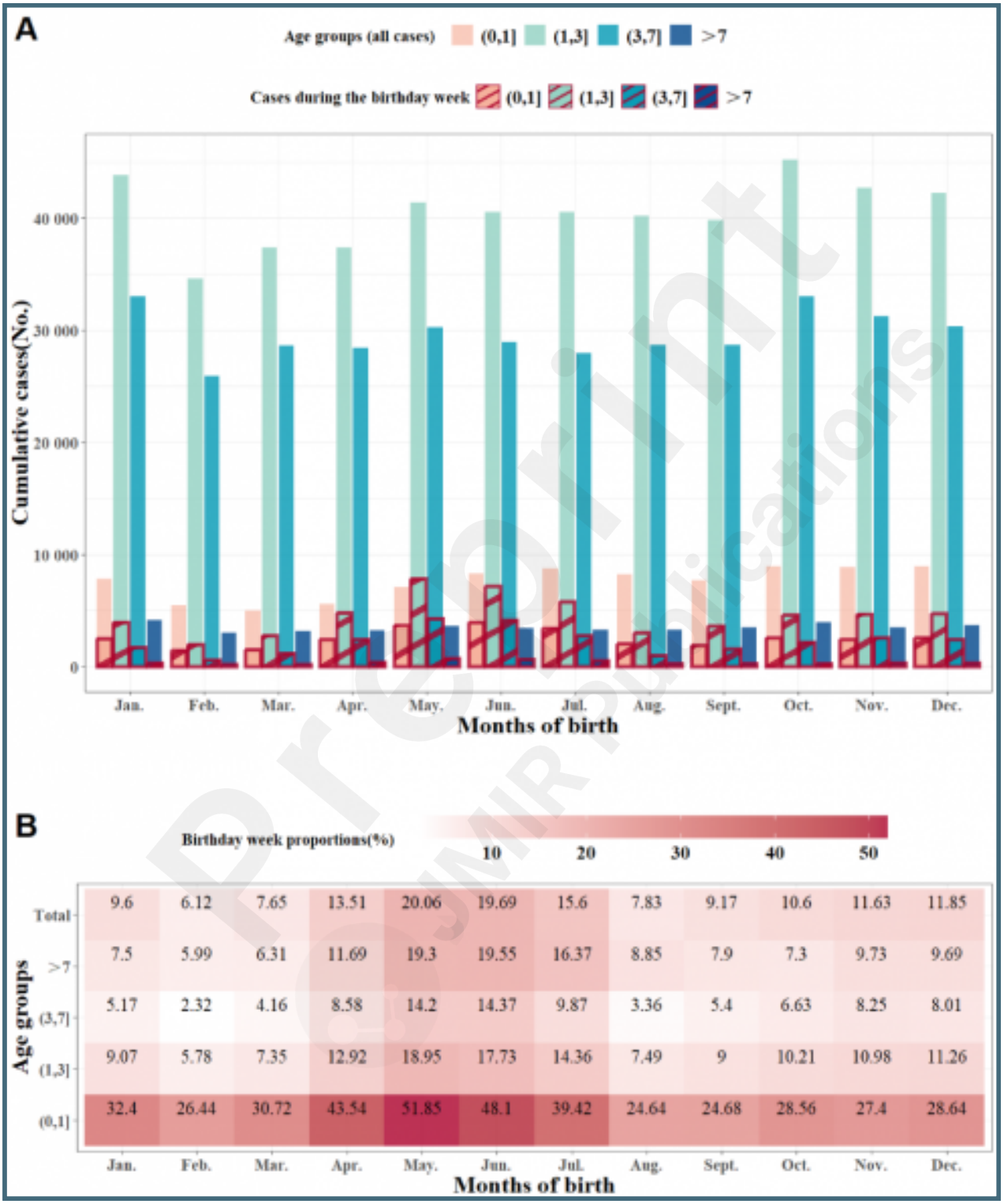
The "pulse and rhythm-type" surge in cumulative HFMD cases during the birthday week in Yunnan Province, China (2008-2022). A: Cumulative cases by age (measured in days) and sex among children aged 0-15 years. B: Cumulative cases based on the difference in days between onset date and birthday, along with ratios relative to the average daily proportion (1/365, 0.27%) for each day of the birthday week.



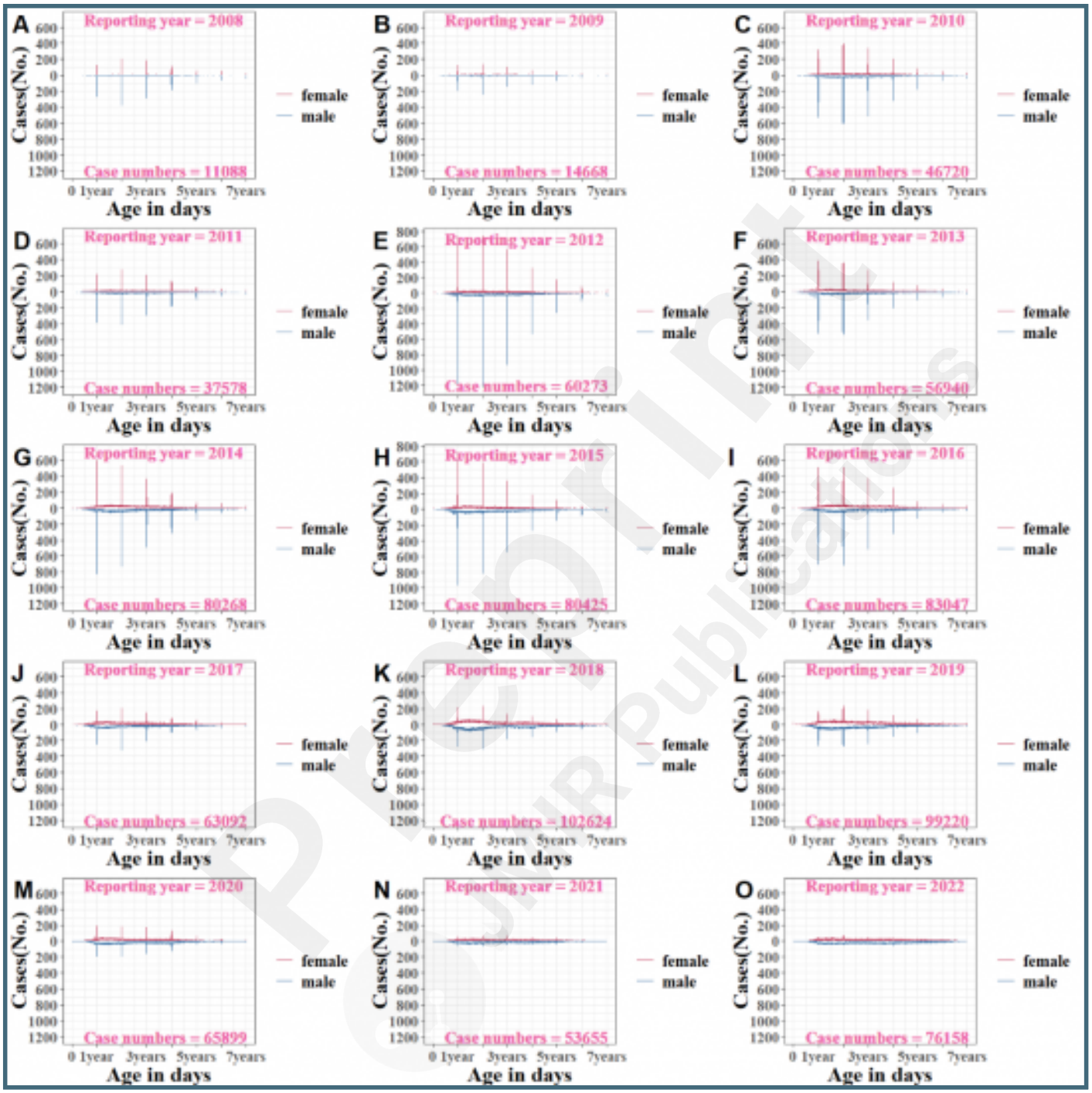
Cumulative HFMD cases by age (measured in days) and sex among children aged 0-7 years, stratified by months of birth in Yunnan Province, China (2008-2022).



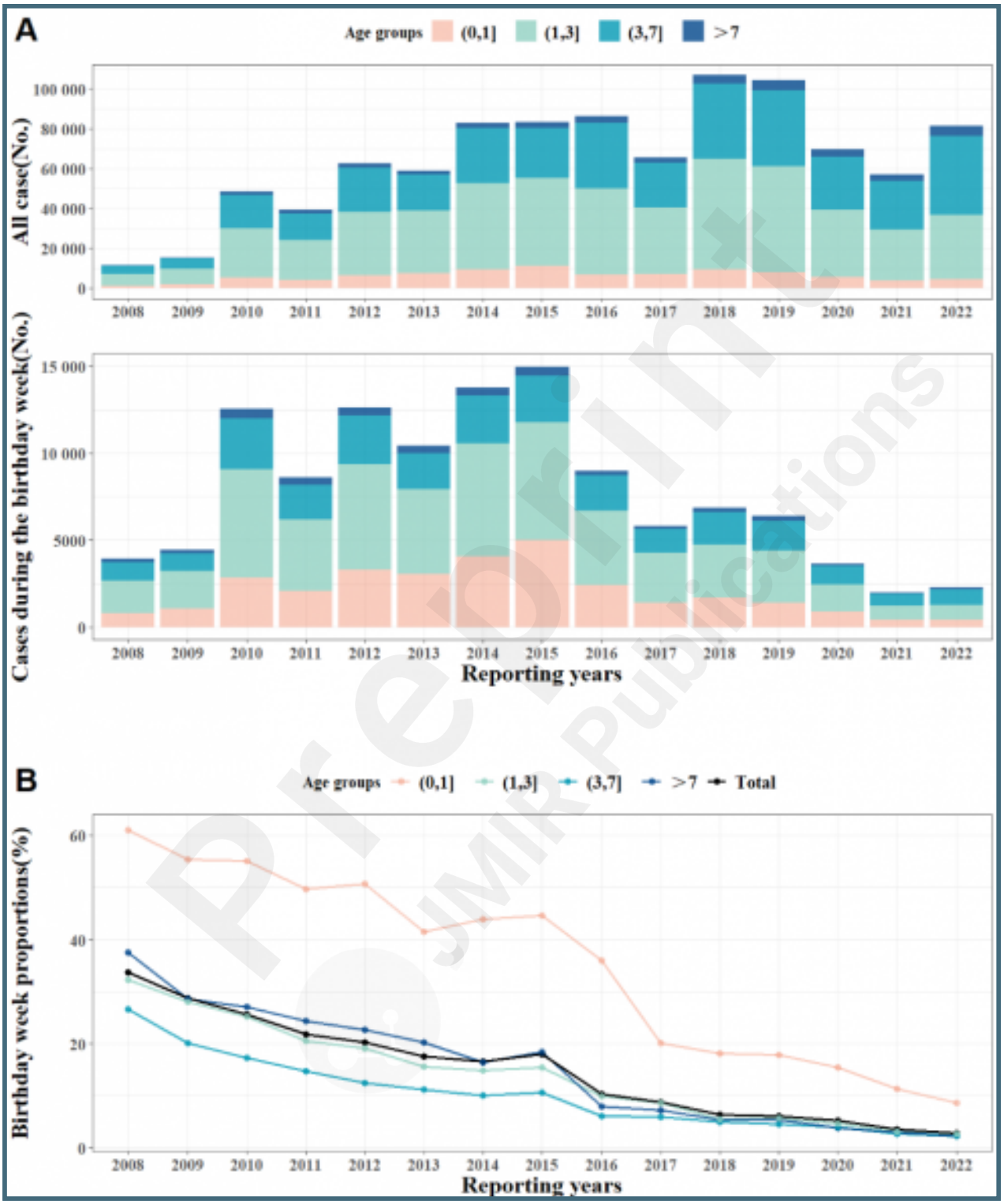
Bar graph of cumulative HFMD cases and cases during the birthday week, and heatmap of birthday week proportions, across different age groups, stratified by months of birth in Yunnan Province, China (2008-2022).



HFMD cases by age (measured in days) and sex among children aged 0-7 years, stratified by reporting years (2008-2022) in Yunnan Province, China.



The age group composition of cumulative HFMD cases and cases during the birthday week, and birthday week proportions, with reporting years (2008-2022) in Yunnan Province, China.



Multimedia Appendixes

Supplementary Materials.
URL: http://asset.jmir.pub/assets/e5434b1bfb40279adf0dd512a2843e32.docx