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Letter to the Editor

## Less is more: Uptake of recommended vaccines in a UK travel clinic



Dear Editor,

The acceptance of vaccines and vaccine-related information from healthcare providers has been a hot topic during the COVID pandemic.<sup>1</sup> This topic is not new to most travel health clinics, where refusal of recommended vaccines may be high, up to 25% in a large US study,<sup>2</sup> or even very high (>40%) especially for some travel-specific vaccines such as rabies or Japanese encephalitis (JE) vaccines. Known factors increasing the risk of refusal of vaccines include travelling to visit friends and relatives (VFRs), trip duration >28 days, and having no underlying medical problems.<sup>1,3,4</sup> Refusal of travel vaccines by VFRs is particularly concerning as they are often at higher risk of vaccine preventable disease.<sup>5</sup> In a fee-paying travel clinic set within a UK NHS hospital, we aimed to quantify the rates of vaccine uptake and identify factors associated with refusal in those who self-referred for assessment prior to travel.

In our clinic, travel advice is given in accordance with national guidance,<sup>6</sup> and details of which vaccines are recommended and received are collected during each consultation. For this study, these data were compiled together with the electronic clinic database including demographic information, significant medical history, and travel itinerary including destinations, duration and reason(s) for travel. Travellers were defined as having 'refused a vaccine' if they did not receive one or more vaccines recommended, aside from reasons of stock non-availability. Data analyses were performed using R-studio version 2023.6.1.524.

From 01/04/2015 to 28/11/2020 a total of 1651 travel consultations were performed (median 8/week). Median traveller age was 39 years (range 16-97) and showed a bimodal distribution (23, 60). 51% (834/1635) were female, 86% (1412/1638) had no significant prior health conditions. Global regions included in planned itineraries were Asia (42%), Africa (23%) or Latin America (15%), with 12% of travellers including more than one in their planned trip. The primary reason provided for travel was holiday (74%, 1160/1571) while 13% (201/1571) were VFR, 27% (400/1484) were planning trips  $\geq 30$  days duration.

The median number of vaccine courses recommended per new consultation was 3 (range 0-10), and 93% of travellers were recommended at least 1 vaccine (Fig. 1). The total number of vaccines recommended during the study period was 4616, of which 1731 (37.5%) were refused. Per individual, 856 (53.9%) travellers accepted all vaccines, while 274 (17.3%), 188 (11.8%), and 269 (17.0%) refused 1, 2 or  $\geq 3$  vaccines, respectively. During the period of study, hepatitis A, typhoid, cholera and combined diphtheria/tetanus/polio vaccines are often available free-of-charge from primary care providers in the UK. Of the travellers who gave a reason for vaccine refusal, 46% (175/377) cited the intention of sourcing these vaccines from primary care.

Univariate analysis identified the following factors associated with travel vaccine refusal; travel to the Americas, travel for the purposes of religion or holiday, and with increasing number of vaccines recommended. Factors associated with increased uptake of recommended vaccines included travel to Asia and travel for aid work (see [Supplementary Tables](#)). Subsequent multivariable logistic regression incorporated these factors together with those previously demonstrated to have a significant correlation with vaccine refusal (see [Table 1](#)).<sup>2</sup> The final model demonstrated increased risk of refusal in younger age groups (16-30years OR = 1.51, P = 0.022, 30-45years OR = 1.46, P = 0.047) and if travelling for religion (OR = 3.64, P = 0.023), and reduced risk of vaccine refusal if travelling for aid work (OR = 0.57, P = 0.017). There was a strong positive linear correlation between the number of vaccines courses recommended and the number of vaccines declined (R = 0.67, Pearson's correlation). The median local cost of vaccines recommended per travel consultation was £191 (IQR 100-315). Costs of commonly prescribed vaccines were compared to the rates of refusal with a significant correlation when vaccines available free of charge at the GP were excluded (R = 0.93, Pearson's correlation).

In context of the current UK hybrid system, where some vaccines are available free-of-charge, we were interested to see if travellers who deferred a vaccine recommended by our clinic subsequently accessed them from their primary care provider. We performed a service evaluation which randomly selected 100 travellers who had deferred typhoid vaccine of which 78 had electronic health records available to view. Of these, 50 (64%) had evidence of receiving typhoid vaccine in primary care either in the 6 months following our travel consultation, or were still protected by a previously received vaccination (i.e. within the prior 2.5 years). Where vaccine was given in primary care, a median delay of 26 days (IQR 18-34) from date of travel consultation was incurred.

Risks of vaccine preventable diseases are often underestimated by the public, particularly before travel.<sup>7</sup> Our analysis confirms a high proportion of pre-travel vaccinations are refused by travellers, even in a population who are sufficiently motivated to attend a self-referred, fee-paying travel clinic.<sup>2,8</sup> Our findings support the correlation between vaccine price and acceptance,<sup>7</sup> which is reflected by our higher rates of refusal of Japanese encephalitis and rabies vaccine.

The national trend of vaccine hesitancy in younger age groups during the covid pandemic<sup>9</sup> is reflected in our reduced vaccine uptake in ages < 45 years. Religion was also found to be associated with vaccine refusal. A primary reason for religious travel is the Hajj, and previous studies have shown variable uptake of non-mandatory travel vaccines before travel.<sup>10</sup> The correlation between the number of vaccines recommended and number refused should prompt

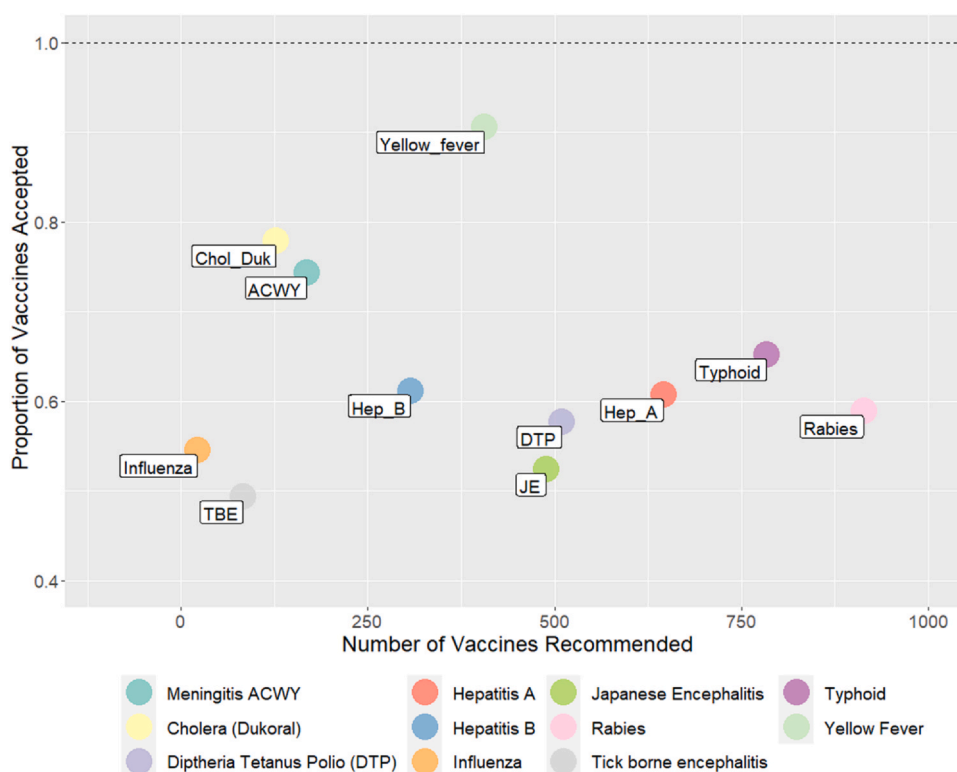


Fig. 1. Total number of each vaccine recommended during the study period and the proportion of visits they were accepted.

**Table 1**  
Multivariable model of the factors associated with travel vaccine refusal.

Characteristic	OR <sup>a</sup>	95% CI <sup>a</sup>	p-value
Continent			
Africa	—	—	
Americas	0.75	0.52, 1.07	0.11
Asia	1.28	0.96, 1.72	0.10
Australasia	0.68	0.29, 1.53	0.4
Europe	0.58	0.23, 1.41	0.2
Age group (years)			
60+	—	—	
16-30	1.51	1.06, 2.14	<b>0.022</b>
30-45	1.46	1.01, 2.13	<b>0.047</b>
45-60	1.08	0.75, 1.54	0.7
Purpose			
Holiday	—	—	
Aid work	0.57	0.36, 0.90	<b>0.017</b>
Business	1.17	0.75, 1.83	0.5
Elective	1.24	0.56, 2.77	0.6
Other	0.96	0.57, 1.63	0.9
Religion	3.64	1.31, 12.8	<b>0.023</b>
VFR	1.20	0.82, 1.75	0.4
Trip duration > 30 days			
FALSE	—	—	
TRUE	0.75	0.55, 1.01	0.060

Bold values indicates significant values ( $p$ -value < 0.05).

<sup>a</sup> OR = odds ratio; CI = confidence interval.

clinicians in the travel health clinic to reflect on which vaccines they prioritise after risk assessment. This study did not show an association between VFR and refusing a vaccine that has previously been reported, but our data rely on self-identification as VFR and so may not fully match the WHO definition of VFR Traveller.

The COVID pandemic has brought to light the issue of vaccine hesitancy and the importance of targeted vaccine education. Identifying the relative importance of the factors associated with vaccine refusal and the cohorts of travellers less likely to be

vaccinated against vaccine preventable diseases should enable us to target evidence-based vaccine messaging to ensure informed decisions are being made.

### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Thomas Darton reports a relationship with Sanofi Pasteur Inc that includes: consulting or advisory. Thomas Darton reports a relationship with Valneva UK that includes: consulting or advisory and travel reimbursement. Co-author Thomas Darton is an associate editor for the Journal of Infection If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.jinf.2024.01.008](https://doi.org/10.1016/j.jinf.2024.01.008).

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