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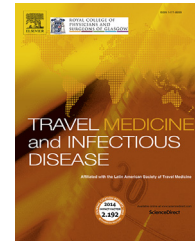
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Imported infections: What information should be collected by surveillance systems to inform public health policy?

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Summary *Background:* International travel carries the risk of imported diseases, which are an increasingly significant public health problem. There is little guidance about which variables should be collected by surveillance systems for strategy-based surveillance.

Methods: Surveillance forms for dengue, malaria, hepatitis A, typhoid and measles were collected from Australia and New Zealand and information on these compared with national surveillance forms from the UK and Canada by travel health experts. Variables were categorised by information relating to recent travel, demographics and disease severity.

Results: Travel-related information most commonly requested included country of travel, vaccination status and travel dates. In Australia, ethnicity information requested related to indigenous status, whilst in New Zealand it could be linked to census categories. Severity of disease information most frequently collected were hospitalisation and death.

Conclusions: Reviewing the usefulness of variables collected resulted in the recommendation that those included should be: overseas travel, reason for travel, entry and departure dates during the incubation period, vaccination details, traveller's and/or parents' country of birth, country of usual residence, time resident in current country, postcode, hospitalisation and death details. There was no agreement about whether ethnicity details should be collected. The inclusion of these variables on surveillance forms could enable imported infection-

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related policy to be formulated nationally and internationally.
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1. Introduction

International travel carries a risk of importing infectious diseases from one region of the globe to another, particularly as faster and more frequent long-haul travel enables many pathogens to cross borders within their incubation periods [1]. The public health consequences of imported infections include local transmission, the reestablishment of infections in areas from which they had been eliminated, or the introduction of infectious diseases into new areas with susceptible populations. Global pandemics, such as SARS in 2003, influenza A (H1N1) pdm09 in 2009, and more recently the MERS-CoV and Ebola outbreaks demonstrate the potential public health impact of imported infections [2–4].

Imported infections are likely to increase as a significant public health issue as changing environmental and climatic conditions present new opportunities for pathogens to establish transmission, either between humans or to humans from a non-human source [5]. Dengue, for example, a disease connected to urbanisation and climate change [6,7], is an increasing concern in many areas [8]. Similarly, a common vector for Chikungunya virus (*Aedes albopictus*) has expanded in Europe and the Americas [9], resulting in outbreaks of this disease in countries not previously affected [10]. The Zika virus epidemic affecting countries in the Western Pacific and South America [11] is another important example of the consequences of disease importations. In Australia, dengue fever outbreaks in the northern state of Queensland have been linked to imported cases [12,13], and autochthonous transmission of chikungunya and Zika viruses is similarly possible due to vector presence [13]. Autochthonous mosquito-borne transmission of both dengue and chikungunya has also occurred in the United States and Europe in recent years [14,15], while sexual transmission of Zika virus has so far been reported in New Zealand, the United States, Europe and South America [16].

Surveillance systems have been usefully differentiated as “control” or “strategy” focused [17], both serving an important function. The former aims to prevent onward transmission from infected individuals, including control of disease outbreaks. The latter is focused on collecting information which can be used by public health experts to develop policies to prevent, reduce or eliminate the impact of infections at a local, regional, national and international level.

Notification forms (whether paper-based or electronic) are the mainstay of surveillance systems. In view of the likely increased public health significance of imported infections, many countries will be relying on specific information collected, formulating new notification forms and amending current ones. As with all surveillance data, there is a delicate balance between capturing sufficient

information and not overburdening notifiers and health department personnel with the time and effort required.

Currently, a range of imported disease-specific data is collected using notification forms at national and sub-national levels. Some prior research has explored the usefulness of particular variables collected by surveillance systems [18,19], and general evaluations of surveillance systems have been undertaken [17,20]. However, there is little published literature appraising notification forms in terms of their usefulness for strategy-based surveillance of imported infections. Our aim therefore was to make recommendations about the most useful variables that should be requested on notification forms for this purpose.

2. Methods

Five infectious diseases (dengue, hepatitis A, malaria, measles and typhoid) were chosen as useful examples of imported infections as they have different routes of transmission, preventive measures and levels of endemicity. General and disease-specific notification forms used in 2013 in Australia and New Zealand, and national notification forms from Canada and England were collected. Each of these countries has increasingly diverse migrant communities and large numbers of overseas travellers, and strategies to reduce the incidence of imported infections are likely to be similar.

A search was performed of the website of the New Zealand Crown Research Institute “Environmental Science and Research” to identify relevant general and disease-specific notification forms for the five diseases. Australian disease surveillance is collated nationally, using information from each jurisdiction. The latter are responsible for collecting disease notification information. Templates for Australian disease-specific notification forms are available from the “Series of National Guidelines” (SoNGs), but jurisdictions can develop their own forms. The websites of all eight jurisdictions (six States and two Territories) were searched and each jurisdiction was also contacted by telephone and/or email to request forms not publicly available.

To provide additional comparisons of notification data collected, public health experts from England and Canada were contacted to request relevant notification forms. The authors considered that national forms from these countries would provide enough information to make useful comparators, whilst the collection of all local surveillance forms could have resulted in the collection of potentially nearly 100 forms, with few new insights.

For data extraction, specific data fields included on available notification forms were categorised into information specific to travel history, relevant demographic data and that relating to the severity of the notified infection. Although not all surveillance forms used the same

wording, they were considered to include this information if it was worded in an unambiguous way. Surveillance forms were examined to determine the range of data collected in each specific category.

Authors, all of whom had practical and academic public health experience in the field of imported infections then discussed each variable to determine its usefulness, drawing on examples of where each had been used in the academic literature to inform policy about imported infections where appropriate.

3. Results

In New Zealand, no general notification forms are used, but five disease-specific notification forms were obtained (Table 1). From Australian States and Territories, either national disease-specific templates (SoNGs) (measles, hepatitis A and dengue) or State-specific forms were collected from seven of the eight jurisdictions (the authors were unable to obtain surveillance forms for South Australia), and in total, 24 different forms were identified from this country (Table 1).

From England, available forms consisted of a national general notification form and national disease-specific notification forms for HAV, malaria and typhoid (to be completed in addition to the general notification form). In Canada, no national notification form is used, and like

Australia, surveillance is coordinated predominately at a Province or Territory level. Measles was the only disease investigated for which a national disease-specific notification form is used. In neither country is dengue fever a notifiable disease (Table 1).

Table 2 shows the specific details regarding the travel-related information collected. Although most forms requested information on overseas travel, only the Northern Territory collected this information for all diseases, whilst Western Australia collected overseas travel data for malaria, and England for malaria and typhoid. Reason for travel was not routinely collected in New Zealand, nor any of the Australian jurisdictions. Not all forms required collection of vaccination history for the three vaccine preventable diseases. Several forms requested verification through health records and/or batch number of the vaccine where relevant. The use of malaria chemoprophylaxis was usually requested, but only the New Zealand and Victorian forms collected details of mosquito avoidance measures used.

Demographic information collected is summarised in Table 3. The majority of notification forms requested information on the postcode of residence, country of birth and English language proficiency of the case. In Australia, details of ethnicity were limited to Aboriginal and Torres Strait Islander status, although the Western Australian notification forms had an option for "other" ethnicity. In

Table 1 Notification forms used in Australian States and Territories,^a New Zealand, Canada and the UK for the surveillance of dengue, hepatitis A, malaria, measles, and typhoid fever in 2013.

Jurisdiction/country	Dengue	HAV	Malaria	Measles	Typhoid
Australian Capital Territory (ACT)	State-specific	ACT/NSW	State-specific	State-specific	State-specific
New South Wales (NSW)	State-specific generic notification form ^c	ACT/NSW	State-specific	SoNGs ^d	State-specific generic notification form
Northern Territory (NT)	SoNGs	Tasmania/Vic/NT	State-specific	SoNGs	Victoria/NT
Queensland	State-specific	State-specific	State-specific	State-specific	State-specific
Tasmania ^b	No state-specific form	Tasmania/Vic/NT	No state-specific form	SoNGs	State-specific
Victoria	State-specific	Tasmania/Vic/NT	State-specific	State-specific	Victoria/NT
Western Australia (WA)	No state-specific form	State-specific	State-specific	State-specific	State-specific
New Zealand ^b	National (arboviral disease)	National	National	National (measles, mumps, rubella)	National (enteric disease)
UK	Dengue not a notifiable disease	National	National	No national disease-specific form	National
Canada	No disease-specific form	No disease-specific form	No disease-specific form	National	No disease-specific form

^a Unable to access disease-specific forms from South Australia.

^b Tasmania does not use general notification forms; instead basic information is supplied in laboratory notification reports, with further disease specific details collected as required by the diagnosing reporting clinician (personal communication David Coleman, Scientific Officer, Disease Surveillance, Department of Health and Human Services, Tasmania).

^c New South Wales has State-specific forms to follow up dengue and typhoid cases.

^d SoNGs – Series of National Guidelines.

Table 2 Travel-related information collected in Australian States and Territories, New Zealand, Canada and the UK for the surveillance of dengue, hepatitis A, malaria, measles, and typhoid fever on surveillance forms in 2013.

Jurisdiction/ country	Overseas travel	Reason for travel	Country visited	Region within country visited	Dates of entry into and departure from country visited	Pre-travel health advice considered/ received	Hotel/tour operator details	Vaccination details (HAV, measles, typhoid)	Chemoprophylaxis (malaria)	Mosquito avoidance measures taken during travel (dengue and malaria)
ACT	Yes	No	Yes	No	Yes* Dengue, HAV, typhoid	No	No	Yes*	Yes*	No
New South Wales	Yes*	No	Yes*	Yes*, HAV, malaria	Yes* HAV, malaria	No	No	Yes	Yes	No
Northern T erritory	Yes*	Yes*	Yes*	Yes*malaria (if acquired in Indonesia, Timor, PNG)	Yes*	No	No	Yes	Yes*	No
Queensland	Yes*	No	Yes	Yes* HAV; measles	Yes* Dengue; HAV; malaria; typhoid	No	No	Yes* HAV; measles	Yes*	No
South Australia ^a	Yes	No	Yes	No	No	No	No	Yes	No	No
Tasmania ^b	Yes	No	Yes	No	Yes	No	No	Yes	—	—
Victoria	Yes*	No	Yes*	Yes measles; typhoid	Yes*	Yes Dengue; malaria	No	Yes*	Yes	Yes
Western Australia	Yes	Yes* Malaria	Yes*	No	Yes* HAV; typhoid	No	No	Yes*(HAV, measles)	Yes	No
New Zealand ^b	Yes*	No	Yes*	Yes: dengue; dengue; HAV; malaria; typhoid	Yes: dengue; malaria	Yes; dengue; HAV; malaria	No	Yes	Yes	Yes (malaria)
UK ^c	Yes* malaria; typhoid: HAV	Yes* Malaria; typhoid	Yes*	Yes* Malaria; typhoid	Yes* HAV; typhoid	Yes* Typhoid	Yes* Typhoid	Yes* HAV; typhoid	Yes*	No
Canada ^c	Yes	No	Yes	Yes	Yes	No	No	Yes	Not applicable	Not applicable

Yes = information is collected on general surveillance forms.

Yes* = information is not requested on general surveillance forms but is on all disease-specific surveillance forms.

Yes* with names of diseases = information is not requested on general surveillance forms but is requested on disease-specific surveillance forms for these diseases.

^a Only information from the general surveillance form was available.

^b General notification forms are not used in Tasmania nor New Zealand.

^c Dengue is not a notifiable disease in Canada nor the UK.

Table 3 Demographic information collected in Australian States and Territories, New Zealand, Canada and the UK for the surveillance of dengue, hepatitis A, malaria, measles, and typhoid fever in surveillance forms in 2013.

Jurisdiction/ country	Country of birth	Ethnicity	Country of usual residence	Length of time resident in current country	Postcode	English language proficiency
ACT	Yes*	Indigenous	No	No	Yes* HAV; measles; typhoid	Yes* HAV; typhoid
New South Wales	Yes	Indigenous	No	No	Yes	Yes
Northern Territory	Yes* HAV; measles; typhoid	Indigenous	No	No	Yes	Yes* HAV; measles; typhoid
Queensland	No	Indigenous	Yes*	No	Yes	Yes
South Australia ^a	No	Indigenous	No	No	Yes	No
Tasmania ^b	Yes	Indigenous	No	Yes	Yes	Yes
Victoria	Yes	Indigenous	Yes*	Yes*	Yes	Yes* HAV; measles; typhoid
Western Australia	Yes	Indigenous/ other	No	No	Yes	Yes* HAV; typhoid
New Zealand ^b	No	Yes	No	No	Yes	Yes
UK ^c	Yes* HAV	Yes	Yes	Yes* Typhoid	Yes	No
Canada ^c	Yes Measles	No	No	Yes	No	No

Yes* = information is not requested on general surveillance forms but is on all disease-specific surveillance forms.

Yes* with names of diseases = information is not requested on general surveillance forms but is requested on disease-specific forms for these diseases.

^a Only information from the general surveillance form was available.

^b General notification forms are not used in Tasmania nor New Zealand.

^c Dengue is not a notifiable disease in Canada nor the UK.

New Zealand and England, the option for multiple ethnicity categories was available, which could be matched to the ethnicity categories used in the national census.

Whilst nearly all notification forms included details of the patient's address, it was often unclear from the wording if a permanent or temporary address was being requested. The UK's malaria notification form overcame this potential confusion by including specific options in the reason for travel section of the form, and provides options for "foreign visitor from abroad", "new entrant to the UK" and "UK citizen living abroad".

Disease-specific information collected is summarised in Table 4. Information on whether a patient had been hospitalised was collected on all forms, and all except the Canadian form required data on whether the patient had died. However, the date the patient started treatment was not collected by most Australian jurisdictions and only on the malaria notification form in the UK.

4. Discussion

This study aimed to appraise the usefulness of information collected on notification forms for strategy-based surveillance of imported diseases. Whilst there were similarities in some of the variables requested, there were also many

variations not attributable to the differences in local epidemiology of these infections. It is therefore worth appraising the usefulness of each variable collected, demonstrating how it has been, or could be used to develop public health policies. Below we describe the factors considered in relation to each variable and the authors' recommendations about which should be collected in order to develop public health policies to prevent imported infections.

4.1. Travel-related information

4.1.1. Recent overseas travel

Recent overseas travel as a risk factor for disease can be used to inform public health strategy. The absence of reported recent overseas travel enables public health practitioners to quickly identify cases in which local transmission has occurred. This is particularly useful for dengue and malaria, where a case not acquired abroad suggests presence of a competent vector. In countries which have eliminated measles as part of the global measles elimination strategy, it is important to establish whether primary cases were acquired abroad, and whether secondary transmission is linked to these. It is also useful to identify the numbers of locally acquired and imported cases

Table 4 Disease severity information collected in Australian states and territories and in New Zealand for the surveillance of dengue, hepatitis A, malaria, measles, and typhoid fever on surveillance forms in 2013.

Jurisdiction/country	Date of starting treatment	Hospitalised	Died
ACT	No	Yes* HAV; measles; typhoid	Yes* HAV; measles
New South Wales	No	Yes* measles	Yes
Northern Territory	Yes	Yes	Yes
Queensland	Yes*	Yes*	Yes*
	Malaria: typhoid	HAV; malaria; measles; typhoid	HAV, measles, typhoid
South Australia ^a	No	Yes	Yes
Tasmania ^b	No	Yes	Yes
Victoria	Yes*	Yes*	Yes
	Measles, typhoid		HAV; measles; typhoid
Western Australia	No	Yes	Yes
New Zealand ^b	No	Yes	Yes
UK ^c	Yes* (malaria)	Yes* typhoid	Yes
Canada ^c	No	Yes	No

Yes* denotes this information requested on all disease-specific forms.

Yes* with diseases listed: denotes this information requested for specific diseases only.

^a Only information from the general surveillance form was available.

^b General notification forms are not used in Tasmania nor New Zealand.

^c Dengue is not a notifiable disease in Canada nor the UK.

of diseases (for example typhoid) to determine the appropriate focus of health promotion campaigns.

Recommendation: important to collect

4.1.2. Reason for travel

Reason for travel has been associated with variable risks for many diseases, and quantifying the proportion of infections associated with each reason enables public health strategies to be appropriately targeted. For example, travellers visiting friends and relatives (VFRs) have been reported to be at greater risk of acquiring many travel-related infectious diseases than other travellers [21]. While the detail regarding reason for travel may be useful for targeting prevention measures, more than one reason for travel may be relevant [22] and should be accommodated on notification forms. Also, it is vital that standardised terms are understood by all stakeholders. There has recently been some disagreement about the definition of a "VFR-traveller", and whether the concept of ethnicity is fundamental in the understanding of this term [23–25]. It may therefore be beneficial to provide a definition on notification forms, such as that available by the WHO publication "International Travel and Health" [26].

Recommendation: important to collect

4.1.3. Country and local areas visited

The specific countries visited during the incubation period for the disease and the dates of entry to and departure from the country/ies should ideally be captured. This information allows a measure to be made of the duration and timing of exposure to particular pathogens, thereby enabling determination of the most likely place of acquisition for cases and inform targeted

travel health promotion campaigns and health alerts. More specific detail regarding places within a country visited might in some circumstances be ideal where there are local variations in disease risk (for example malaria and dengue fever) but inaccuracies in reporting and the effort of capturing these data may outweigh potential benefits.

Recommendation: collect dates of entry to/departure from the countries visited during the disease incubation period

4.1.4. Pre-travel health advice considered/received

A pre-travel health encounter provides an opportunity for a traveller to receive appropriate vaccinations, medications (e.g., malaria chemoprophylaxis) and health education. There is considerable evidence that many of those who acquire imported infections have not sought pre-travel health advice [21], and some evidence that those who do receive pre-travel health advice are less likely to return with disease [27]. Collection of prior health seeking can be used to inform public health strategies.

Recommendation: important to collect

4.1.5. Hotel/tour operator

Details of the hotel or tour operator used have proven useful for the control outbreaks of malaria in The Gambia [28]. This has also been used by the European Centre for Disease Control to investigate outbreaks of Legionnaire's disease [29,30] but may be of more importance in control, rather than strategy-based surveillance of imported diseases.

Recommendation: less important to collect

4.1.6. Vaccination uptake

Information about vaccine uptake among patients with imported infections is clearly important for policy makers. For example, an epidemiological review of typhoid cases in 2010 and 2011 in New South Wales showed that 7% of those for whom information was available had been vaccinated [31]. National Australian data highlights the risk of measles in partially vaccinated children [32]. Information about the date of vaccination enables examination of the proportion with up-to-date immunisation for relevant travel-related diseases and identifies cases of potential vaccine failure and waning of immunity. However this question is likely subject to recall bias and misclassification, as some patients may be reluctant to disclose that they had failed to access vaccines or may be unable to recall if and when they received specific vaccines. To enable this information to be used effectively, verification of vaccination administration is vital; otherwise this information will be unreliable. Vaccination status could be potentially validated from electronic databases kept by many GPs or travel medicine specialists and in some circumstances, vaccine registries, but such validation will often not be feasible. Despite these barriers, monitoring vaccine uptake of notified cases is important for program evaluation.

Recommendation: important to collect

4.1.7. Malaria chemoprophylaxis

Malaria chemoprophylaxis uptake information is also subject to recall bias. As with vaccination details, GP, travel clinic or pharmacy records may be more accurate in determining whether chemoprophylaxis was prescribed and which regimen. Even where this information is collected, the possibility of poor adherence to the prescribed course is an additional limitation, as this cannot be easily measured or documented in a meaningful way.

Recommendation: less important to collect

4.1.8. Use of insect repellents

Details of the use of insect repellents have the similar limitations related to recall bias. Patients may not provide accurate information [33], and even when mosquito avoidance measures have been used, they may not have been done so routinely [34].

Recommendation: less important to collect

4.2. Demographic and disease severity information

4.2.1. Country of birth of travellers and their parents

Information about country of birth provides valuable information about disparities in disease risk in first generation migrant travellers, and in conjunction with ethnicity data (where collected) enables capture of information about second generation residents, who are also an important risk group for some diseases. For instance, a review of data collected by GeoSentinel (a sentinel surveillance network,

<http://www.istm.org/geosentinel/>) found that some diseases, for example HAV, have a higher incidence in second generation migrants who undertake VFR travel than tourist travellers [21].

Recommendation: important to collect

4.2.2. Ethnicity

Ethnicity has been shown to be an important determinant of patient's behaviour vis à vis travel health [34,35]. Whilst it could be argued that a patient's country of birth provides sufficient information on which to develop strategy to reduce the incidence of imported disease, it has been counterclaimed that culture is an important factor affecting knowledge, attitudes and behaviour [19,23] and this may be shared more between people of a common ethnicity than country of birth. Collection of ethnicity data also allows the capture of second generation migrants as this can be matched to country of birth data if the country of birth of the traveller's parents is not collected.

In England and New Zealand, ethnicities included on notification forms match those requested on census forms which allow incidence rates to be calculated for residents returning with imported infections. Although there are potentially hundreds of ethnicities that could be reported, including multiple ethnicities for the same person, in both these countries there are established methods for managing this with reference to ethnicity data collected in the census [36,37]. Similar methods could be incorporated by those who collate the data provided on notification forms.

In the UK, ethnicity data have been used to demonstrate that the uptake of measles immunisation was higher in those of Indian origin compared to other ethnic groups [38], providing evidence for the targeting of specific ethnic communities for strategies to increase vaccination uptake. There are also sensitivities to be considered regarding ethnicity, which may potentially be used to target specific communities, and this awareness must be weighed against the need for this information to direct health services to those in most need [39].

Recommendation: no agreement reached between authors about whether this should be collected

4.2.3. Country of usual residence

Country of usual residence is important information. In the UK, an analysis of imported malaria infections between 1987 and 2006 found that up to 25% of cases were not UK residents, and as such would likely not have been aware of UK-focused disease prevention strategies [40].

Recommendation: important to collect

4.2.4. Length of time resident in current country

An awareness of the length of time a person has been resident in the current country is useful with respect to some diseases, particularly malaria, as natural immunity wanes in the absence of regular re-exposure [41]. Those who have spent several years in a non-malarious country

may be more likely to suffer severe illness if exposed, thus length of time resident in the current county gives one indication of the risk for severe disease.

Recommendation: important to collect

4.2.5. Postcode

Postcode information may be particularly useful for geographical mapping of cases to local areas of deprivation to determine if there is a correlation with the incidence of imported diseases. This information allows public health strategies to be targeted to specific locations and has been usefully undertaken in New Zealand with respect to diseases of close contacts [17].

Postcode information can also be used to map the changing distribution of imported infections over time. For example, in the UK, this information has been used together with other data collected on the national malaria notification form to show the change over a 20 year period of malaria incidence caused by *Plasmodium vivax* mostly occurring in Asian populations based in the Midlands and North of England to an epidemiological profile where the majority of cases live in London, are of African origin and become infected with *Plasmodium falciparum* [40]. In New South Wales, analyses of typhoid cases over six years showed that the majority of cases resided in Western Sydney, an area with large migrant populations [31].

Recommendation: important to collect

4.2.6. Knowledge of national language proficiency

For strategy development, knowledge of national language proficiency of particular communities could be used to determine the need for translation of health-related materials. However, this may be too difficult to measure in a meaningful way to be worthwhile collecting, as data would be required of written, spoken and listening proficiency.

Recommendation: less important to collect

4.3. Disease severity

Details regarding disease severity are important for prioritising the need for interventions to reduce the burden of imported infections. However, these data are usually collected at one point in time from the treating doctor and information about subsequent hospitalisation or death is often not known unless data linking is performed.

Recommendation: less important to collect

4.3.1. Date of starting treatment for travel-related infection

Delays in starting treatment have been linked to poor access to healthcare and/or misplaced confidence in self-treatment [42], and from a public health perspective, it is important to quantify the numbers of patients who do not

access treatment promptly. A more useful measure for strategy-based surveillance may be to include a variable asking if there was a delay in seeking treatment.

Recommendation: less important to collect

4.3.2. Hospitalisation

Details of the need for hospitalisation and length of stay resulting from imported infections provide an important measure of the severity of these diseases and their impact on hospital services which can be measured by geographic area and over time. Linkage to other health service data, for example access to primary care before admission, also allows a measure of the burden on other health services.

Recommendation: important to collect

4.3.3. Death

Information about the number of deaths amongst infected patients can be used to calculate case fatality rates, although the accuracy of these analyses is dependent on the completeness of notifications. Underestimation of case fatality rate is likely if deaths occurred after the disease notification was made and notification details were not updated. Deaths due to imported infections should be prompt changes in preventive strategies or public health advice.

Recommendation: important to collect

4.4. Data collection systems

The study also identified a range of options for data collection. Collecting data at a local rather than national level for strategy-based surveillance enables the information collected on notification forms to be targeted to the local situation, and may encourage a sense of "ownership" amongst stakeholders that otherwise may be lost. However, ambiguity around the wording of variables and non-uniformity in the data collected means that results may not be easily comparable at a national level or between diseases. Disease-specific notification forms offer an opportunity to collect a range of disease-specific information but duplication with information collected on general surveillance form should be avoided. In New Zealand, national notification forms are specific to one disease or group of diseases with similar transmission patterns. This model could be considered by others as a way of managing competing priorities of collecting sufficient data with demands on time.

5. Conclusions

International travellers are important sources of infectious disease in countries with low disease incidence and strong national disease control systems. These include many countries in Europe, as well as Australia, New Zealand, Canada and the United States. After careful consideration, we believe that the minimum information listed below

should be included on notification forms in these countries to enable strategy development for the prevention of imported diseases.

Travel-related information: recent international travel; reason for travel; dates of entry to and departure from the countries visited during the disease incubation period; and vaccination details. **Demographic information:** traveller's and parent's country of birth; country of usual residence; length of time resident in current country; postcode. There was no agreement about whether ethnicity should be collected. **Disease severity information:** hospitalisation; death.

It should be borne in mind that the recommendations are only for high income countries. In low and middle income countries, national surveillance systems may not be in place, and/or the epidemiology of imported infections may be sufficiently different to that in high income countries to reduce the validity of these recommendations. One further limitation is that, as mentioned earlier it was judged that the 34 forms from four countries were sufficient for evaluation purposes. Local forms were not collected from Canada or the UK, and it is possible that these contain other useful and relevant variables. However, it is hoped that the recommendations made are useful for those planning or amending notification forms who wish to capture information to help them in developing policies aimed at reducing the burden of imported infections.

Conflict of interest

The authors declare that there is no conflict of interest.

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