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Figures and figure supplements

Effectiveness of traveller screening for emerging pathogens is shaped by epidemiology and natural history of infection

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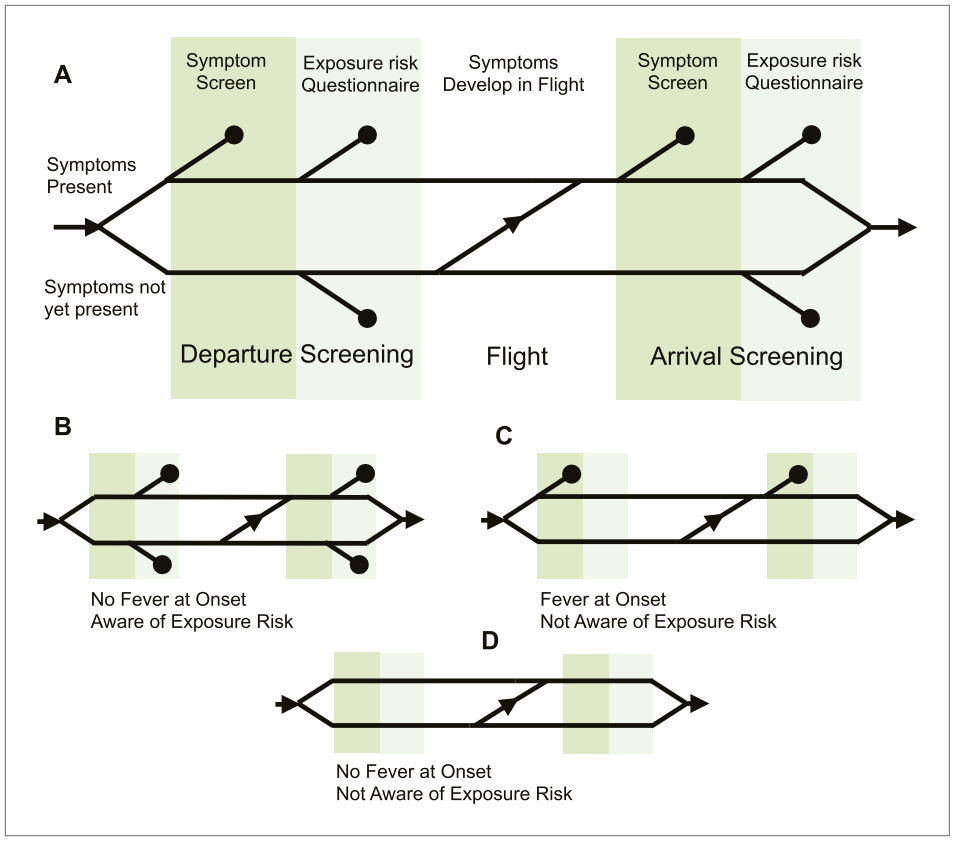

Figure 1. Model of traveller screening process. (**A**) Upon airport arrival, passengers passed through screening for fever, followed by screening for risk factors. We assumed a one-strike policy: passengers identified as potentially infected by any single screening test were detained. (**B**) Passengers who did not present with fever would always pass through symptom screening, but could still be identified during questionnaire screening. (**C**) Passengers who were not aware of exposure risk would always pass through questionnaire screening. (**D**) Passengers with neither fever nor knowledge of exposure would go undetected.

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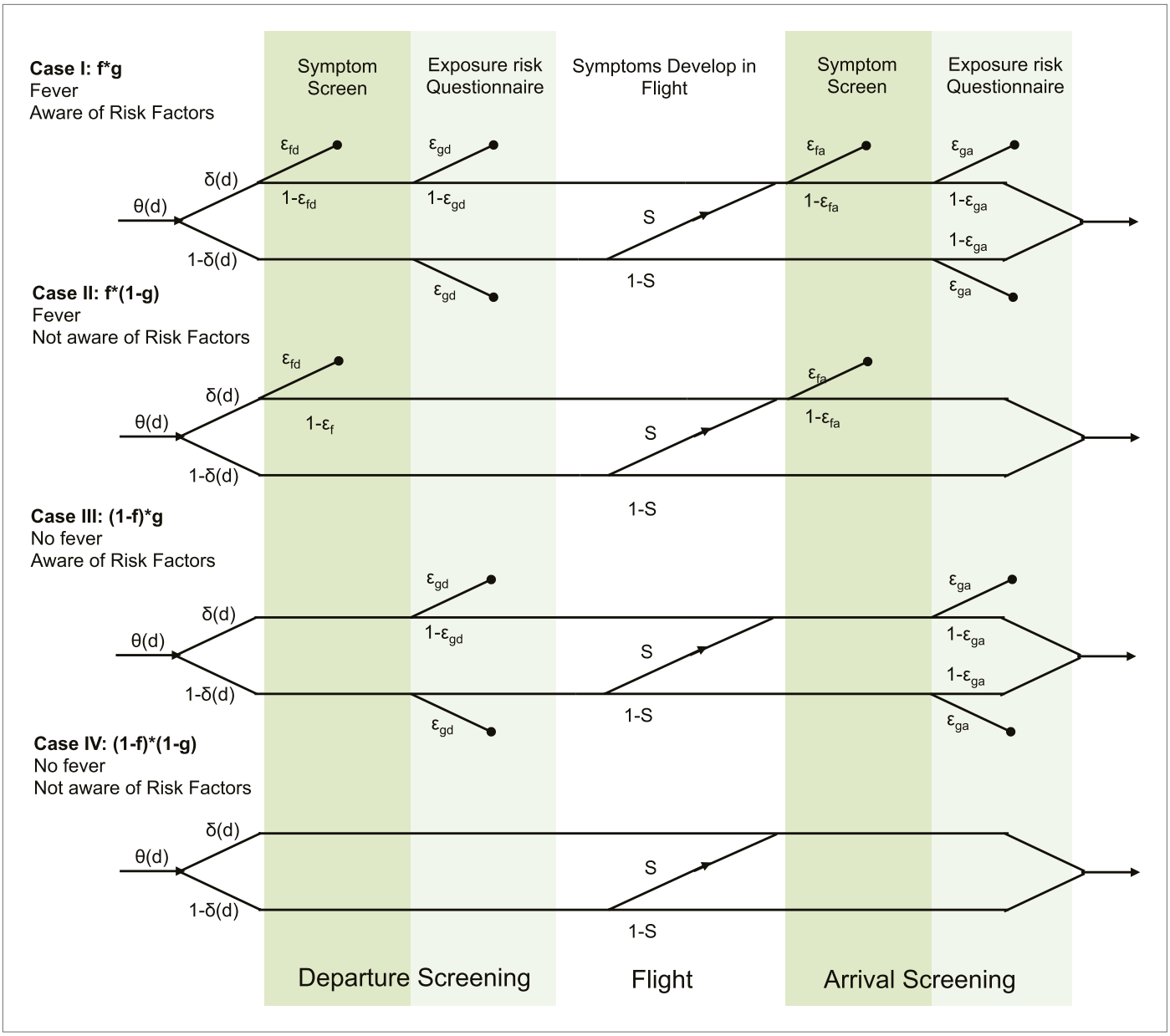

Figure 1—figure supplement 1. Detailed model formulation with parameters. Each case represents a different detectability class. Travellers are assigned to detectability classes with probabilities f (presence of fever) and g (awareness of exposure risk). Values for f and g are given in ***Table 2***. θ(d) describes the infection age distribution (times since exposure) in individuals attempting travel. **δ**(d) is the incubation period cumulative distribution function, which describes the probability that travellers have progressed to symptom onset at the time of attempted travel. **ε** describes the efficacy of each respective screening module. S is the probability that travellers develop symptoms in flight, given that they did not yet have symptoms at departure.

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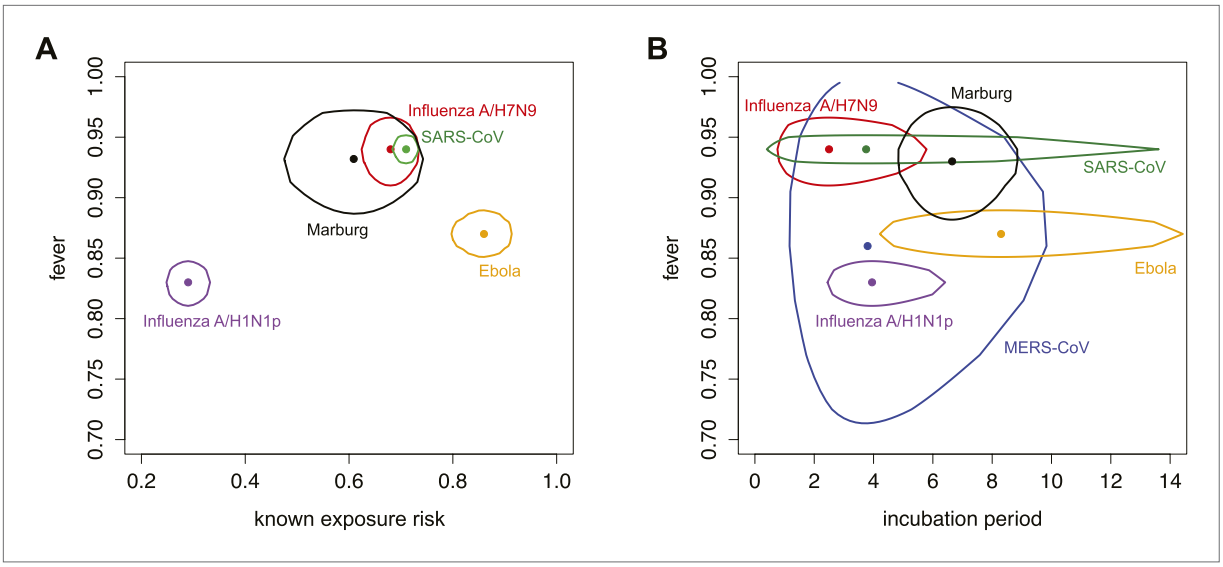

Figure 2. Parameters characterizing natural history of infection and epidemiological knowledge. (**A**) Proportion of infected individuals who report known exposure risk and show fever at onset. Point shows median estimate, using data in ***Tables 2, 3***; circle shows joint 95% binomial confidence interval. Red, influenza A/H7N9; purple influenza A/H1N1p; blue, MERS; green, SARS; orange, Ebola; black, Marburg. (**B**) Incubation period and fever at onset. Point shows median estimate, circle shows joint 95% CI, generated using a binomial distribution for fever symptoms and fitted parametric distributions given by references in ***Table 3*** for incubation period.

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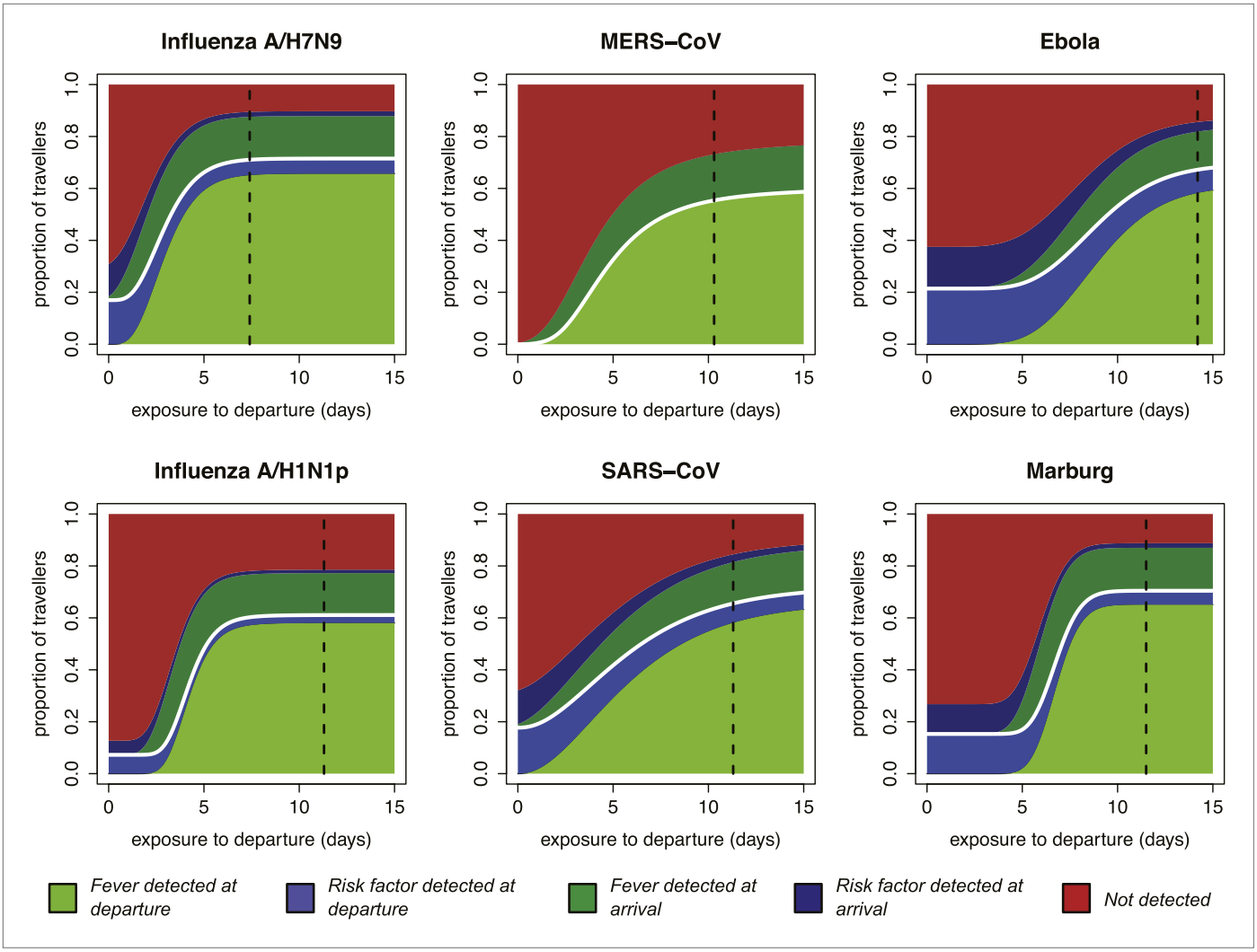

Figure 3. Impact of infection age on effectiveness of screening measures. Expected fraction of passengers detected by fever and risk factor screening, at arrival and departure, as a function of the time between an individual's exposure and the departure leg of their journey. We assume a 70% probability that fever screening will identify febrile patients, and a 25% probability that a traveller with a known history of risky exposure will report it on a questionnaire. We assume 24 hr travel time. The white lines denote the point at which travellers board their flight; the black dashed line shows the median time from exposure to hospitalization for each pathogen.

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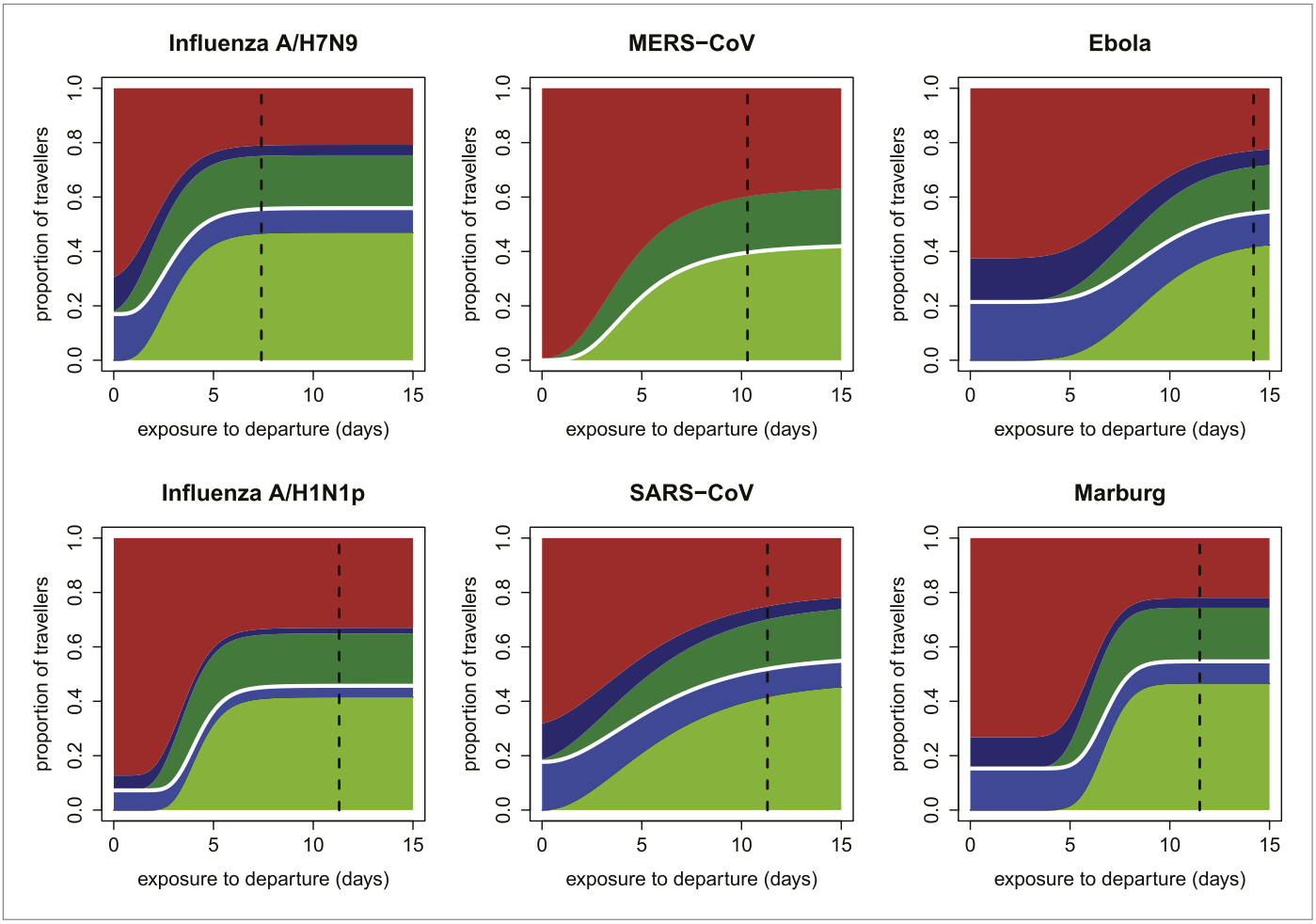

Figure 3—figure supplement 1. Expected proportions detected by screening when efficacy of fever screening is 50% and proportion of cases with known exposure history who report correctly is 0.25.

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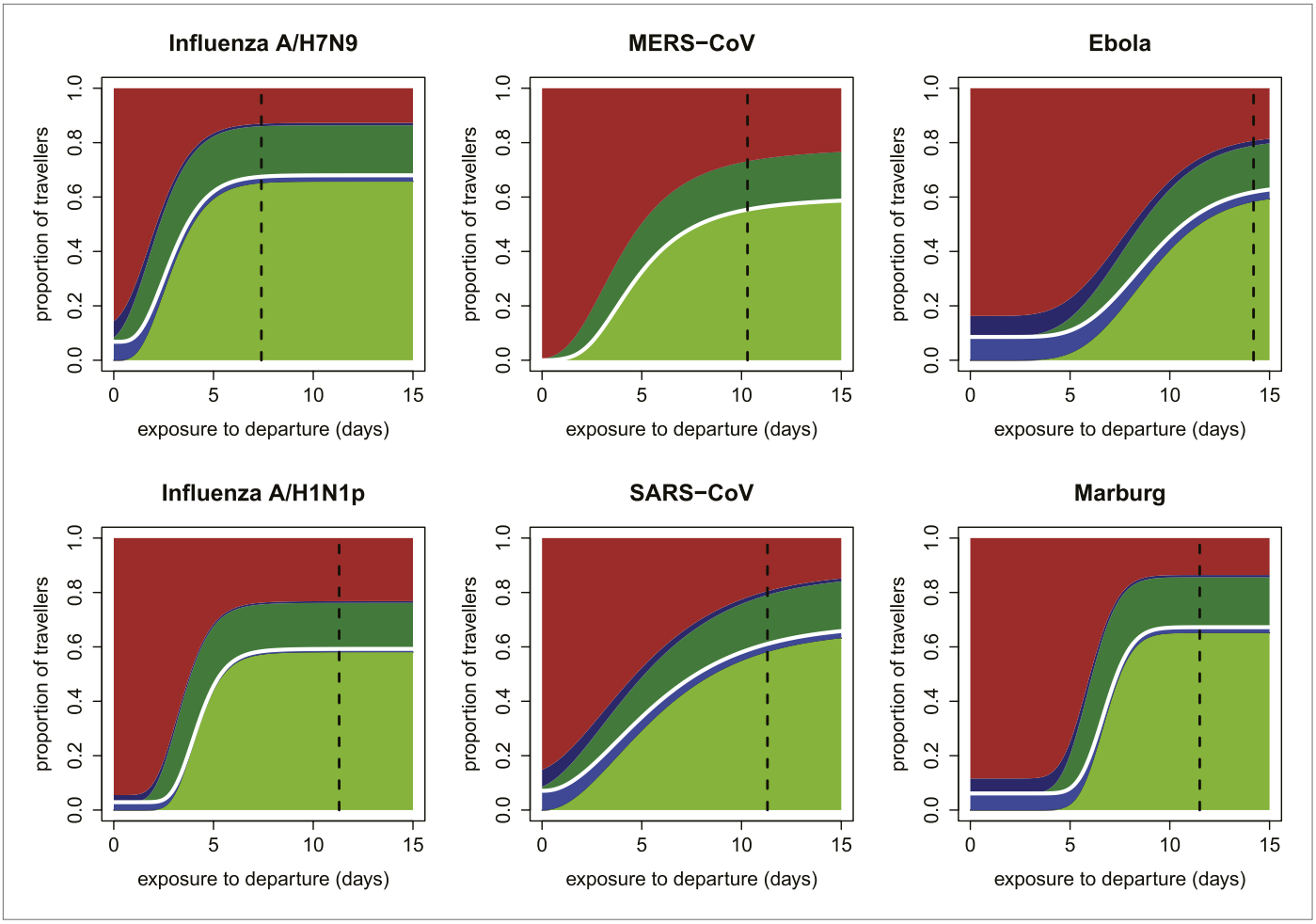

Figure 3—figure supplement 2. Expected proportions detected by screening when efficacy of fever screening is 70% and proportion of cases with known exposure history who report correctly is 0.1.

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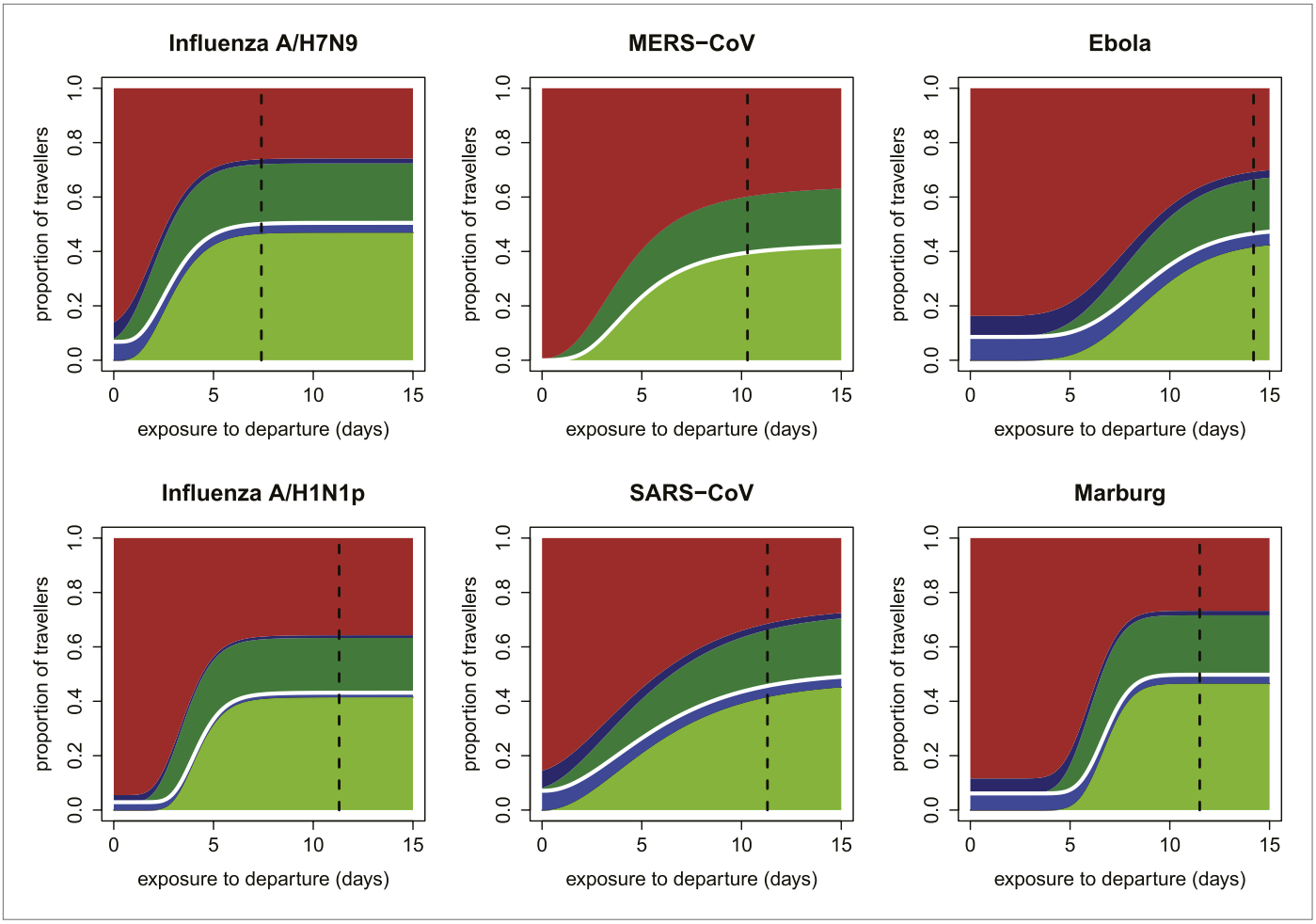

Figure 3—figure supplement 3. Expected proportions detected by screening when efficacy of fever screening is 50% and proportion of cases with known exposure history who report correctly is 0.1.

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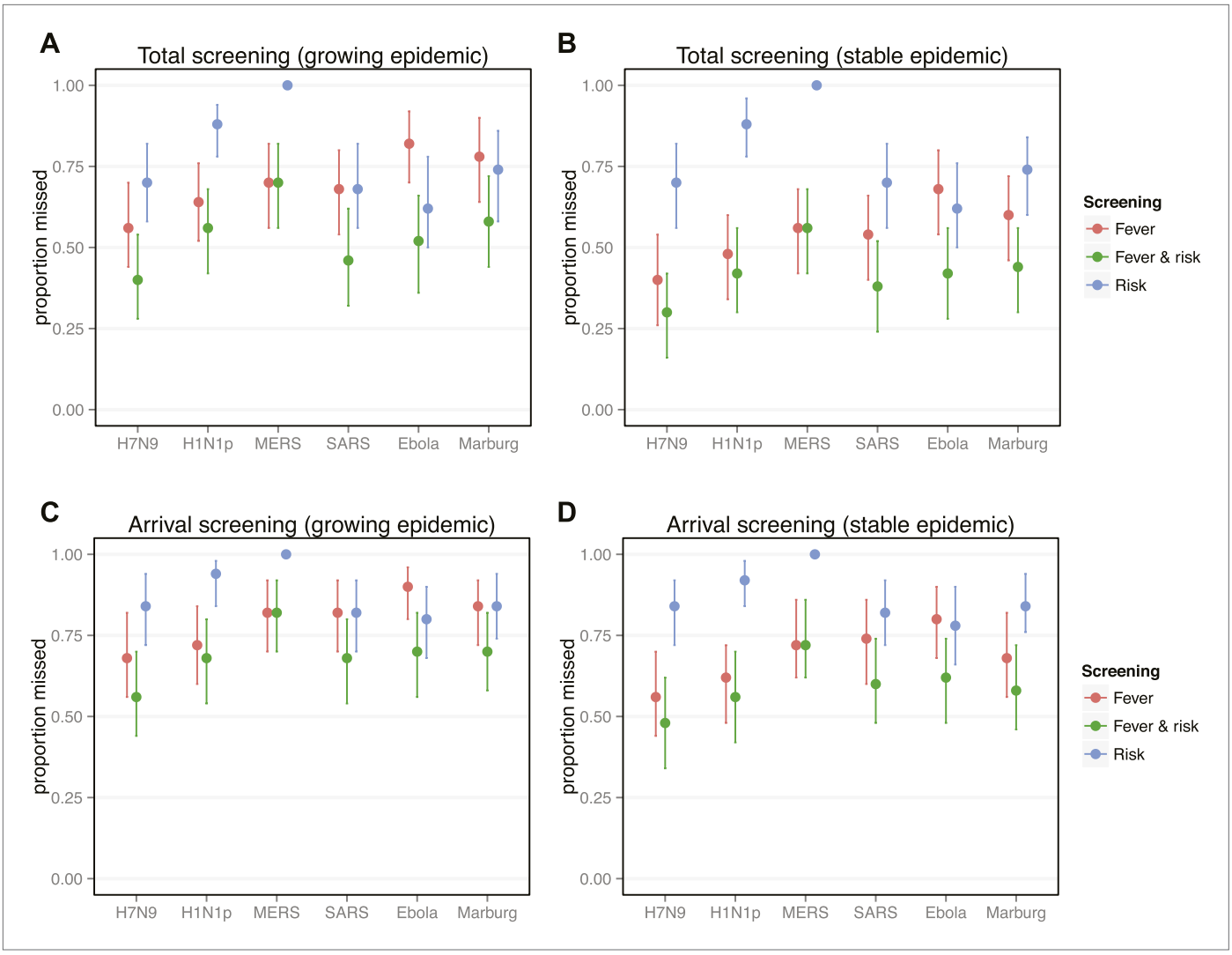

Figure 4. Proportion of infected travellers that would be missed by each of four screening scenarios. (**A**) Proportion of 50 infected travellers that would be missed by both departure and arrival screening in a growing epidemic. Figure shows three possible screening methods: fever screen, exposure risk questionnaire, or both. Lines show 95% bootstrapped CI. (**B**) Proportion of infected travellers missed by both departure and arrival screening in a stable epidemic. (**C**) Proportion of infected individuals who fly that are missed by arrival screening in a stable epidemic. (**D**) Proportion of infected arrivals missed by point of entry screening in a stable epidemic. We assume 25% probability traveller will report if they know exposure and 70% probability screening with identify visibly febrile patients. We assume R0 = 2 and a 24 hr travel time.

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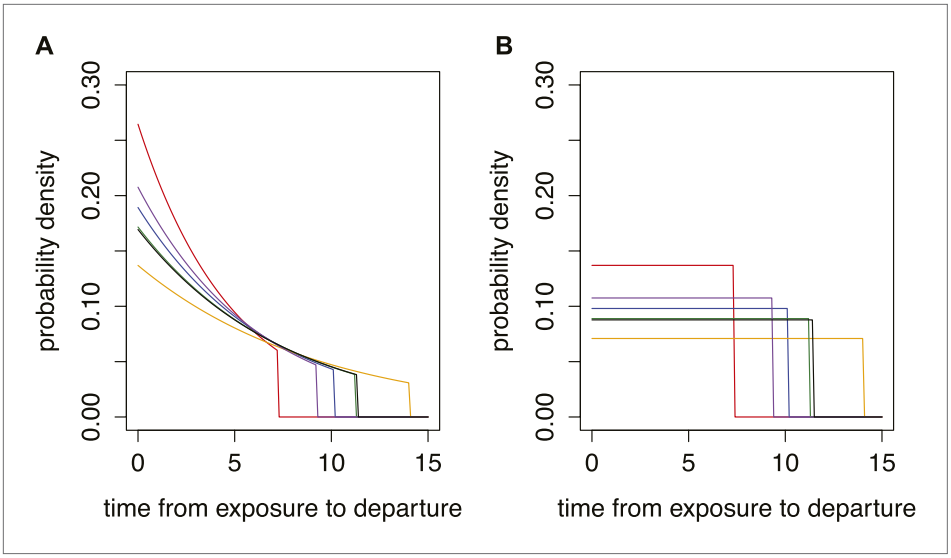

Figure 4—figure supplement 1. Different time from exposure to departure functions used in model. Red, influenza A/H7N9; purple influenza A/H1N1p; blue, MERS; green, SARS; orange, Ebola; black, Marburg. (**A**) Growing epidemic with R0 = 1.5. (**B**) Stable situation.

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