Annex – Supplementary Items

**Supplementary Table 1.** Knowledge and attitudes of influenza virus, transmission, and vaccine stratified by survey year, healthcare workers, Costa Rica, 2017-2018.

| Knowledge and attitudes                                      | 2017          | 2018          | p-valueb |
|--------------------------------------------------------------|---------------|---------------|-----------|
|                                                              | Totala N      | Agree % (95% CI) | Totala N      | Agree % (95% CI) |          |
| Knowledge of influenza                                        |               |               |            |               |         |
| Influenza may be transmitted from person to person           | 553 521       | 94.2 (92.3–96.2) | 193 187     | 96.9 (94.4–99.4) | 0.15     |
| Influenza may be transmitted from birds or pigs to people    | 551 347       | 63.0 (58.9–67.0) | 194 114     | 58.8 (51.8–65.7) | 0.30     |
| People may contract influenza multiple times                 | 553 490       | 88.6 (86.0–91.3) | 194 185     | 95.4 (92.4–98.3) | 0.01     |
| Influenza may be transmitted via droplets from coughs or sneezes | 553 544       | 98.4 (97.3–99.4) | 194 188     | 96.9 (94.5–99.3) | 0.21     |
| Influenza may be transmitted if people touch their mouths or noses with contaminated hands | 553 460       | 83.2 (80.1–86.3) | 193 174     | 90.2 (85.9–94.4) | 0.02     |
| Everyone has the same risk of getting sick or dying from influenza | 553 160       | 28.9 (25.1–32.7) | 194 53      | 27.3 (21.0–33.6) | 0.67     |
| The influenza vaccine protects against influenza complications | 548 520       | 94.9 (93.0–96.7) | 193 190     | 98.4 (96.7–100)  | 0.03     |
| The influenza vaccine is composed of inactivated viruses     | 553 118       | 21.3 (17.9–24.8) | 194 37      | 19.1 (13.5–24.6) | 0.50     |
| Attitudes towards the influenza vaccine                      |               |               |            |               |         |
| The influenza vaccine may cause harm                         | 517 201       | 38.9 (34.7–43.1) | 186 51      | 27.4 (20.9–33.9) | 0.01     |
| Healthcare personnel should get vaccinated for influenza every year | 512 488       | 95.3 (93.5–97.1) | 188 185     | 98.4 (96.6–100)  | 0.06     |
| The influenza vaccine causes flu-like symptoms               | 518 489       | 94.4 (92.4–96.4) | 190 181     | 95.3 (92.2–98.3) | 0.65     |
| Would get vaccinated if offered the vaccine at work          | 514 436       | 84.8 (81.7–87.9) | 189 172     | 91.0 (86.9–95.1) | 0.03     |
| Recommends the influenza vaccine to family and friends       | 511 454       | 88.8 (86.1–91.6) | 187 171     | 91.4 (87.4–95.5) | 0.32     |

CI: confidence interval; a Excluded healthcare workers who did not respond; b P-value from Pearson Chi-square test.

**Supplementary Table 2.** Sources of information about influenza vaccination stratified by survey year, healthcare workers, Costa Rica, 2017-2018.

| Source of information                             | 2017 (n = 553) | 2018 (n = 194) | p-valuea |
|---------------------------------------------------|----------------|----------------|-----------|
|                                                   | N             | % (95% CI)     | N         | % (95% CI)     |          |
| Conversations with family                         | 62            | 11.2 (8.6–13.8) | 9         | 4.6 (1.7–7.6)  | < 0.01   |
| Conversations with friends or coworkers           | 247           | 44.7 (40.5–48.8) | 37        | 19.1 (13.5–24.6) | < 0.01 |
| Mass media                                        | 360           | 65.1 (61.1–69.1) | 106       | 54.6 (47.6–61.7) | 0.01    |
| Informal information from the healthcare facility | 331           | 59.9 (55.8–64.0) | 108       | 55.7 (48.6–62.7) | 0.31    |
| Training in the healthcare facility               | 131           | 23.7 (20.1–27.2) | 71        | 36.6 (29.8–43.4) | < 0.01  |
| Doctor or nurse at healthcare facility            | 207           | 37.4 (33.4–41.5) | 75        | 38.7 (31.7–45.6) | 0.76    |
| Medical consultation                              | 78            | 14.1 (11.2–17.0) | 17        | 8.8 (4.7–12.8)  | 0.05    |

CI: confidence interval; a P-value from Pearson Chi-square test.
Supplementary Table 3. Demographics and influenza vaccination coverage of 747 healthcare workers stratified by survey year, Costa Rica, 2017-2018.

| Characteristic | 2017 | 2018 | p-value<sup>a</sup> |
|---------------|------|------|---------------------|
|               | N = 553 | N = 194 |                  |
| Age (in years) |      |      | 0.21               |
| 20-30         | 134 (24.2) | 35 (18.0) |                  |
| 31-40         | 197 (35.6) | 75 (38.7) |                  |
| ≥41           | 222 (40.2) | 84 (43.3) |                  |
| Female sex    | 319 (57.7) | 126 (65.0) | 0.08              |
| Marital status|      |      | 0.16               |
| Single        | 188 (34.0) | 68 (35.0) |                  |
| Married       | 296 (53.5) | 95 (49.0) |                  |
| Divorced      | 63 (11.4) | 31 (16.0) |                  |
| Other         | 6 (1.1) | 0 (0) |                  |
| Profession    |      |      | < 0.01             |
| Doctor        | 153 (27.6) | 43 (22.2) |                  |
| Nursing professional | 141 (25.5) | 60 (30.9) |                  |
| Nursing assistant | 101 (18.3) | 9 (4.6) |                  |
| Other healthcare profession | 158 (28.6) | 82 (42.3) |                  |
| Years in profession |      |      | 0.24               |
| ≤10           | 267 (48.3) | 80 (41.2) |                  |
| 11-20         | 148 (26.8) | 58 (29.9) |                  |
| ≥21           | 138 (24.9) | 56 (28.9) |                  |
| Works in multiple healthcare facilities | 95 (17.2) | 25 (12.9) | 0.16              |
| Self-reported influenza vaccination in previous year<sup>b</sup> | 324 (63.5) | 125 (67.2) | 0.37              |
| Self-reported current influenza vaccination<sup>c</sup> | 279 (54.1) | 114 (60.0) | 0.16              |

<sup>a</sup>P-value from Pearson Chi-square test; <sup>b</sup>Self-reported influenza vaccination in previous year (2017: n = 510; 2018: n = 186). Excluded participants who did not know their vaccination status or did not respond; <sup>c</sup>Self-reported influenza vaccination (2017: n = 516; 2018: n = 190). Excluded participants who did not know their vaccination status or did not respond.
**Supplementary Table 4.** Associations between demographics, sources of information, knowledge and attitudes, and influenza vaccination stratified by survey year, healthcare workers, Costa Rica, 2017-2018.

| Variable | 2017 (N = 505)* | 2018 (N = 183)* |
|----------|----------------|----------------|
| Age in years (Ref: 20-30) | | |
| 31-40 | 0.78 (0.49–1.24) | 1.46 (0.64–3.35) |
| ≥ 41 | 1.03 (0.65–1.63) | 1.96 (0.87–4.44) |
| Male sex (Ref: female) | | |
| Male | 1.13 (0.79–1.61) | 0.83 (0.45–1.55) |
| Marital status (Ref: single) | | |
| Married | 0.98 (0.67–1.44) | 1.41 (0.73–2.70) |
| Divorced | 0.77 (0.42–1.39) | 1.66 (0.67–4.10) |
| Other | 0.82 (0.11–5.95) | – |
| Profession (Ref: doctor) | | |
| Nursing professional | 1.47 (0.91–2.38) | 0.76 (0.34–1.70) |
| Nursing assistant | 1.51 (0.89–2.56) | 1.54 (0.27–8.89) |
| Other | 1.54 (0.92–2.46) | 1.96 (0.87–4.44) |
| Years in profession (Ref: ≤10) | | |
| 11-20 | 0.83 (0.55–1.27) | 2.00 (0.97–4.14) |
| ≥21 | 0.97 (0.63–1.51) | 2.00 (0.97–4.14) |
| Works in multiple healthcare facilities (Ref: no) | | |
| | 0.68 (0.43–1.08) | 0.80 (0.34–1.88) |
| Source of information (Ref: not a source of information) | | |
| Conversations with family | 1.63 (0.93–2.88) | 2.00 (0.39–10.19) |
| Conversations with friends or coworkers | 1.06 (0.74–1.50) | 0.86 (0.40–1.84) |
| Mass media | 0.91 (0.62–1.33) | 0.70 (0.38–1.27) |
| Informal information from the healthcare facility | 0.70 (0.38–1.27) | 1.07 (0.75–1.54) |
| Training in the healthcare facility | 1.47 (0.98–2.21) | 0.76 (0.41–1.40) |
| Doctor or nurse at healthcare facility | 1.20 (0.84–1.72) | 0.85 (0.47–1.56) |
| Medical consultation | 1.57 (0.95–2.60) | 0.42 (0.15–1.15) |
| Knowledge and attitudes (Ref: no) | | |
| Believe influenza may be transmitted from person to person | 0.72 (0.32–1.61) | 0.30 (0.03–2.61) |
| Believe influenza may be transmitted from birds or pigs to people | 0.80 (0.56–1.15) | 0.79 (0.43–1.45) |
| Believe people may contract influenza multiple times | 1.10 (0.63–1.92) | 0.92 (0.21–3.98) |
| Believe influenza may be via droplets from coughs or sneezes | 0.38 (0.08–1.92) | 1.03 (0.17–6.31) |
| Believe influenza may be transmitted if people touch their mouths or noses with contaminated hands | 1.31 (0.82–2.09) | 0.89 (0.33–2.38) |
| Believe everyone has the same risk of getting sick or dying from influenza | 1.17 (0.79–1.72) | 0.44 (0.23–0.85) 0.27 (0.11–0.66) |
| Believe the influenza vaccine is composed of inactivated viruses | 1.31 (0.86–1.99) | 2.25 (0.99–5.12) |
| Believe the influenza vaccine may cause harm | 0.53 (0.37–0.76) 0.63 (0.42–0.94) | 0.41 (0.21–0.79) 0.92 (0.21–3.98) |
| Vaccinated for influenza in previous year (Ref: no) | 6.27 (4.19–9.39) 5.96 (3.97–8.95) | 25.75 (11.05–60.02) 31.10 (12.62–76.65) |

Ref: reference; OR: odds ratio; aOR: adjusted odds ratio; CI: confidence interval; * Analyses excluded people who did not know or did not provide their vaccination status and those who did respond to questions regarding knowledge and attitude of influenza vaccination; Adjusted for the other variables listed in the model.
**Supplementary Table 5.** Clinical manifestations seven days after vaccination, healthcare workers, Costa Rica, 2017-2018.

| Clinical manifestation       | All participants (n = 393) | 2017 (n = 279) | 2018 (n = 114) | p-value* |
|-----------------------------|---------------------------|----------------|---------------|----------|
|                             | n  | % (95% CI)     | n  | % (95% CI)     | n  | % (95% CI)     |          |
| General discomfort          | 58 | 14.8 (11.2–18.3) | 44 | 15.8 (11.5–20.1) | 14 | 12.3 (6.2–18.4) | 0.38     |
| Vaccination site pain       | 76 | 19.3 (15.4–23.3) | 54 | 19.4 (14.7–24.0) | 22 | 19.3 (11.9–26.7) | 0.99     |
| Fever                       | 31 | 7.9 (5.2–10.6)   | 21 | 7.5 (4.4–10.6)   | 10 | 8.8 (3.5–14.0)   | 0.68     |
| Flu-like symptoms           | 80 | 20.4 (16.4–24.4) | 61 | 21.9 (17.0–26.7) | 19 | 16.7 (9.7–23.6)  | 0.25     |
| Headache                    | 9  | 2.3 (0.8–3.8)    | 6  | 2.2 (0.4–3.9)    | 3  | 2.6 (0.5–5.6)    | 0.77     |

CI: confidence interval; *P-value from Pearson Chi-square test.

**Supplementary Table 6.** Reasons for not receiving influenza vaccination stratified by survey year, healthcare workers, Costa Rica, 2017-2018.

| Reasons                                | 2017 (N = 237) | 2018 (N = 76) | p-value* |
|----------------------------------------|----------------|---------------|----------|
|                                        | n  | % (95% CI)     | n  | % (95% CI)     |          |
| Limited access                         | 66 | 27.8 (22.1–33.6) | 17 | 22.4 (12.8–32.0) | 0.35     |
| Did not have time to get vaccinated    | 41 | 17.3 (12.4–22.2) | 10 | 13.2 (5.4–20.9)  | 0.39     |
| Vaccine was not offered                | 30 | 12.7 (8.4–16.9)  | 8  | 10.5 (3.5–17.6)  | 0.62     |
| Did not know where to go for vaccine   | 7  | 3.0 (0.8–5.1)    | 1  | 1.3 (0–3.9)      | 0.43     |
| Rejection                              | 160| 67.5 (61.5–73.5) | 50 | 65.8 (54.9–76.7) | 0.78     |
| Fear of side effects                   | 99 | 41.8 (35.4–48.1) | 29 | 38.2 (27.0–49.3) | 0.58     |
| Fear of contracting influenza          | 78 | 32.9 (26.9–38.9) | 17 | 22.4 (12.8–32.0) | 0.08     |
| Believed influenza does not cause serious illness | 33 | 13.9 (9.5–18.4) | 8  | 10.5 (3.5–17.6)  | 0.44     |
| Believed vaccine is ineffective        | 26 | 11.0 (7.0–15.0)  | 5  | 6.6 (0.9–12.3)   | 0.26     |
| Was sick                               | 20 | 8.4 (4.9–12.0)   | 4  | 5.3 (0.1–10.4)   | 0.37     |

CI: confidence interval; Composite subheadings (limited access, rejection) included at least one positive response for one of the listed reasons; *P-value from Pearson Chi-square test.

**Supplementary File 1. Sample size formula**

The following equation was used to obtain sample sizes for surveys of healthcare workers (Schaeffer R, Mendenhall W, Ott L [1990] Elementary Survey Sampling, Boston. Massachusetts: PWS-Kent Publishing Company):

\[
n = \frac{N}{\text{def} f} \times \frac{Z_{1-\alpha/2}^2 P(1-P)}{(N-1)\sigma^2 + Z_{1-\alpha/2}^2 P(1-P)}
\]

Where:
- \(N\) = population size
- \(Z_{1-\alpha/2}\) = Quantile of a variable with standard normal distribution
- 100(1 – α)% = Confidence level
- \(P\) = Expected proportion in the population.
- \(\sigma\) = Absolute accuracy required
- \(\text{def} f\) = Design effect