National Institute for Health and Care Excellence

Final

Flu vaccination: increasing uptake

Evidence reviews for increasing uptake in health and social care staff

NICE guideline NG103

Evidence reviews

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Final

These evidence reviews were developed by Public Health – Internal Guideline Development team

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Introduction

Each winter hundreds of thousands of people see their GP and tens of thousands are hospitalised because of flu.

Increasing influenza vaccination rates among healthcare workers (HCWs) is considered key to preventing flu among people in clinical risk groups[a]. Vaccinating staff in social care settings may provide similar benefits.

Flu and its complications have a number of direct costs (such as treatment and hospitalisation) and indirect costs (such as staff absences from work). Programmes that increase vaccination rates can reduce the risk of related healthcare costs[b]. An economic evaluation that included the costs of providing cover for staff off sick in the UK showed that vaccinating healthcare workers is cost saving[c].

In England, 69% of healthcare workers with direct patient contact working in NHS trusts and area teams were vaccinated during the 2017/18 flu season, an increase from 63% the previous year (Seasonal flu vaccine uptake in healthcare workers in England: winter 2017/18). No comparable data are available on vaccination rates among people who work in social care settings. Vaccination of health and social care staff is the responsibility of the employing organisation through occupational health activities.

[a] Hollmeyer et al. 2012. Review: interventions to increase influenza vaccination among healthcare workers in hospitals.
[b] Peasah et al (2013) Influenza cost and cost-effectiveness studies globally – a review. Vaccine 31: 5339–48
[c] Burls et al. (2006) Vaccinating healthcare workers against influenza to protect the vulnerable - is it a good use of healthcare resources? A systematic review of the evidence and an economic evaluation. Vaccine 24: 4212–21

The aim of this review was to examine interventions that can be delivered in health and social care settings to increase the uptake of influenza vaccination among frontline workers involved in direct patient or client care.

The review focused on identifying studies that fulfilled the criteria specified in

Table 1. For full details of the review protocol, see Appendix A.

PICO table

Table 1: PICO inclusion criteria for the review questions on increasing uptake in Health and social care staff

Population	Health and social care staff directly involved with people's care according to the Green book[d]
Interventions RQ4	**Education and programme leadership for increasing uptake among health and social care staff:** • Assigned organisational lead to promote annual flu programme to peers. • Targeted and settings-based information campaigns. • Education, for example, multidisciplinary, peer education, educational outreach, educational DVDs, myth busting and e-learning packages. • Flu vaccination 'champions'. • Recommendations from a respected person, for example, a peer. • Reminders and follow-up approaches (such as verbal reminders, text messages, emails, postcards and posters). • Feedback on uptake rates. • Incentive schemes, including targets for providers. • Policies on conditions of employment (including the use of surgical masks, where applicable) and opt-out for health and social care staff. • Signed statements from staff who decline a vaccine. • Shared health record for providers of flu vaccination.
Interventions RQ5	**Improving access to flu vaccination for health and social care staff**: • On-site vaccination. • Peer vaccination. • Mobile flu vaccination clinics. • Drop-in clinics for example, at staff events. • Extended hours clinics for example, 24-hour access to reflect different working patterns.
Comparators RQ4-5	• Other intervention • Status quo/do nothing/control

[d] https://www.gov.uk/government/publications/influenza-the-green-book-chapter-19

	• Time (before and after)
Outcomes RQ4-5	• Uptake (Critical) • Acceptability (Critical) • Knowledge (Important) • Attitudes (Important) • Beliefs (Important) • Intentions (Important) • Adverse outcomes [any] (Important)
Economic Outcomes RQ4-5	• Economic evaluations • Cost-utility (cost per QALY) • Cost benefit (i.e. Net benefit) • Cost-effectiveness (Cost per unit of effect) • Cost minimisation • Cost-consequence

Public Health evidence

Included studies

Studies were included if they met the PICO and were:

- Randomised controlled trials (RCT) including cluster randomised controlled trials (cRCT), non-randomised controlled trials (nRCT), randomised pragmatic trials (RPT), controlled before and after studies, before and after studies.
- Observational studies were included only if they provided evidence on approaches where there was no experimental study design and they included a comparison group (i.e. comparative case control and cohort studies).
- Systematic reviews of effectiveness studies that directly answered the questions and reported critical or important outcomes were included. If they did not directly answer the questions they were citation chased for relevant studies.
- Qualitative studies (interviews and focus groups) that assessed the views and opinions of healthcare workers on any of the interventions listed in table 1.
- Economic studies which included costs and benefits of any (or a combination) of the interventions listed in table 1.

See table 2a (primary effectiveness studies), table 2b (systematic reviews of effectiveness studies) and table 3 (qualitative studies) for a summary of all included studies in this review.

Excluded studies

Studies were excluded if they were:

- Narrative reviews, case studies/reports, case series, non-comparative studies (unless they were qualitative studies meeting the inclusion criteria)

- Cross-sectional surveys, epidemiological studies, correlation studies and studies to assess coverage rates
- Economic studies that included only costs, burden of disease and cost of illness
- Cost-effectiveness studies of the flu vaccination itself
- Animal studies
- Not published in the English language.

For the list of studies that were excluded after full-text review, with reasons for their exclusion, see Appendix L.

Evidence Review

In total, 9647 references were found for these review questions, and full-text versions of 292 citations that seemed potentially relevant to this topic were retrieved. In total 31 studies were included in the effectiveness section of this review: 27 primary studies and 4 systematic reviews. Additionally 7 primary studies and 1 systematic review are included in the qualitative section of the review. No primary studies or systematic reviews of cost effectiveness met the inclusion criteria for this review (see PRISMA diagram in Appendix M).

Summary of included effectiveness studies

Table 2a: Included effectiveness primary studies for each review question (RQ 4&5)

RQ4: Education and programme leadership for increasing uptake among health and social care staff					
First author, year	**Design**	**Country**	**Setting**	**Population**	**Intervention**
Education					
Afonso, 2013	Before and after	USA	University	Medical students	Educational programme
Rothan-Tondeur, 2010	cRCT	France	Geriatric hospital	All HCWs in regular contact with elderly patients	Educational material
Conner 2011	RCT	Canada	Three local public hospitals in Quebec City	Nurses, auxiliary and technical staff	Questionnaire (based on question-behaviour effect) about influenza vaccination prior to next flu season campaign, with an opportunity to receive a vaccination
Declination					
Polgreen 2008	Before and after	USA	Healthcare institutions	HCW	Declination policy
Lehman 2016	RCT	Netherlands	Tertiary care centre for patients with	HCWs in a tertiary care centre for patients with	Opt-out/opt-in email with presentation, free

			complex chronic organ failure	complex chronic organ failure	vaccination availability 2 days of the week
Mandated vaccination and Refusal/Declination with mask wearing policy and automated alert system (reminders)					
Quan 2014	Before and after	USA	University of California Irvine Medical Centre	All employees on medical centre grounds	Mandated vaccination policy, declination + mask wearing policy, and alert system
Mandated vaccination and refusal/declination with mask wearing policy + free vaccine, education and vaccination coverage report					
Kim 2015	Before and after	USA	Health care facilities	All employees in the study facilities	Mandated vaccination policy, medical exemption or declination statement + mask wearing policy (with fine for non-compliance); education; coverage reporting
Campaign (National)					
Maltezou, 2007	Before and after	Greece	Hospitals throughout Greece	Physicians, technical personnel; administrative personnel; clinicians	Nationwide promotional campaign
Flu guide					
Chambers, 2015	RCT	Canada	Acute care hospitals, continuing care organisations and regional health authorities	All HCWs employed by studied settings	Flu 'guide' for managers
RQ5: Improving access to flu vaccination for health and social care staff					
No studies identified that focused on access alone					
RQ 4&5: Multi-component interventions crossing over review questions					
Education, vaccine planning, notification, (RQ4) and Access (RQ5)					
Nace, 2007	Before and after	USA	Long term care facilities	All staff employed by the facilities	Educational material; on-site vaccination
Education, declination policy and incentives (RQ4) and Access (RQ5)					
Sand, 2007	Before and after	USA	Long term care facilities	All staff members employed at study facilities	Educational material; declination forms, incentives (free lunches and raffles); information sharing between facilities and leadership

					involvement; mobile clinic and clinic drop ins
Education, declination policy (RQ4) and Access (RQ5)					
Bruce 2007	Before and after	Canada	Paramedic services	Paramedics	Educational programme, workplace flu vaccination (peer to peer), screening and vaccine administering training; management standing order, invitation to vaccination, declaration signing
Palmore, 2009	Before and after	USA	Hospital	All staff with patient contact	Education (posters, flyers, e-mails); mandatory signed declination statements; mobile, occupational medical site and nurse delivered vaccination
Education and feedback (RQ4), and Access (RQ5)					
Nace, 2012	Before and after	USA	Long term care – nursing and assisted living facilities; urban and suburban facilities	All HCWs employed by study facilities	Educational material; training, facility feedback, uptake feedback; increased access via on/off site provision during all shifts
Education and incentives (RQ4) and Access (RQ5)					
Friedl, 2012	Before and after	Switzerland	Hospital	All hospital employees, including those without direct patient contact	On-site vaccination; incentives; educational material
Llupia 2013	Before and after	Spain	Hospital	All HCWs employed at study hospital	Educational material and prize incentives; on-site vaccination
Marwaha 2015	Before and after	Canada	Multi-site academic community hospital	All employees, including professional staff, volunteers and students	Incentives; publicity campaign; improved access and flexibility of hours; uptake data reporting and feedback.
Mouzoon, 2010	Before and after	USA	Medical practice, Houston, Texas	All HCWs employed by the clinic	Educational campaign to increase flu knowledge; flu champions; reporting vaccination rate; on-site vaccination; Highest flu vac rate in clinic award and free lunch

Multicomponent: education and flu champions (RQ4) and access (RQ5) + Incentives and posters (RQ4)					
Munford, 2008	Before and after	Canada	Hospital, Saanich Peninsula, British Columbia	All HCWs employed by the hospital	Incentives (prize draw), promotional campaign, peer recommendations
Education and reminders (RQ4) and Access (RQ5)					
Patterson, 2011	Before and after	USA	Hospital	All staff employed at study hospital	Reminders; educational materials; on-site vaccination
Education, active declination, training and feedback (RQ4) and Access (RQ5)					
Cadena, 2011	Before and after	USA	Hospital	All HCWs employed by studied hospital	Educational material; on-site vaccination; declination forms; feedback on % flu vac uptake;
Mandatory flu vaccination or masking policy, flu champions, and advertisement of increased access (RQ4), access (RQ5)					
Leibu, 2015	Before and after	USA	Hospitals and clinics across New York	All staff employed at study hospitals and clinics	Mandatory vaccination or masking policy; flu champions, advertisement of increased access; flu buses, increased opening hours for vaccination, flu champions administering vaccination),
Education and clinic promotion (RQ4) and Access (RQ5)					
Sanchez, 2003	Before and after	USA	Outpatient pharmacy	All employees of a regional medical organisation, including those with patient contact and those without	Pharmacist training; Educational article in health system newsletter; Flu clinic promotion (e-mail to employees); On-site vaccination
Education, reminders and feedback (RQ4) and Access (RQ5)					
Salgado, 2004	Before and after	USA	Tertiary care centre	HCW (not specified)	Mobile vaccine cart and outpatient clinics; education and reminders; feedback to HCW on compliance rates
Mandatory declination/masking policy and incentives (RQ4) and Access (RQ5),					
Drees 2015	Before and after	USA	Private hospitals within a community based academic	All employees within the healthcare system	Mandatory declination and masking policy;

			healthcare system		
Mandatory flu vaccination policy or mask wearing (RQ4) and Access (RQ5)					
Perlin, 2013	Before and after	USA	Hospitals, outpatient surgeries and physician practices	All staff employed at study centres	Mandatory vaccination or mask wearing policy – facilitated with brochures on the policy; workplace free onsite vaccine provisions
Education, campaign, incentives, record keeping (RQ4) and Access (RQ5)					
Parry 2004	Before and after	USA	Hospital	Hospital employees, volunteers and corporate office	Fliers, Campaign, electronic record keeping, raffle; vaccination for hospital employees, volunteers and corporate office

Table 2b: Included effectiveness systematic reviews with included studies noted where relevant to each review question (RQ 4&5)

First author, year	Design	Country	Setting	Population	Intervention
Hollmeyer 2013	Systematic Review	Various	Hospitals	Healthcare workers	Education and leadership (RQ4) Access (RQ5) plus Multi -component interventions
Lam 2010	Systematic Review	Various	Long term care facilities and hospital settings	Healthcare personnel	Education, promotional, incentives, campaigns, (RQ4) Access (RQ5) plus Multi -component interventions
Lytras 2015	Systematic Review	Various	Hospitals and nursing homes	Healthcare workers	Education, mandatory vaccination, declination statements, incentives, education (RQ4) Access (RQ5)
Pitts 2014	Systematic Review	Various	Hospitals and 'health systems covering multiple institutions'	All health care providers including house staff, all medical staff, affiliated physicians, volunteers,	Mandatory Vaccination (RQ4)

				contractors, vendors and students	

For full evidence tables relating to included studies of intervention effectiveness see Appendix G.1 (primary studies) and Appendix G.2 (systematic reviews).

Synthesis and quality assessment of effectiveness evidence

Included studies were a mix of experimental and observational study designs. Studies with a control group were assessed for risk of bias using the Cochrane Effective Practice and Organisation of Care (EPOC) checklist as referenced in Appendix H of the NICE methods manual. The Effective Public Health Practice Project (EPHPP) QA Checklist was applied to assess risk of bias in uncontrolled before-and-after studies.

Data analyses were undertaken in Review Manager (version 5.3). Where data from more than one study were pooled in a meta-analysis, a random effects model was used to account for the different effects anticipated across different study populations and types of intervention. A fixed effects model was used only where it was clear that an intervention with identical content and mode of delivery was examined in different studies undertaken in the same population subgroup.

A general approach was taken to pool data from RCTs with data from observational studies where the same outcome was being investigated under conditions that were considered to be sufficiently similar. This is because although observational studies may introduce more bias than RCTs, it has been suggested that this issue might be outweighed by the potential benefits of including data from observational studies to improve inferences from RCT trials, particularly where RCT evidence is limited, as the increased sample size may provide additional evidence to choose a correct intervention for a condition (Shrier et al 2007)[e]. A sensitivity analysis was conducted in all instances where RCTs and observational studies were pooled to assess the impact of the pooling. Sensitivity analyses did not result in any changes to pooling decisions in this review.

GRADE methodology was used to appraise the evidence across five potential sources of uncertainty: risk of bias, indirectness, inconsistency, imprecision and other issues. Overall ratings start at 'High' where the evidence comes from RCTs, and 'Low' for evidence derived from observational studies. Where RCT and observational studies remained pooled in analyses, a decision was made to start GRADE from 'Low'. Details of how the evidence for each outcome was appraised across each of the quality domains is given below.

Quality domain	Description
Risk of bias	Limitations in study design and implementation may bias the estimates of the treatment effect. Major limitations in studies decrease the confidence in the estimate of the effect. Examples of such limitations are selection bias (often due to poor allocation concealment), performance and detection bias (often due to a lack of blinding of the patient, healthcare professional or assessor) and attrition bias (due to missing data causing systematic bias in the analysis). Where there are no study limitations, evidence is assessed as having 'no serious' risk of bias. Alternatively, evidence may be downgraded one level ('serious' risk of bias) or two levels ('very serious' risk of bias).
Indirectness	Indirectness refers to differences in study population, intervention, comparator and outcomes between the available evidence and the review

[e] Shrier, I., Boivin, J., Steele, R. J. et al. 2007. Should Meta-Analyses of Interventions Include Observational Studies in Addition to Randomized Controlled Trials? A Critical Examination of Underlying Principles. *American Journal of Epidemiology,* 166 (10); 1203-1209.

Quality domain	Description
	question. Where the evidence is directly applicable to the PICO, it is assessed as having 'no serious' risk of indirectness. Alternatively, evidence may be downgraded one level ('serious' risk of indirectness) or two levels ('very serious' risk of indirectness).
Inconsistency	Inconsistency refers to an unexplained heterogeneity of effect estimates between studies pooled in the same meta-analysis. The I^2 statistic describes the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance). For the purposes of this review, the committee agreed that a large amount of clinical and methodological diversity would be expected from pooled analyses of studies in this area. Heterogeneity could be explained by differences in study design, content of interventions and comparators, or differences in clinical risk factors between study populations. A decision was therefore made to downgrade pooled analyses by 1 level (indicating 'serious' inconsistency) only when the I^2 statistic was ≥75%. If the I^2 statistic for a pooled analysis was less than 75%, the evidence was not downgraded for inconsistency.
Imprecision	Results are imprecise when studies include relatively few patients and few events (or highly variable measures) and thus have wide confidence intervals around the estimate of the effect relative to clinically important thresholds. 95% confidence intervals denote the possible range of locations of the true population effect at a 95% probability, and so wide confidence intervals may denote a result that is consistent with conflicting interpretations (for example a result may be consistent with both public health benefit AND public health harm) and thus be imprecise. For the purpose of this review, the committee agreed that a relative increase in vaccination uptake of 5% would be clinically important for all target populations. Imprecision was therefore assessed with reference to minimally important difference (MID) thresholds of RR 0.95 and RR 1.05. It was decided that the point measure would be used to decide whether or not the result was clinically important, and that the 95% confidence intervals would indicate certainty of this importance. Uncertainty is introduced where confidence intervals crossed the MID threshold. If the confidence interval crosses either the lower (RR 0.95) or upper MID threshold (RR 1.05), this indicates 'serious' risk of imprecision. Crossing both MID thresholds indicates 'very serious' risk of imprecision in the effect estimate. Where the 95%CI does not cross either MID threshold, the evidence is assessed as having 'no serious' risk of imprecision unless the effect estimate is derived on the basis of few events and a small study sample (that is, less than 300 'vaccination events' across both intervention and comparator groups). In that case the results were downgraded one level for 'serious' imprecision to reflect uncertainty in the effect estimate.

Quality domain	Description
Other issues	Publication bias is a systematic underestimate or overestimate of the underlying beneficial or harmful effect due to the selective publication of studies. A closely related phenomenon is where some papers fail to report an outcome that is inconclusive, thus leading to an overestimate of the effectiveness of that outcome. Sometimes randomisation may not adequately lead to group equivalence of confounders, and if so this may lead to bias, which should be taken into account. Potential conflicts of interest, often caused by excessive pharmaceutical company involvement in the publication of a study, should also be noted. A decision to upgrade was made where there was evidence of a dose-response relationship, or evidence from 2 or more observational studies consistently indicated a large effect size (RR of 2 or more).

Overall GRADE rating	Description
High	Further research is very unlikely to change our confidence in the estimate of effect.
Moderate	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very Low	Any estimate of effect is very uncertain.

See Appendix I for full GRADE tables by outcome.

The GRADE tables and forest plots (Appendix K) are used to generate the overall evidence quality rating and, where applicable, the pooled results that are summarised in the evidence statements below. Each GRADE table and forest plot (where applicable) includes a cross reference to the associated evidence statement.

Evidence statements

Each evidence statement is associated with the relevant review question for example ES 4.1 corresponds to evidence statement 1 for review question 4. ES45.1 relates to a study that is multi-component and crosses review questions where the data cannot be dis-aggregated for

separate review questions. SR-ES indicates this evidence statement is associated with a systematic review.

Education

ES 4.1 Very low quality evidence from 1 cluster randomised control trial of 2,345 HCWs found that an information session (including educational slide show, videos and summary leaflet) did not increase flu vaccination uptake compared to a 'no additional information' control (RR 0.86; 95%CIs 0.63 to 1.17) [GRADE profile 1]

ES 4.2 Very low quality evidence from 1 before and after study with 124 1st year medical students found that a 2 hour educational session (including interactive activities and discussions with infectious disease physicians) significantly changed Likert-scale responses to 7 out of 8 statements about the importance and acceptability of flu vaccination for HCWs. The most significant changes in pre- to post-intervention agreement were with the following statements: 'It is important to be vaccinated against influenza' (mean difference, MD: 0.68; 95%CI 0.43 to 0.93), 'I would recommend the influenza vaccine to family/friends' (MD: 0.48 (95%CI 0.26 to 0.70), 'HCWs should receive influenza vaccine' (MD: 0.36; 95%CI 0.17 to 0.55), and in disagreement with the statement: 'Influenza vaccine may cause influenza' (MD: -0.63; 95%CI -0.89 to -0.37) [GRADE profile 2].

ES 4.3 Moderate quality evidence from 1 randomised control trial of 1,200 HCW (nurses, auxiliary and technical staff) found that a questionnaire (based on QBE), delivered a few months before the study hospitals' annual flu vaccination campaigns, increased flu vaccination uptake compared with a 'no questionnaire' control, but the importance of the effect is uncertain (RR 1.16; 95%CI 1.00 to 1.33) [GRADE profile 1]

SR-ES 4.1 Very low quality evidence from 8 before and after studies with 21,543 participants indicates that educational interventions, including educational materials, sessions and reminders increase flu vaccination uptake among HCWs compared with pre-intervention rates (RR 1.15; 95%CI 1.10 to 1.21) [GRADE profile 4]

SR-ES 4.2 Low to moderate quality evidence from 1 RCT with 800 participants found that educational materials alone (RR1.03; 95%CIs 0.80 to 1.31), incentives alone (RR 1.11; 95%CIs 0.87 to 1.41), or both combined (RR 1.17; 95%CIs 0.93 to 1.48) did not increase flu vaccination in HCWs compared with controls who received no intervention but were exposed to usual hospital vaccination publicity [GRADE profile 4].

SR-ES 4.5 Moderate quality evidence from 2 cluster RCTs and 2 randomised controlled trials, with a total of 6,085 participants, found that educational interventions (including learning and promotional materials, awareness raising by a nurse, letters and personalised phone calls) increased flu vaccination uptake among HCWs compared with no intervention or usual flu campaigns (RR 1.36; 95%CI 1.23 to 1.50).

A subgroup analysis of one of the cluster RCTs, with 2,984 participants, found low to moderate quality evidence that, compared with no intervention, educational interventions increased vaccination uptake among HCWs in nursing homes (RR 1.80; 95% CI 1.33 to 2.43) but not in primary care settings (RR 1.04 95%CI 0.80 to 1.35).

A subgroup analysis of one of the RCTs with 496 participants found low to moderate quality evidence that, compared with no intervention, an educational intervention along with a letter from the chief of infectious diseases increased flu vaccination uptake among HCWs (RR 2.71; 95%CI 1.53 to 4.81), but there was no effect if the letter was substituted with a personalised phone call (RR 1.77; 95%CI 0.79 to 3.96) [GRADE profile 5]

Education and Incentives

SR-ES 4.6 Very low quality evidence from 1 controlled before and after study and 1 RCT with a total of 15,628 participants indicates that educational campaigns and incentives including gift cards, entry into a lottery and a party did not increase uptake of flu vaccination among HCWs compared with pre-intervention or control group uptake (RR 1.03; 95%CI 0.98 to 1.09).

A subgroup analysis of data from the controlled before and after study found very low and low quality evidence that vaccination uptake increased, compared with pre-intervention rates, in HCWs with indirect patient contact (RR 1.29; 95%CI 1.12 to 1.50) and in those with direct contact, although there is some uncertainty in the importance of this effect (RR 1.11; 95%CI 1.02 to 1.21). However, there was low quality evidence that vaccination uptake declined among business and administration staff following the intervention (RR 0.86; 95%CI 0.80 to 0.92) [GRADE profile 5]

National campaigns

ES 4.4 Very low quality evidence from 1 before and after study with 86,765 participants found a national campaign to increase flu vaccination uptake among hospital-based HCWs increased overall uptake by 14.6% compared with baseline (mean pre-intervention rate: 1.7% vs. mean post-intervention uptake: 16.4%) [GRADE profile 1].

Planning guides

ES 4.5 Moderate quality evidence from 1 cluster randomised control trial with 8,921 participants found that a guide to planning, implementing and evaluating flu vaccination campaigns with support provided (including a facilitated training workshop on how to use the guide) significantly increased flu vaccination uptake among HCWs in hospitals, continuing care and nursing homes compared with no-intervention controls who ran campaigns without the guide or additional support (median % change in vaccination rate from baseline to year 2: intervention: +7.1% vs control: -5.8%; p=0.0001) [GRADE profile 1].

Mandatory vaccination policy

ES 4.6 Low quality evidence from 1 before and after study with 6,957 participants found that mandatory vaccination, with a declination and mask wearing policy and alert system (automated e-mail sent to HCWs not currently compliant) increased year-on-year flu vaccination uptake among HCWs in one medical centre for 4 years following the intervention compared with pre-intervention uptake (Yr 1: RR 1.48; 95%CI 1.45 to 1.52; Year 2: RR 1.59; 95%CI 1.55 to 1.62; Year 3: RR 1.66; 95%CI 1.62 to 1.69; Year 4: RR 1.66 95% CI 1.62 to 1.69) [GRADE profile 1]

ES 4.7 Very low quality evidence from 1 before and after study of 271 healthcare facilities indicated that a mandatory vaccination and refusal/declination with mask wearing policy + free vaccine, education and coverage reporting increased flu vaccination uptake among all employees (+17.5%), HCWs in hospitals (+14.6%) and HCWs in care homes (+16.2%) compared with pre-intervention usual care (free access and education but no mandated vaccination or declination / face-mask policy) [GRADE profile 1]

SR-ES 4.7 Very low quality evidence from 6 before and after studies with 105,538 participants found that mandatory flu vaccinations in healthcare settings increased flu vaccination uptake among HCWs compared with pre-intervention rates (RR 1.71; 95%CI 1.70 to 1.72) [GRADE profile 6]

Declination

ES 4.8 Very low quality evidence from 1 randomised control trial with 122 participants found that that an opt-out strategy (with pre-booked appointments) delivered by e-mail to HCWs did not increase flu vaccination uptake compared with an opt-in e-mail (requiring an appointment to be booked) (RR 1.70; 95%CI 0.84 to 3.41) [GRADE profile 1].

SR-ES 4.4 Low quality evidence from 1 before and after study with 20,170 participants indicated that a change from a paper based declination form as part of the declination policy to an internet based form that included an educational intervention, reminder and incentives increased uptake of flu vaccination among HCWs (internet vs. paper-based: RR 1.99; 95%CI 1.92 to 2.07) [GRADE profile 4]

Access

SR-ES 5.1 Very low quality evidence from 1 before and after study with around 25,000 participants showed that adding flexible worksite delivery of free vaccinations did not increase uptake among HCWs compared with free vaccination alone (RR 0.78; 95%CI 0.76 to 0.79). However very low quality evidence from another controlled before and after study with 5,946 participants found that flexible worksite delivery of free vaccinations in addition to educational materials and incentives did increase uptake among HCWs compared with free vaccination, education and incentives alone (RR 1.70; 95%CI 1.66 to 1.74) [GRADE profile 4]

Incentives

SR-ES 4.3 Very low quality evidence from 1 before and after study with 5,151 participants found that adding incentives to an existing intervention that included educational material, reminders and feedback increased uptake of flu vaccination among HCWs with direct patient care compared with uptake rates before the incentives were added, but there is uncertainty in the importance of the effect (RR 1.10; 95%CI 1.01 to 1.20) [GRADE profile 4]

Component of interventions

SR-ES 4.8*:* Very low quality evidence from a systematic review of 46 studies (2 RCT, 9 cRCT, 3cB&A, 32 B&A), using a component matrix approach, showed that the most effective

intervention component for improving uptake of vaccination was hard mandated approaches (RR of remaining unvaccinated = 0.18; 95%CI: 0.08 to 0.45), followed by soft mandates such as declination statements (RRunvacc = 0.64; 95%CI: 0.45 to 0.92), increased awareness (RRunvacc = 0.83; 95%CI: 0.71 to 0.97) and increased access (RRunvacc = 0.88; 95%CI: 0.78 to 1.00). For incentive-based and education-based interventions, there were no significant differences compared with comparator groups in respect of HCWs remaining unvaccinated (incentive-based approaches: RRunvacc = 0.89; 95%CI: 0.77 to 1.03; education-based approaches: RRunvacc = 0.96, 95% CI: 0.84 to 1.10) [GRADE profile 7].

Multicomponent interventions including education and access

ES 45.1 Very low quality evidence from 1 before and after study of 2,443 participants indicates that a multicomponent intervention including educational material, training feedback, facility feedback on flu vaccination uptake and access in the workplace increased flu vaccination uptake in HCW at 1 year compared with pre-intervention uptake (RR 1.44 95% CI 1.37 to 1.52). Change fluctuated somewhat between years but generally continued to increase (RR 1.69 95% CI 1.61 to 1.77 in year 6 compared to year 1 uptake). [GRADE profile 3]

ES 45.2 Very low quality evidence from one before and after study with 1,095 participants found that a multicomponent pharmacist-led intervention, including training and education, clinic promotion and increased access for HCWs with direct patient contact, increased flu vaccination uptake over the 2 year study period from an estimated 19.5% pre-intervention to 36% 2 years post-intervention [GRADE profile 3]

SR-ES 45.1 Very low quality evidence from 9 before and after studies with a total of 36,597 participants found that a multicomponent intervention including educational materials, reminders and greater access through flexible and worksite arrangements increased flu vaccination uptake among HCWs compared with pre-intervention rates (RR 3.34; 95%CI 3.24 to 3.43) [GRADE profile 4]

SR-ES 45.7 Very low quality evidence from 2 controlled before and after studies with a total of 10,522 participants found that a multicomponent intervention, including educational campaigns, conferences on issues identified via a staff questionnaire and greater access via a mobile vaccine cart increased flu vaccination uptake among HCWs compared with pre-intervention rates (RR 1.28; 95%CI 1.21 to 1.36).

A subgroup analysis of one of the controlled before and after studies, with 5,008 participants, found very low quality evidence that vaccination uptake increased among HCWs with direct patient contact, although there is uncertainty in the importance of the effect (RR 1.13; 95%CI 1.03 to 1.24). Very low quality evidence from the same study indicates that vaccination uptake did not increase post-intervention among those HCWs with indirect patient contact (RR 1.01; 95%CI 0.85 to 1.18) [GRADE profile 5]

Multicomponent interventions including education, declination and access

ES 45.3 Very low quality evidence from 3 before and after studies with 15,515 participants found that adding a declination policy to usual care (educational material, vaccine planning, payslip notification, feedback and workplace access) increased flu vaccination uptake in HCWs compared with usual care alone (with no declination policy)(RR 1.29; 95%CI 1.17 to 1.42). A subgroup analysis of one of these studies showed that the increased uptake of the flu vaccine in HCW was sustained from one year post-intervention (RR 1.46 95% CI 1.32 to 1.62) to four years post-intervention (RR 1.34 95% CI 1.20 to 1.50). A national shortage in vaccine 3 years post-intervention was associated with a dip (RR 1.15 05% CI 1.01 to 1.30) during which the intervention remained effective, although the effect may not have been important in that year [GRADE profile 3].

ES 45.4 Very low quality evidence from one before and after study in 43 healthcare institutions, in which a declination policy was added to existing multicomponent flu vaccination interventions (including education campaigns and new vaccine locations), found an increase in flu vaccination uptake among employees compared with before introduction of the declination policy (from 54% ±14.5% before to 65% ±15.7% post-intervention) [GRADE profile 3]

ES 45.5 Very low quality evidence from 1 before and after study of a quality improvement initiative in 13 long-term care facilities indicates found that a multicomponent intervention including educational materials, declination forms, incentives (free lunches and raffles), a mobile clinic and clinic drop-ins increased vaccination uptake among the staff in 11 facilities compared with pre-intervention rates (10 facilities increased uptake >10%) [GRADE profile 3].

ES 45.6 Very low quality evidence from 2 before and after studies found that multicomponent interventions (including education, declination policy and access) increased flu vaccination doses administered to HCWs in contact with immunocompromised patients by 10.8%, and increased flu vaccination uptake among paramedics by 26.4% compared with pre-intervention rates [GRADE profile 3].

SR-ES 45.5 Low quality evidence from 1 before and after study with 26,000 participants found that adding declination and feedback to a multicomponent intervention that included educational materials, incentives and greater access through workplace delivery, increased uptake of flu vaccination among HCWs compared with the multicomponent intervention alone (RR 1.31; 95%CI 1.30 to 1.33) [GRADE profile 4]

Multicomponent interventions including education, incentives and access

ES 45.7 Very low quality evidence from 3 before and after studies with 8,844 participants showed that multicomponent interventions comprising educational materials, incentives and onsite access increased uptake of flu vaccination among HCWs compared with pre-intervention rates (RR 1.11; 95%CI 1.07 to 1.16).

Very low quality evidence from a subgroup analysis of data from 1 before and after study indicated that the multicomponent intervention significantly increased flu vaccination rates

among HCWs with indirect patient contact (RR 3.33; 95%CI 2.51 to 4.42) but not among those with direct contact (RR 1.13; 95%CI 0.97 to 1.32). The uptake of flu vaccination in HCWs with indirect contact increased over time (2003-04: RR 2.19; 95%CI 1.56 to 3.06; 2003-2009: RR 3.33 95%CI 2.51 to 4.42).

A subgroup analysis of data from the same before and after study found very low quality evidence that flu vaccination uptake significantly increased among doctors compared with pre-intervention rates (RR 3.71; 95%CI 2.41 to 5.72) but not among nurses (RR 0.90; 95%CI 0.70 to 1.17) nor other staff with direct contact (RR 0.52; 95%CI 0.27 to 0.98). [GRADE profile 3]

ES 45.8 Low to very low quality evidence from 2 before and after studies with approximately 41,200 participants in total found that multicomponent interventions, including campaign fliers, incentives, electronic databases for record keeping, assessment, feedback, vaccination order forms and workplace access, increased flu vaccination uptake among HCWs compared with pre-intervention rates. In one study uptake increased by 24% (from a pre-intervention rate of 34%) by the third year of the intervention. In the second study, uptake increased across all employees in the first year of the intervention (RR 1.18; 95%CI 1.15 to 1.21). A subgroup analysis of the second study found very low quality evidence that vaccination uptake increased most among physicians (RR1.50; 95%CI 1.29 to 1.73) and among volunteers/students (RR1.49; 95%CI 1.39 to 1.61). Very low quality evidence indicates that vaccination uptake also increased among other staff, but there is some uncertainty in the importance of this effect (RR1.07; 95%CI 1.03 to 1.11) [GRADE profile 3].

SR-ES 45.3 Very low quality evidence from 3 before and after studies with 36,283 participants found that the addition of incentives and reminders to a multicomponent intervention that included educational interventions and greater access through flexible and worksite delivery (usual care) increased uptake of flu vaccination among HCWs compared with usual care alone (RR 1.32; 95%CI 1.30 to 1.34) [GRADE profile 4]

SR-ES 45.8 Low quality evidence from 1 controlled before and after study with 10,518 participants sound that a multicomponent intervention, including educational campaign, material and sessions, greater access (via a mobile vaccination cart) and incentives such as gift cards and entry into a lottery increased uptake of flu vaccination in HCWs compared with pre-intervention rates (RR 1.18; 95%CI 1.10 to 1.27)

A subgroup analysis of data from the same controlled before and after study found low quality evidence that vaccination uptake increased, compared with pre-intervention rates, among those HCWs with direct patient contact (RR 1.20 95%CI 1.11 to 1.30), but very low quality evidence that uptake did not increase among HCWs with indirect patient contact (RR 1.13 95%CI 0.98 to 1.31) [GRADE profile 5]

Multicomponent interventions including education, incentives, declination, reminders and access

SR-ES 45.4 Low quality evidence from 1 before and after study with 9,214 participants found that that the addition of reminders, incentives and a declination policy to an existing multicomponent intervention (that included educational intervention and access through

flexible and worksite delivery) increased uptake of flu vaccination among HCWs compared with the multicomponent intervention alone (RR 1.56; 95%CI 1.52 to 1.60) [GRADE profile 4]

Multicomponent interventions including education, reminders and access

ES 45.9 Low quality evidence from 1 before and after study with 5,578 participants showed that a multicomponent intervention including education, reminders and access increased the uptake of flu vaccination in all staff employed at the study hospital compared with pre-intervention rates (RR 1.41; 95%CI 1.37 to 1.45) [GRADE profile 3]

ES 45.10 Very low quality evidence from one before and after study of indicated that a multicomponent intervention, including a mobile vaccination cart on hospital wards and in outpatient clinics, employee education and flu vaccination compliance feedback increased HCW uptake from 4% during the pre-intervention 1987-88 season to 67% during the post-intervention 1999-2000 season ($p<0.0001$). The study also found a significant decrease in the proportion of laboratory-confirmed flu cases among HCW ($p<0.0001$) [GRADE profile 3].

SR-ES 45.9 Very low quality evidence from 1 controlled before and after studies with 371 participants found that the addition of director level feedback and vaccination offered at specific meetings to a multicomponent intervention that included an educational campaign and free vaccination did not increase the uptake of flu vaccination among HCWs compared with the educational campaign and free vaccination alone (RR 0.94; 95%CI 0.80 to 1.12) [GRADE profile 5].

Multicomponent interventions including mandatory flu vaccination

ES 45.11 Very low quality evidence from three before and after studies with approximately 384,287 participants found that a multicomponent intervention, including mandatory flu vaccination and masking policy, flu champions, incentives and improved access, increased uptake of flu vaccination among all employees compared with pre-intervention rates (1 year post-intervention: RR 1.39; 95%CI 1.16 to 1.66; 2 years post-intervention: 1.51; 95%CI 1.40 to 1.63) [GRADE profile 3].

SR-ES 45.2 Very low quality evidence from 3 before and after studies of 43,022 participants indicated that the addition of a mandatory flu vaccination policy to a multicomponent intervention that included education, incentives, reminders and improved access increased flu vaccination among HCWs compared with the multicomponent intervention alone (RR1.36; 95%CI 1.35 to 1.37) [GRADE profile 4]

Multicomponent intervention including dedicated team and access

SR-ES 45.6 Very low quality evidence from 5 before and after studies with a total of 30,444 participants indicates that multicomponent interventions comprising educational intervention, greater access through flexible and worksite delivery mechanisms and the assignment of dedicated staff increased uptake of flu vaccination among HCWs compared with baseline (pre-intervention) rates (RR 1.48; 95%CI 1.46 to 1.50) [GRADE profile 4].

Qualitative evidence review

To consider the acceptability of influenza vaccination and interventions to increase uptake, the views and experiences of health and social care providers were assessed from the qualitative literature. The quality of included studies was appraised based on a checklist adapted from the Quality in qualitative evaluation framework (see Appendix H of the NICE methods manual). A summary of included studies and their final quality rating is included in Table 3 below. The quality ratings used were:

++ All or most of the checklist criteria have been fulfilled, and where they have not been fulfilled the conclusions are Very unlikely to alter.

+ Some of the checklist criteria have been fulfilled, and where they have not been fulfilled, or are not adequately described, the conclusions are unlikely to alter.

– Few or no checklist criteria have been fulfilled and the conclusions are likely or Very likely to alter.

Included studies

See Appendix G.3 for full evidence tables for the included qualitative studies.

Table 3a: Included qualitative studies for each review question (RQ 4&5) in health and social care staff

First author, year	Design & analysis	Country	Setting	Population	Subject	Rating
Chalmers, 2006	Interviews and thematic analysis	UK	Wards or clinics	Hospital and community nursing staff with direct patient contact	Knowledge attitudes and behaviour towards flu vaccination	+
Leask, 2010	Interviews and Thematic analysis	AUS	Hospitals, department of health, professional associations, unions	Staff involved with policy directives	Feasibility of including flu vaccination in the mandatory schedule	+
Lim, 2014	Interviews and Thematic analysis	AUS	Hospital	Staff involved with policy development and implementation	Views about setting policy around occupational flu vaccination	+

Hill, 2015	Interviews and Thematic analysis	US	Veterans centre and spinal cord injury unit	Staff member involved in implementing declination form programme	Evaluate factors influencing implementation of a declination form programme	-
Real, 2013	Focus Groups and Thematic analysis	US	Hospitals	Healthcare practitioners including MD, nurse, allied professionals	Assess risk perception and efficacy beliefs and how they relate to flu vaccination uptake, and patient safety beliefs	-
Rhudy, 2010	Interviews and Thematic analysis	US	Inpatient and outpatient clinics	Registered nurses	Factors influencing nurse decision making – personal receipt of flu vaccination	++
Willis, 2007	Focus groups	US	Urban community setting	Frontline nurses	Attitudes and concerns regarding flu immunisation, and nurses information needs	-

Table 3b: Included qualitative systematic reviews with included studies noted where relevant to each review question (RQ 4&5)

First author, year	Design & analysis	Country	Setting	Population	Subject	Rating
Hollmeyer 2009	Systematic Review, thematic analysis	Various	Hospitals	Healthcare workers	Attitudes and predictors of flu vaccination	-

Qualitative evidence statements

Q-ES 3.1 *Perception of personal risk of flu may impact on decision to accept vaccination offers in healthcare workers, this may be important for information and education approaches*

1 UK (+) 1 AUS (+) 2 US (-; ++) and 1 systematic review (-) examining the views and experiences of healthcare workers indicated that risk perception of flu (for selves) may affect the uptake of flu vaccination offers. The acceptance of vaccination offers appeared to be based on a number of assumptions including the underlying health of themselves and whether they were at risk, those unvaccinated believed that "as they were generally healthy and had no previous experience with influenza" it was unnecessary; whilst those vaccinated "view risk to self and patients greater than those never vaccinated"[1]; or, that staff "did not need to be vaccinated because they were not at risk of influenza and 'didn't get sick'"[2]. Others considered that risk to self was important whilst recognising this may not be the reason for vaccinating staff "To me it's convincing people that influenza can be fatal and not just for them but their patients at risk…. and the importance of health care workers as a factor for transmission of disease"[3]. There was scepticism amongst nurses of the value of the vaccine believing that the symptoms of influenza were not bothersome enough or predictable enough to warrant vaccination "If I am going to get sick and people come to work with a different strain of the flu, then what am I vaccinated for?..."[4], Overall lack of perception of own risk was one of the primary reasons cited for not obtaining the flu vaccination "I believe in my own host defence", whilst the main reason for getting the vaccination was for self-protection "I do not want to get sick"[5] even though this is not the reason why healthcare workers are offered occupational flu vaccination.

1. Chalmers 2006 + UK
2. Leask 2010 + AUS
3. Real 2013 - US
4. Rhudy 2010 ++ US
5. Hollmeyer 2008 - systematic review

Q-ES 3.2 *Protecting patients may be an important factor in accepting vaccination offers in healthcare workers, this may be important for information and education approaches*

1 UK (+), 1 AUS (+), 1 US (-), 1 Greek (-) studies and 1 systematic review (-) covering views and experiences of healthcare workers suggested that protecting patients was a factor in decision making around uptake of flu vaccination. Protection of vulnerable patients was an important reason to get the vaccination for varied health practitioners "We take care of kids with cancer who are immune-compromised already. They do not need to get the flu on top of that"…"Yes I do because we are carriers of disease and when we have a patient in the hospital their immune system is compromised so they're at greater risk of contracting the diseases"[3]. Although this was not always the case as nurses whilst having knowledge that vaccination of HCWs could protect patients at risk; only one participant in the cohort interviewed had received the flu vaccine during that season[4]. However, a systematic review of 25 studies indicated that patient protection was one of the most cited reasons for obtaining

flu vaccination[5]. Protecting patients was considered a rationale for healthcare workers to accept mandatory vaccination poicies[2] according to policy makers.

1. Chalmers 2006 + UK
2. Leask 2010 + AUS
3. Real 2013 - US
4. Raftopoulos 2008 – Greece
5. Hollmeyer 2008 – systematic review

Q-ES 3.3 *Efficacy beliefs may impact on acceptability of flu vaccination offers in healthcare workers, this may be important for information and education approaches*

2 AUS (+), 1 Canadian (++), 1 Greek (-), 2 US (-;++) studies and a systematic review (-) covering views and experiences from healthcare workers and those who had a leadership role in implementing campaigns suggested efficacy beliefs may alter acceptability of flu vaccination offers. Some participants saw influenza vaccination to be highly effective, others thought it had moderate or debatable effectiveness "If we had more evidence to actually see that vaccinating the staff did reduce the transmission of disease to patients I think that it might be a bit easier for us…although there's evidence out there…I don't think there's enough"[2] A perception of lack of efficacy was noted as a barrier to acceptance of flu vaccination in registered nurses "I believe that the vaccine is 40% effective"[4]. It may not however be a uncertainty in vaccine efficacy but a lack of information on effectiveness year on year ""Every year there's a new strain of flu; yearly it's a new vaccine, and I don't think that's enough time to have adequate research studies on the long-term effects"[6] which was corroborated by a systematic review of 25 studies which identified that doubts about vaccine efficacy was the fourth most cited reasons for not obtaining the flu vaccination "The vaccine does not work"[7] It was also highlighted that medical specialists wanted clearer epidemiological and disease modelling evidence to justify policy decisions *"*If you're mandating something, then you really have to show that the efficacy of that is almost universal*"*[1]

1. Leask 2010 + AUS
2. Lim 2014 + AUS
3. Quach 2013 ++ Canada
4. Raftopoulos 2008 - Greece
5. Rhudy 2010 ++ US
6. Willis 2007 - US
7. Hollmeyer 2008 – systematic review

Q-ES 3.4 *Overcoming misconceptions may be important in improving acceptability of flu vaccination offers by healthcare workers, this may be important for information and education approaches*

1 UK (+), 1 AUS (+), 1 Canadian (++), 1 Irish (+) 1 Greek (-) and 2 US (++;+) studies plus a systematic review suggested that information on the risk and benefits of flu vaccination was

desirable and may alter acceptability of flu vaccination offers. The decision maker needed enough information to make an informed choice, the contents of which could include the risk and benefits of the vaccination, as well as addressing a number of areas where there appeared to be concerns with or misconceptions including the vaccination causing illness particularly flu[1,2,3,4,6,7], with fear of adverse reactions being the most cited reason for not obtaining the vaccination "I am concerned about getting influenza from the vaccine" in systematic review of 25 studies[8]. One study indicated that policy makers also considered that the vaccine caused respiratory illness "The first flu [vaccine] they have they get a very bad cold and they nearly die"[2]. Additionally it was believed that the vaccination was not as important as other preventative measures "We're still using our techniques of hand washing and universal precautions"[7] The misconceptions in healthcare workers were similar to those in parents and those with chronic conditions (RQs 1-3).

1. Chalmers 2006 + UK
2. Leask 2010 + AUS
3. Quach 2013 ++ Canada
4. Quinn 2014 + Ireland
5. Raftopoulos 2008 - Greece
6. Rhudy 2010 ++ US
7. Willis 2007 - US
8. Hollmeyer 2008 – systematic review

Q-ES 3.5 *Education and awareness raising may be an important factor in improving acceptability and uptake of flu vaccination offers in healthcare workers*

3 AUS (+; -; ++), 1 Irish (+), 1 Canadian (+), and 2 US (-;++) studies indicated that those involved in implementing vaccination policy and those eligible for the vaccination considered education and knowledge to be an important factor in vaccine acceptance[1, 4, 5] with a number of preferences for content expressed. General and specific information was desirable, including, the side effects and risk of complications of the vaccine, signs and symptoms and myths vs truths about influenza and the vaccination and whether it was live[3,5]. Specific information about the incidence and severity of influenza was voiced. Death rates or epidemiology were requested including incidence of influenza for HCWs, nurses specifically and patients, also data about their work settings, or wards/occupations and communities in addition to state and national statistics were desired[3,5]. Having more vaccination information in nursing journals and magazines was suggested as an approach[6] as was more message targeting to healthcare workers reinforcing basic principles of infection control as they were given the same information as the public[7].

1. Lim 2014 + AUS
2. Quinn 2014 + Ireland
3. Rhudy 2010 ++ US
4. Seale 2012 - AUS
5. Seale 2016 ++ AUS
6. Willis 2007 - US
7. Yassi 2010 + Canada

Q-ES 3.6 *Accessibility is an important factor in improving likelihood of vaccination uptake.*

1UK (+), 1 AUS (+), and 2 US (-; ++) studies and 1 systematic review (-) identified that accessibility may be a barrier or facilitator in improving uptake. Nurses indicated that access particularly convenience for getting the vaccination were important factors in them having the vaccination many who did not have strong opinion on the importance of the vaccine were vaccinated because it had been convenient[4]; conversely unsuitable access was cited as a reason for not having a vaccination even in those who had been vaccinated in previous seasons[1] additionally accounting for shift work in nursing staff was a further access barrier "Extremely inconvenient, there are many things I miss out on because they are designed around the day shift and they sort of forget there are people that do work nights. There are a lot of us that don't live in (city) so it makes it very inconvenient at times"[3]. This was corroborated by the systematic review where the most cited reason associated with access for obtaining the flu vaccination was its convenience "The vaccine was readily available", whilst the most cited reason for not obtaining the vaccine was inconvenient delivery "I did not have time to get it" "Absence during vaccination programme" and lack of availability "The vaccine was not offered"5. The issue of access was also considered extremely important by communicable disease policy makers and implementers, with access to the vaccine being proposed as the primary system barrier to increasing vaccination coverage by them[2]. They suggested mobile vaccine carts as a means of improving accessibility, and also recommended that hospitals set up more vaccination clinics at times convenient for shifts[2].

1. Chalmers 2006 + UK
2. Lim 2014 + AUS
3. Rhudy 2010 ++ US
4. Willis 2007 - US
5. Hollmeyer 2008 – systematic review

Q-ES 3.7 *Incentives may be a factor in accepting offer of a flu vaccination in healthcare workers*

2 AUS (++;-); studies indicated that policy implementers considered incentives to be important for increasing uptake[1,2] However, this was not noted as important by healthcare workers themselves.

1. Lim 2014 + AUS
2. Seale 2012 - AUS

Q-ES 3.8 *Perceptions of mandatory and/or declination policies are different in policy makers or implementers than in healthcare workers*

2 US (-;++), 2 Canadian (++;+), 1 Irish (+), 1 AUS (-) studies plus a systematic review (-) noted a number of considerations regarding mandatory or declination policy with sentiment being mixed. Some policy makers suggested they were probably the most effective

approaches[1, 2,], although it was noted it could also be resource intensive and they did not garner support with staff readily[5]. The response in staff however, indicated less acceptance than policy makers appeared to consider, with expressions including anger, loss of autonomy and feeling disempowered[3]; feeling pressured and that approaches should not be punitive and need to respect individual choice[6].

1. Hill 2015 - US
2. Quach 2013 ++ Canada
3. Quinn 2014 + Ireland
4. Rhudy 2010 ++ US
5. Seale 2012 - AUS
6. Yassi 2010 + Canada
7. Hollmeyer 2008 – systematic review

Q-ES 3.9 *Reducing absenteeism, is considered a factor in flu vaccination acceptance*

1 AUS (+) and 1 Irish (+) study plus a systematic review (-) suggested that reducing absenteeism or work ethic were factors in acceptance of vaccination offer. Those at higher administrative levels considered reducing absenteeism to be a reason to support mandatory approaches more than did clinical management level staff[1], with recipients believing that the only reason the organisation was prompting vaccination was to reduce absenteeism[2]. However, a systematic review of 25 studies identified that one of the most cited self-reported reasons for obtaining the vaccination by healthcare workers was work ethic “I don’t want to miss work because of influenza”[3].

1. Leask 2010 + AUS
2. Quinn 2014 + Ireland
3. Hollmeyer 2008 – systematic review

Q-ES 3.10 *Negative personal experiences may be important in deciding whether to accept flu vaccination offers in healthcare workers*

1 Canadian study (++) suggested negative experiences in A&E and ICU staff was a barrier to them accepting the flu vaccination as they saw many patients who said they were recently vaccinated and had Guillain-Barré syndrome (GBS)[1].

1. Quach 2013 ++ Canada

Economic evidence

To consider cost effectiveness of interventions to increase uptake of flu vaccination economic literature was assessed. No health economic studies were identified that met the review protocol criteria.

Economic model

Please see the separate economic modelling report produced by the Economic Modelling Unit (EMU) for de novo modelling for this guideline

Appendix A: Review protocols

Review protocols for Flue vaccination: increasing uptake in health and social care staff

A number of elements within the protocols are common across each question namely:

- searches
- methods for selecting evidence (data screening);
- data extraction and quality assessment;
- strategy for data synthesis
- exclusion criteria
- strategy to manage low numbers of references

To reduce repetition these details are provided here:

Searches	The identification of evidence will conform to the methods set out in chapter 5 of the "Developing NICE Guidelines Manual" (October 2014). Relevant databases and websites will be searched systematically to identify relevant qualitative, quantitative and cost effectiveness evidence. The search will use a traditional systematic approach, using PICO to formulate the search strategy. <u>Effectiveness</u> Two searches will be carried out on effectiveness. One will cover interventions for effectiveness for the clinical risk groups, carers and children age 2-17 years and the other will cover the health and social care	

	staff population. These will be carried out separately because the interventions vary between these groups. Study filters will be applied for Systematic review, RCT, Observational study and Qualitative study types. Results will then be split between those with and without study filters for sifting so that, if necessary, studies that have been excluded by the study filters can be identified. <u>Cost-effectiveness</u> These searches will comprise: the effectiveness searches for Medline and Embase without study type filter but with an economics filter; effectiveness searches of the other databases with no filters applied (economics studies to be identified by sifting); additional searches of Econlit and NHS-EED using the main body of the effectiveness search strategy without study type filters. Limits: Sources will be searched from 1996-2016. Language: English language. A separate search will also be carried out about theories and models of behaviour change to address sub questions within question 1a and 4a. Sources to be searched: see Appendix 1. See Appendix 2 for details of the search strategy.	
Selecting evidence (data screening)	Stage 1. Title abstract screening All references from the database searches will be downloaded, de-duplicated and screened on title and abstract against the criteria above.	As noted elsewhere, if large numbers of papers are identified and included at full text, the following may be implemented:

	A randomly selected initial sample of 10% of records will be screened by two reviewers independently. The rate of agreement for this sample will be recorded, and if it is over 90% then remaining references will screened by one reviewer only. Disagreement will be resolved through discussion. Where abstracts meet all the criteria, or if it is unclear from the study abstract whether it does, the full text will be retrieved. Stage 2. Full text screening Full-text screening will be carried out by two reviewers independently on a 10% sample and any differences resolved by discussion. The rate of agreement for this sample will be recorded, and if it is over 90% then remaining references will screened by one reviewer only. Disagreement will be resolved through discussion. Reasons for exclusion at full paper will be recorded. Inter-rater agreement will be recorded.	• Prioritising evidence with critical or highly important outcomes • Prioritising evidence of higher quality in terms of study type • Prioritising evidence with larger participant numbers (> 100)or number of sites it applies to • Consideration of a date cut off (on advice of topic experts)
Data extraction and quality assessment	Data extraction of included studies will be conducted using approaches described in Developing NICE guidelines: the manual. Each included study will be data extracted by 1 reviewer and the data extraction sheet will be confirmed by a second reviewer. Any differences will be resolved by discussion or recourse to a third reviewer. Quality assessment for all included studies will be conducted using the tools in Developing NICE guidelines: the manual. Each included study will be quality assessed by 1 reviewer and checked by another. Any differences in quality grading will be resolved by discussion or recourse to a third reviewer.	
Strategy for data synthesis	Data will be grouped and synthesised into concise evidence statements in line with Developing NICE guidelines: the manual. We will routinely use narrative synthesis for the effectiveness reviews and may pilot GRADE on one review question. See individual protocols for potential a priori groupings.	

	If sufficiently homogeneous and high-quality data are located, meta-analysis will be conducted, including any unintended consequences of an intervention.	
Exclusion criteria	Exclusion criteria: • The epidemiology of influenza • Uptake of pandemic influenza vaccines • Not English Language • Not EU/OECD countries • Dissertation and theses • Opinion pieces (e.g. letters, editorials, commentaries) • Conference abstracts • Poster presentations	
Strategy to manage low number of references	• Extrapolation to other groups i.e. Older people to other groups • Call for Evidence • Expert Testimony	

PICO RQ 4 & 5 (Health and social care staff)

	Details			Additional comments
Study design	**(A)** Comparator studies (effectiveness): ○ Systematic reviews ○ Randomised or non-randomised controlled trials ○ Before and after studies *Observational studies will be used to fill gaps where effectiveness evidence is not available*: ○ Cohort studies ○ Case-control studies	**(B)** Qualitative primary studies: • Interviews • Focus groups • Case studies	**(C)**Economic studies with both costs and benefits: • Economic evaluations • Cost-utility (cost per QALY) • Cost benefit (i.e. Net benefit) • Cost-effectiveness (Cost per unit of effect) • Cost minimisation • Cost-consequence	**Exclusions** (study design): Non-comparative studies. **Exclusions** (Quantitative): •Cross-sectional surveys, epidemiological studies, correlation studies and studies to assess coverage rates are excluded. **Exclusions** (Qualitative): •Cross-sectional surveys/epidemiological studies/ correlations studies/studies to assess coverage rates which contain information related to knowledge/attitudes/beliefs/ perception/intentions/acceptance about vaccination are excluded. **Exclusions** (study design): Systematic reviews will only be included if the review question matches the reviews questions in our reviews or as a source for citation searching if primary searches do not yield a substantial amount of evidence.

	Details			Additional comments
				Exclusions (econ): Theory papers, cost only studies, 'burden of disease' studies and 'cost of illness' studies, which do not report data to inform a model will be excluded. Cost-effectiveness of flu vaccine studies will be excluded.
Setting	**Settings:** o Primary and secondary healthcare settings o Community settings Included countries (Quantitative): Europe and OECD: Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, UK, USA. Included countries (qualitative): Europe, North America, Canada, Australia, New Zealand only			**Excluded settings** : Occupational health settings **Excluded countries (quantitative)**: Non-OECD. If too many studies are identified those OECD countries where there are significant cultural differences – Japan, Korea, South and Central America, and Eastern Europe will be excluded. **Excluded countries** (qualitative): Non-OECD, Japan, Korea, South and Central America. If too many studies are identified those European countries where there are significant cultural differences – Eastern Europe will be excluded and priority will be given to UK studies.

	Details			Additional comments

Population	Health and social care staff directly involved with the care of risk groups eligible for flu vaccination, including:
	• doctors
	• dentists
	• nurses (midwives, practice nurses, district nurses and health visitors)
	• pharmacists
	• paramedics and ambulance staff
	• allied health professionals
	  • chiropodists/podiatrists
	  • dieticians
	  • occupational therapists
	  • orthopaedists
	  • physiotherapists
	  • radiographers
	  • art/music/drama therapists
	  • speech and language therapists
	• health or social care support staff (e.g. medical secretaries, receptionists, practice or residential care managers, porters, healthcare assistants)
	• scientific, therapeutic and technical staff (ST&T) (e.g. ST&T managers and healthcare scientists)
	• students and trainees
	• volunteers
	• social workers
	• care home staff
	health and social care staff working in the community and voluntary sector			

Intervention group	**Education and programme leadership (RQ4)**	**Access to flu vaccination (RQ5)**	**Behaviour change models, techniques and theories**	

	Details			Additional comments

Intervention	• Assigned organisational lead to promote annual flu programme to peers
	• Payment systems
	• Targeted and settings-based information campaigns
	  ○ targeted
	  ○ settings-based
	• Education
	  • Multidisciplinary
	  • peer education
	  • educational outreach
	  • educational DVDs
	  • myth busting
	  • e-learning packages
	• Flu vaccination 'champions'
	  • senior leadership engagement
	• Recommendations from a respected person
	  • peer
		• On-site vaccination.
		• Peer vaccination.
		• Mobile flu vaccination clinics.
		• Drop-in clinics
		- staff events.
		• Extended hours clinics
		- 24-hour access to reflect different working patterns.
			• Motivational interviewing
			• Trans-theoretical model (stages of change)
			• Theory of planned behaviour
			• Theory of reasoned action
			• Health Protection Theory
			• Protection motivation Theory
			• Social cognitive theory
			• Perceptions of risk
				Exclusions: Interventions related to uptake of pandemic flu vaccines during pandemic outbreaks. Note: papers related to interventions to increase uptake of H1N1 vaccination (swine flu vaccine) where results are also relevant to uptake of seasonal flu vaccine (i.e. the intervention is not delivered during a pandemic outbreak) will be included.
				Interventions related to haemophilus influenza type B vaccine are excluded as this vaccine is not a flu vaccine. It is given to prevent against meningitis.

	Details			Additional comments

	• Reminders and follow-up approaches
	  • verbal reminders
	  • text messages
	  • emails
	  • postcards
	  • posters.
	• Feedback on uptake rates
	• Incentive schemes
	  • targets for providers
	• Policies on conditions of employment and opt-out
	  • use of surgical masks
	  • mandatory vaccination
	  • Signed statements from staff who decline a vaccine.
	  • Professional standards/good practice			

	Details			Additional comments
	• Appraisals, inductions and CPD • Sickness absence • Shared health record for providers of flu vaccination			
Comparator	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons			
Outcomes	Primary outcome: • Changes in uptake rate among target groups Secondary outcomes: • Changes in: o knowledge o attitudes o beliefs o acceptance o intentions • Unintended consequences of an activity, including o increase uptake of other vaccines o increase in inequalities o increase in issues of concern if vaccinated outside health and social care settings e.g. about resuscitation facilities, aseptic techniques, needle contamination o increase in distress caused by having the vaccine within specific groups e.g. people with learning disabilities o Vaccinations not captured by other providers o Risk of being vaccinated twice			

	Details	Additional comments
	○ Vaccine wastage • Cost effectiveness and economic outcomes: ○ Cost per quality-adjusted life year ○ Cost per unit of effect	

Appendix B: Health economic analysis

See separate modelling report

Appendix C: Research recommendations

See full guideline for prioritised research recommendations

Appendix D: Included evidence study selection

Afonso N, Kavanagh M, and Swanberg S (2014) Improvement in attitudes toward influenza vaccination in medical students following an integrated curricular intervention. Vaccine 32(4), 502-506

Bruce G (2007) Paramedic services workplace program improves influenza immunization rates among paramedics. The Canadian journal of infection control : the official journal of the Community & Hospital Infection Control Association-Canada = Revue canadienne de prevention des infections / Association pour la prevention des infections a l'hopital et dans la communaute-Canada, and CHICA-CANADA 22(3), 156-1

Cadena Jose, Prigmore Teresa, Bowling Jason, Ayala Beth Ann, Kirkman Leni, Parekh Amruta, Scepanski Theresa, and Patterson Jan E (2011) Improving influenza vaccination of healthcare workers by means of quality improvement tools. Infection control and hospital epidemiology 32(6), 616-8

Chalmers C (2006) Understanding healthcare worker uptake of influenza vaccination: a survey. British Journal of Infection Control 7(2), 12-17

Chambers Larry W, Crowe Lois, Lam Po-Po, MacDougall Donna, McNeil Shelly, Roth Virginia, Suh Kathryn, Dalzell Catherine, Baker Donna, Ramsay Hilary, DeCoutere Sarah, Hall Heather L, and McCarthy Anne E (2015) A new approach to improving healthcare personnel influenza immunization programs: a randomized controlled trial. PloS one 10(3), e0118368

Conner Mark, Godin Gaston, Norman Paul, and Sheeran Paschal (2011) Using the question-behavior effect to promote disease prevention behaviors: Two randomized controlled trials. Health Psychology 30(3), 300-309

Drees Marci, Wroten Kathleen, Smedley Mary, Mase Tabe, and Schwartz J Sanford (2015) Carrots and sticks: achieving high healthcare personnel influenza vaccination rates without a mandate. Infection control and hospital epidemiology 36(6), 717-24

Friedl A, Aegerter C, Saner E, Meier D, and Beer J H (2012) An intensive 5-year-long influenza vaccination campaign is effective among doctors but not nurses. Infection 40(1), 57-62

Hill J N, Smith B M, Evans C T, Anaya H, Goldstein B, and LaVela S L (2015) Implementing a declination form programme to improve influenza vaccine uptake by staff in Department of Veterans Affairs spinal cord injury centres: A pilot study. Journal of Hospital Infection 91(2), 158-165

Hollmeyer Helge G, Hayden Frederick, Poland Gregory, and Buchholz Udo (2009) Influenza vaccination of health care workers in hospitals--a review of studies on attitudes and predictors. Vaccine 27(30), 3935-44

Hollmeyer Helge, Hayden Frederick, Mounts Anthony, and Buchholz Udo (2013) Review: interventions to increase influenza vaccination among healthcare workers in hospitals. Influenza and other respiratory viruses 7(4), 604-21

Kim Hanna, Lindley Megan C, Dube Donna, Kalayil Elizabeth J, Paiva Kristi A, and Raymond Patricia (2015) Evaluation of the impact of the 2012 Rhode Island health care worker influenza vaccination regulations: implementation process and vaccination coverage. Journal of public health management and practice : JPHMP 21(3), E1-9

Koharchik Linda S, Hardy Elaine, and Salman Khlood (2012) Evidence-based initiative to improve influenza immunisation participation among undergraduate nursing students. Journal of Infection Prevention 13(6), 186-191

Lam Po-Po, Chambers Larry W, MacDougall Donna M. Pierrynowski, and McCarthy Anne E (2010) Seasonal influenza vaccination campaigns for health care personnel: systematic review. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 182(12), E542-8

Leask Julie, Helms Charles M, Chow Maria Y, Robbins Spring C. Cooper, and McIntyre Peter B (2010) Making influenza vaccination mandatory for health care workers: the views of NSW Health administrators and clinical leaders. New South Wales public health bulletin 21(9-10), 243-7

Lehmann B A, Chapman G B, Franssen F M. E, Kok G, and Ruiter R A. C (2016) Changing the default to promote influenza vaccination among health care workers. Vaccine 34(11), 1389-1392

Leibu Rachel, and Maslow Joel (2015) Effectiveness and acceptance of a health care-based mandatory vaccination program. Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine 57(1), 58-61

Lim Yi Chen, and Seale Holly (2014) Examining the views of key stakeholders regarding the provision of occupational influenza vaccination for healthcare workers in Australia. Vaccine 32(5), 606-10

Llupià Anna, Mena Guillermo, Olivé Victòria, Quesada Sebastiana, Aldea Marta, Sequera Víctor G, Ríos José, García-Basteiro Alberto L, Varela Pilar, Bayas José M, and Trilla Antoni (2013) Evaluating influenza vaccination campaigns beyond coverage: A before-after study among health care workers. American Journal of Infection Control 41(8), 674-678

Lytras T, Kopsachilis F, Mouratidou E, Papamichail D, and Bonovas S (2015) Interventions to increase seasonal influenza vaccine coverage in healthcare workers: A systematic review and meta-regression analysis. Human Vaccines and Immunotherapeutics , 0

Maltezou H, Maragos A, and Halharapi T (2007) Factors influencing influenza vaccination rates among healthcare workers in Greek hospitals. Journal of Hospital Infection 66(2), 156-159

Marwaha S, Lorv B, Henseleit S, Iroanyah N. GET POKED: Comparing an Incentive-Based Flu Campaign with Vaccinate-or-Mask Policies to Boost Influenza Vaccination Rates Among Healthcare Workers. Healthcare quarterly (Toronto, Ont.). 2015 Dec;18(4):73-9.

Munford Cathy, and Finnigan Shirley (2008) Influenza campaign 2006 and 2007: a residential care success story. The Canadian journal of infection control : the official journal of the Community & Hospital Infection Control Association-Canada = Revue canadienne de prevention des infections / Association pour la prevention des infections a l'hopital et dans la communaute-Canada, and CHICA-CANADA 23(4), 222-227

Nace David A, Hoffman Erika L, Resnick Neil M, and Handler Steven M (2007) Achieving and sustaining high rates of influenza immunization among long-term care staff. Journal of the American Medical Directors Association 8(2), 128-33

Nace David A, Handler Steven M, Hoffman Erika L, and Perera Subashan (2012) Impact of the raising immunizations safely and effectively (RISE) program on healthcare worker influenza immunization rates in long term care settings. Journal of the American Medical Directors Association 13(9), 806-10

Parry et al (2004). Influenza Vaccination: A collaborative Effort to Improve the Health of Community. Infection control and hospital Epidemiology.:25: 929-932

Palmore Tara N, Vandersluis J Patrick, Morris Joan, Michelin Angela, Ruprecht Lisa M, Schmitt James M, and Henderson David K (2009) A successful mandatory influenza vaccination campaign using an innovative electronic tracking system. Infection control and hospital epidemiology 30(12), 1137-42

Patterson Jan E, Cadena Jose, Prigmore Teresa, Bowling Jason, Ayala Beth Ann, Kirkman Leni, Parekh Amruta, and Scepanski Theresa (2011) Improving health care workers for seasonal influenza vaccination at university health system: a paradigm for closing the quality chasm. Transactions of the American Clinical and Climatological Association 122, 166-73

Perlin JB, Septimus EJ, Cormier SB, Moody JA, Hickok JD, Bracken RM. Developing a program to increase seasonal influenza vaccination of healthcare workers: lessons from a system of community hospitals. Journal for Healthcare Quality. 2013 Nov 1;35(6):5-15

Pitts S I, Maruthur N M, Millar K R, Perl T M, and Segal J (2014) A systematic review of mandatory influenza vaccination in healthcare personnel. American Journal of Preventive Medicine 47(3), 330-340

Polgreen et al (2008). Relationship of Influenza Vaccination Declination Statements and Influenza Vaccination Rates for Healthcare Workers in 22 US Hospitals. Infection Control & Hospital Epidemiology: 29:675-677

Quan Kathleen A, Cousins Sarah M, Hizon Denise A, Heck Kristie K, Samuelson Pamela, Garcia Froylan Jr, and Huang Susan S (2014) Electronic solutions to enhance tracking and compliance with mandatory influenza vaccination for all hospital staff. Infection control and hospital epidemiology 35(11), 1421-4

Real Kevin, Kim Sujin, and Conigliaro Joseph (2013) Using a validated health promotion tool to improve patient safety and increase health care personnel influenza vaccination rates. American Journal of Infection Control 41(8), 691-696

Rhudy Lori M, Tucker Sharon J, Ofstead Cori L, and Poland Gregory A (2010) Personal choice or evidence-based nursing intervention: Nurses' decision-making about influenza vaccination. Worldviews on Evidence-Based Nursing 7(2), 111-120

Rothan-Tondeur Monique, Filali-Zegzouti Younes, Belmin Joel, Lejeune Benoist, Golmard Jean-Louis, de Wazieres , Benoit , Carrat Fabrice, Piette Francois, Mouala Christian, Gavazzi Gaetan, and association Orig (2010) Assessment of healthcare worker influenza vaccination program in French geriatric wards: a cluster-randomized controlled trial. Aging clinical and experimental research 22(5-6), 450-5

Sanchez Deborah, Breland Burnis D, Pinkos Laura, Eagle Andrea, Nowlin Debbie, and Duty Lauren (2003) Pharmacist-run influenza immunization clinic for health workers. American journal of health-system pharmacy: AJHP : official journal of the American Society of Health-System Pharmacists 60(3), 241-3

Sand Kelly L, Lynn Joanne, Bardenheier Barbara, Seow Hsien, and Nace David A (2007) Increasing influenza immunization for long-term care facility staff using quality improvement. Journal of the American Geriatrics Society 55(11), 1741-7

Willis Bayo C, and Wortley Pascale (2007) Nurses' attitudes and beliefs about influenza and the influenza vaccine: a summary of focus groups in Alabama and Michigan. American journal of infection control 35(1), 20-4

Appendix E: Economic evidence study selection

No cost effectiveness studies were identified for inclusion in this review

Appendix F: Literature search strategies

Search Strategy 1 – Main search strategy (Healthcare workers)

Database: Ovid MEDLINE (R) <1996 to April Week 2 2016>
1 exp Influenza, Human/ (40962)
2 Influenza A virus/ (17680)
3 Influenza B virus/ (3371)
4 Influenzavirus C/ (311)
5 (influenza* or flu or grippe).tw. (93972)
6 or/1-5 (100301)
7 exp Vaccination/ (70311)
8 Vaccines/ (18090)
9 Immunization/ (46579)
10 (vaccin* or immuni*).tw. 389959
11 or/7-10 419164
12 6 and 11 30787
13 exp Influenza Vaccines/ 18389
14 12 or 13 33402
15 exp health personnel/ or allied health personnel/ or dental assistants/ or dental hygienists/ or dental technicians/ or physical therapists/ or dentists/ or medical staff, hospital/ or nurses/ or physicians/ or Midwifery/ or Students, Medical/ or Students, Nursing/ or Hospitals/ or Pharmacists/ (523987)
16 (doctor* or GP or physician* or clinician* or nurs* or dentist* or dental hygienist* or dental technician* or dental staff or midwife* or midwives or paramedic* or occupational therapist* or physiotherapist* or physical therapist* or ambulance driver* or radiographer* or pharmacist* or health visitor* or dietician* or chiropodist* or podiatrist* or orthop?edist*).tw. (898240)
17 ((health or health care or healthcare or social care or social) adj2 (personnel or worker* or provider* or employee* or staff or professional* or practitioner* or assistant* or scientist*)).tw. (140328)
18 ((medical or hospital or care home) adj2 (staff or employee* or personnel or worker* or practitioner* or student* or setting* or receptionist* or secretar* or manager* or porter* or volunteer*)).tw. (80007)
19 ((art or music or drama or speech or language) adj3 therapist*).tw. (1573)
20 or/15-19 (1317621)
21 Health Promotion/ (59462)
22 ((increas* or improv* or rais* or higher) adj4 (uptake or rate* or immuni* or vaccin* or complian*)).tw. (397309)
23 Health Education/ or Education, Medical, Continuing/ or Leadership/ or Mandatory Programs/ or Immunization Programs/ or Physician Incentive Plans/ (122586)
24 ((flu or influenza) adj3 (lead* or champion*)).tw. (217)

Database: Ovid MEDLINE (R) <1996 to April Week 2 2016>

25 ((educat* or learn*) adj3 (outreach or tool* or resource* or multidisciplinary or peer* or dvd*)).tw. (11700)

26 (e-learn* or elearn*).tw. (1270)

27 ((information or advice or advised or recommend*) adj3 (campaign* or doctor* or GP* or physician* or clinician* or nurse* or peer* or forum* or social media)).tw. (19178)

28 (remind* or track* or alert* or postcard* or mail* or email* or text* or sms or recall* or telephon* or registry or registries or letter* or appointment* or schedul* or invite* or invitation* or prompt* or poster* or myth* or follow-up or follow up).tw. (1438756)

29 ((system* or process*) adj3 (audit* or feedback or statistic* or response*)).tw. (55787)

30 Health Policy/ or Reminder Systems/ or Motivation/ or Physician Incentive Plans/ or Reimbursement, Incentive/ or Medical Audit/ or Clinical Audit/ or Feedback/ or Registries/ or Immunization Programs/ or Medical Records Systems, Computerized/ or Electronic Health Records/ or "Appointments and Schedules"/ (260268)

31 ((incentive* or reward*) adj3 (scheme* or program* or target*)).tw. (1642)

32 ((policy or policies or condition* or term*) adj3 (work* or employ*)).tw. (25292)

33 ((policy or policies or requirement*) adj3 (surgical mask* or mandatory or standard* or practice* or appraisal* or induct* or CPD or professional development or sick* absence* or sick* leave)).tw. (11437)

34 ((declin* or sign*) adj3 (form* or statement*)).tw. (27389)

35 (opt out* or opt-out*).tw. (838)

36 ((vaccin* or immuni*) adj3 (pay* or financ* or fiscal)).tw. (385)

37 ((share* or centrali* or integrat*) adj3 (health record* or healthcare record* or health care record* or social care record* or data interchange or data record*)).tw. (252)

38 ((vaccin* or immuni*) adj3 (access or peer* or on-site or on site or mobile or extended hour* or extended-hour* or 24-hour* or 24 hour* or drop-in or drop in)).tw. (823)

39 or/21-38 (2233715)

40 Randomized Controlled Trial.pt. (411978)

41 Controlled Clinical Trial.pt. (90457)

42 Clinical Trial.pt. (498624)

43 exp Clinical Trials as Topic/ (290438)

44 Placebos/ (33206)

45 Random Allocation/ (86260)

46 Double-Blind Method/ (134422)

47 Single-Blind Method/ (21619)

48 Cross-Over Studies/ (37761)

49 ((random$ or control$ or clinical$) adj3 (trial$ or stud$)).tw. (812860)

50 (random$ adj3 allocat$).tw. (22732)

51 placebo$.tw. (162234)

52 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).tw. (131520)

53 (crossover$ or (cross adj over$)).tw. (60494)

54 or/40-53 (1487946)

55 Observational Studies as Topic/ (1299)

56 Observational Study/ (19615)

57 Epidemiologic Studies/ (7079)

58 exp Case-Control Studies/ (769481)

59 exp Cohort Studies/ (1517858)

60 Cross-Sectional Studies/ (211263)

Database: Ovid MEDLINE (R) <1996 to April Week 2 2016>

61 Controlled Before-After Studies/ (113)
62 Historically Controlled Study/ (45)
63 Interrupted Time Series Analysis/ (126)
64 Comparative Study.pt. (1734410)
65 case control$.tw. (85558)
66 case series.tw. (38829)
67 (cohort adj (study or studies)).tw. (98944)
68 cohort analy$.tw. (4156)
69 (follow up adj (study or studies)).tw. (38409)
70 (observational adj (study or studies)).tw. (49968)
71 longitudinal.tw. (147040)
72 prospective.tw. (371880)
73 retrospective.tw. (296548)
74 cross sectional.tw. (181737)
75 or/55-74 (3552642)
76 Meta-Analysis.pt. (63705)
77 Meta-Analysis as Topic/ (14733)
78 Review.pt. (2031739)
79 exp Review Literature as Topic/ (8506)
80 (metaanaly$ or metanaly$ or (meta adj3 analy$)).tw. (75306)
81 (review$ or overview$).ti. (299772)
82 (systematic$ adj5 (review$ or overview$)).tw. (70440)
83 ((quantitative$ or qualitative$) adj5 (review$ or overview$)).tw. (5094)
84 ((studies or trial$) adj2 (review$ or overview$)).tw. (27871)
85 (integrat$ adj3 (research or review$ or literature)).tw. (6280)
86 (pool$ adj2 (analy$ or data)).tw. (16558)
87 (handsearch$ or (hand adj3 search$)).tw. (5969)
88 (manual$ adj3 search$).tw. (3551)
89 or/76-88 (2207936)
90 Qualitative Research/ (26259)
91 Nursing Methodology Research/ (15828)
92 Interview.pt. (25975)
93 exp Interviews as Topic/ (46483)
94 Questionnaires/ (339340)
95 Narration/ (5892)
96 Health Care Surveys/ (26861)
97 (qualitative$ or interview$ or focus group$ or questionnaire$ or narrative$ or narration$ or survey$).tw. (947595)
98 (ethno$ or emic or etic or phenomenolog$ or grounded theory or constant compar$ or (thematic$ adj4 analys$) or theoretical sampl$ or purposive sampl$).tw. (45906)
99 (hermeneutic$ or heidegger$ or husser$ or colaizzi$ or van kaam$ or van manen$ or giorgi$ or glaser$ or strauss$ or ricoeur$ or spiegelberg$ or merleau$).tw. (7551)
100 (metasynthes$ or meta-synthes$ or metasummar$ or meta-summar$ or metastud$ or meta-stud$ or metathem$ or meta-them$).tw. (521)
101 or/90-100 (1105288)
102 or/40-101 (6855296)

Database: Ovid MEDLINE (R) <1996 to April Week 2 2016>
103 and/14,20,39 (2424)
104 and/14,20,39,102 (1743)
105 animals/ not humans/ (4189112)
106 Editorial/ (374840)
107 News/ (165432)
108 or/105-107 (4707973)
109 103 not 108 (2367)
110 limit 109 to (english language and yr="1996 - 2016") (2025)
111 104 not 108 (1740)
112 limit 111 to (english language and yr="1996 - 2016") (1480)

Search Strategy 2 – Additional search strategy on behaviour change (carers, healthcare workers, children, clinical risk groups) in psych info only

Database: Ovid PsycINFO <1996 to May Week 3 2016>
1 exp Immunization/ (3441)
2 (vaccin* or immuni*).tw. (9248)
3 1 or 2 (9301)
4 INFLUENZA/ (1089)
5 (influenza* or flu or grippe).tw. (2599)
6 4 or 5 (2602)
7 3 and 6 (1014)
8 exp Health Behavior/ or exp Health Attitudes/ or exp Behavior Change/ or exp Health Knowledge/ or exp Risk Management/ or exp At Risk Populations/ or exp Risk Perception/ or exp MOTIVATION/ or exp Planned Behavior/ or exp Behavioral Intention/ or exp Reasoned Action/ or exp Social Cognition/ or exp Behavior Modification/ (163753)
9 ((behavio?r* or cognitive or attitude* or knowledge* or lifestyle* or life-style*) adj3 (chang* or adapt* or alter* or intent* or influenc* or modification or modify or modifying or belie* or control* or adopt*)).tw. (140294)
10 ((increas* or improv* or rais* or high* or more or better or best or low* or less or worse or worst or fewer) adj3 (motivat* or confiden* or opportunit* or feasib* or plan*)).tw. (35163)
11 ((vaccin* or immuni*) adj3 (barrier* or facilitat* or hinder* or block* or obstacle* or restrict* or restrain* or obstruct* or inhibit* or impede* or delay* or constrain* or hindrance or uptake or take up or increas* or impact* or effect* or improve* or enhance* or encourag* or support* or promot* or optimiz* or optimis* or adher* or access* or motivat* or accept* or satisfaction or compliance or comply or complie* or refus* or availabl* or provision or provid* or offer or incentive* or start or attend* or adopt* or persuad* or persuation or attitude* or intend* or intention or counsel*)).tw. (2535)
12 or/8-11 (306151)
13 exp Psychological Theories/ or exp Motivational Interviewing/ (19480)

Database: Ovid PsycINFO <1996 to May Week 3 2016>
14 ("Trans?theoretical model*" or "stage* of change" or "theor* adj3 planned behavio?r" or "theor* adj3 reasoned action" or "health protection adj3 theor*" or "protection motivation adj3 theor*" or "social cogniti* adj3 theor*").tw. (3417)
15 ((theor* or trans?theor* or belie*) adj3 (framework* or model*)).tw. (52686)
16 (health belie* adj3 (model* or theor*)).tw. (1508)
17 ((theor* or model* or program* or therap* or treatment* or intervention*) adj3 (plan* or behavio?r or reason* or action* or protect* or motivat* or confiden* or opportunit* or feasib* or persua* or cognit*)).tw. (140448)
18 (motivation* adj3 (interview* or question* or model* or theor* or program*)).tw. (9878))
19 or/13-18 (202987)
20 12 or 19 (459291)
21 7 and 20 (600)
22 limit 21 to (english language and yr="1996 - 2016") (575)

Appendix G: Evidence tables

G.1 Effectiveness – primary studies

G.1.1 Afonso 2014

<table>
<tr><th colspan="5">Afonso 2014</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/ Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Afonso N, Kavanagh M, Swanberg S. Improvement in attitudes toward influenza vaccination in medical students following an integrated curricular intervention. Vaccine. 2014 32:502-6.</td>
<td>Inclusion criteria:
1st year medical student in 2011 or 2012

Exclusion criteria:
None</td>
<td>HCW sub-population
Medical students

Number of participants:
Pre-intervention survey: n=124
Post-intervention survey: n=97

Participant characteristics:
48% had been vaccinated in previous year</td>
<td>Intervention:

An educational intervention was scheduled to coincide with the beginning of the flu season. At the beginning of the 2 hour education session, students participated in an interactive activity guided by a librarian, where students generated questions or myths they felt patients may have</td>
<td>Overall, there was a statistically significant improvement in the attitudes regarding importance of influenza vaccination for themselves and for other HCWs. There was a decrease in the perception that influenza vaccination causes flu.
<table>
<tr><th>Attitude</th><th colspan="2">Positive responses pre-intervention</th><th colspan="2">Positive responses post-intervention</th><th>Percentage change</th></tr>
<tr><th></th><th></th><th>Mean score[a] (SD)</th><th></th><th>Mean score[a] (SD)</th><th></th></tr>
<tr><td>Influenza is contagious</td><td>93 (95.9%)</td><td>4.57 (0.86)</td><td>95 (97.9%)</td><td>4.71 (0.63)</td><td>2.0%</td></tr>
<tr><td>Vaccination decreases the risk of influenza</td><td>89 (91.8%)</td><td>4.26 (0.74)</td><td>91 (93.8%)</td><td>4.47 (0.79)</td><td>2.0%</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th colspan="8">Afonso 2014</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/ Comparator</th><th colspan="4">Results</th></tr>
<tr><td>Quality score:
-

Study type:
Before and after

Aim of the study:
To assess the change in attitudes and perceptions towards influenza vaccination following an educational intervention combined with hands-on training and administration of influenza vaccine to classmates</td><td></td><td></td><td>regarding the influenza vaccine. Student generated questions served as the starting point to search for appropriate online education materials that could be used for counselling patients on the influenza vaccine.

An infectious disease physician also discussed the epidemiology of influenza, practical aspects of patient counselling, impact of influenza for patients, public health implications of influenza and the influenza vaccine including effectiveness,</td><td colspan="4"><table>
<tr><td>HCWs may spread influenza to patients</td><td>91 (93.8%)</td><td>4.45 (0.61)</td><td>96 (98.9%)</td><td>4.70 (0.52)</td><td>5.1% **</td></tr>
<tr><td>It’s important to be vaccinated against influenza</td><td>69 (71.1%)</td><td>3.81 (1.07)</td><td>90 (92.8%)</td><td>4.49 (0.81)</td><td>21.7% **</td></tr>
<tr><td>As a HCW I am at risk of getting influenza</td><td>96 (98.9%)</td><td>4.43 (0.52)</td><td>97 (100%)</td><td>4.71 (0.46)</td><td>1.1% **</td></tr>
<tr><td>HCWs should receive influenza vaccine</td><td>80 (82.5%)</td><td>4.28 (0.85)</td><td>92 (94.8%)</td><td>4.64 (0.58)</td><td>12.3% **</td></tr>
<tr><td>Influenza vaccine may cause influenza</td><td>16 (16.5%)</td><td>2.34 (1.04)</td><td>8 (8.2%)</td><td>1.71 (0.91)</td><td>-8.3% *</td></tr>
<tr><td>Would recommend vaccine to family/friends</td><td>71 (73.2%)</td><td>3.92 (0.85)</td><td>90 (92.8%)</td><td>4.4 (0.79)</td><td>19.6% **</td></tr>
</table></td></tr>
</table>

Afonso 2014				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/ Comparator**	**Results**
Location and setting: Oakland University School of Medicine, Michigan, USA **Source of funding:** Not reported			safety and adverse events.	[a] Likert scale responses where 1=strongly disagree and 5=strongly agree * p value <0.05 ** p value <0.01
Notes <u>Limitations identified by author</u> Relatively small sample size, and conducted only at 1 medical school; long term attitudinal changes couldn't be assessed here. <u>Limitations identified by review team</u> Pre-intervention survey conducted 6 weeks prior to intervention, and post-intervention survey conducted 2 months after intervention, meaning there is more chance of contamination of the results due to another intervention altering attitudes during this time. Other				

G.1.2 Bruce 2007

<table>
<tr><th colspan="5">Bruce 2007</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Bruce 2007
Paramedic services workplace program improves influenza immunization rates among paramedics. The Canadian Journal of Infection Control. 2007. 22:156-161.

Quality score
+

Study type
Before and after</td>
<td>Inclusion criteria:
None reported

Exclusion criteria:
None reported</td>
<td>HCW sub-population:
Paramedics

Number of participants:
No data available on numbers for 2002 and 2003 - % presented in study
2004: 213 eligible participants
2005: 256 eligible participants

Participant characteristics

Paramedics</td>
<td>Multifaceted Influenza vaccination programme delivered in Oct/Nov 2005 – 1) educate (educational programme delivered by infection control officer as part of mandatory continuing medical education via PowerPoint presentation: 2 halves - 1 didactic sessions on severity, signs and symptoms, transmission, communicability, risk populations, complications; 2 common facts about flu vac)
2) provide easy access to flu vac (workplace flu immunization clinic supported by local health unit; standing order allowing paramedics to administer flu vac)
3) Training to screen vaccine candidates and administer vaccine (peer to peer) – 4 paramedics trained
4) invites for vaccine immediately following delivery of educational session and</td>
<td>
<table>
<tr><th>Eligible (n)</th><th>Received Flu Vac</th><th>Contraindicated</th><th>Refused</th></tr>
<tr><td colspan="4">2002</td></tr>
<tr><td>n=N/R</td><td>54.2%</td><td>2.8%</td><td>43%</td></tr>
<tr><td colspan="4">2003</td></tr>
<tr><td>n=N/R</td><td>46%</td><td>2.6%</td><td>51.4%</td></tr>
<tr><td colspan="4">2004 (pre-intervention)</td></tr>
<tr><td>213</td><td>62.4% (n=133)</td><td>1.9% (n=4)</td><td>35.6 (n=76)</td></tr>
<tr><td colspan="4">2005 (post-intervention)</td></tr>
<tr><td>256</td><td>87% (n=224)</td><td>1.6% (n=4)</td><td>10.9% (n=28)</td></tr>
</table>
N/R = not reported
Lessons learnt – from discussions with paramedics
Paramedics not always reading educational material as per policy – misconceptions held regarding vaccination
Interactive sessions allowed understanding of appropriate modes of education and learning, provided a forum for peer to peer discussion – creation of an ‘atmosphere of acceptance’
Peer to peer vaccination - increased peer mentoring, peer role modelling and vaccine acceptance; management were vaccinated by paramedics
</td>
</tr>
</table>

Bruce 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Aim of the study Increase flu vaccination in paramedics in 2005 **Location and setting** Canada, paramedic services **Source of funding:** Internally funded by County of Simcoe Paramedic Services			signing declarations once vaccination administered	Availability of vaccine – immediacy post education attributed to 'success' – less likely to refuse, vaccination occurred whilst working New management – 2004 to 2005 change of management and more supportive of flu vac in HCW and role of infection control officer
Notes : Paramedics trained and administered to other paramedic colleagues (peer to peer) <u>Limitations identified by author</u>				

Bruce 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Nothing outlined <u>Limitations identified by review team</u> Small sample, generalisability low, no information on paramedic characteristics				

G.1.3 Cadena 2011

Cadena 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Cadena 2011 **Quality score** - **Study type** Before and after	Inclusion criteria Exclusion criteria	**HCW sub-population:** HCWs in hospital with solid-organ-transplant programme, haematology oncology unit, outpatient clinic and emergency dept. **Number of participants** 5578 active employers	2006-2009 – usual practice Education programmes, free vaccination in the workplace and yearly vaccination campaigns 2010 - Usual practice + Seasonal flu vac quality improvement project: Support of leadership Distribution of vaccination kits (instructions, vaccines, syringes, gloves, supplies,	Flu vaccination rates amongst active staff | | Flu vac rate (%) | Eligible | Vaccinated | |---|---|---|---| | 2006/07 | 45% | | | | 2007/08 | 58.5% | | | | 2008/09 (Oct-March) | 58.8% | 5496 | 3232 | | September to November 2009 | 76.6% | 5578 | 4273* | *the paper reports 82.9% received the vaccination (4271/5155). 82.9% of 5155 is 4273 – amended by NICE

Cadena 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Aim of the study Effect of a quality improvement (QI) programme to increase flu vaccination rates **Location and setting** University affiliated health system, USA **Source of funding**		**Participant characteristics:** Active employees	consent and screening forms, vac information sheets, employee list, educational fliers) Grand rounds presentations Campaign announcements to unit directors Influenza website Screensavers E-mails Phone messages Declination form Enhanced staff awareness Audit feedback Colour-coded dashboard displaying vaccination rates – per resident vaccination rates sent to resident directors After start of intervention 'plan-do-study-act' cycle used by QI team	Main finding: 17.8% increase in flu vaccination rate from 2008-2009 flu season (OR 2.7; 95%CI 2.5-2.97; P<0.1) Other findings: Quality improvement (QI) team identified causes for low flu vac uptake prior to developing intervention: Lack of information; misconceptions about flu vac/efficacy; accountability; difficulty contacting employees; lack of time and education; delay of flu vac shipments; lack of interest; lack of audit feedback to those with accountability; lack of visible leadership support; lack of easy access to vaccine
Notes: A specific quality improvement team was formed with representatives from employee health, infection prevention, corporate communication, nursing, medical executive board and quality improvement				

Cadena 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Limitations identified by author: 7.6% (N=424) of HCW did not respond to vaccination forms and may have been vaccinated elsewhere; awareness raised by 2009 H1N1 virus; vaccination rates already high relative to other US institutions (62%); no shortage of vaccine supply – 2009 had widely reported shortage in US Limitations identified by review team: US study applicability may be lower, Context different regarding flu vaccination e.g. usual care UK vs. Usual care US Other				

G.1.4 Chambers 2015

<table>
<tr><th colspan="5">Chambers 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Chambers 2015.

Quality score
+

Study type
Cluster RCT

Aim of the study</td>
<td>Inclusion criteria
Organisations eligible included: acute care hospitals, continuing care organisations (eg assisted living facilities,</td>
<td>Number of participants
13 organisations in intervention group
Number of personnel within intervention organisations, year 2 post-intervention:
Mean: 2971
Median: 2577</td>
<td>The “Successful Healthcare Personnel Influenza Immunisation Programs: A Guide for Program Managers” (the guide) and a companion Tool Kit were produced and provided for intervention groups.

The guide presents healthcare organisations with a systematic</td>
<td>
<table>
<tr><td></td><td colspan="2">Median immunisation rate (%)</td><td colspan="2">Range of immunisation rate (%)</td><td></td></tr>
<tr><td>Year</td><td>Intervention</td><td>Control</td><td>Intervention</td><td>Control</td><td>p-value</td></tr>
<tr><td>2008-09 (Baseline)</td><td>43</td><td>62</td><td>27 to 70</td><td>29 to 92</td><td>0.13</td></tr>
<tr><td>2010-11 (Year 1)</td><td>44</td><td>57</td><td>33 to 71</td><td>28 to 70</td><td>0.09</td></tr>
<tr><td>2011-12 (Year 2)</td><td>51</td><td>55</td><td>33 to 87</td><td>24 to 80</td><td>0.66</td></tr>
<tr><td>Rate change from</td><td>7.1</td><td>-5.8</td><td>-2 to 24</td><td>-11 to 1</td><td>0.0001</td></tr>
</table>
</td>
</tr>
</table>

Chambers 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
To assess the impact of the Guide with facilitation in improving healthcare personnel influenza immunisation rates Location and setting Healthcare organisations across 6 Canadian provinces Source of funding Supported in part by grant no. 90189 from the Canadian Institutes of	personal care homes, nursing homes and long-term care organisations) and regional health authorities Eligible healthcare organisations were also only included if they: regularly conducted seasonal healthcare personnel influenza immunisation programs; used systematic approaches	Minimum: 125 Maximum: 9260 13 organisations in control group Number of personnel within control organisations, year 2 post-intervention: Mean: 5950 Median: 1860 Minimum: 190 Maximum: 26,922 Participant characteristics Intervention organisations: 8 – acute care hospitals, including	approach to planning, implementing and evaluating their campaign. The Tool Kit is designed to supplement the Guide with templates and documents that can be downloads and customised for each site. The Guide: Outlines 5 steps to planning, implementing and evaluating a seasonal influenza immunisation program for healthcare personnel. Tools and checklists are provided as supplements to the Guide (the Tool Kit). Support: A facilitated training workshop was held, with 2 representatives from each intervention organisation attending. The full day interactive	Baseline to Year 2 | | | | | |

Chambers 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Health Research. Additional support was provided by the Bruyere Research Institute, Bruyere Continuing Care, The Ottawa Hospital, The Ottawa Research Institute, the Canadian Centre for Vaccinology, the University of Ottawa and Immunize Canada.	to measuring immunisation rates; could provide immunisation rates for the baseline year plus 2 intervention years and agreed to be randomised to receive the intervention or be in the control group. Exclusion criteria None specifically reported	academic teaching, paediatric and community hospitals 3 – mixed, including regional health authorities and district health units 2 – continuing care, including nursing homes and long-term care facilities Control organisations: 2 – acute care hospitals, including academic teaching,	workshops provided in-depth assistance on how to implement the steps of the Guide and use the Tool Kit. Individual site workshops were held at each of the 13 intervention organisations. These were held to conduct on-site inter-professional team training and facilitate problem-solving specific to each site. Control organisations implemented their campaigns as usual, without the Guide or any facilitation support	

Chambers 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
		paediatric and community hospitals 7 – mixed, including regional health authorities and district health units 4 – continuing care, including nursing homes and long-term care facilities		
Notes: Limitations identified by author The perception of the dangers of H1N1 during 2009-10 by healthcare personnel could have resulted in different behaviours regarding immunisation in post-intervention years Fewer organisations were recruited than estimated in the trial protocol sample size calculation. The small number of participating organisations precluded multi-variate analysis, as did the non-normal character of influenza rates Information characterising the 46 organisations which did not participate in the trial was not collected and it's possible that the 26 participating organisations differ from these organisations.				

Chambers 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Limitations identified by review team Unknown what is meant by standard practice in control sites. Other				

G.1.5 Conner 2011

Conner 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Conner 2011 Quality score ++ Study type RCT Aim of the study Test the efficacy of	Inclusion criteria Exclusion criteria	HCW sub-population nurses, auxiliary and technical staff Number of participants 1,200 randomly selected from hospital staff Participant characteristics: 38.1 years (SD=12.2).	Randomly allocated (random number generator) by researcher blinded to experimental condition Intervention QBE intervention: Intervention package distributed in each hospital by supervisors of hospital units, contained: an information letter explaining the study, the QBE questionnaire and an SAE for return	Main finding: Intention-to-treat analyses indicated that influenza vaccination was significantly higher among participants in the question behaviour effect intervention (42.0%) compared with the control group (36.3%), and this effect persisted after controlling for demographic variables See table below

	Vaccinated	Unvaccinated
Control (n=600)	218 (36.3%)	382 (63.7%)
QBE (n=600)	252 (42.0%)	348 (58.0%)
• Completers (n=429)	196 (45.7%)	233 (54.3%)

Conner 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
interventions based on the question-behaviour effect (QBE) in promoting the adoption of disease prevention behaviours Location and setting Three local public hospitals in Quebec City, Canada Source of funding A grant from Centre Hospitalier		83% female nurses 50% nurses	Control No contact by researchers (did not receive a questionnaire) QBE questionnaire was distributed approximately 2 months prior to annual flu vaccination campaign. Examined moderating role of attitudes and other components of the theory of planned behaviour (Ajzen, 1991; i.e. subjective norms, perceived behavioural control and intentions) on vaccination uptake rate.	• Non-completers (n=171) 56 (32.8%) 115 (67.3%) Post-hoc analysis by NICE: RR 1.16 (95%CI 1.00 to 1.33) Approx.. 6% increase in flu vac uptake; OR 1.27 (95% CI= .01–1.60); a small effect (ds = 0 .13) Explanatory analyses indicated that the effects were attributable to completing rather than merely receiving the questionnaire and were stronger for those with positive attitudes or intentions about the target behaviour: GEE analysis revealed an overall condition effect, even after controlling for confounding variables, X^2 (2, N=1200) = 9.02, p = .01) Participants who received and completed the questionnaire were more likely to get vaccinated than participants who received but did not complete the questionnaire (OR=1.53, 95% CI=1.05–2.23) or did not receive a questionnaire (OR=1.43, 95% CI=1.11–1.84). Valence of cognition: positive vs. Negative Subjective norms ds =.67 Perceived behavioural control ds = .60,

Conner 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Universitaire de Quebec				Attitudes ds = 1.25 Intentions ds = 1.19,
Limitations identified by author: drop-out analysis revealed that completers differed significantly from the non-completers; mechanism of QBE is not fully understood so caution outlined Limitations identified by review team Other: Power of 65% to detect this size of difference between conditions (one-tailed test).				

G.1.6 Drees 2015

Drees 2015				
Study details	**Inclusion/exclusion criteria**	**population**	**Intervention/comparator**	**Results**
Full citation Drees M, Wroten K, Smedley M, Mase T, Schwartz JS. Carrots and sticks: Achieving high	Inclusion criteria Employee of the Christiana Care Health System Exclusion criteria None specifically reported	HCW sub-population: All employees within healthcare system Number of participants:	Overall intervention: Strengthening tracking and enforcement of the mandatory declination and masking policies, increasing availability and promotion of the vaccine, utilising a disciplinary process for noncompliant employees and linking a financial incentive to achieving high vaccination rates.	Flu vaccination rate: Pre-intervention** / Post-intervention Year: 08-09 | 09-10* | 10-11 | 2011-12 | 12-13 | 13-14 | 14-15 % of employees vaccinated: 56.6 | n/a | 66.4 | 92.4 | 93.5 | 93.4 | 93.4

Drees 2015				
Study details	**Inclusion/exclusion criteria**	**population**	**Intervention/comparator**	**Results**
healthcare personnel influenza vaccination rates without a mandate. Infection Control & Hospital Epidemiology. 2015 Jun 1;36(06):717-24. Quality score - Study type Before and after Aim of the study To assess the effectiveness of a voluntary influenza		Post-intervention, the total number of employees ranged from 10,286-11,046*** over a 4 year period. Participant characteristics: Not reported	The new policy: Required all employees to complete 1 of 3 forms prior to 30th November: a vaccination consent form, an exemption form (medical or religious) or a declination form, including reasons for declining. No proof for exemption was required. Anyone not wearing the "I'm vaccinated" tag (and thus assumed to be unvaccinated) was required to wear a mask while in patient care areas. Mangers were informed of their employees' vaccination status 2 weeks after the start of the campaign using an automated system which scans the forms described above to log vaccination status. Managers were required to follow up with those not vaccinated. Increasing the availability and promotion of influenza vaccine:	<table><tr><td></td><td>61.5% (n=6793)</td><td>10207</td><td>10328</td><td>10317</td><td>10317</td></tr></table> *in 2009-10, non-vaccinated employees were required to vaccinate or wear a mask due to H1N1 pandemic (% vac rate was 72%) **baseline taken as the average of % flu vac rate between 2008/09 and 2010/11 (61.5%; n = 6793) *** total participants were expressed as a range post intervention - for post hoc analysis the upper end of the range has been utilised as this represents the maximum number of participants in the study (n=11046)

Drees 2015				
Study details	**Inclusion/exclusion criteria**	**population**	**Intervention/comparator**	**Results**
vaccination program Location and setting 2 private hospitals within a community based academic healthcare system, northern Delaware Source of funding This work was supported by Christiana Care Health System and the Christiana Care Value Institute			A 'blitz' campaign was conducted in the first 2 weeks of the season (early October). Vaccination stations were set up across all shifts at entrances to hospitals and other outpatient/ancillary facilities. At each entrance, the HCW's identification badge and the appropriate form was scanned, and then they were directed to the next available vaccinator (volunteer nurses and pharmacists). After vaccination, HCWs were given a hanging badge stating "I'm vaccinated because I care" to wear. After the 2 week 'blitz', employee health staff served as roving vaccinators to capture weekend staff and others. Disciplinary process for noncompliance: Those who had not completed a consent form before the 30th November, or those who were not vaccinated and repeatedly failed to wear a mask had this considered in their performance evaluations and	

Drees 2015				
Study details	**Inclusion/exclusion criteria**	**population**	**Intervention/comparator**	**Results**
			could result in an employee being considered ‘below standard’. Employees in this status were ineligible for annual raises or any financial incentive. Financial incentives: A minimum 75% employee influenza vaccination rate (excluding exemptions) was designated as a patient safety metric, which upon reaching would result in an employee bonus, with additional pay out available if rates reached 80 or 85%. (The rate of vaccination required to achieve the bonus was raised to 85% in later years) Comparator (before 2011-12): Annual employee vaccination campaign included promotional materials, web-based and in-person education, free vaccination for employees and medical-dental staff, roving vaccinators who provided vaccinations at convenient locations and provision of vaccine	

Drees 2015				
Study details	**Inclusion/exclusion criteria**	**population**	**Intervention/comparator**	**Results**
			doses to inpatient and outpatient areas for staff self-vaccination. During 2009-10 season, a policy was in place that required explicit declination in writing of influenza vaccine by all employees, as well as the wearing of surgical masks of all non-vaccinated HCWs within 6 feet of patients during the flu season; however, there was no system to enforce these measures.	
Notes: Limitations identified by author: The program was specifically tailored to the specific facilities at this institute. Temporal societal trends may have contributed to an increase in vaccination rate No proof of external vaccination or medical exemption was ascertained. Various components of the intervention cannot be assessed individually Limitations identified by review team: Vaccinations acquired prior to 2011 (pre-intervention) were not reliably tracked, but were recorded post intervention as a ‘vaccinated’ Lack of population data from pre-intervention years including a lack of demographic data US study may lack generalisability to UK setting Other				

G.1.7 Friedl 2012

<table>
<tr><th colspan="5">Friedl 2012</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Friedl 2012

Quality score
-

Study type
Before and after

Aim of the study
Double the vaccination rates of hospital employees from 20 to 40% by specific interventions over a 5-year</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population:
hospital employees, particularly of the staff with direct patient contact

Number of participants:
400-bed teaching hospital with 1,687 hospital employees]

Participant characteristics:
157 doctors, 705 nurses, and 69 other medical staff (such as physiotherapists, ergotherapists, and speech therapists)</td>
<td>Vaccination campaign and the interventions
were organized by a team of six specialists,
two doctors (the attending physician for infectious disease (A.F.) and the M.D. responsible for employee health),
hospital pharmacist,
two head nurses from the Departments of Medicine and Obstetrics, and
a member of the technical staff
Vaccination was offered free of charge
and could be easily obtained on several working days within the hospital

Information brochures and flyers in the magazine for hospital employees</td>
<td>Flu vaccination rate:

Seasonal influenza vaccination changed non-significantly during the intervention period from 20% in 2003 to 27% in 2007

The difference between nurses and doctors in 2007 is highly significant
($p<0.001$)

At the end of the follow-up period in 2009, the vaccination rate was 26%, which was not significantly higher compared with that in 2003.

Flu vaccination rates by total hospital staff, direct and indirect contact
<table>
<tr><th></th><th>Direct contact</th><th>Indirect contact</th><th>Total staff</th></tr>
<tr><td>2003</td><td>201/931</td><td>67/691</td><td>268/1322</td></tr>
<tr><td>2004</td><td>153/927</td><td>50/236</td><td>203/1163</td></tr>
<tr><td>2005</td><td>286/986</td><td>90/250</td><td>376/1236</td></tr>
<tr><td>2006</td><td>240/1038</td><td>66/252</td><td>106/1290</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th colspan="4">Friedl 2012</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>period (2003–2007)*

Location and setting
teaching hospital; Switzerland

Source of funding
National Foundation of Science (SNSF)</td>
<td></td>
<td></td>
<td>Posters (effect of flu vac) – multiple sites particularly entry/exit doors

Employee flu vac e-mail reminders including flu vac clinic times

Lectures by infections staff including dept. head

Senior staff vaccinated in public – doctors offered in staff meetings

Wards/units encouraged to increase flu vac opportunity according to need</td>
<td>
<table>
<tr><td>2007</td><td>267/1164</td><td>110/251</td><td>377/1415</td></tr>
<tr><td>2008</td><td>251/1331</td><td>90/269</td><td>341/1600</td></tr>
<tr><td>2009</td><td>342/1402</td><td>92/285</td><td>434/1687</td></tr>
</table>

Flu vaccination rates by professional groups
<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Nurses</td><td>Doctors</td><td>Other</td><td>Non direct</td></tr>
<tr><td>2003</td><td>124/705</td><td>54/157</td><td>23/69</td><td>67/691</td></tr>
<tr><td>2004</td><td>85/697</td><td>51/143</td><td>17/87</td><td>50/236</td></tr>
<tr><td>2005</td><td>148/737</td><td>95/151</td><td>43/98</td><td>90/250</td></tr>
<tr><td>2006</td><td>109/763</td><td>87/171</td><td>44/104</td><td>66/252</td></tr>
<tr><td>2007</td><td>126/867</td><td>113/181</td><td>28/116</td><td>110/251</td></tr>
<tr><td>2008</td><td>132/1038</td><td>99/207</td><td>20/117</td><td>90/269</td></tr>
<tr><td>2009</td><td>168/1038</td><td>144/218</td><td>30/146</td><td>92/285</td></tr>
</table>
</td>
</tr>
<tr><td colspan="5">Notes:

Limitations identified by author: non-responsiveness of nurses – impacted results

Limitations identified by review team: In the year of the avian influenza threat (2005), a significant increase was observed (30 vs. 20%, p=0.001). This observation was seen again in 2009 (influenza A/H1N1v pandemic), during which the H1N1 vaccine uptake was 33% (p\0.001, compared to seasonal flu vaccine in 2003); some persons were included in more than one vaccination campaign</td></tr>
</table>

Friedl 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Other: *The secondary endpoint was to compare the effects of the avian influenza in 2005 (intervention period) and the H1N1 influenza pandemic in 2009 (follow-up period, 2008–2009) on vaccination rates –				

G.1.8 Kim 2015

<table>
<tr><th colspan="5">Kim 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Kim 2015

Quality score
-

Study type
Before and after

Aim of the study</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population:

Number of participants:
271 facilities – no individual data reported

Participant characteristics

No participant data reported</td>
<td>Usual care policy (2007):
Offer influenza vaccine at no cost to HCW,
provide education on influenza illness and the safety of influenza vaccine,
report HCW influenza vaccination coverage to HEALTH
Amended policy (2012):
all 2007 items
all HCWs to either receive influenza vaccination or</td>
<td>
<table>
<tr><th></th><th>Flu vac rate (%) in employees</th><th>Flu vac for employee HCWs (hospitals)</th><th>Flu vac for employee HCWs (care homes)</th><th>Eligible facilities</th></tr>
<tr><td>2011/12 flu season</td><td>69.7%</td><td>74%</td><td>55%</td><td>117*</td></tr>
<tr><td>2012/13 flu season</td><td>87.2%</td><td>88.6%</td><td>71.2%</td><td>117*</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th colspan="4">Kim 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Describe the implementation of the 2012 Rhode Island HCW influenza vaccination regulations and examine their impact on vaccination coverage

Location and setting
health care facilities, USA

Source of funding</td>
<td></td>
<td>All facilities run by HEALTH by health care facilities</td>
<td>provide a proof of medical exemption or a declination statement to their health care facilities by December 15th of each year.
Unvaccinated workers in facilities must wear a surgical face mask during direct, face-to-face contact with patients when influenza is declared widespread.
Unvaccinated HCWs who fail to comply with the mask-wearing requirement are subject to a $100 fine for each violation and possible disciplinary action by their licensing board</td>
<td>*137/271 responded to evaluation; a further 20 facilities did not submit data.

<table>
<tr><th></th><th></th><th>Requirement to wear mask in unvaccinated HCW</th><th>Requirement to undergo education in unvaccinated HCW</th><th>Eligible facilities</th></tr>
<tr><td>2011/12 flu season</td><td></td><td>9.4%</td><td>23.9%</td><td>117*</td></tr>
<tr><td>2012/13 flu season</td><td></td><td>94%</td><td>43.6%</td><td>117*</td></tr>
</table>

Other findings:
Masking policy, as required by the revised regulations, increased from 9.4% to 94.0% (P< .001).
Facilities perceived benefits to collecting HCW influenza vaccination data, including strengthening infection prevention efforts (83.2%) and improving patient and co-worker safety (75.2%)
Fewer facilities applied the regulations to their non-employees</td>
</tr>
</table>

Kim 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
				Supervisors of HCWs were responsible for verifying mask compliance (69.9%), and more than one-half of facilities (56.6%) reported that each unvaccinated HCW was responsible for wearing his or her mask Education to staff who reported that they were challenged by the facility's influenza vaccination policy (34.5% to 65.5%)
Notes: Limitations identified by author: only 43.5% facilities completed survey; evaluation survey data could not be linked to reported vaccination coverage so relationships between vaccination coverage levels and facility policies/promotion strategies could not be examined; Data on vaccination coverage and survey information used for this study were all self-reported Limitations identified by review team: None Other				

G.1.9 Koharchik 2012

<table>
<tr><th colspan="4">Koharchik 2012</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation

Koharchik 2012

Quality score
-

Study type
Before and after

Aim of the study
Development of strategies to improve the influenza immunisation rate among nursing students for the influenza season 2011–2012</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population:

Undergraduate nursing students

Number of participants:
N=218

Participant characteristics:</td>
<td>Intervention strategies that have been implemented to improve the immunisation status among undergraduate nursing students in a local university including:
Education about the importance of the influenza vaccine,
Email reminders about convenient times and influenza clinic locations,
raffles,
an appeal to the moral responsibility that healthcare personnel have to their patients to increase immunisation
4 phased approach:
University influenza policy assessed
Incentivised survey of potential participants used to inform strategies
Strategies formed
Followed up</td>
<td>Flu vaccination rate:
<table>
<tr><th></th><th>Events (flu vac n//%)</th><th>Total</th></tr>
<tr><td>2010/11</td><td>97 (43.1%)</td><td>225</td></tr>
<tr><td>2011/12</td><td>101 (46.3%)</td><td>218</td></tr>
</table>
Main finding:
3.2% increase in flu vaccination rates from 2010/11 to 2011/12</td>
</tr>
</table>

Koharchik 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Location and setting local university, USA Source of funding School of Nursing Center for Nursing Research Faculty Research Grant				
Notes: Limitations identified by author: included only sophomore, junior, and senior nursing students (external validity); students attending a university (confounding by other interventions); self-reported influenza-like symptoms and immunisation rates (reporting bias) Limitations identified by review team: Other				

G.1.10 Lehman 2016

<table>
<tr><th colspan="5">Lehman 2016</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Lehman 2016

Quality score
+
Study type
RCT
Aim of the study
test an opt-out strategy in promoting uptake among HCWs in a tertiary care centre for patients with complex chronic organ failure
Location and setting</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population
HCWs in a tertiary care centre for patients with complex chronic organ failure

Number of participants
122

Participant characteristics

CIRO+ employees</td>
<td>Presentation, outlining the available evidence regarding the effectiveness of influenza vaccination in protecting patients, during one of their regular educational seminars

Opt-out condition (N = 61), participants received an e-mail with a pre-scheduled appointment for influenza vaccination, which could be changed or cancelled - Vaccinations free of charge were given on two different days of the week

Opt-in condition (N = 61), participants received an e-mail explaining that they had to schedule an appointment if they wanted to get vaccinated - there were two days on which free influenza vaccinations</td>
<td>HCWs' behaviour in the two conditions and vaccination uptake
<table>
<tr><td></td><td>Opt-in</td><td>Opt-out</td></tr>
<tr><td>Assigned</td><td>61</td><td>61</td></tr>
<tr><td>Appointment</td><td>12</td><td>24 (5 rescheduled)</td></tr>
<tr><td>vaccinated</td><td>10 (2 without appointment)</td><td>17</td></tr>
<tr><td>%</td><td>16.4</td><td>27.9</td></tr>
</table>
Main finding:
No statistically detectable effect of condition on being vaccinated against influenza.
HCWs in the opt-out condition were more likely to have an appointment for influenza vaccination, which in turn increased the probability of getting vaccinated

11.5% absolute difference [95% .01CI, 3.3–25.8%]; (χ^2(1,N = 122) = 2.33, p = 0.13)
Logistic regression coefficients (SE): meaningful indirect effect of appointment status (cancelled vs. Made/kept) on</td>
</tr>
</table>

Lehman 2016				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Netherlands tertiary care centre for patients with complex chronic organ failure Source of funding Unrestricted educational grant from Abbott Health Care Products B.V.			were available and they had to schedule an appointment by responding to the chest physician via e-mail if they wanted to get vaccinated	the relationship between condition (opt-in vs. opt-out) and flu shot (yes vs. no) (b = .553, BCa 95% CI [0.107;1.043]
Limitations identified by author: modest sample size (N = 122),which might have led to a too small power to detect an effect of condition on vaccination uptake (post hoc power calculation: 0.28 power to detect a 12%absolute difference in vaccination uptake between the two groups, when N = 61 per condition); HCWs might be less responsive to the default effect; no demographic data due confidentiality and anonymity issues; study was executed in a tertiary care centre of expertise for the diagnosis and treatment of patients with complex chronic organ failure, findings may not be generalizable to other healthcare settings Limitations identified by review team: None Other: None				

G.1.11 Leibu 2015

<table>
<tr><th colspan="5">Leibu 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Leibu 2015

Quality score
-

Study type
Before and after

Aim of the study
Decrease the risk of transmission of hospital-associated transmission of influenza and pertussis through mandatory</td>
<td>Inclusion criteria:
All staff who work in or visit clinical facilities frequently

Exclusion criteria
Non employed medical staff and staff working at the corporate location were encouraged but not required to be vaccinated

Approved for an exemption from</td>
<td>HCW sub-population

Number of participants
N=12000(approx.)

Participant characteristics</td>
<td>Intervention:
Multicomponent flu vaccination programme:
Mandatory influenza and toxoid-diphtheria toxoid-acellular pertussis program
Occupational Medicine Service (OMS) at all three hospital sites was:
Open during regular business hours for vaccination
Conducted numerous well-advertised “vaccination clinics” during all shifts.
Nursing units that had designated flu champions were provided with influenza vaccines to administer on their units.

There were also roaming “flu buses” which consisted of carts staffed by OMS nurses, which</td>
<td>System wide influenza vaccination rates increased from 67% historically, 76.2% in the 2012 to 2013 influenza season, to 94.7% in 2013 to 2014 with an overall compliance rate of 97.8%.

Change in flu vaccination rates across AHS 3 hospitals (Excluding corporate)
<table>
<tr><td></td><td>Flu vac (%)</td><td>Events</td><td>total</td></tr>
<tr><td>Historical average</td><td>65-67%</td><td>7920</td><td>12000**</td></tr>
<tr><td>2013/14</td><td>96.6-97.6%</td><td>11693</td><td>12000**</td></tr>
</table>
*lack of study data so the NICE team have approximated the event numbers by estimating the average from the range of flu vaccination rates in 12/13 season and the approximate total number 6 of HCW across the 3 sites
** the study makes reference to corporate office – the narrative outlines the AHS employees as comprised three acute care adult hospitals, a children’s hospital, an inpatient rehabilitation hospital, homecare, transportation services, and several off-site clinical office practices including diagnostic facilities</td>
</tr>
</table>

Leibu 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
vaccination of staff Location and setting Atlantic Health System - USA Source of funding Not outlined	vaccination—for a medical condition that precluded vaccination or non-medical reasons such as for a religious or moral/ethical belief that precluded vaccination		circulated to the floors on specific dates to capture the weekend and off-hours staff Staff who had an exemption on medical/non-medical grounds were required to adhere to a 'masking policy' (all unvaccinated staff to wear a mask when they entered any clinical facility - Failure to adhere resulted in a warning for first offence and termination with repeated offenses Those with no approved exemption and had not been vaccinated by a 'deadline' were removed from the working schedule and given 2 weeks to decide on vaccination – failure to do so would mean they were subject to disciplinary action Comparator (historic): System wide voluntary campaigns	

Leibu 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Limitations identified by author Ongoing issues regarding pending signing of mandatory flu bill for HCW may have impacted for non-employed medical staff Limitations identified by review team: There were a number of interventions regarding flu vac uptake prior to the implementation of mandatory flu vac in HCW ; data utilises to demonstrate effect of the intervention includes participants that were not subject to all the conditions of the mandatory intervention (e.g. Non employed medical staff and staff working at the corporate location); preceding impact of previous campaigns and the impact of the 'H3N2' flu pandemic; Other: data from 12/13 omitted from post hoc analysis due to H3N2 flu pandemic				

G.1.12 Llupia 2013

<table>
<tr><th colspan="5">Llupia 2013</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr><td>Full citation
Llupia 2013

Quality score
-

Study type</td><td>Inclusion criteria

Exclusion criteria</td><td>HCW sub-population

Number of participants
N=5157 exposed to the hospital campaign

Interview sample (post-campaign)</td><td>Educational campaign to increase HCW perceptions of the risk of influenza and their role as promoters of influenza vaccination among their colleagues and to increase knowledge about influenza</td><td>Flu vaccination uptake
<table>
<tr><td></td><td>Before (09/10)</td><td>After (10/11)</td><td>Total</td></tr>
<tr><td>Total flu vac rate</td><td>39% (2011)</td><td>34% (1753)</td><td>5157</td></tr>
<tr><td>Physicians</td><td>50.7%</td><td>Not reported</td><td>Not reported</td></tr>
<tr><td>Nurses</td><td>28%</td><td>Not reported</td><td>Not reported</td></tr>
<tr><td>Auxiliary Nurses</td><td>38%</td><td>31.4%</td><td>Not reported</td></tr>
</table></td></tr>
</table>

<table>
<tr><th colspan="4">Llupia 2013</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Aim of the study
1) Evaluate the key strategic objectives established in
the campaign design (a) knowledge of
influenza - represented by the key messages of the campaign, (b) the perceived risk of influenza, (c) the perception of HCW as promoters of vaccination</td>
<td></td>
<td>N=189

Participant characteristics
Total population:
Age in years - mean (SD): 44 (11.8)
Female: 3725/5258 (70.8%)

Interview sample:
Age in years - mean (SD): 44.8 (11.4)
Female: 140/189 (74.1%)</td>
<td>4 promotional videos on strategically placed screens and internet
2 posters sequentially designed, placed in 2 steps in all wards and hospital entrances
Brochures – information on transmission of flu vac, vaccine, risk groups – adapted version added to pay slips of HCW (Sept 2010)
Website launched (Sept 2010)
Intranet and other practical campaign information
Incentives: 1) prize draw vaccinated HCW; 2) get vaccinated for the good of others initiatives
HCW vaccinated free of charge via occupational health service or mobile unit</td>
<td>Main finding: 5% decrease in vaccination coverage post campaign; In those participating in the interview study (n=189) there was an identified rise in the perception of HCW as promoters of vaccination, in influenza risk perception, and in awareness of the key messages of the campaign

Changes in HCW perceptions by strategic objectives
<table>
<tr><th>Strategic obs.</th><th>Promoter (n=180)</th><th>Own risk (n=179)</th><th>Family risk (n=178)</th><th>Patient risk (n=170)</th><th>Key messages (n=189)</th></tr>
<tr><td>Before, median (IQ* range)</td><td>2 (1-3)</td><td>2 (1-2)</td><td>2 (1-3)</td><td>2 (2-3)</td><td>3 (2-4)</td></tr>
<tr><td>After, median (IQ* range)</td><td>2 (2-3)</td><td>2 (1-3)</td><td>2 (1-3)</td><td>3 (2-3)</td><td>4 (3-4)</td></tr>
<tr><td>p-value</td><td>0.001</td><td>0.006</td><td>0.001</td><td>0.001</td><td>0.002</td></tr>
</table>
IQ = interquartile range</td>
</tr>
</table>

Llupia 2013				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
among their colleagues. Location and setting Single university hospital, Spain Source of funding Not outlined				
Limitations identified by author: impact of 2009 flu pandemic – neighbouring hospitals also experienced decrease in coverage; most nurses and auxiliary nurses did not have a corporate e-mail account in 2010 so their exposure to the intervention would have been lower than other HCW; small sample size Limitations identified by review team: lack of data on flu vac uptake across sample (was not the primary outcome of this paper); Other				

G.1.13 Maltezou 2007

<table>
<tr><th colspan="5">Maltezou 2007</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Maltezou 2007

Quality score
-

Study type
Before and after

Aim of the study
To describe the effect of a nationwide campaign to promote influenza vaccination of hospital HCWs.

Location and setting</td>
<td>Inclusion criteria
HCWs working at a public hospital in Greece.

Exclusion criteria
None specifically reported</td>
<td>HCW sub-population
Physicians
Nurses
Paramedical
Technical
Administrative

Number of participants
132 public hospitals
86,765 HCWs

Participant characteristics
No others apart from specific HCW role reported above</td>
<td>In September 2005, the Hellenic Centre for Disease Control and Prevention (HCDCP) communicated with Greek hospitals in order to promote influenza vaccination of HCWs.
Leaflets on influenza vaccination, educational materials and information on vaccination strategies were sent.</td>
<td>Mean influenza vaccination rate across professions was 1.72% pre-intervention and 16.36% (range 0-85.6%) post-intervention
= 14.64%-point increase in vaccination rate

<table>
<tr><th>Profession</th><th>No. employees</th><th>No. vaccinated</th><th>Vaccination rate (%)</th></tr>
<tr><td>Physician</td><td>18965</td><td>3200</td><td>16.87</td></tr>
<tr><td>Nurse</td><td>37253</td><td>6222</td><td>16.7</td></tr>
<tr><td>Paramedical</td><td>7618</td><td>1285</td><td>16.87</td></tr>
<tr><td>Technical</td><td>9578</td><td>1141</td><td>11.91</td></tr>
<tr><td>Administrative</td><td>13351</td><td>2343</td><td>17.55</td></tr>
<tr><td>Total</td><td>86765</td><td>14191</td><td>16.36</td></tr>
</table>
</td>
</tr>
</table>

Maltezou 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Public hospitals throughout Greece Source of funding Not reported				
Limitations identified by author None Limitations identified by review team During the period between baseline data and post-intervention data, 33 avian influenza H5N1 cases occurred in wild birds in Greece. While no cases occurred in humans, this may have influenced a decision to be vaccinated in an assumption that the vaccine provided protection from this virus. Baseline data collected post-intervention, and thus reliability of baseline results may be unreliable. No individual baseline data reported according to profession or type of hospital No participant characteristics reported, limiting generalisability Greek study may not be generalisable to the UK setting Other Data comparing vaccination rates according to profession and hospital type reported, but only provides post-intervention data, meaning it has cannot be utilised here for effectiveness of intervention for each profession/type of hospital				

G.1.14 Marwaha 2015

<table>
<tr><th colspan="4">Marwaha 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Marwaha S, Lorv B, Henseleit S, Iroanyah N. GET POKED: Comparing an Incentive-Based Flu Campaign with Vaccinate-or-Mask Policies to Boost Influenza Vaccination Rates Among Healthcare Workers. Healthcare quarterly (Toronto, Ont.). 2015 Dec;18(4):73-9.

Quality score</td>
<td>Inclusion criteria
None specified

Exclusion criteria
None specified</td>
<td>Number of participants:
10,045 in 2013 (pre-intervention)

N=9353 in 2014 (pre-intervention); n=10,045 (post-intervention)

Participant characteristics:
Full and part time employees, medical staff, students and adult volunteers</td>
<td>GET POKED campaign was launched 15th October 2014 (from vaccine availability) and ran for 8 weeks.

It focused on 5 streams of activity (detailed below).
In addition, senior hospital leadership support was gained early in development and there was increased campaign resourcing compared to previous years.

Incentives
At time of vaccination, employees were given a chocolate bar and the opportunity to roll dice for a coffee gift card (1/6 chance). Employees were also automatically entered into weekly and grand prize draws for merchandise and $500 gift cards. The earlier an employee received a vaccination, the more weeks they were eligible to win an additional prize. Winners were publically acknowledged with their permission, in weekly communications to the organisation and at public events.

Disruptive advertising
Campaign concepts were brainstormed with an interdisciplinary design team. Concepts went through 3 rounds of internal feedback and 1 round</td>
<td>
<table>
<tr><td></td><td>Pre-intervention</td><td>Post-intervention</td></tr>
<tr><td></td><td>2013</td><td>2014</td></tr>
<tr><td>Documented vaccination</td><td></td><td></td></tr>
<tr><td>Staff</td><td>3892</td><td>3870</td></tr>
<tr><td>Physicians</td><td>301</td><td>419</td></tr>
<tr><td>Volunteers/Students/Other</td><td>1104</td><td>1536</td></tr>
<tr><td>Documented exception</td><td>9</td><td>21</td></tr>
<tr><td>Total population/denominator</td><td>10,045</td><td>9,353</td></tr>
<tr><td>Reported vaccine rate</td><td>53%</td><td>63%</td></tr>
</table>
Flu vaccination rate:
The median HCW vaccination rate for Toronto acute care facilities during the same reporting period was 62% (range 29-75%), meaning the intervention site achieved 1% higher vaccination than the median rate in the area.

Number of vaccinations given in the first 2 weeks of the campaign
<table>
<tr><td></td><td>Pre-intervention</td><td>Post-intervention</td></tr>
<tr><td></td><td>2013</td><td>2014</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th colspan="4">Marwaha 2015</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>-

Study type
Before and after

Aim of the study
To evaluate a multimodal, incentive-based campaign that aimed to improve the flu vaccination experience and recognise those who got their flu shot, with the aim of increasing HCW</td>
<td></td>
<td></td>
<td>of feedback from frontline staff and senior hospital leaders, resulting in the GET POKED campaign.
The campaign aimed to shift employee perception of the flu vaccine from an annual burden to an opportunity to be recognised. In addition to carrying the visually distinct GET POKED branding throughout all campaign elements, there was public display of the current flu vaccination rate at each site.

Improving access
The number of circulating vaccination carts increased from 5 in the previous year to 8 during the campaign. Mobile and branded screens for the flu carts were used to offer privacy during vaccination.
36 clinical employees were trained as ‘vaccinators’ and they vaccinated colleagues.
Site-specific outpatient pharmacies were used as static vaccine administration sites that were available to employees on weekends and off-hours.

Improving data integrity
Binders with full names of all employees as they appear in the Employee Health Safety and Wellness database were printed on adhesive labels. These labels were transferred to the vaccine log at the time of vaccination to minimise difficulties in reading</td>
<td>
<table>
<tr><td>Number of vaccinations</td><td>1148</td><td>2472</td></tr>
</table>

Number of vaccinations given by trained vaccinators over 8 week campaign
<table>
<tr><td></td><td>Pre-intervention</td><td>Post-intervention</td></tr>
<tr><td></td><td>2013</td><td>2014</td></tr>
<tr><td>Number of vaccinations</td><td>1196</td><td>3285</td></tr>
</table>

Secondary outcomes:
Qualitative outcomes:

Anecdotal feedback from vaccine administrators and front-line staff showed that GET POKED created a more positive experience at the flu carts and focused on recognition.
It was observed (as in previous years) that there were reported incidents of tension and confrontation from unvaccinated staff near the campaign’s final 2 weeks.
</td>
</tr>
</table>

Marwaha 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
vaccination rates. Location and setting Multi-site academic community hospital; Mississauga Ontario, Canada. Source of funding All incentives were generously provided by the Trillium Health Partners Foundation and Trillium Health Partners Volunteers.			handwriting and ensure that employees did not use nicknames that could not be matched with the database. Weekly reports of vaccine compliance were sent out to managers and senior executives and publically posted on individual units. Senior executive progress was also visualised on a leader board displayed publically to encourage competition. Reporting Branded vaccine status cards for employees to easily submit via email to Employee Health Safety and Wellness were distributed. These could be used by employees, professional staff and volunteers vaccinated outside of the hospital or with documented medical exemption. Self-reporting of vaccine status via email was allowed, with proof of status required at a later date. “To achieve the documented increase we spent additional funds in promotional materials and prizing and increased staff resourcing significantly.”	The incentives made the experience at individual vaccine carts fun and engaging despite extra steps for vaccine administrators. The branding was attention grabbing and stood out from other hospital communications. The labelling system for recording was an improvement compared to handwriting names, but it required a substantial amount of manual labour and did not eliminate human error.

Marwaha 2015				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Notes: Limitations identified by author: It was difficult to get an accurate denominator with which to calculate institutional vaccine rate, as employee databases were separated by staff type. Employees who were vaccinated at their own pharmacy or doctor's office may not have reported their vaccination or exception status and thus won't have been recorded as vaccinated; this may be especially likely for the volunteer population. The volunteer population was difficult to reach through standard campaign communication channels and may not have been as exposed to the intervention, while still being included in the denominator for calculating vaccination rate. There was widely reported media coverage of the limited effectiveness of the 2014 flu vaccine. This negative coverage may have influenced the decision to get vaccinated despite positive campaign messages. Limitations identified by review team: The campaign only ran for 8 weeks, with the overall vaccination coverage rate for the season not reported. Other				

G.1.15 Mouzoon

Mouzoon 2010				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation	Inclusion criteria	Number of participants:	Vaccination was offered to patients and HCWs from October through February in 2006-2007. If was offered as	Flu vaccination rate:

<table>
<tr><th colspan="5">Mouzoon 2010</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Mouzoon ME, Munoz FM, Greisinger AJ, Brehm BJ, Wehmanen OA, Smith FA, Markee JA, Glezen WP. Improving influenza immunization in pregnant women and healthcare workers. The American journal of managed care. 2010 Mar;16(3):209-16.

Quality score
-

Study type</td>
<td>None specifically reported

Exclusion criteria
None specifically reported</td>
<td>~2000 in each year of study

Participant characteristics:
None reported</td>
<td>soon as it was available through April in 2007-08 and 2008-09.

Before each influenza season, a committee met to review current promotional material, uptake rates and practice, including standing orders and discussed implementation of the current year’s program.

Program components include:
Providing various educational pieces directed to HCWs addressing any knowledge deficits from an employee survey on knowledge and perceptions of influenza vaccination, new recommendations, the importance of influenza vaccination for HCWs and the low risk of adverse events associated with immunisation
Making employee vaccines readily available and free of charge at all clinic locations and at employee benefits and fairs
Designating an immunisation nurse at each clinic to serve as a clinical champion to encourage staff to be vaccinated and to facilitate vaccination
Monitoring the employee influenza vaccination rate weekly by clinic location and sharing these rates with clinical champions
Recognising the clinic with the highest vaccination rates with an award and lunch</td>
<td>
<table>
<tr><th></th><th>Year</th><th>% vaccination uptake rate</th></tr>
<tr><td>Pre-intervention</td><td>03-04</td><td>36.0</td></tr>
<tr><td rowspan="5">Post-intervention</td><td>04-05</td><td>51.0</td></tr>
<tr><td>05-06</td><td>56.0</td></tr>
<tr><td>06-07</td><td>62.1</td></tr>
<tr><td>07-08</td><td>72.7</td></tr>
<tr><td>08-09*</td><td>64.0</td></tr>
</table>

*interruption of medical services due to Hurricane Ike
</td>
</tr>
</table>

Mouzoon 2010				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Before and after Aim of the study To evaluate the effect of several strategies to increase influenza immunisation in a multispecialty clinic Location and setting Large multi-speciality medical organisation at 19 clinics in Houston, Texas			Education was promoted through an influenza website for the intranet, including true-false questions about influenza and vaccination, distributed over a 5 week period before and going into immunisation activities. Statements such as "Influenza vaccine can give you the flu" could be reviewed and answered by accessing an interactive PowerPoint on the intranet or through weekly emails. Information about influenza activity in the community, electronic copies of vaccine information statements, safety briefings on the vaccine, standing orders for the vaccine and ACIP (advisory committee on immunisation practices) recommendations was among the other information on the intranet. At the ned of the campaign, a flu quiz was posted on the intranet and HCWS who score 100% are entered into a random draw, with 5 winners receiving a $50 gift card. Safety briefings that include information about vaccine administration and current CDC recommendations as well as CDC posters noting who should be vaccinated are displayed at all clinic locations and pharmacies. There is also a friendly competition among clinic locations to achieve the highest percentage of immunised HCWs before November 15th.	

Mouzoon 2010				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Source of funding Kelsey Research Foundation			A toolkit is distributed to clinical champions that includes competition guidelines, standing orders for influenza vaccination, information about current trivalent vaccine strains, a flu vaccination log, a vaccine information statement for influenza vaccine, a screening questionnaire, a declination form for HCWs who chose not to be vaccinated (since 2007) and safety briefings.	
Notes: Limitations identified by author: None Limitations identified by review team: No participant characteristics (including job titles) are reported, making generalisability more difficult Probable influence in the interruption of vaccination services in 08-09 Unable to attribute any 1 intervention to the outcomes Other Study also included in CRG review, within an included systematic review. Specific interventions were targeted at HCWs which have been extracted and presented here, with interventions targeted at CRGs omitted.				

G.1.16 Munford 2008

<table>
<tr><th colspan="5">Munford 2008</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Munford 2008

Quality score
-
Study type
Controlled Before and after.

Aim of the study:
Evaluate the impact of a campaign that involved the development of staff policies around influenza immunization and outbreak</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population

Number of participants

Participant characteristics
Health Care Workers in extended care unit</td>
<td>Comparator:
Vancouver Island Health Authority
(VIHA) influenza management plan (in response to British Columbia Ministry of Health influenza campaign to achieve 80% vaccination of people at most risk for influenza its complications as well as those that provide care and support to them)

VIHA targeted flu campaign:
inform the high-risk groups, including HCW, about influenza (2000)
Provide easy access to immunization (2000)
Nurse champions on every unit (2005) – education and immunization of staff
Intervention:
Comparator +</td>
<td>Saanich Peninsula Hospital Extended Care Unit (SPH) Flu vac % vs. VIHA vs. SPH residents

<table>
<tr><th></th><th>HCW (SPH Staff) flu vac</th><th>2012 indirect VIHA – south island staff</th></tr>
<tr><td>2005/06</td><td>39%</td><td>45%</td></tr>
<tr><td>2006/07</td><td>84%</td><td>43%</td></tr>
<tr><td>2007/08</td><td>83%</td><td>43%</td></tr>
</table>

Main finding:

SPH staff flu vac % increased; Study author attributes this to communications campaign based on local intelligence and focused on availability of flu vac clinics, importance of HCW vaccination and novel unit specific approaches. Close working with Infection prevention and control; proactive clinical nurse lead with availability to provide ‘drop-in vaccination’ for staff – the prize draw was also located in the nurses office; peer to peer motivation (based on the prize</td>
</tr>
</table>

Munford 2008				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
management, an enhanced media campaign, incentive program for staff and refinement of protocols for quick access and testing of isolates during an outbreak Location and setting Canada, Hospitals Source of funding			Specific flu campaign (2006) – post specific flu outbreak: Incentives – prize draws (low prize up to high prize C$150) once previous years vac % had been passed and draw participation subject to receipt of vac two large fun, colourful posters with picture cartoons and percentage scales; one on each unit that allowed all staff to track the progress as a team with each ECU challenging the other unit	draw); follow up of some staff by phone call (regarding proof of vac and prize draw) Authors recommend: Incentives – prize draws Availability/scheduling of flu vac clinics for need Establish goals of 60-80% flu vac rate for HCW in high risk areas. Educational presentations – messages: risks and benefits of flu vac Address cultural needs of unit Management involvement Early planning

Munford 2008				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Notes: Limitations identified by author: Limitations identified by review team: prior to the unit specific extended campaign the SPH unit experience what is documented as a severe flu outbreak this may have impacted the willingness and readiness of staff at this unit to engage with flu vac; lack of information on participant characteristics, numbers exposed to the different campaigns before and after. Other				

G.1.17 Nace 2007

Nace 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Nace DA, Hoffman EL, Resnick NM, Handler SM. Achieving and sustaining high rates of influenza immunization	Inclusion criteria Exclusion criteria Non-employee staff including	HCW sub-population: Employees of a long-term care facility Number of participants: Range between 211-242 over 10 years	Before the immunisation program: Staff were notified about vaccination availability by department managers and by flyers posted at various sites in the facility. No information about the	Flu vaccination rate: Year / No staff / No Vaccinated / % vaccinated 96-97 / 211 / 114 / 54.03 97-98 / 235 / 130 / 55.32 98-99 / 218 / 169 / 77.52

<table>
<tr><th colspan="4">Nace 2007</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>among long-term care staff. Journal of the American Medical Directors Association. 2007 Feb 28;8(2):128-33.

Quality score
-

Study type
Before and after

Aim of the study
To assess if non-academic community based long-term care facilities can achieve staff vaccination rates in excess of 60% and if so, can these rates be</td>
<td>volunteer staff; agency staff; physician staff; and contracted rehabilitation, laboratory and radiology personnel were excluded from the analysis.</td>
<td>Participant characteristics:
(characteristics of ‘current’ participant population – published 2007, ~1 year after study period):

Position:

Nursing: 59%
Dietary: 15%
Housekeeping: 4%
Laundry: 2%
Maintenance: 6%
Activities, social work, wellness: 7%
Administration: 7%

Race:
White: 81%
African American: 18%
Other: <1%</td>
<td>benefits of immunisation was included in the flyers. Vaccine was administered at no charge during limited daytime hours. Facility policy required the vaccine to be administered only with a physician onsite at the facility. Vaccine was offered through December or until supply was exhausted.

Intervention initiated in 1996:

System changes were actions taken to alter the way vaccines were obtained, delivered and tracked at the facility.

Vaccine planning:
Reviews of prior usage, targets were set and staff turnover was considered so that an accurate estimate</td>
<td>
<table>
<tr><td>99-00</td><td>215</td><td>135</td><td>62.79</td></tr>
<tr><td>00-01</td><td>211</td><td>133</td><td>63.03</td></tr>
<tr><td>01-02*</td><td>220</td><td>141</td><td>64.09</td></tr>
<tr><td>02-03</td><td>221</td><td>207</td><td>93.67</td></tr>
<tr><td>03-04</td><td>242</td><td>231</td><td>95.45</td></tr>
<tr><td>04-05</td><td>232</td><td>171</td><td>73.71</td></tr>
<tr><td>05-06</td><td>236</td><td>203</td><td>86.02</td></tr>
</table>

*refusal statements introduced in each subsequent year

Increase in flu vaccination from baseline (96/97) to the end of the study: RR 1.59 (95%CI 1.39; 1.82)

Post hoc analysis under taken by NICE – the data allowed an assessment of the effectiveness of the intervention prior to the introduction of refusal statements (96/97 – 00/01) and an assessment of the introduction of the refusal statement compared to the original intervention (01/02-05/06)

Flu vaccination rate: Intervention without the addition of flu declination

<table>
<tr><td>Year</td><td>Vaccinated</td><td>Not vaccinated</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th colspan="4">Nace 2007</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>sustained over time.

Location and setting
Campus for independent living, assisted living and nursing facility services in the urban Pittsburgh region

Source of funding
This study was supported in part by the University of Pittsburgh Institute on Aging, an American Medical Directors Association Foundation/Pfizer Quality Improvement Award grant, a National</td>
<td></td>
<td>Age, y:
<20: 3
20-29: 12
30-39: 15
40-49: 29
50-59: 28
60-69: 12
70-79: 1</td>
<td>of vaccine supply could be ordered

Staff education:
Education about the impact of influenza on long term care residents, the ability of the vaccine to reduce resident mortality and vaccine safety was given to staff and department managers formally using in-services and informational flyers and informally in point of contact conversations.

Leadership commitment:
Department managers were accountable to the quality improvement leadership team, with department performance being reviewed at QI meetings.

Staff notification:</td>
<td>
<table>
<tr><td>96-97</td><td>114</td><td>97</td></tr>
<tr><td>00-01</td><td>133</td><td>78</td></tr>
</table>
Increase in flu vaccination: RR 1.17. (95%CI 0.99; 1.37)

Flu vaccination rate: intervention with the addition of flu vac declination

<table>
<tr><td>Year</td><td>Vaccinated</td><td>Not vaccinated</td></tr>
<tr><td>00-01</td><td>141</td><td>79</td></tr>
<tr><td>05-06</td><td>203</td><td>33</td></tr>
</table>
Increase in flu vaccination from the introduction of refusal statements (00/01) to 05/06: RR 1.36 (95% CI 1.22; 1.53)
</td>
</tr>
</table>

Nace 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Institutes of Health grant 8K12RR023267 (Roadmap Multidisciplinary Clinical Research Careers Development Award Grant), and the Merck/American Federation for Aging Research Junior Investigator Award in Geriatric Clinical Pharmacology.			Pay check reminders each September reminded staff how to get the vaccine Vaccine administration: During all shifts, vaccination were given directly at employee work units, throughout the entire flu season. Requirements for an on-site physician and written consent were removed. From 2002, all staff refusing vaccination wrote refusal statements indicating they had been offered the immunisation. Non-responder notification: Staff failing to receive vaccination were contacted to accept vaccination or sign a refusal consent. Data tracking:	

Nace 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
			Accurate administration records were kept Continual performance feedback and shared learning: Feedback on facility performance was provided to all staff, through QI reporting, pay check mailings and flyers	
Notes: Limitations identified by author: The impact of each individual intervention addressed by our group cannot be quantified since multiple changes were often made at once. Results are from a single facility, we don't know their generalisability to other facilities Volunteer staff, physician staff and outside rehabilitation, laboratory and radiology personnel immunisation rates were not included in the analysis A single point prevalence estimate in December of each year was used to report immunisation rate. This could lead to missing anyone vaccinated each year past this date In 2003, the Pennsylvania state legislature enacted legislation requiring facilities to offer vaccine to their staff Limitations identified by review team: Unclear when the intervention was fully implemented and whether the data from 96-97 is accepted as baseline data (pre-intervention) Not necessarily representative of other long-term care facilities as the staff turnover rates are lower than average at the study site. The use of refusal consent forms was introduced in 2002, acting as a secondary form of intervention, but its use is unclearly reported				

Nace 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Other				

G.1.18 Nace 2012

Nace 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Nace DA, Handler SM, Hoffman EL, Perera S. Impact of the raising immunizations safely and effectively (RISE) program on healthcare worker influenza immunization rates in long term care	Inclusion criteria Exclusion criteria	HCW sub-population: HCW served by long term condition pharmacies Number of participants: 14 pharmacies; 2443 HCW Participant characteristics: Nursing and assisted living facilities; unionized and non-unionized facilities; and urban, suburban and	Quality improvement (QI) project - Pharmacy promoted organizational change by assuming oversight and control of HCW immunization policies and processes for all facilities Voluntary immunization program: pharmacy provided: written immunization policies - no cost vaccination of HCW, provided for vaccination of HCW during all shifts both on and off work units, and utilized standing orders, resident	Overall, 14 of 16 hospitals participated (87.5%) Across facilities, the rates of HCW immunisation for influenza increased steadily over time from approximately 58% in 2005-2006 to 76% in 2010-2011 Immunisation coverage: all facilities achieved 60% HCW immunisation rate by the last season (2010/11) 5 hospitals have >=80% (80-89%); 3 hospitals have >=90% (90-100%); Flu vaccination rate:

Nace 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
settings. Journal of the American Medical Directors Association. 2012 Nov 30;13(9):806-10. Quality score - Study type Before and after Aim of the study Test the impact of a quality improvement (QI) project in which HCW immunizations were overseen and managed by the LTC		rural facilities. Bed size ranged from 45 to 440 beds and the number of staff varied from 38 to 527. Primary and secondary outcomes are the number of facilities reaching HCW influenza immunization rates of 60% and 80%.	vaccinations, influenza surveillance and outbreak response educational flyers and posters, in-service training programs for staff members "Immunization and the HCW" video HCW vaccination clinic "kick-off" event for each facility each season a standard declination form, data collection forms centralized data collection using a standardized definition for HCW immunization rates facility feedback email distribution list to assist with questions, provide performance feedback, and update members on influenza prevention and management topics	<table><tr><th></th><th>Vaccination* (total % HCW)</th><th>Vaccination by facility (total % across all 14 sites)</th></tr><tr><td colspan="3">Baseline period***</td></tr><tr><td>2001/02</td><td>40%</td><td></td></tr><tr><td>2002/03</td><td>49%</td><td></td></tr><tr><td>2003/04**</td><td>46%</td><td></td></tr><tr><td>2004/05</td><td>Not recorded</td><td></td></tr><tr><td colspan="3">Intervention commences</td></tr><tr><td>2005/06</td><td>64%</td><td>58%</td></tr><tr><td>2006/07</td><td>60%</td><td>61%</td></tr><tr><td>2007/08</td><td>63%</td><td>70%</td></tr><tr><td>2008/09</td><td>70%</td><td>74%</td></tr><tr><td>2009/10</td><td>79%</td><td>80%</td></tr><tr><td>2010/11</td><td>76%</td><td>76%</td></tr></table> *estimated by NICE based on graphical representation of data presented in study **national flu vac shortage 2004/05 ***no data reported in the first 3 seasons (01/02 -03/04) Post hoc analysis:

Nace 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
pharmacy on flu vac uptake in HCW were overseen and managed by LTC Pharmacy. Location and setting Pharmacies; USA Source of funding AMDA Foundation / Pfizer 2002 QI Award, the Pittsburgh Claude D. Pepper Older Americans Independence Center (NIH P30				<table><tr><td></td><td>Events</td><td>Total</td></tr><tr><td>Baseline period (01-04)</td><td>1099</td><td>1343</td></tr><tr><td>2010-11</td><td>1857</td><td>586</td></tr></table> RR 1.69 95%CI 1.61 to 1.77 *Mean flu vac rate over baseline period (45%)

Nace 2012				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
AG024827), the Pharmaceutical Outcomes Research in Aging Program (NIH K07 AG033174), and the Agency for Healthcare Research and Quality (AHRQ R01HS018721).				
Notes: Limitations identified by author: all facilities participating in the RISE program were non-profit organizations which limits generalizability – issues regarding the ability to transfer oversight; RISE program requires significant ongoing efforts to ensure sustainability; did not track immunization rates for volunteers, physicians, or contracted non-employees Limitations identified by review team: Other				

G.1.19 Palmore 2009

<table>
<tr><th colspan="5">Palmore 2009</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Palmore 2009

Quality score
-

Study type
Before and after

Aim of the study
Evaluate the outcome of a mandatory staff flu vac programme

Location and setting
USA, National Institutes of Health Clinical Centre</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population

HCW supporting a largely immunosuppressed patient population. All contracted staff including:
Junior, senior and in training physicians
Housekeeping staff
Patient transport staff
Admin staff in clinical units

Number of participants

n= approximately 8000 to 9000 doses of flu vaccination administered (assumed 1 dose = 1 participant)

Participant characteristics</td>
<td>Policy mandating all employees who have patient contact to either be:
Vaccinated annually against flu
Sign declination specifying reasons for refusal – which outlined that they were placing their patients at risk
Failure to comply requires appearance at Medical Executive Committee to explain rationale for refusal.

The policy was publicised with an emphasis on ‘patient safety’ and accompanied by:
Educational posters
Flyers
E-mails
Employees were repeatedly encouraged through the vac campaign to comply with the policy. Final few employees (n=25) were personally called/visited by deputy director</td>
<td>Total number of doses of flu vac administered

<table>
<tr><th></th><th>Flu vac uptake by number of doses administered**</th></tr>
<tr><td>2005/06</td><td>8813*</td></tr>
<tr><td>2006/07</td><td>8794*</td></tr>
<tr><td>2007/08***</td><td>8875*</td></tr>
<tr><td>2008/09</td><td>9780</td></tr>
</table>
*Mean number of doses administered for season
** Total number of participants not reported
*** intervention (mandated flu vaccination starts)

10.8% increase in doses administered (08/09) compared to mean doses for previous seasons (NICE calculates that there was a <1%; increase in doses administered in previous year 2005/06-2007/08)

By Feb 2009 (100%) had complied with policy and either been vaccinated or declined vaccination

Those employees identified as having patient or patient specimen contact and eligible for flu vaccination</td>
</tr>
</table>

<table>
<tr><th colspan="4">Palmore 2009</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr><td>(Hospitals, clinical centre departments)

Source of funding

National Institutes of Health Clinical Centre; Conflicts of interest outlined</td><td></td><td>2754 had direct contact with patients or patient specimens (2008/09 participant numbers only)</td><td>to encourage adherence to the policy

Vaccination administered via:
Mobile occupational medical services (OMS) vaccination sites in clinical areas
OMS clinics
Nurse delivered vaccination in patient care units (especially those who did not work regular hours)
Badge scanning and bar-coded data entry utilised to capture essential data</td><td><table><tr><td></td><td>Declined</td><td>Events (flu vac)</td><td>total</td></tr><tr><td>2008/9</td><td>294</td><td>2424</td><td>2718*</td></tr></table>*34 employees reported contraindications for flu vac

Main finding: supervisors, department chiefs and administration were key to success; the ‘teeth’ of the intervention were outlined as the consequence of noncompliance (appearance before the Medical executive board); electronic tracking system facilitated compliance monitoring; declination in person was anecdotally attributed to vac uptake;</td></tr>
<tr><td colspan="5">Notes:

Limitations identified by author: Specific set of employees who were already motivated earlier on to seek flu vac; recruitment procedure did not identify all employees who have contact with patients

Limitations identified by review team: None

Other</td></tr>
</table>

G.1.20 Parry 2004

<table>
<tr><th colspan="5">Parry 2004</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Parry 2004

Quality score
-

Study type
Before after study

Aim of the study
Aim of program to increase number of patients receiving flu vaccine, moderate the severity of lower respiratory tract illness in the winter seasons and</td>
<td>Inclusion criteria

Exclusion criteria</td>
<td>HCW sub-population:

Number of participants:

Participant characteristics:

Total of 18,471 HCW were vaccinated at 3-yr post-intervention. The study does not provide data on the total number of hospital staff</td>
<td>Planning occurred with senior DOH directors and community nurses along with hospital infectious disease physicians, administrators, epidemiologists, educators and corporate director at the start and end of each flu campaign.
Initiatives included:
Fliers
Joint conference and campaign kick-off in conjunction with Senior health Fair covered by local tv & radio with the mayor and city health director vaccinated at a press conference
Vaccination cards with agency logos
Common consent form
Electronic database to improve record keeping
Immunization patient assessment and vaccination order forms for high-risk inpatients</td>
<td>Flu vaccination rate:
<table>
<tr><th></th><th>1998-99 (Baseline)</th><th>1999-00</th><th>2000-01</th><th>2001-02</th></tr>
<tr><td>Hospital clinics</td><td>200</td><td>710</td><td>740</td><td>790</td></tr>
<tr><td>Hospital Inpatients</td><td>10</td><td>119</td><td>198</td><td>154</td></tr>
<tr><td>Immediate Care Centre</td><td>0</td><td>2,881</td><td>6,716</td><td>9,605</td></tr>
<tr><td>Hospital employees</td><td>500</td><td>765</td><td>894</td><td>1,174</td></tr>
<tr><td>Corporate Health Services</td><td>2,000</td><td>3,119</td><td>2,251</td><td>2,648</td></tr>
<tr><td>Stamford DOH</td><td>4,677</td><td>4,965</td><td>4,189</td><td>4,100</td></tr>
<tr><td>TOTAL</td><td>7,387</td><td>12,559</td><td>14,988</td><td>18,471</td></tr>
</table>
Main finding:
Rates of hospital employee vaccination increased from 34% to 58% during the 4-year period (1998-99 to 2001-02)</td>
</tr>
</table>

Parry 2004				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
build a frameword for cooperative programs between the city DOH and the community hospital Location and setting USA, One community hospital in Stamford Connecticut in partnership with city DOH Source of funding Not reported			City and hospital pharmacy ordered more vaccine to pre-empt shortages Vaccination for hospital employees and in-hospital campaign for (RQ4) employees along with raffle for vaccinated individuals Partnership with nursing homes and assisted living centres Contacting the Visiting Nurses Association and home care agencies to inform about initiative Community nurses visiting all senior residential facilities to perform in-house flu vaccination Vaccination of home-bound patients using hospital nursing resources Hospital opened and used new Immediate Care Centre which provided vaccine from 7am-11p, 7 days a week	

Parry 2004				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
			Fee charged by Stamford DOH and hospital:$10 in 1999 and $12 in 2000. Vaccinations provided at no out of pocket cost to those with primary Medicare and free to employees Additional staffing for vaccination clinics including use of volunteers	
Limitations identified by author: None Limitations identified by review team: Lack of total sample sizes or data on participant characteristics.				

G.1.21 Patterson 2011

Patterson 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Patterson 2011	Inclusion criteria Not reported	HCW sub-population: Number of participants:	Quality improvement (QI) project: Formation of inter-professional team with aim to improve HCW	Flu vaccination rate: | | No. vaccinated/ | Vaccination rate |

<table>
<tr><th colspan="5">Patterson 2011</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Quality score
-

Study type
Before-After

Aim of the study
Quality Improvement project to increase influenza vaccination of HCW

Location and setting
Texas, University Health System (UHS), 500 bed tertiary care hospital for 2009-10</td>
<td>Exclusion criteria
Not reported</td>
<td>5578 (based on the number of participants population expressed in 2009/10)

Participant characteristics:
HCW in tertiary care hospital</td>
<td>influenza vaccination rate to 80% for 2009-10 flu season.
QI tools used included: brainstorming ideas for increasing vaccination rate, cause-and-effect diagram analysing causes of low vaccination rates, flow monitoring of vaccination process, Pareto analysis of reasons for declination of vaccination in previous years, and statistical process-control chart of the vaccination rate.
Interventions included:
continual distribution of flu vaccine kits to UHS ward and clinic units
Grand rounds presentations for major departments
Vaccination campaign announcement to unit directors
Development of UHS flu website with information and a blog on flu
Screen-saver reminders</td>
<td>
<table>
<tr><td></td><td>Total HCW population</td><td></td></tr>
<tr><td>2008-09 (pre intervention)</td><td>2,989/ 5,496</td><td>54.4%*</td></tr>
<tr><td>2009-10</td><td>4,271/ 5,578</td><td>76.6%</td></tr>
</table>

22.2% increase from the pre-intervention period (RR:1.41, 95%CI 1.37 to 1.45)*

*calculated post hoc by NICE due to identified discrepancies in calculations – the paper presents baseline flu vac rate as 58.8% and the subsequent change in flu vac uptake as 17.8% OR: 2.7, 95% CI 2.5-2.97; p<0.01 – RR 1.30 95%CI 1.27 to 1.34</td>
</tr>
</table>

Patterson 2011				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
influenza season Source of funding -University of Texas System -Institute for Healthcare Improvement - Josiah Macy Jr. Foundation			Employee emails messages, phone messages Audit/feedback process with color-coded dashboard displaying vaccination rates by UHS department posted on the intranet	
Limitations identified by author: Tools for Quality Improvement such as brainstorming, cause-and-effect diagrams, process flow, Pareto analysis and statistical process flow are widely known in business but not in medicine. Limitations identified by review team: % change in vaccination rates appears incorrect (re-calculated by NICE)				

G.1.22 Quan 2014

<table>
<tr><th colspan="5">Quan 2014</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Quan KA, Cousins SM, Hizon DA, Heck KK, Samuelson P, Garcia F, Huang SS. Electronic Solutions to Enhance Tracking and Compliance with Mandatory Influenza Vaccination for All Hospital Staff. Infection Control & Hospital Epidemiology. 2014 Nov 1;35(11):1421-4.

Quality score</td>
<td>Inclusion criteria
All employees present on the University of California Irvine Medical Centre grounds

Exclusion criteria
None reported</td>
<td>HCW sub-population
Physicians, nurses, ancillary staff, medical school faculty and staff, interns, residents, students, temporary workers, volunteers and vendors

Number of participants
In year 4 after policy introduction – 6,957*

Participant characteristics
Not reported (other than job role as described above)</td>
<td>Mandatory vaccination policy (MIV):

All employees on the Medical Centre grounds were required to be vaccinated or submit a written declination, recording an acknowledgment of vaccination information and their reason for declination, and wear a mask during annual flu seasons.

An alert system sent automated email reminders every 2 weeks from October to eligible staff who had not yet participated.

The deadline for compliance is the first week of December, with masking required from December through March for those who decline the vaccine.
All influenza vaccines are delivered free of charge.</td>
<td>Vaccination coverage increased from 58% to 86% in 1 year and increased to 96% within 3 years of implementing the MIV policy:
<table>
<tr><td></td><td>Pre-intervention</td><td colspan="4">Post-intervention</td></tr>
<tr><td>Year</td><td>2008-09</td><td>2009-10</td><td>2010-11</td><td>2011-12</td><td>2012-13</td></tr>
<tr><td>% coverage</td><td>58</td><td>86</td><td>92</td><td>96</td><td>96</td></tr>
</table>
*In the absence of participant data for preceding years the participant number 6957 is assumed as the number of participants in the intervention to facilitate analysis</td>
</tr>
</table>

Quan 2014				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
+ Study type Before and after Aim of the study To assess automated solutions to aid implementation of a mandatory influenza vaccination policy Location and setting University of California Irvine Medical Centre Source of funding			Non-participant employees would be taken off the work schedule after the compliance deadline passed. Departments lost funding if their participation rate was too low. Faculty non-participants were counselled in person by their department chair and could lost 'good citizen' standing and bonus pay. Non-participant interns, residents and fellows were taken off duty and medical students were not allowed to take part in clinical rotations. Mandatory influenza vaccination policy database: An MIV database linked to human resources payroll databases was compiled, along with a list of login accounts, recording all employees and students. All industry vendors were tracked through a separate system,	

Quan 2014				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
This work was funded by the university of California Irvine Health. Cousins was supported by the University of California Irvine Medical Scientist Training Program.			which generated daily temporary access badges only if they wore a mask or had been vaccinated. An internal portal with an integrated email alert system was created to provide feedback on participation and vaccination status to individuals and supervisors.	
Notes: Limitations identified by author None stated Limitations identified by review team Unclear population numbers in baseline and first 3 years after intervention implementation No population characteristics recorded, therefore unsure of the generalisability US study, may not have direct application to UK setting				

G.1.23 Perlin 2013

<table>
<tr><th colspan="5">Perlin 2013</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Perlin JB, Septimus EJ, Cormier SB, Moody JA, Hickok JD, Bracken RM. Developing a program to increase seasonal influenza vaccination of healthcare workers: lessons from a system of community hospitals. Journal for Healthcare Quality. 2013 Nov 1;35(6):5-15.

Quality score
-

Study type
Before and after</td>
<td>Inclusion criteria
None explicitly reported

Exclusion criteria
None explicitly reported</td>
<td>HCW sub-population:
Clinical employees and all other individuals with access to patient-care areas (vendors, hospital volunteers, contract employees hired from the healthcare organisation staffing agency)

Number of participants:
2009: 161,601
2010: 176594
2011: 176919</td>
<td>Influenza Patient Safety Program:
A vaccination or mask use policy from October 1st until March 31st each year (expect year 1: November 1st-March 31st)

Tools such as forms, template letters, brochures, and signage were created to aid in program implementation.

All employees were eligible for free influenza vaccine through the workplace

The vaccination policy featured the choice of free seasonal influenza vaccination or wearing a mask for all clinical employees (those with direct patient contact). Those who could or would not be</td>
<td>Flu vaccination rate:

Vaccination rate across facilities:

<table>
<tr><td></td><td>Pre-intervention</td><td colspan="3">Post-intervention</td></tr>
<tr><td>Year</td><td>2008-09</td><td>2009-10b</td><td>2010-11</td><td>2011-12</td></tr>
<tr><td>Total vaccination rate %, (range)</td><td>58.0[a]
(20 – 74)</td><td>n/a</td><td>90.7</td><td>92.3</td></tr>
<tr><td>Number of employees</td><td>[b]161601</td><td>n/a</td><td>176594</td><td>176919</td></tr>
</table>

a outlined in the study – no further details regarding estimate
b taken from year 09/10 as participant numbers for 2008/09 were not provided</td>
</tr>
</table>

Perlin 2013				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Aim of the study To describe development of influenza vaccination strategies, challenges to implementation and strategies to maintain success and their effectiveness. Location and setting Large, national healthcare organisation operating in 163 hospitals. 112 outpatient surgery and endoscopy centres, over 400 physicians practices in 23 states in the USA. Including general community, suburban and rural hospitals as well as		Participant characteristics: None specifically reported	vaccinated for any reason, a facemask was required to be worn during the influenza season while in patient-care areas. When possible, workflows were revised eliminate patient contact for non-vaccinated employees who were unable to wear a mask for extended periods. Refusal of both vaccination and mask wear initiated previously established disciplinary procedures for patient safety violations, which could result in termination. Between December-February each year, vaccine supply and ordering was organised according to a review of the current season's usage.	

Perlin 2013				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
academic health centres and tertiary referral hospitals. Source of funding Not reported				
Notes: Limitations identified by author: The program was implemented in all facilities because the goal was to maximise protection of all patients. The results of this program can only be compared to previous results in the same facilities, with the caveat of changing external factors such as the H1N1 pandemic. Infection rate or patient outcomes were not reported in this program Limitations identified by review team: Baseline data for vaccination uptake rate for clinical employees specifically was not reported, although this is the target group for the intervention. Reported uptake data includes employees not subject to the intervention, but is the only data which fits the review protocol as it can be compared to a baseline. Employee number unreported for baseline year Other				

G.1.24 Polgreen 2008

<table>
<tr><th colspan="5">Polgreen 2008</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Polgreen 2008

Quality score
-

Study type
Before-after study

Aim of the study
To gather preliminary information about the use of declination policies and determine their impact on institutional HCW</td>
<td>Inclusion criteria
100 infectious diseases consultants in the U.S. This is a subset of members of the Infectious Diseases Society of America who indicated in previous survey they worked in an institution with an influenza vaccination declination policy or members who responded to Emerging Infections Network listserv</td>
<td>HCW sub-population:

Number of participants:
43 institutions in April 2007; 32 (72%) of these implemented declination policy but only 22 could provide vaccination rates for both year before and year following policy implementation.</td>
<td>Introduction of an influenza declination policy - Respondents asked to describe resistance to the policy, concurrent interventions, whether completion of declination form was mandatory and if any penalties imposed on employees who refused to sign declination statement.

**Note that 18 of 22 institutions concurrently implemented other strategies in addition to declination policies (e.g. education campaigns or new vaccination locations). These additional initiatives are not described in the paper</td>
<td>Flu vaccination rate:
<table>
<tr><td></td><td>Mean (SD);
HCW vaccination rate</td></tr>
<tr><td>Pre-declination policy (Year not specified)</td><td>54%± (14.5%);
[Median 50% (range 30-83%)]</td></tr>
<tr><td>Season after implementation (year not specified)</td><td>65% ± (15.7%)
[Median 64% (39-96%)]</td></tr>
</table>
The mean change in vaccination rates amongst HCW at institution from before to after implementation was 11.6% and median change was 9.5% (range, -1% to 50%); (p<.001)</td>
</tr>
</table>

Polgreen 2008				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
vaccination rates Location and setting Source of funding U.S. Centers for Disease Control and Prevention	postings about flu declination policies Exclusion criteria Non-responders to previous surveys			
Notes: Limitations identified by author: Institutions with low initial flu vaccination rates tended to benefit more than institutions with higher rates from declination statement policies but the impact of these statements is unclear due to the concurrent implementation of other strategies to increase HCW vaccination rates. There were no consequences for individuals who refused vaccination and refused to sign declination statement. Early adoption of declination policy may reflect a supportive hospital administration or effective leadership (infer this is not found in all hospitals). Declination policy implemented in a heterogeneous manner (e.g. signing declination was mandatory at some cites and optional at others). The proportion of HCW signing the forms not reported at respective institutions. Unable to verify independently data reported by respondents. Given voluntary nature of study, results subject to responder bias. Results should be viewed as preliminary only. Limitations identified by review team: Survey distributed to respondents of previous surveys hence. This is a Very biased sampling frame to start with and findings may not be generalizable				

G.1.25 Rothan-Tondeur 2010

<table>
<tr><th colspan="5">Rothan-Tondeur 2010</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria</th><th>Population</th><th>Intervention/Comparator</th><th>Results</th></tr>
<tr>
<td>Full citation
Rothan-Tondeur M, Filali-Zegzouti Y, Belmin J, Lejeune B, Golmard JL, et al. Assessment of healthcare worker influenza vaccination program in French geriatric wards: a cluster-randomized controlled trial. Aging clinical and experimental research. 2010 Oct 1;22(5-6):450-5.

Quality score</td>
<td>Inclusion criteria
Geriatric wards with more than 50 beds and without patients aged <64 years in public hospitals throughout France

HCWs in regular contact with elderly patients, present at the time of the study in the wards

Exclusion criteria
Nursing or nursing auxiliary students</td>
<td>HCW sub-population
Physicians, non-student nurses, auxiliaries and other workers.

Number of participants
2345:
1201 in the intervention group, within 24 wards
1144 in the control group, within 19 wards

Participant characteristics
~50% in both groups were nursing auxiliaries and ~25% in each group were nurses</td>
<td>Between December 1-15th 2005, the intervention groups received the active program, and no action was performed in the control groups

Materials for the active program included a slide show (52 slides +4 short movies), a leaflet and a guide for the leading investigator:

The local investigator organised information sessions for all HCWs, and a total of three 2 hour sessions were performed.
The slide show titled “Myths and reality about flu vaccination” was shown to expose myths in favour of realities; for example, “the vaccine can cause flu” was contradicted by the reality that “the vaccine does not cause flu”</td>
<td>Percentage of vaccinated healthcare workers by flu season
<table>
<tr><th></th><th>Intervention (n=1201)</th><th>Control (n=1144)</th><th>p-value</th></tr>
<tr><td>Pre-intervention season (2004-05)</td><td>336 (28%)</td><td>286 (25%)</td><td>Not significant[a]</td></tr>
<tr><td>Post-intervention season (2005-06)</td><td>408 (34%)</td><td>366 (32%)</td><td>Not significant[a]</td></tr>
<tr><td>Pre- post-change in uptake</td><td>+72 (6.0%)</td><td>+80 (7.0%)</td><td>Not significant[a]</td></tr>
<tr><td>p-value</td><td><0.05</td><td><0.05</td><td></td></tr>
</table>
in each cluster:

No statistically significant difference in vaccination rate was seen between intervention and control group, in either year

[a] p-value not reported in study</td>
</tr>
</table>

Rothan-Tondeur 2010				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
+ **Study type** cRCT **Aim of the study** To assess the success of the implementation of the first active program developed during the VESTA study **Location and setting** Geriatric wards with 50+ beds, within public hospitals throughout France **Source of funding**			3 of the 4 short movies were interviews of physicians: a national well-known geriatrician, a young geriatrician and a hospital nursing director. The 4th which was humorous, showed an elderly patient talking with his son about the nurses and saying that, in his view, he would appreciate the fact that they were vaccinated against influenza as much as they were pretty and kind to him. The leaflet summarised the slide show and was distributed to all participants at the end of the each information session.	

Rothan-Tondeur 2010				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Sanofi Pasteur MSD and Sanofi Pasteur SA				
Notes: Limitations identified by author There was no evaluation of the information sessions, so there may have been a lack of consistency. The length of time between implementation and assessment of vaccination status may not have been short enough to assess the full effects of the intervention. Limitations identified by review team HCWs in the control group were exposed to posters telling them they were participating in a flu study, which may have increased their motivation to be vaccinated. Study performed in France and may not be directly applicable to the UK setting Other Linked to Rothan-Tondeur, 2011 which is included within a SR included in this review				

G.1.26 Sanchez 2003

Sanchez 2003				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Sanchez 2003 Quality score - Study type Before and after Aim of the study increase employee access to influenza immunizations at different clinic (Pharmacist and Nurse), care home and community	Inclusion criteria: All employees Exclusion criteria Employees who had had hypersensitivity reactions, including anaphylactic reactions, to influenza vaccine or eggs Women who had been pregnant for less than 14 weeks	HCW sub-population Number of participants not reported. Participant characteristics: all HCW attending different flu vaccination clinics	Vaccination clinic program in outpatient pharmacy: Clinic promotion Pharmacist training on vaccine characteristics, contraindications to vaccination, injection technique, and how to respond to anaphylaxis Article published in the health system's newsletter describing the benefits of immunization for both employees and patients intranet link was created to display when and where influenza vaccination would be available, and an e-mail was sent to all employees free vaccination – priority to those with direct patient contact	Employee influenza vaccination rates during 1996–2000 ranged from 18% to 21% annually (NICE estimated baseline flu vaccination rate for post hoc analysis = 19.5%*) The employee immunization rate increased to 30% during the clinic's first year (2000/01) and 36% in the second year (2001/02). No data on total staff numbers provided Total flu vaccination in 200/01 = 602 Total flu vaccination in 2001/02 = 1095 Main finding: Clinics run in different settings increased % flu vaccination in employees from 19.5%* to 36%

Sanchez 2003				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
hospital settings Location and setting Pharmacist; USA Source of funding				
Notes: Limitations identified by author: national shortage of influenza vaccine between 2000 and 2001 impacted access and cancellation of 2 clinics (authors estimated a 2%-5% impact on flu vac uptake Limitations identified by review team: small sample, no power calculation, no statistical test for assessment of effect, no participant characteristics Other: flu vaccine shortage (2000/01) – leading to cancellation of some clinics				

G.1.27 Salgado 2004

Salgado 2004				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Salgado 2004 Quality score - Study type Before and after Aim of the study To report outcome of new preventive measures implemented over 12 influenza seasons from 1987-88 to 1999-2000 Location and setting University of Virginia Health System	Inclusion criteria Not reported Exclusion criteria Not reported	HCW sub-population: Overall study population not provided Number of participants: Not reported Participant characteristics: Not reported.	New preventive measures introduced during and following outbreak of 1987-88 season included: 1) Creation of a mobile cart to visit hospital wards and outpatient clinics to provide on-site flu vaccine to HCWs 2) increased efforts to educate and motivate employees to get flu vaccine by way of reminders explaining importance of flu3) provision of regular feedback to HCWs on their total rates of compliance with vaccine using a chart updated biweekly and posted in frequented areas of hospital. Also included efforts to prevent flu transmission by furloughing ill HCWs, isolating patients with flu-like symptoms and discouraging visits from those with flu-like symptoms Interventions established pre-1987 included:1)annual memorandum to HCW summarizing CDC guidelines	Flu vaccination rate: The annual rate of HCW vaccination increased from 4% during 1987-88 season [baseline] to 67% during the 1999-2000 season (p<.0001) Secondary outcomes: Proportion of lab-confirmed influenza cases amongst HCWs also decreased significantly (p<.0001)

Salgado 2004				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
tertiary care centre 600 bed hospital Source of funding Not reported			for high-risk patients, 2) reminder of availability of free vaccine for all workers, 3) isolation of patients with diagnosed flu	
Notes: Limitations identified by author: Multiple interventions were introduced at the same time there are questions as to the relative importance of the different interventions.				

G.1.28 Sand 2007

Sand 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Full citation Sand 2007 Quality score -	Inclusion criteria Exclusion criteria	HCW sub-population: Staff members at facilities Number of participants: 13 nursing homes	Rapid cycle quality improvement (RCQI): Intervention plans based on the barriers it identified in its setting and built on insights from previous research	Main findings: 11/13 LTCFs that used QI saw improvements in their staff immunization rates; 10 improved more than 10%, and seven improved to more than 55% Flu vaccination rate:

Sand 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
Study type Before and after Aim of the study Change in staff influenza immunization rate by the implementation of rapid cycle quality improvement (RCQI) Location and setting long-term care facilities (LTCFs). USA Source of funding CDC funded and involved		Participant characteristics: LTCF differed in size Quality improvement teams: three to eight members per facility and included managers, administrators, nurses, physicians, and front-line workers	Information sharing between team members within facilities Vaccine access – free and clinics at facilities during all shifts with a rolling location + information on clinics Education – posters, written materials and speakers – to discuss benefits, fears and concerns regarding flu vac Declination forms Leadership involvement (opinion leaders and admin leaders; senior leadership) – encourage flu vac uptake Incentives – free lunches, lottery, raffles	

	Flu vac rate pre-RCQI (%)	Flu vac 04/05 (yr1) (%)	Flu vac rate 05/06 (Yr2) (%)
Minnesota	25	85	92
Pennsylvania	53	49	92
Maryland	30	No intervention	84
Massachusetts	30	No intervention	65
N. Dakota	50	No intervention	60
NY	47	42	57
D, Of Columbia	34	44	56
NY	17	34	54
Pennsylvania	52	60	50
Pennsylvania	20	No intervention	50
NY	41	38	41
D. Of Columbia	NA	32	40
NY	24	30	35
Mass	20	25	NA
Georgia	66	50	No intervention

Sand 2007				
Study details	**Inclusion/ Exclusion criteria**	**Population**	**Intervention/Comparator**	**Results**
throughout the project, including review of the final manuscript				
Notes: Limitations identified by author: Volunteers not necessarily representative of target population; short period of time QI intervention requires 'rapid multiple cycles of improvement' Limitations identified by review team: rates included staff members immunized off-site on the basis of self-report; differences in availability of flu vac between year 1 and 2 (only enough immunizations for direct care staff and residents in year 1, year 2 included all staff including dietary and housekeeping); vaccination availability was late in year 2); variation in intervention across sites, Other				

G.2 Effectiveness – systematic reviews

G.2.1 Hollmeyer 2012

Hollmeyer 2012			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Full citation Hollmeyer 2012 **Quality score** Moderate (+) **Study type** SR **Aim of the study** To assist in the development of successful vaccination programmes, reviewed studies where interventions aimed to increase the uptake of influenza vaccination among hospital HCW **Location and setting**	**HCW sub-population** 17 studies described sample as 'Healthcare workers'; 4 studies described sample as hospital employees **Number of included studies:** N = 24 24 published articles describing 25 studies from 423 initially identified studies **Number of participants** No info **Participant characteristics** No info **Country of study origin**: 16 USA, 6 European, 1 Korean, 1 Singaporean, 1 Brazilian 22 studies in Individual hospitals, 3 in other settings (not described) **Inclusion criteria**	**Study details** 14 studies categorised as Type A - implemented and evaluated one intervention programme in one observation season (Before and after studies) 4 studies categorised as Type B - implemented and evaluated identical and/or distinct intervention programmes over consecutive observation seasons within same facility (Before and after) 5 studies categorised as Type C - implemented and evaluated distinct intervention programme arms in different settings/facilities/ HCW groups during same observation season and with at least one concurrent control strategy for comparison (Controlled before and after)	Searched PUBMED from 1990 up to December; keyword and subject heading searches using terms 'influenza', 'health personnel', 'vaccination', 'influenza vaccines', 'hospitals 45 multicomponent interventions identified - 10 intervention components grouped into 3 categories: <u>Access related</u>: Free vaccine offered to HCW Flexible and worksite vaccine delivery Convenient access to flu vac at work (e.g. mobile vac cart) <u>Knowledge and behaviour related</u>: Educational material / sessions Dissemination of info to increase awareness of flu in healthcare settings, flu vac safety & effect (e.g. posters, leaflets, mass mailing) In-service meetings/lectures Reminders Vaccination fairs Incentives - gifts, coupons, raffle Info distribution for flu vac time and place delivered verbally, by email, paper <u>Management and policy related</u>: Assignment of dedicated staff trained to organise and promote flu vac among peers Feedback

Hollmeyer 2012			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Source of funding Swiss Federal Office of Public Health supported the WHO Global Influenza Programme (GIP) - $33500	• Implemented and evaluated a strategy aimed at increasing seasonal influenza vaccination uptake among HCW; • Included HCW from acute care hospitals; • Compared effect of vaccination strategy against a historical or concurrent control; • Described all activities carried out before (historical control) and after start of vaccination strategy; • Published in English, French or German	2 studies categorised as Type D - evaluating an intervention programme that was implemented consistently for more than 10 observation seasons (Observational)	Signed declination statements Mandatory vaccination HCWs required to receive flu vac as prerequisite to employment unless medical/religious exemption HCWs required to sign statement when flu vac declined for reasons other than medical contraindications – no HCW contract implications from failure to sign Info on flu vac uptake rates to HCW **Main findings:** The most effective intervention was mandatory vaccination policy for healthcare workers. Comprehensive, well-supported, well-staffed, well-planned, multifaceted intervention programme can raise uptake rates Provision of free vaccine seems to be indispensable – but requires organisational and educational planning as part of a multifaceted intervention. Sustained (>1 season) lead to high and sustained vaccination uptake rates. Other useful components identified – flexible and worksite vaccine delivery, the assignment of staff dedicated to take responsibility for the programme, and provision of educational materials Successful HCW vaccination programme includes: Commitment/support of hospital management Pre-intervention information to identify barriers and allow tailoring

Hollmeyer 2012			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
			Provision of free vaccine Easily accessible vaccine e.g. flexible/worksite delivery Organizing activities (educational material, sessions, reminders, incentives) Management optimization (assignment of dedicated staff; feedback on vac uptake rates) Well-prepared setting: requirement for all HCW to be vaccinated with appropriate opt-out by signing declination statement Continuation of assessment: planning – intervention cycle for several years
Notes Limitations identified by author Inability to pool data across studies or estimate the overall magnitude of effect of a single intervention component because of heterogeneity in study methods outlined as dependence on institutional and cultural settings, as well as on different baseline approaches Publication bias due to studies not demonstrating effect (increase flu vac) unlikely to be published Neither Individual intervention components nor intervention programmes can be standardised despite attempts by the authors to group into distinct components. Comparisons between should be done with caution. Intervention components were not mutually exclusive and were often delivered with others. Components can be delivered in different ways dependent on a number of factors			

Hollmeyer 2012			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Comparison of components may vary depending on type of comparison group (before and after studies do not necessarily always account for influences outside the intervention) Limitations identified by review team None Other comments None			

G.2.2 Lam 2010

Lam 2010			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Full citation Lam 2010 Quality score High (++) Study type Systematic review	HCW sub-population Physicians, nurses or both Number of included studies: N = 12 A total of 99 studies were identified 12 were included Number of participants Participant characteristics The populations targeted in the campaigns: physicians, nurses, nursing assistants,	Long-term care facilities (n=5: 4 cRCT; 1 CBA), Ascertainment of vaccination status relied primarily on self-reporting and reporting by the vaccine provider types of campaigns were: education or promotion, improved access to the vaccine, legislation or regulation, and/or role models: Hospitals and primary health care settings (n=7: 2 RCT, 3	Search strategy yielded 3302 citations, 99 met initial inclusion criteria (increase flu vac in staff and evaluated strategies); 12 final includes 87 exclusions on study design) of mixed quality although not specified referenced made to concealment, protection against contamination, lack of follow-up, lack of baseline comparison. Main finding: In eight of the nine campaigns, the health care personnel in the intervention groups were more likely to be vaccinated than those in the control groups.

Lam 2010			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Aim of the study Determine which seasonal influenza vaccination campaign or campaign components in health care settings were significantly associated with increases in influenza vaccination among staff. Location and setting Various Source of funding Supported by the Ontario Ministry of	housekeeping staff, technicians, other professionals and administrators; Inclusion criteria: Seasonal influenza vaccination campaigns; any studies evaluating influenza vaccination campaigns for health care personnel; Had to report the percentage or number of health care personnel who received the influenza vaccine as an outcome measure Exclusion criteria pandemic influenza vaccination programs; did not describe the study population or did not report ascertainment of vaccination status; studies involving other vaccines Restriction by study design - only to randomized controlled trials, cluster randomized controlled trials, controlled before-and-after studies and interrupted time series designs Study details	cRCT; 2 interrupted time series). The populations targeted in the campaigns medical residents, nurses, physicians, other professionals, administrators, housekeeping staff and volunteers. Vaccination rates were collected through tracking by the vaccine provider and/or mandatory self-reporting. The interventions used included education or promotion, improved access to the vaccine, measurement with feedback, and legislation or regulation	Campaigns with more components had higher risk ratios (i.e., favouring the intervention group). Three of the eight comparisons involving educational or promotional campaigns alone, the results favoured the intervention group. In two of the three comparisons involving campaigns with educational or promotional components combined with improved access to the vaccine staff in the intervention group were more likely to be vaccinated than those in the control group. In the two interrupted time series studies legislation or regulation components were integrated into the overall campaigns. In one campaign, in which staff completed a mandatory electronic declination form vaccination coverage increased to 55%. This was an improvement over the previous nine years, during which rates had ranged from 21% to 38%. When unvaccinated personnel were required to wear masks vaccination rates increased from 33% to 52%, but the authors did not report the statistical significance.

Lam 2010			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Health and Long-Term Care; Élisabeth Bruyère Research Institute, The Ottawa Hospital, the Ottawa Hospital Research Institute, the Canadian Center for Vaccinology, the University of Ottawa and the Canadian Institutes of Health Research	The studies were based in the United States, Canada, the United Kingdom, Germany and Switzerland Included studies were published from 1992 to 2009 and were conducted in: Eight electronic databases: OvidSP interface on Apr. 29, 2008: MEDLINE (January 1950 to present), EMBASE (1980–2008) and CINAHL, the Cumulative Index to Nursing and Allied Health Literature (1982–2008) Search terms included "health personnel," "influenza vaccine" and "health facilities." Two reviewers independently abstracted the data and assessed the risk of biases Risk ratios and 95% confidence intervals for randomized controlled trials and controlled before-and-after studies and described interrupted time series studies calculated		Findings were not pooled together but Relative Risks (RR) were calculated by NICE and pooled where appropriate
Notes Limitations identified by author Inability to pool data			

Lam 2010			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
across studies because of heterogeneity in study methods and campaign components but studies outlined graphically (p.6) Individual study methods had several risks of bias that might have generated misleading results, such as lack of comparable baseline characteristics across study groups Limitations identified by review team None Other comments None			

G.2.3 Lytras 2016

Lytras 2016			
Study details	**Inclusion/ Exclusion criteria**	**Interventions/Comparators**	**Results**
Full citation Lytras et al 2016 Quality score Study type Systematic review Aim of the study Reviewed studies evaluating	HCW sub populations Number of included studies N= 46 Number of participants Participant characteristics Inclusion criteria studies comparing actual vaccination rates; Exclusion criteria:	Interventions: Mandatory vaccination Soft mandates including declination statements Increased awareness Increased access Incentives Education	Literature search yielded 4,925 unique (non-duplicate) citations; 146 full-text articles retrieved (post title and abstract screening); 37 plus another 9 (identified from reference lists of relevant articles), were included in the analysis (N=46) 32 uncontrolled before and after; 3 controlled before and after; 9 cluster RCTs; 2 RCTs 43 studies occurred in hospital or nursing home settings 7 studies did not consider all HCW's

interventions to increase seasonal influenza vaccination coverage in HCWs Location and setting Mostly hospital and nursing home settings Source of funding	studies assessing pandemic vaccination coverage of HCWs; assessing "intention to be vaccinated" as outcome, Study details Publication years ranged from 1992 to 2015 MEDLINE and Scopus databases for published articles using the following combination of keywords: vaccine* AND (influenza OR flu) AND ("healthcare worker(s)" OR "health worker(s)" OR "health personnel" OR "health staff" OR "physician(s)" OR "doctor(s)" OR "nurse(s)" OR "practitioner (s)"). Reference lists searched Double screening; consensus based discrepancy resolution	No further details provided in study	Majority multicomponent (increased access; education; incentives; soft mandates) except 8 comparisons on 'hard' mandates with no 'simultaneous' component (across 7 studies) Main finding: Mandatory vaccination was the most effective intervention component (Risk Ratio of being unvaccinated [RRunvacc] = 0.18, 95% CI: 0.08–0.45), followed by "soft" mandates such as declination statements (RRunvacc=0.64, 95% CI: 0.45–0.92), increased awareness (RRunvacc=0.83, 95% CI: 0.71–0.97) and Increased access (RRunvacc=0.88, 95% CI: 0.78–1.00). Incentives the difference was not significant Education no effect was observed. Heterogeneity was substantial (t2 = 0.083; I2 = 99.5%) These results indicate that effective alternatives to mandatory HCWs influenza vaccination do exist, and need to be further explored in future studies.

Notes

Limitations identified by author:
2009 pandemic flu vac not considered but recognised could impact flu vac (Hard mandates lower effect post 2009)

Risk of bias greater in uncontrolled Before and afters and form the majority of includes; RCT's outlined some bias; implications to overall findings (test for interaction to assess impact of uncontrolled before and after on effect estimates of other studies was not statistically significant)

Funnel plot and Egger test result potentially indicate the
existence of publication bias, a finding that also needs to be
taken into account
Limitations identified by review team
The risk of bias in studies varied with the author flagging risks across all study types
Other comments
None

G.2.4 Pitts 2014

Pitts 2014			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Full citation Pitts et al 2014 Quality score High (++)	HCW sub-population All health care providers including house staff, all medical staff, affiliated physicians, volunteers, contractors, vendors and students, In some sites contracted studies not providing direct care were excluded	Interventions: •Four studies assessed mandates implemented at multiple institutions, including one performance improvement initiative	Search strategy yielded 778 citations; 232 potential studies; 12 final includes (all observational studies). Eight examined single hospitals or health systems - including five pre-and post-mandate studies one with pre-and-post-mandate and cross-sectional components, and two case reports.

<table>
<tr><th colspan="4">Pitts 2014</th></tr>
<tr><th>Study details</th><th>Inclusion/ Exclusion criteria and Population</th><th>Interventions/Comparators</th><th>Results</th></tr>
<tr>
<td>Study type
Systematic review

Aim of the study
Systematically examines published evidence of the benefits and harm of influenza vaccine mandates.

Location and setting

Location not stated – hospital, health systems, multiple intuitions

Source of funding</td>
<td>Number of included studies: N = 12
A total of 232 studies were identified 12 were included

Number of participants

Participant characteristics

Inclusion criteria:
Studies must have assessed the effect of a mandate for influenza vaccination among health care professional (HCP) practice – defined as the requirement of vaccination for continued employment or clinical practice, with limited exemptions for medical or religious reasons

Exclusion criteria
Studies without explicit use of the term mandate (e.g., “requirement”) were excluded unless >75% of participants were subject to a mandate that met the study definition

Study details</td>
<td>•All studies examined impact on vaccination on HCP</td>
<td>All studies allowed medical and religious exemptions (1 specifically for vegans)
4 studies reported the presences of ‘labour unions’
11 studies had at least one indication of elevated risk of bias
Main finding: Following implementation of a vaccine mandate, vaccination rates increased in all eight studies reporting this outcome, exceeding 94%. Three studies documented increased vaccination rates in hospitals with mandates compared to those without (p<0.001 for all comparisons). Two single- institution studies reported limited, inconclusive results on absenteeism among HCP

Findings were not pooled together but 7 provided information on % change in proportions vaccinated pre/post mandate

<table>
<tr><th>Study</th><th>% before/after mandate</th></tr>
<tr><td>Rakita 2010</td><td>30%/98%</td></tr>
<tr><td>Karanfil 2011</td><td>54%/99%</td></tr>
<tr><td>Huynh 2012</td><td>68%/96%</td></tr>
<tr><td>Babcock 2010</td><td>71%/98%</td></tr>
<tr><td>Smith 2012</td><td>71%/98%</td></tr>
<tr><td>Miller 2011</td><td>71%/98%</td></tr>
<tr><td>Feemster 2011</td><td>92%/99%</td></tr>
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Pitts 2014			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
No funding source had a role in the conduct of this systematic review.	MEDLINE, Embase, the Cochrane Library ,Cumulative Index to Nursing and Allied Health Literature, Science Citation Index Expanded, and Conference Proceedings Citations Index searched and analysed in2013. Two reviewers independently abstracted data and assessed bias risk Search encompassed three concepts, searched by Medical Subject Headings (MESH),including influenza (influenza, human/prevention, and control [MESH] or influenza vaccines [MESH]); HCP (health personnel [MESH: No Exp]); and mandatory programs (mandatory programs [MESH]). These MESH terms were combined with text word searches Risk of bias assessed Findings outlined via qualitative synthesis		Mean vaccination rate prior to a mandate, 72.1% (95%CI = 66.6, 77.7); mean vaccination rate following a mandate, 94.5% (95% CI=93.5, 95.5). Reviewers concluded that evidence from observational studies that a mandate for HCP influenza vaccination increases vaccination rates. Secondary outcomes: Exemptions/deferrals 6 studies reported HCP exemptions: 4 studies ranged from 0.3%-2.6% (medical) 0.02%-2.3% (religious); 1 study: 2.5% met deferral criteria; 1 study 71/4500 Adverse effects 1 study 15 compensation claims; 1 study 0.08% adverse events post vac (one case of chronic inflammatory demyelinating polyneuropathy); 6 studies 0.02%-0.15% terminations/resignations; 1 study suspension of affiliated physicians (4%); 2 studies reported legal challenges
Notes Limitations identified by author Evidence on clinical outcomes is lacking.			

Pitts 2014			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Differences in study Designs and strategies precluded quantitative pooling Only 12 studies met inclusion criteria; All studies were observational Definition of HCP varied by study Limitations identified by review team None Other comments None			

G.3 Qualitative studies

To be inserted once final includes have be finalised

G.3.1 Chalmers 2006

Chalmers 2006				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year Chalmers 2006 Quality score + Study type Qualitative Aim of the study To investigate the knowledge attitudes and behaviour towards influenza vaccination of qualified nursing staff directly	Data collection Pre-testing and piloting of the questionnaire was undertaken. Semi-structured questionnaires were performed, including closed ended and open ended responses Method of analysis Descriptive and inferential statistics used to analyse data. The sphinx survey system, coupled with statistical advice and support was utilised for this purpose	Inclusion Qualified nursing staff with direct patient care, within wards and/or clinics as their main daily working activity or actively carrying caseloads of patients	Participant numbers 372 Participant characteristics Aged 41-50yrs 94.6% female 40.6% hospital based (elderly care or paediatrics) 59.4% community nurses	Participants fell into 1 of 3 groups: Those who have never been vaccinated against influenza Those who had vaccinated during the 2004-05 campaign Those who had previously vaccinated but not during the 2004-05 campaign Reasons for receiving vaccination or not: Those who have never vaccinated previously, made decisions based on their own health, rather than that of patients or family. They stated being healthy and never having flu as the main reasons for avoiding vaccination and maintained that a healthy lifestyle was a way to avoid influenza. They felt they were not at risk, as they were generally healthy and had no previous experience with influenza

involved in patient care Location and setting Lanarkshire Primary Care Division Source of funding Not reported				Those vaccinated during the 2004-05 campaign cited their reason to be the protection of themselves and others. Those vaccinated previously but not during the 2004-2005 campaign cited unsuitable access and misconceptions such as experiences of symptoms post-vaccination, which they attributed to the vaccine. Knowledge: There appeared to be no difference in the knowledge of respondents in relation to influenza and vaccination when considered by vaccination history. Large numbers of staff did not recognise themselves at greater risk than the general public of contracting influenza (^%.9%) and 55.9% of respondents did not appear to know that influenza vaccination was part of the overall management of severe acute respiratory syndrome. Attitudes: Those vaccinated during the 2004-05 campaign or previously appear to view risk to self and patients greater than those never vaccinated 16% of respondents considered influenza vaccination to be a part of a nurses duty to care
Notes Limitations identified by author				

The ability to generalise these results are limited by the poor response rate to self-administered questionnaire, the difficulties in matching the respondents to the target population and the use of a relatively untested data collection tool

Limitations identified by review team

Unclear how much of the questionnaire allowed closed-ended responses and how much open-ended

No original quotes used to validate conclusions

Very little description of methods of analysis, making the ability to judge the reliability of the themes described difficult.

G.3.2 Hill 2015

Hill 2015				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year Hill 2015 Quality score - Study type Qualitative Aim of the study To evaluate factors influencing implementation and effectiveness for	Intervention The Declination Form Programme: The form offered a place to record where the vaccination occurred, and the provider and asked for a signature. For those declining the vaccine, there was a place to indicate if he/she was eligible to receive the vaccine. Regardless of eligibility, participants were asked to provide a reason.	Inclusion A team member involved in implementation of the declination form programme. Exclusion No criteria reported	Participant number 7 Participant characteristics Leadership, nurses, physicians and infection preventionists 71% - holder of a clinical position 46 – average age 10 yrs – average time in VA 71% had high familiarity with efforts to increase HCW vaccination	Attitudes towards effectiveness: *"I can't think of other activities that would be as effective as signed declination… it is more effective because it is an active method of making sure you approach everybody"* *"It is better… they're writing their response out rather than just saying no and walking away… people are more responsible and understand what is really happening when they decline"* There was improved process for tracking vaccination

achieving participation in a declination form programme Location and setting United States 2 Veteran Affairs, Spinal Cord Injury Units Source of funding Department of Veterans Affairs, Office of Research and Development, Health Services Research and Development Service, Quality Enhancement Research Initiative Rapid Response Project 12-515	For those eligible but declining, a statement about the potential risk to others, especially patients with spinal cord injuries due to their increased risk of serious complications from influenza was included, and they were asked to sign the form acknowledging this risk. 2-4 15 minute informational sessions were conducted where staff were told the purpose of the programme and leadership support was demonstrated. Declination forms were tracked and the programme promoted, particularly by champions in each department targeted Data collection Semi-structured interviews were conducted with 3-4 key members of the implementation team at each facility.			*"I think it increased vaccination rates in the unit… I am not sure whether it was declination itself or the fact that we used the declination form to be able to get to everyone in a much more personal manner"* Attitudes towards the acceptability: 7/7 of the participants indicated that the innovation was perceived as consistent with the values, experiences and needs of individuals in the unit. Potential barriers to implementation: 6/7 of respondents indicated that the complexity of the declination programme was not an issue in its implementation *"It was not hard… I didn't have any kickback, I didn't have any problems... there was no confusion"*

	Method of analysis Analysis was performed by 2 researchers. A mixed inductive-deductive approach to coding, beginning with a preliminary coding structure using DIM constructs was followed. IT also used the grounded-theory approach. Sub codes were added as they emerged. The final code structure was applied to all transcripts.			

Notes

Limitations identified by author

The small number of clinicians providing feedback on implementation and the use of 2 study sites may limit generalisability

The stakeholder group included members that were highly enthusiastic and supportive of the study efforts

Limitations identified by review team

Research team and participants work together over a number of months, with researchers subsequently conducting interviews. A relationship may build over these months, introducing bias into responses.

G.3.3 Hollmeyer 2009

Hollmeyer 2009			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
Full citation Hollmeyer 2009 Quality score Low (-) Study type Systematic review Aim of the study To aid in designing effective immunization programs - reviewed the literature for studies on self-reported reasons of HCW regarding vaccination	HCW sub-population Physicians, nurses or both Number of included studies: A total of 25 studies were included which were then assessed for relevance against sub questions and data extracted Self-reported reasons of HCW regarding vaccination against influenza: Reasons for refusing influenza vaccine - 21 studies relevant to self-reported reasons for rejecting or accepting vaccination Reasons for acceptance of influenza vaccine - 15 studies met selection criteria Number of participants Participant characteristics Inclusion criteria: Study population Included: HCW (physicians, nurses or both) from hospitals; published in English, French or German.	Study details PUBMED (1980 to 2008) searching the following words: influenza, influenza vaccine, vaccination, immunization, health care worker(s), health care personnel, nurse(s), physician(s), knowledge, attitudes, behaviour, practice(s), acceptance, refusal, predictor(s), infection control, survey(s), questionnaire(s). Details regarding interventions an comparators not provided The studies (n = 25) were grouped under each of the primary research questions and sub questions using a self-developed 9 category grouping system. For each study the 6 most	Knowledge and beliefs: The most cited reasons for not obtaining influenza vaccination due to reasons related to knowledge and beliefs, in order of occurrence were: Fear of adverse reactions “I am concerned about getting influenza from the vaccine” Lack of concern “I forgot it” “I have doubts it’s necessary” Lack of perception of own risk “I believe in my own host defence” Doubts about vaccine efficacy “The vaccine does not work” Avoidance of medications “I believe in homeopathic medication” Dislike of injections “The shot is painful” Self-perceived contraindications “I had an allergy” “I was pregnant” “I felt ill on the day when the vaccine was being offered” The most cited reasons for obtaining the influenza vaccination, due to reasons related to knowledge and beliefs, in order of occurrence were: Self-protection “I do not want to get sick”

Hollmeyer 2009			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
against influenza Location and setting Various (9 countries) – 43% USA (n=9) Source of funding Not outlined	Acceptance the study had to List (i) at least 6 reasons given by HCW for not having been vaccinated or (ii) at least 3 self-reported reasons for having been vaccinated Exclusion criteria Support staff or para/non-medical personnel;	frequent reasons given by HCW who "did not receive flu vac' and the 3 most frequently stated reasons why "HCW reported receiving flu vac" were recorded. The order of frequency of reasons were then ranked and scored – 6 for the most stated (highest frequency) for non-receipt and 3 for the most frequently stated reason for flu vac acceptance per study – these rankings per study were then totalled to provide an overall indicator of the importance of each identified category across the totality of the studies	Protection of patients Protection of family or colleagues "help colleagues by not being off work" Compliance with recommendation Work ethic "I don't want to miss work because of influenza" Trust in the vaccine To set an example for patients "Always get the influenza vaccine" Access: The most cited reasons for not obtaining influenza vaccination due to access issues, in order of occurrence were: Inconvenient delivery "I did not have time to get it" "Absence during vaccination programme" Lack of availability "The vaccine was not offered" The most cited reasons for obtaining influenza vaccination regarding access, in order of occurrence were: Convenient access "The vaccine was readily available" Free vaccine
Limitations identified by author			

Hollmeyer 2009			
Study details	**Inclusion/ Exclusion criteria and Population**	**Interventions/Comparators**	**Results**
For each of the selected studies the authors restricted the review to only the first 6 most frequently cited reasons for non-receipt and the first 3 most frequently cited reasons for acceptance of influenza vaccine – which may have excluded other key information The inclusion or non-inclusion of factors (e.g. age or profession), the type of question asked or the phrasing of the question in the study instrument differed among studies and hence permits only limited comparability. Limitations identified by review team Lack of methodological detail regarding the systematic nature of the review; an absence of critical appraisal of included studies; no indication of limitations outlined by authors – all of which limit the degree to which findings can be taken forward; also predominantly USA studies which may impact generalisability of findings Other comments Predictive factors for influenza immunization – 13 studies were also included in the review, however they were not relevant to the review question so have not been extracted.			

G.3.4 Leask 2010

Leask 2010				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year Leask 2010 Quality score + Study type Qualitative	Data collection Participants were selected by stratified sampling for semi-structured interviews. Interviews lasted 40-60 minutes, concentrating on questions about barriers	Inclusion Staff closely involved with policy directive development and/or implementation. This included staff from the New South Wale Department of Health, New South Wales Health implementation Group,	Participant numbers 58 Participant characteristics 8 from the New South Wales Department of Health 5 from the New South Wales Health implementation Group	51% favoured mandatory influenza vaccination 31% were not supportive 17% were undecided Support for mandatory influenza vaccination: Supportive participants felt that mandating influenza vaccination would provide extra 'teeth' to their current efforts.

Aim of the study To ascertain views about the feasibility of including influenza vaccine within the existing mandatory provisions Location and setting New South Wales, Australia Source of funding New South Wales Health Immunisation Branch	and facilitators to policy directive implementation Method of analysis All interviews were read and a list of themes developed, compared and re-developed by the authors. Themes were coded using NVivo software Version 8. Findings were compared across hospital types and professional groups to identify if any professional/ workplace role or circumstance influenced opinions.	staff of New South Wales public hospitals and staff of professionals associations and university student liaison groups. Exclusion None reported	37 from a range of public hospitals (administrative leaders, clinical managers and clinicians) 8 from unions and professional associations	Reducing absenteeism and protecting patients were both rationales for support Many felt that staff did not see themselves to be at risk, and so this was not a good rationale for support Participants at higher administrative levels tended to have more support than those at a clinical management level *"I don't think there would be a big backlash"* Potential barriers to mandating influenza vaccination: <u>Logistics</u> 17 participants mentioned barriers to include the logistics of mandating and enforcing a yearly vaccination: It was felt that a mandate would necessitate a significant amount of money and resources, such as trained staff and immunisation clinics and more active approaches to immunising staff, such as ward visits. *"I'd support it in principle. In actual operational terms, it would be a logistical nightmare"*

				"My views are that philosophically it should happen. Practically, I think it may be a bit of a nightmare…Having said that, a lot of effort goes into encouraging influenza vaccination each season and I suspect if it were mandatory, less effort would be required to encourage people, if it became more or less an automatic thing." <u>Staff resistance</u> 19 participants mentioned the persistence of staff to vaccinate based on misunderstandings of the vaccine's necessity safety and efficacy: Some participants spoke of a backlash, resentment and opposition from staff, as well as a stigma surrounding the vaccine. They anticipated this based on previous experience and 2 participants who themselves believe the vaccine caused a respiratory illness *"The first flu [vaccine] they have they get a very bad cold and they nearly die"* Some participants mentioned that staff did not need to be vaccinated because they were not at risk of influenza and 'didn't get sick'. There was an assumption that influenza vaccination is primarily to protect staff, not patients <u>Need for evidence</u> 8 participants mentioned the need for better evidence to support influenza immunisation of HCWs:

				Medical specialists wanted clearer epidemiological and disease modelling evidence about the impact of influenza vaccination in health care settings to justify the policy. *"If you're mandating something, then you really have to show that the efficacy of that is almost universal"* Other needs In order to implement the mandate, participants mentioned the need for a consultative and critical dialogue with health professionals and the broader community, and innovative campaigns. Others mentioned wanting information on the best way to implement such a policy.
Notes Limitations identified by author Not a representative sample of all HCWs in New South Wales Limitations identified by review team There is some incomplete data as only 45 of 58 participants responded to key questions Many responses are based on the assumption of the opinions of others, rather than the opinions of themselves (staff resistance and need for evidence sections)				

G.3.5 Lim 2014

Lim 2014				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year Lim, 2014 Quality score + Study type Qualitative Aim of the study To find out the views of key stakeholders responsible for setting policy and agenda around occupational vaccination towards occupational influenza vaccination	Data collection An interview guide was jointly developed and reviewed. Questions related to the following topics were included: General attitudes around the use of the influenza vaccine for HCWs, knowledge regarding the available evidence on vaccination, challenges associated with the current occupational vaccine provision system and possible barriers and strategies in improving coverage. Questions were asked in an open-ended manner to allow room for expansion. Method of analysis	Inclusion Individuals officially involved with policy making or the implementation of control strategies for communicable diseases including seasonal influenza in hospital environment Exclusion No specific criteria reported	Participant number 21 Participant characteristics Participants included: immunisation managers/directors, senior medical advisors/officers from the health department, communicable disease directors and public health nurses responsible for coordinating hospital campaigns	Attitudes towards influenza vaccination: There was overwhelming support for HCW influenza vaccination amongst the participants. Participants unanimously agreed that occupational influenza vaccination should be a core component of every hospitals occupational safety agenda Some participants saw influenza vaccination to be highly effective, others thought it had moderate or debatable effectiveness. Participants agreed there is a lack of published evidence supporting the impact of vaccinating staff, which makes it difficult to convince some HCWs to get vaccinated. Others reasoned there is no dire need to obtain additional data to justify the use of the vaccine, given that it is a common belief that influenza vaccination of health adults is beneficial. *"If we had more evidence to actually see that vaccinating the staff did reduce the transmission of disease to patients I think that it might be a bit easier for us…although there's evidence out there…I don't think there's enough"*

Location and setting Different health organisations and sectors in Australia Source of funding Dr Holly Seale holds an NHMRC Australian-based Public Health Training Fellowship (10112631)	Interviews were digitally recorded, transcribed verbatim and analysed thematically. 2 investigators jointly developed the list of themes after 1 quarter of the transcripts have been analysed. An agreed framework was then applied to another sub-sample of transcripts and modified further. Using this final framework, all of the transcripts were analysed and coded. Text was organised with the identified themes and the developed framework without the use of any software.			Barriers to vaccination: Access to the vaccine was proposed as the primary system barrier to increasing vaccination coverage. However, staffing levels and/or funding were not viewed as issues. Although some agreed that more funding would benefit the situation, they also highlighted that vaccines are cheap and are not too difficult to provide to the HCWs. Strategies to increase vaccination rates: Participants recommended that hospitals should continue to promote the use of conventional, voluntary strategies to increase vaccine coverage. It was suggested that hospital promotion campaigns should primarily revolve around educating HCWs to overcome their attitudinal barriers *"I think education is the key: I think we need to be looking at how the education is delivered and I think we need to be asking the healthcare workers themselves how they would like to receive the information"* Among the different strategies proposed, mobile vaccine carts was suggested to be the most effective means of improving accessibility. It was suggested that hospitals should set up

				more vaccination clinics at convenient shifts for HCWs. The use of incentives or friendly competitions to increase vaccine rates could be used. Some form of role modelling should be considered as well for vaccine campaigns.
Notes Limitations identified by author Interviews were only undertaken with a select group of participants so the possibility of other important themes emerging cannot be ruled out The use of snowball recruitment (participants offered the chance to nominate a colleague to participate) may have also reduced the range of opinions amassed from participants Specific details regarding the participants role was also not collected No documentation of whether the participant had received any previous funding from a pharmaceutical company Limitations identified by review team Australian study, which may not be representative of the same population group in the UK Some of the results indicate the HCW population attitudes towards vaccination, however these are provided 'second hand' by stakeholders, rather than from the general HCW population				

G.3.6 Real 2013

Real 2013				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
	Data collection	Inclusion	Participant numbers 29	Proactive towards vaccination: 38% Responsive to prompts to vaccination: 41%

Author name and year Real 2013 Quality score - Study type Qualitative Aim of the study To determine whether the risk perceptions and efficacy beliefs could be used to segment healthcare practitioners into meaningful groups related to vaccination uptake, influenza-related absenteeism and patient safety beliefs Location and setting	Pilot interviews were conducted with 3 HCP to help inform the protocol for interviews Initial survey participants were recruited through emails send to hospital management and through an advert on the hospital intranet. After an initial survey, HCPs were interviewed to better understand respondent's beliefs about the importance of the influenza vaccination. Participants were asked about the impact of HCP vaccination on patient safety and general questions about both patient safety and HCP safety Method of analysis Interviews were analysed qualitatively using the constant comparison methods. Themes were	Hospital based healthcare practitioners Exclusion None reported	Participant characteristics 15 registered nurses 7 MDs 6 Allied Health 1 unit manager	Indifference towards vaccination: 3% Avoidance of vaccination: 14% Reasons for vaccination Protection for patients Protection for vulnerable patients was mentioned by many participants "We take care of kids with cancer who are immune-compromised already. They do not need to get the flu on top of that" "Yes I do because we are carriers of disease and when we have a patient in the hospital their immune system is compromised so they're at greater risk of contracting the diseases" Heard immunity It was expressed that vaccination was used as a mechanism for heard immunity "To me it's convincing people that influenza can be fatal and not just for them but their patients at risk. And the importance of health care workers as a factor for transmission of disease" "We're here every day and we pass things, we bring them home, we take things here and we

Lexington, Kentucky, USA Source of funding Not reported	developed through iterative analysis by authors.			take them back home so we need to do our best to limit the spread of infection" It was suggested that vaccination was important for patient safety in hospitals and the general population as well.
Notes Limitations identified by author The cross sectional design, which makes it challenging to distinguish between cause and effect. Limitations identified by review team Financial incentive of $50 may bias participants to respond in a way favoured by researchers There appears to be missing data as only responses positive about vaccination have been reported, although 14% of participants avoid vaccination. Other This study also includes a survey, but results and methodology are excluded as this is not within the review protocol				

G.3.7 Rhudy 2010

Rhudy 2010				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year	Data collection	Inclusion	Participant numbers:	Reasons for not obtaining an influenza vaccination:

Rhudy, 2010 Quality score ++ Study type Qualitative Aim of the study To seek further understanding of the factors influencing nurses decision-making about personal receiving immunisation against influenza. The research sought to answer: -what factors do registered nurses who intend to decline or are uncertain about receiving influenza vaccination describe as	An email invitation was extended to 170 nurses Data was collected over 5 months (December 07-April 08) The interview guide was tested in face-to-face interviews with the first 4 participants and subsequent interviews were conducted via telephone A semi-structured format was used to conduct interviews. All interviews were audio recorded. Field notes were used by the interviewer to document observations or insights occurring during the interview. Audio recordings were transcribed verbatim and verified for accuracy. Method of analysis	Registered nurses who indicated in a prior study that they did not intend to receive influenza vaccine or were uncertain if they intended to receive the influenza vaccine Exclusion No criteria reported	14 registered nurses participated Participant characteristics: 8 inpatient nurses Critical care, neurology, float pool, thoracic units 6 outpatient nurses Emergency department, outpatient surgery and gynaecology clinic units	Sense of good health: Participants had perceptions of being 'young and healthy' which deterred them from vaccination Answers were framed in the context of the perceived health risk associated with the patients they cared and the risk to themselves "I felt like I was a healthy person. I never really got sick. [It is] kind of advertised for 65 and over, you know, the older population. And I don't work with immunosuppressed people, I don't work with sick people" Scepticism of vaccines value: There were concerns expressed about the vaccines effectiveness. Some believed that the symptoms of influenza were not bothersome enough or predictable enough to warrant vaccination "I am not sure if it really works, if it's effective… If I am going to get sick and people come to work with a different strain of the flu, then what am I vaccinated for?... we can't possibly vaccinate for every single thing…" Fear of the vaccine side effects: Participants described personal experiences thought to be vaccine reactions, and also described their fear of illness and long-term conditions as consequences of vaccination

influencing their decision, how do they view mandatory vaccination and what educational approaches do they recommend? Location and setting A large, integrated multispecialty medical group practice; Rochester, USA Source of funding Not reported	Content analysis was used to analyse data. The interview data was examined coded to identify core themes and subthemes related to the research questions. Analysis was iterative with core themes and subthemes redefined as new themes emerged.			"I don't get it (vaccine) because I had 3 episodes where I had gotten the vaccine where I had side effects…" Four of us acquired shingles within 2-4 days after receiving the vaccine.. So I was really, really standoffish about getting a flu shot… It just scared the heck out of me." Other methods can be used to prevent influenza transmission: All participants described hand washing as an effective alternative to vaccination 2 participants described wearing masks as a useful alternative to vaccination "The only thing I can do...to try to keep my patients from getting sick is just hand washing because I know I'm doing what I should be doing" "I do really good hand washing and… I never get sick" "If I am at work and feeling a little sniffy, I wear a mask, so I feel like I do a pretty good job of protecting my patients from the flu bugs" Inconvenient access to vaccination Vaccination stations were considered to be too far from the work unit and/or not readily available for nurses working off shifts

				“Extremely inconvenient. There are many things I miss out on because they are designed around the day shift and they sort of forget there are people that do work nights. There are a lot of us that don’t live in (city) so it makes it very inconvenient at times” Views on mandatory vaccination policies: Participants were generally not in favour of mandatory vaccination, although 12/14 (86%) stated that if influenza vaccination were mandatory, they would likely accept the vaccine. “If they made it mandatory, I think more people would probably get it, because it’s part of my job. Where the ones that were kind of on the fence would be like ‘well, they are making me so I’ll just do it’” Education preferences about influenza vaccination: Delivery preferences and options included email messages, posters and online education courses similar to that for other required education. Simple, short and sweet, precise and quick were the characteristics required for educational interventions General and specific information was desirable, including, the side effects and risk of complications of the vaccine, signs and symptoms and myths vs truths about influenza Specific information about the incidence and severity of influenza was voiced. Death rates were requested and

				incidence of influenza for HCWs, nurses specifically and patients. Specific data about their work settings and communities in addition to state and national statistics were desired.
Notes Limitations identified by author Generalisability of the study findings are limited by small convenience sample. Only a small proportion of nurses responded to the invitation to participate. Whether or not the sample includes nurses with the strongest opinions about influenza vaccination is not known. Limitations identified by review team Participants were all characterised as either not intending to vaccinate or unsure if they would vaccinate. With regard to data presented that 'participants were generally not in favour of mandatory vaccination', this data is particularly unlikely to be representative of the general population				

G.3.8 Willis 2007

Willis 2007				
Study details	**Research Parameters**	**Inclusion/Exclusion Criteria**	**Population**	**Results**
Author name and year Willis 2007 **Quality score** - **Study type** Qualitative	**Data collection** Nurses were recruited by a professional focus group facility using the facility's database of participants. A telephone-screening questionnaire was used to prequalify active front line nurses and to select participants to yield racially balanced groups.	**Inclusion:** Front line nurse (providing direct patient care) **Exclusion:** No specific exclusion criteria reported	**Number of participants:** Average 9 nurses with each of 4 focus groups **Characteristics:** Vaccinated nurses received the influenza vaccination during the previous 14 months 97% female	**Safety of the vaccine:** Vaccinated and unvaccinated participants both expressed concerns regarding vaccine safety. Several nurses mentioned that the vaccine contains live virus, therefore they suspected an association between vaccine receipt and acquiring the disease *"I took one [flu shot] a couple of years ago and my whole family got the flu. I didn't take one last year, and we never got it"*

Aim of the study To obtain information on nurse attitudes and concerns regarding influenza immunisation and to explore issues related to workplace vaccination and nurse's information needs. **Location and setting** Birmingham, Alabama, Detroit and Michigan (USA); urban settings **Source of funding**	Contacted nurses could also refer other nurses. 8, 1 hour long focus groups were conducted using with open ended questions Each focus group was conducted in a professional facility equipped with a one-way mirror to permit observation The moderator and observers took notes during the sessions, and sessions were audiotaped. **Method of analysis** Notes were compiled by the moderator who identified overall trends and patterns upon completion of all focus groups. Audiotapes were reviewed by the researchers to verify the content of the transcripts and notes. This helped to verify the classification of trends and patterns.		88% had 5+ years nursing experience 79% were employed in hospitals Black nurses were over represented	**Lack of information:** A specific concern was the lack of information on vaccine effectiveness from year to year: *"Every year there's a new strain of flu; yearly it's a new vaccine, and I don't think that's enough time to have adequate research studies on the long-term effects"* **Perception of risk** Many unvaccinated participants believed they were not at risk for influenza as they don't fall into high-risk groups, and believed they had a stronger immune system because they had workplace exposure to disease They also believed that vaccine was not important as other preventative measures were used, such as hand washing *"We're still using our techniques of hand washing and universal precautions"* **Knowledge:** Many participants were aware of their potential to spread influenza, even if they were asymptomatic Participants mentioned that placing more information about influenza vaccine in nursing journals and magazines would allow for greater exposure to such information among nurses.

				Access: Among vaccinated participants, some believed strongly that vaccination was important and some did not have strong opinions. Many of the latter group seemed to have been vaccinated because vaccination had been made convenient
Notes Limitations identified by author A small sample in a small number of locations thus cannot be considered representative of all nurses Limitations identified by review team Participants were able to self-refer other nurses to participate – it's possible that a participant would be more likely to self-refer others with similar beliefs to themselves. Small financial incentive provided to participants No clear inclusion or exclusion criteria Unclear how the analysis was performed other than by 'thematic analysis'				

Appendix H: Economic evidence tables

No economic evidence was identified for review questions 4 & 5

Appendix I: GRADE tables

I.1 GRADE profile 1

Outcome: Flu vaccination uptake in HCWs

Quality assessment								Effect		
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of participants	Relative Risk (95% CI)	Quality	Rating
Educational (slide show + video) vs Control [Forest plot Figure 1; ES 4.1]										
1[1]	cRCT	Serious [a]	n/a	No Serious	Very serious [b]	None	2,345	Change in flu vaccination uptake: intervention: 6% vs. control 7% RR 0.86 (0.63 to 1.17)*	Very low	Critical
Attitudinal questionnaire preceding annual flu campaign (based on question-behaviour effect) vs. Usual care [Forest plot Figure 3; ES 4.3]										
1[2]	RCT	No Serious	n/a	No Serious	Serious [c]	None	1,200	RR 1.16 (1.00 to 1.33)*	Moderate	Critical
National campaign to promote flu vaccination in hospital HCWs vs. pre-intervention uptake [ES 4.4]										
1[3]	Before and after	Very serious [d]	n/a	No Serious	Very serious [e]	None	86,765	Total mean increase in vaccination rate: 14.6%	Very low	Critical
Guide to flu vaccination campaign with support vs. control (no intervention) – change in uptake at 2 years [ES 4.5]										
1[4]	cRCT	No serious	n/a	No Serious	Serious [f]	None	8,921	Median change in % flu vaccination rate between baseline and yr2: Intervention:+7.1% vs Control: -5.8%, p=0.0001	Moderate	Critical

Mandated vaccination and refusal/declination with mask-wearing policy plus automated alert system (reminders) vs. Usual care (pre-intervention) [Forest plot Figure 4; ES4.6]										
1[5]	Before and after	Serious [g]	n/a	No Serious	No Serious	None	6,957	Year 4: RR 1.66 (1.62 to 1.69)	Low	Critical
Sub group analysis: mandated vaccination and Refusal/Declination with mask wearing policy and automated alert system (reminders) vs. baseline (pre-intervention) – years 1, 2 and 3 [Forest plot Figure 4; ES4.6]										
1[5]	Before and after	Serious [g]	n/a	No serious	No serious	None	6,957	Year 1: RR 1.48 (1.45 to 1.52)	Low	Critical
1[5]	Before and after	Serious [g]	n/a	No serious	No serious	None	6,957	Year 2: RR 1.59 (1.55 to 1.62)	Low	Critical
1[5]	Before and after	Serious [g]	n/a	No serious	No serious	None	6,957	Year 3: RR 1.66 (1.62 to 1.69)	Low	Critical
Mandated vaccination and refusal/declination with mask wearing policy + free vaccine, education and vaccination coverage report vs. baseline (pre-intervention) [ES 4.7]										
1[6]	Before and after	Very serious [h]	n/a	No Serious	Very serious [i]	None	271 facilities Individual data not reported	Change in flu vaccination rate in all employees: +17.5% Change in flu vaccination rate in HCWs (hospitals): +14.6% Change in flu vaccination rate in HCWs (care homes): +16.2%	Very low	critical
Opt-out strategy (e-mail with pre-scheduled flu vaccine appointment vs e-mail requesting scheduling of an appointment) + presentation, educational seminar and free vaccination [Forest plot Figure 5; ES 4.8]										
1[7]	RCT	Serious [j]	n/a	No Serious	Very serious [b]	None	122	RR 1.70 (0.85 to 3.41)*	Very low	critical

1 Rothan-Tondeur 2010
2 Conner 2011
3 Maltezou 2007
4 Chambers 2015
5 Quan 2014
6 Kim 2015
7 Lehman 2016

a Downgraded 1 level - control group exposure to part of the intervention (poster) during recruitment which may have impacted their motivation to be vaccinated (potential performance bias:)
b Downgraded 2 levels – 95%CI crosses upper and lower MID threshold (RR 0.95 and RR1.05)
c Downgraded 1 level – 95%CI crosses upper MID threshold (RR 1.05)
d Downgraded 2 levels - lack of reliable baseline data - collected post-intervention (sampling bias); lack of demographic information (potential sampling bias); potential confounding due to identified H5N1 cases during the intervention (potential confounding)
e Downgraded 2 levels - unclear reporting of baseline/follow-up numbers and characteristics (potential selective reporting); no measure of variance
f Downgraded 1 level – effect estimate not calculable (reports only median % uptake and range)
g Downgraded 1 level – no information on baseline characteristics or sample size
h Downgraded 2 levels - low response rate - 43.5% facilities completed before and after evaluation survey (potential selective reporting); employee sample sizes and baseline characteristics not reported
i Downgraded 2 levels – % uptake only reported – no measures of variance or no sample size information provided
j Downgraded 1 level - no demographic data to appropriate assess possible selection bias

* calculation RR: from post hoc analysis undertaken by the review team

I.2 GRADE profile 2

Outcome: Attitudes to and acceptability of flu vaccination

Quality assessment								Effect	Quality	Rating
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of participants	Relative risk (95% CI)		
Educational intervention to change attitudes and perceptions towards the acceptance of flu vaccination [Forest plot Figure 2; ES4.2]										
1[1]		Very serious [a]	n/a	Serious [b]	Serious [c]	None	124	(1 = strongly disagree; 5=strongly agree')	Very Low	Critical

	Before and after							'Flu is contagious' MD: 0.14 (-0.06 to 0.34)		
								Vaccination decreases risk of flu MD: 0.21 (0.01 to 0.41)		
								HCWs may spread flu to patients MD: 0.25 (0.10 to 0.40)		
								It is important to be vaccinated MD: 0.68 (0.43 to 0.93)		
								As a HCW I am at risk of flu MD: 0.28 (0.15 to 0.41)		
								HCWs should receive vaccine MD: 0.36 (0.17 to 0.55)		
								Flu vaccine may cause flu MD: -0.63 (-0.89 to -0.37)		
								Would recommend vaccine to friends/family MD: 0.48 (0.26 to 0.70)		

1 Afonso 2014

a Downgrade 2 levels – high attrition (22% of sample did not complete post-intervention questionnaire); potential contamination from another intervention – pre-intervention survey was 6 weeks prior to intervention, and post intervention survey 2 months after.
b Downgrade 1 level – population were 1st year medical students so unlikely to have high level of direct patient care
c Downgraded 1 level due to small study sample

* calculation of MD (95%CI) from post hoc analysis undertaken by the review team

I.3 GRADE profile 3

Outcome: Flu vaccination uptake

Quality assessment								Effect	Quality	Rating
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of participants	Relative risk (95% CI)		
Multicomponent interventions including education and access [Forest plot Figure 6; ES 45.1]										
1[1]	Before and after	No serious	n/a	No Serious	No serious	None	Between 3,909 and 4373 per year	RR after year 1: 1.44 (1.37, 1.52) RR after year 2: 1.33 (1.26 to 1.41) RR after year 3: 1.40 (1.33 to 1.48) RR after year 4: 1.56 (1.48 to 1.64) RR after year 5: 1.76 (1.67 to 1.84) RR after year 6: 1.69 (1.61, 1.77)	Low	critical
Multicomponent intervention including pharmacist-managed clinic, education, clinic promotion and access vs. pre-intervention baseline [ES 45.2]										
1[2]	Before and after	Serious [a]	n/a	No Serious	Very serious [b]	None	1,095	Clinics run in different settings increased % flu vaccination in employees from an estimated 19.5% to 36%	Very low	Critical
Multicomponent interventions including education, training, feedback and access with active declination vs. pre-intervention baseline (or intervention without active declination) [Forest plot Figure 7; ES 45.3]										
3[3-5]	Before and after	No Serious	Serious [c]	No Serious	No Serious	None	15,515	RR 1.29 (1.17 to 1.42)	Very low	Critical
Subgroup analysis: year-on-year effect of multicomponent intervention (education, feedback and access with active declination) vs. pre-intervention baseline [Forest plot Figure 8 ; ES 45.3]										

1[3]	Before and after	No serious	n/a	No serious	No serious	None	Between 361 and 471 per year	Yr 1: RR 1.46 (1.32 to 1.62) Yr 2: RR 1.49 (1.34 to 1.65) Yr 3: RR 1.15 (1.01 to 1.30) Yr 4: RR 1.34 (1.20 to 1.50)	Low	Critical
Multicomponent intervention including education campaign and new vaccine location plus the addition of a declination policy vs. multicomponent intervention with no declination policy [ES 45.4]										
1[6]	Before and after	Serious [d]	n/a	No serious	Very serious [b]	None	43 health care institutions	Mean pre-intervention uptake: 54% (±14.5%) Mean post-intervn uptake: 65% (±15.7%) Mean change in vaccination rate +11.6%	Very low	Critical
Multicomponent interventions including: education, declination policy, incentives and access vs. pre-intervention uptake [ES45.5]										
1[7]	Before and after	Very serious [e]	n/a	No Serious	Very serious [b]	None	13 long-term care facilities	Mean % change in flu vaccination uptake across facilities who provided data for yr 1 (n=10) +11% Mean change in flu vaccination uptake across facilities providing data for yr 2 (n=12) +23.4%	Very Low	critical
Multicomponent intervention including: education, declination policy and access vs. pre-intervention uptake [ES45.6]										
2[8-9]	Before and after	Serious [f]	Not calculable	No Serious	Very serious [g]	None	Unclear	10.8% increase in doses administered	Very Low	Critical
							Unclear	24.6% increase in paramedics receiving flu vaccination		
Multicomponent interventions including educational materials, incentives and on-site access vs. pre-intervention uptake [Forest plot Figure 9; ES 45.7]										
3[5,10-11]	Before and after	Serious [h]	Serious [c]	No serious	No serious	None	8,844	RR 1.11 (1.07 to 1.16)	Very Low	Critical
Subgroup analysis: HCWs with direct contact with patients vs pre-intervention uptake [Forest plot Figure 9; ES 45.7]										

1[10]	Before and after	Serious [h]	n/a	No Serious	Serious [i]	None	2,333	Direct (years 2003-2009) RR 1.13 (0.97 to 1.32)	Very low	Critical
Subgroup analysis: HCWs with indirect contact with patients vs. pre-intervention uptake [Forest plot Figure 9; ES 45.7]										
1[10]	Before and after	Serious [h]	n/a	No Serious	No serious	None	976	Indirect (years 2003-2009) RR 3.33 (2.51 to 4.42)	Very low	Critical
Subgroup analysis: by HCW profession (direct contact) vs. pre-intervention uptake [Forest plot Figure 9; ES 45.7]										
1[10]	Before and after	Serious [h]	n/a	No Serious	Serious [j]	None	375	Doctors: RR 3.71 (2.41 to 5.72)	Very low	Critical
1[10]	Before and after	Serious [h]	n/a	No Serious	Very serious [k]	None	1743	Nurses: RR 0.90 (0.70 to 1.17)	Very low	Critical
1[10]	Before and after	Serious [h]	n/a	No Serious	Serious [l]	None	215	Others: RR 0.52 (0.27 to 0.98)	Very low	Critical
Multicomponent intervention including education, campaign, incentives, record keeping, feedback and access vs. pre-intervention uptake [ES 45.8]										
2 [12-13]	Before and after	Serious [a]	n/a (not pooled)	No Serious	Very serious [b]	None	31,850 (estimate for 2001-02)	HCW vaccination increased from 34% to 58% during the 4-year period (1998-99 to 2001-02)	Very low	Critical
		No serious			No serious		9,353 (post-intervention)	All HCW employees RR 1.18 (1.15 to 1.21)	Low	
Subgroup analysis: by HCW professional group vs. pre-intervention uptake [Forest plot Figure 21; ES 45.8]										
1[13]	Before and after	Serious [m]	n/a	No serious	No serious	None	9,353 (post-intervention: all staff)	Physicians: RR 1.50 (1.29 to 1.73)	Very low	Critical
1[13]	Before and after	Serious [m]	n/a	No serious	Serious [i]	None	9,353	Staff: RR 1.07 (1.03 to 1.11)	Very low	

							(post-intervention: all staff)			
1[13]	Before and after	Serious [m]	n/a	No serious	No serious	None	9,353 (post-intervention: all staff)	Volunteers/students: RR 1.49 (1.39 to 1.61)	Very low	
Multicomponent interventions including education, reminders and access vs. pre-intervention uptake [ES 45.9]										
1[14]	Before and after	No Serious	n/a	No Serious	No Serious	None	5,578	RR 1.41 (1.37 to 1.45)	Low	Critical
Multicomponent interventions including education, reminders and access vs. pre-intervention uptake [ES 45.10]										
1[15]	Before and after	Serious [a]	n/a	No Serious	Very serious [b]	None	Not reported	compliance feedback increased from 4% during 1987-88 season to 67% during the 1999-2000 season (p<0.0001)	Very low	Critical
Multicomponent interventions including mandatory or masking policy, flu champions, advertisement of increased access and access vs. pre-intervention uptake [Forest plot Figure 10; ES 45.11]										
3[16-18]	Before and after	Serious [a]	Serious [n]	No Serious	Serious [o]	None	384,287 (estimated)	Year 1 vs. pre-intervention: RR 1.39 (1.16 to 1.66) Year 2 vs. pre-intervention: RR 1.51 (1.40 to 1.63)	Very low	Critical

1 Nace 2012
2 Sanchez 2003
3 Nace 2007
4 Cadena 2011
5 Mouzoon 2010
6 Polgreen 2008
7 Sand 2007
8 Bruce 2007
9 Palmore 2011

10 Friedl 2012
11 Llupia 2013
12 Parry 2004
13 Marwaha 2016
14 Patterson 2011
15 Salgado 2004
16 Leibu 2015
17 Drees 2015
18 Perlin 2013

a Downgraded 1 level – no information on baseline characteristics or sample size
b Downgraded 2 levels – % uptake reported only; no measures of variance or sample size information provided so imprecision cannot be assessed
c Downgraded 1 level – serious inconsistency (I^2 >75%)
d Downgraded 1 level - survey distributed to respondents of a previous related survey (sampling bias)
e Downgraded 2 levels - data collected using different methods (reporting bias) including self-report and difference in availability of vaccination over the 2 year period so intervention not delivered consistently over 2 year follow up (performance bias)
f Downgraded 1 level - Palmore (2009) provides no information on baseline characteristics or sample size; participants already mandated to receive flu vaccination so sample not representative of all HCW's (sampling bias)
g Downgraded 2 levels – % uptake only reported (no measures of variance); Palmore (2009) does not provide sample size information
h Downgraded 1 level - influence of other campaign activity (confounding) in Friedl (2012) and not all participants had access to e-mail educational component
i Downgraded 1 level - 95%CI crosses upper MID threshold (RR 1.05)
j Downgraded 1 level – small study sample (total vaccination events<300)
k Downgraded 2 levels – 95%CI crosses upper and lower MID thresholds (RR 0.95 and RR 1.05)
l Downgraded 1 level – 95%CI crosses lower MID threshold (RR 0.95)
m Downgrade 1 level – no sample size information for HCW subgroups; denominator used in analyses is total employee population at pre- and post-intervention timepoints
n Downgrade 1 level – serious inconsistency: Year 1: I^2 = 100%; Year 2: I^2 = 99%
o Downgrade 1 level - denominators estimated for Leibu (2015) and Drees (2015) as sample size information not provided

I.4 GRADE profile 4

Outcome: uptake of influenza vaccination among hospital HCWs [SR – Hollymeyer 2012]

Quality assessment		Effect	Quality	

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of participants	Relative Risk (95% CI)		Rating
Educational – material, sessions, reminders vs. pre-intervention uptake [Forest plot Figure 11; SR-ES 4.1]										
8[1-8]	Before and after	No serious	Serious [a]	No Serious	No Serious	None	21,543	RR 1.15 (1.10 to 1.21)*	Very low	Critical
Educational materials (with or without incentives), or incentives alone vs. Control (no additional intervention) [Forest plot Figure 12; SR-ES 4.2]										
1[9]	RCT	No serious	n/a	No serious	Very serious [b]	None	400	Educational materials RR 1.03 (0.80 to 1.31)*	Low	Critical
1[10]	RCT	No serious	n/a	No serious	Very serious [b]	None	400	Incentives RR 1.11 (0.87 to 1.41)*	Low	Critical
1[11]	RCT	No serious	n/a	No serious	Serious [c]	None	400	Educational materials + incentives RR 1.17 (0.96 to 1.27)*	Moderate	Critical
Incentives vs. pre-intervention uptake [Forest plot Figure 11; SR-ES 4.3]										
1[12]	Before and after	No Serious	n/a	No Serious	Serious [c]	None	5,151	RR 1.10 (1.01 to 1.20)*	Very low	critical
Declination: internet-based vs. paper declination form [SR-ES 4.4]										
1[13]	Before and after	No serious	n/a	No serious	No serious	None	20,170	RR 1.99 (1.92 to 2.07)*	Low	critical
Access (+ usual care) vs. usual care alone [Forest plot Figure 13; SR-ES 5.1]										
2[14-15]	Before and after	Serious [d]	n/a (not pooled)	No Serious	Serious [e]	None	5,946	Intervn+UC vs. Usual care (free vac + educ + incentives) – yr1 RR 1.70 (1.66 to 1.74)*	Very low	critical

							25,000 estimated	Intervn+UC vs. Usual care (free vac) – yr1 RR 0.78 (0.76 to 0.79)*		
Multicomponent: Education and access vs. pre-intervention uptake [Forest plot Figure 14; SR-ES 45.1]										
9[16-24]	Before and after	No serious	Serious [a]	No Serious	No Serious	None	36,597	RR 3.34 (3.24 to 3.43)*	Very low	critical
Multicomponent: Mandatory flu vaccination + usual care (education, incentives and access) vs. usual care [Forest plot Figure 14; SR-ES 45.2]										
3[25-27]	Before and after	No serious	Serious [a]	No Serious	No Serious	None	43,022	RR 1.36 (1.35 to 1.37)*	Very low	critical
Multicomponent: Incentives and reminders + usual care (education, access) vs. usual care [Forest plot Figure 14; SR-ES 45.3]										
[28-30]	Before and after	No Serious	Serious [a]	No Serious	No Serious	None	36,283	RR 1.32 (1.30 to 1.34)*	Very low	critical
Multicomponent: Incentives, reminders and declination + usual care (education, access) vs. usual care [Forest plot Figure 14; SR-ES 45.4]										
1[31]	Before and after	No serious	n/a	No Serious	No Serious	None	9,214	RR 1.56 (1.52 to1.60)*	Low	critical
Multicomponent: Declination + usual care (education, access) vs. usual care [Forest plot Figure 14; SR-ES 45.5]										
1[32]	Before and after	No serious	n/a	No serious	No serious	None	26,000	RR 1.31 (1.30 to 1.33)*	Low	critical
Multicomponent: dedicated team and access [Forest plot Figure 14; SR-ES 45.6]										
5[33-37]	Before and after	No serious	Serious [a]	No serious	No serious	None	30,444	RR 1.48 (1.46 to 1.50)*	Very low	critical
1 de Juanes – year 1 - 2007 2 Girasek (Nurses) 1990 3 Girasek (Physicians) 1990 4 Harbarth 1998										

5 Sartor 2004
6 Smedley 2002
7 Song – year 1 - 2006
8 Song – year 2 - 2006
9 Doratotaj – educational materials vs. control- 2008
10 Doratotaj – incentives vs. control - 2008
11 Doratotaj – incentives and educational materials vs. control- 2008
12 Zimmerman – (incentives) – 2009
13 Bertin 2007
14 Lee 2007
15 Poland – year 1 – 2005
16 Begue 1998
17 de Juanes – year 2 - 2007
18 Hall 1998
19 Harbarth – education/access 1998*
20 Lopes 2008
21 Sartor – education/access 2004
22 Song - year 3 2006
23 Tapianen 2005
24 Zimmerman – access 2009
25 Gaughan 2010
26 Babcock – year 2 - 2010
27 Rakita – year 1 - 2010
28 Llupia 2010
29 Poland – year 3 – 2005
30 Zimmerman – access/incentives 2009
31 Ribnar 2008
32 Babcock – year 1 - 2010
33 Fedson 1996
34 McCullers 2006
35 Nichol 2005
36 Poland – year 4 2005
37 Shannon 1993

a Downgraded 1 level –serious inconsistency ($I^2 > 75\%$)
b Downgraded 2 levels - 95%CI crosses both lower and upper MID thresholds (RR 0.95 and RR 1.05)
c Downgraded 1 level - 95%CI crosses upper MID threshold (RR 1.05)
d Downgraded 1 level - potential confounding due to Yr1 vaccination shortage and delays (Poland 2005), and differential rates of reporting of vaccine delivery at worksite access points vs. clinics (Lee 2007)
e Downgraded 1 level - sample size estimated for Poland (2005).
*posthoc analysis completed by NICE team

I.5 GRADE profile 5

Outcome: increase the uptake of influenza vaccination among staff in health care settings [SR –Lam 2010]

Quality assessment								Effect	Quality	Rating
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of participants	Relative Risk (95% CI)		
Educational – material, sessions, reminders vs. control (no intervention / usual flu campaign) [Forest plot Figure 15; SR-ES 4.5]										
4[1-4]	2 cRCT and 2 RCT	No serious	Serious [a]	No Serious	No serious	None	6,085	RR 1.36 (1.23 to 1.50)	Moderate	Critical
Subgroup analysis – letter, awareness raising from a nurse, education and promotional material by setting (nursing homes or primary care) vs. no intervention / usual flu campaign [Forest plot Figure 15; SR-ES 4.5]										
1[1]	cRCT	No serious	n/a	No serious	No serious	None	2,132	RR 1.80 (1.33 to 2.43) – nursing homes	High	Critical
1[1]	cRCT	No serious	n/a	No serious	Very serious [b]	None	852	RR 1.04 (0.80 to 1.35) – primary care	Low	Critical
Subgroup analysis – campaign and mode of promotion (letter from chief of infectious diseases or personalised phone call) vs. no intervention / usual flu campaign [Forest plot Figure 15; SR-ES 4.5]										
1[4]	RCT	No serious	n/a	No serious	Very serious [b]	None	141	RR 1.77 (0.79 to 3.96) – phone call	Low	Critical
1[4]	RCT	No serious	n/a	No serious	No serious	None	355	RR 2.71 (1.53 to 4.81) - letter	High	Critical
Education and incentives vs. control or pre-intervention rate [Forest plot Figure 15; SR-ES 4.6]										
2[5-7]	1 RCT and 1 Controlled Before and After	No serious	No serious	No serious	Serious [c]	None	15,628	RR 1.03 (0.98 to 1.09)	Very low	Critical

Subgroup analysis: educational campaign plus incentives by professional group (direct patient care, indirect and business/administrative personnel) vs. pre-intervention uptake [Forest plot Figure 15; SR-ES 4.6]										
1[7]	Controlled before and after	No Serious	n/a	No Serious	Serious [c]	None	5,154	Direct patient care RR 1.11 (1.02 to 1.21)	Very low	Critical
1[7]	Controlled before and after	No Serious	n/a	No Serious	No serious	None	1,890	Indirect patient care RR 1.29 (1.12 to 1.50)	Low	Critical
1[7]	Controlled before and after	No Serious	n/a	No Serious	No serious	None	7,984	Business / admin personnel RR 0.86 (0.80 to 0.92)	Low	Critical
Multicomponent: Education and access vs. pre-intervention uptake [Forest plot Figure 16; SR-ES 45.7]										
2[8-9]	Controlled before and after	No serious	Serious [a]	No Serious	No serious	None	10,522	RR 1.28 (1.21 to 1.36)	Very low	Critical
Sub group analysis – Educational campaign plus increased access by professional group (direct patient care, indirect patient care) vs. pre-intervention uptake [Forest plot Figure 16; SR-ES 45.7]										
1[9]	Controlled before and after	No serious	n/a	No Serious	Serious [c]	None	3,708	Direct patient care RR 1.13 (1.03 to 1.24)	Very low	Critical
1[9]	Controlled before and after	No serious	n/a	No serious	Very serious [b]	None	1,300	Indirect patient care RR 1.01 (0.85 to 1.18)	Very low	Critical
Multicomponent: Education, access plus incentives vs. pre-intervention uptake [Forest plot Figure 17; SR-ES 45.8]										
1[10]	Controlled before and after	No Serious	n/a	No Serious	No serious	None	10,518	RR 1.18 (1.10 to 1.27)	Low	Critical

Sub group analysis - Educational campaign, increased access plus incentives by professional group (direct patient care, indirect patient care) vs. pre-intervention uptake [Forest plot Figure 17; SR-ES 45.8]										
1[10]	Controlled before and after	No serious	n/a	No Serious	No serious	None	7,747	<u>Direct patient care</u> RR 1.20 (1.11 to 1.30)	Low	Critical
1[10]	Controlled before and after	No serious	n/a	No serious	Serious [c]	None	2,771	<u>Indirect patient care</u> RR 1.13 (0.98 to 1.31)	Very low	Critical
Multicomponent: Feedback and increased access + standard campaign (education, free vaccine) vs. standard campaign only [Forest plot Figure 18; SR-ES 45.9]										
1[11]	Controlled before and after	No serious	n/a	No serious	Very serious [b]	None	371	RR 0.94 (0.80 to 1.12)	Very low	critical

1 Dey 2007*
2 Doratotaj – letter - 2008
3 Kimura – educational video and information - 2007
4 Ohrt 1992**
5 Doratotaj – letter and raffle - 2008
6 Doratotaj – raffle – 2008
7 Zimmerman – education and incentives - 2009
8 Harbarth 1998
9 Zimmerman – education and access – 2009
10 Zimmerman – education, incentives and access – 2009
11 Polgreen 2006

a Downgraded 1 level – serious inconsistency (I^2 > 75%)
b Downgraded 2 levels –95%CI crosses both lower and upper MID thresholds (RR 0.95 and RR 1.05)
c Downgraded 1 level – 95%CI crosses upper MID threshold (RR 1.05)
* the systematic review presented the Dey 2007 findings by setting (Primary Care and Care homes) for the purposes of this analysis they have been combined – a sub-group analysis presents the findings by setting
** the systematic review presented the Ohrt 1992 findings by specific educational intervention (letter and phone call) for the purposes of this analysis they have been combined – a sub-group analysis presents the findings by intervention

I.6 GRADE profile 6

Outcome: increase the uptake of influenza vaccination among hospital HCW [SR –Pitts 2014]

Quality assessment								Effect		
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**No. of participants**	**Relative Risk (95% CI)**	**Quality**	**Rating**
Mandatory flu vaccination vs. pre-intervention uptake [Forest plot Figure **19**; SR-ES 4.7]										
6[1-6]	6 Before and after studies	Serious [a]	Serious [b]	No Serious	No serious	None	105,538	RR 1.71 (1.70 to 1.72)	Very low	Critical

1 Babcock 2010
2 Feemster 2011
3 Huynh 2012
4 Karanfil 2011
5 Rakita 2010
6 Smith 2012

a Downgraded 1 level – the review identified at least one indication of elevated risk of bias in the majority of studies
b Downgraded 1 level – I^2 = 100%

I.7 GRADE profile 7

Outcome: relative risk of remaining unvaccinated among hospital HCW [SR – Lytras 2016]

Quality assessment								Effect		
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**No. of participants**	**Risk Ratio of being unvaccinated (95% CI)**	**Quality**	**Rating**
Multicomponent including awareness-raising [Forest plot Figure 20; SR-ES 4.8]										
23	RCT, cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	Serious [c]	None	Not reported	RR unvacc 0.83 (0.71 to 0.97)	Very Low	Critical

Multicomponent including education [Forest plot Figure 20; SR-ES 4.8]										
27	cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	Very serious [d]	None	Not reported	RR unvacc 0.96 (0.84 to 1.10)		
Multicomponent including incentives [Forest plot Figure 20; SR-ES 4.8]										
18	RCT, cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	Serious [c]	None	Not reported	RR unvacc 0.89 (0.77 to 1.03)		
Multicomponent including greater access [Forest plot Figure 20; SR-ES 4.8]										
11	cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	Serious [c]	None	Not reported	RR unvacc 0.88 (0.78 to 1.00)		
Multicomponent including soft mandates (refusal/declination statement) [Forest plot Figure 20; SR-ES 4.8]										
7	cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	No serious	None	Not reported	RR unvacc 0.64 (0.45 to 0.92)		
Multicomponent including hard mandates (mandatory vaccination policy) [Forest plot Figure 20; SR-ES 4.8]										
8	cRCT, cB&A, B&A	Very serious [a]	Serious [b]	No Serious	No serious	None	Not reported	RR unvacc 0.18 (0.08 to 0.45)		

GRADE based on systematic review and issues highlighted by authors, Lytras 2016

a. Downgraded 2 levels - domains conferring a high risk of bias were identified in most studies; out of the 11 RCTs or cRCTs, in 7 the method of randomization was unclear and 1 employed a factorial design with partial randomisation; allocation concealment in the 2 RCTs was unclear

b. Downgraded 1 level - substantial heterogeneity was identified; between-cluster variance t^2 was 0.083, while within-cluster variance ω^2 was zero, indicating no clustering of effects between studies performed on the same population or using the same control group. The I^2 statistic was 99.5%, meaning that almost the entire variance was due to differences between studies and not due to sampling; the large I^2 value is not unexpected though, given the large number of studies and the small standard errors for most of the effect estimates

c. Downgraded 1 level – 95%CI crosses lower MID threshold (RR 0.95)

d. Downgraded 2 levels – 95%CI crosses both lower and upper MID thresholds (RR 0.95 and RR 1.05)

Appendix J: Health economic evidence profiles

No health economic studies were identified that met inclusion criteria for this review

Appendix K: Forest plots

(includes post-hoc analyses of data for single studies undertaken by review team)

Figure 1: Education: Information session with slide show and videos vs. control (no action) – pre- to post-intervention change in flu vaccination uptake [GRADE profile 1; ES 4.1]

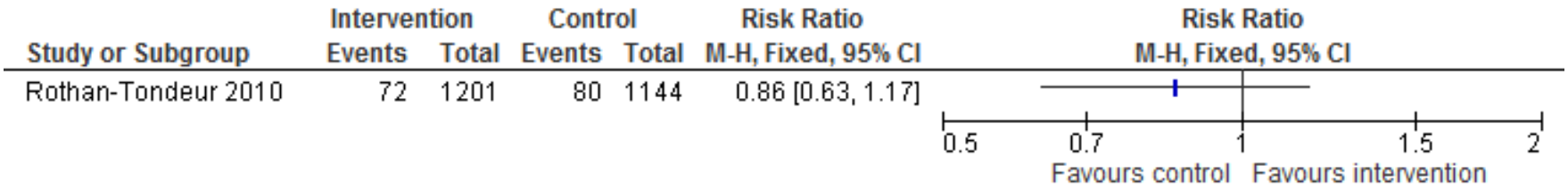


Figure 2: Attitude questionnaire scores (`1=strongly disagree; 5 = strongly agree') pre- and post-educational intervention for 1st year medical students [GRADE profile 2; ES 4.2]

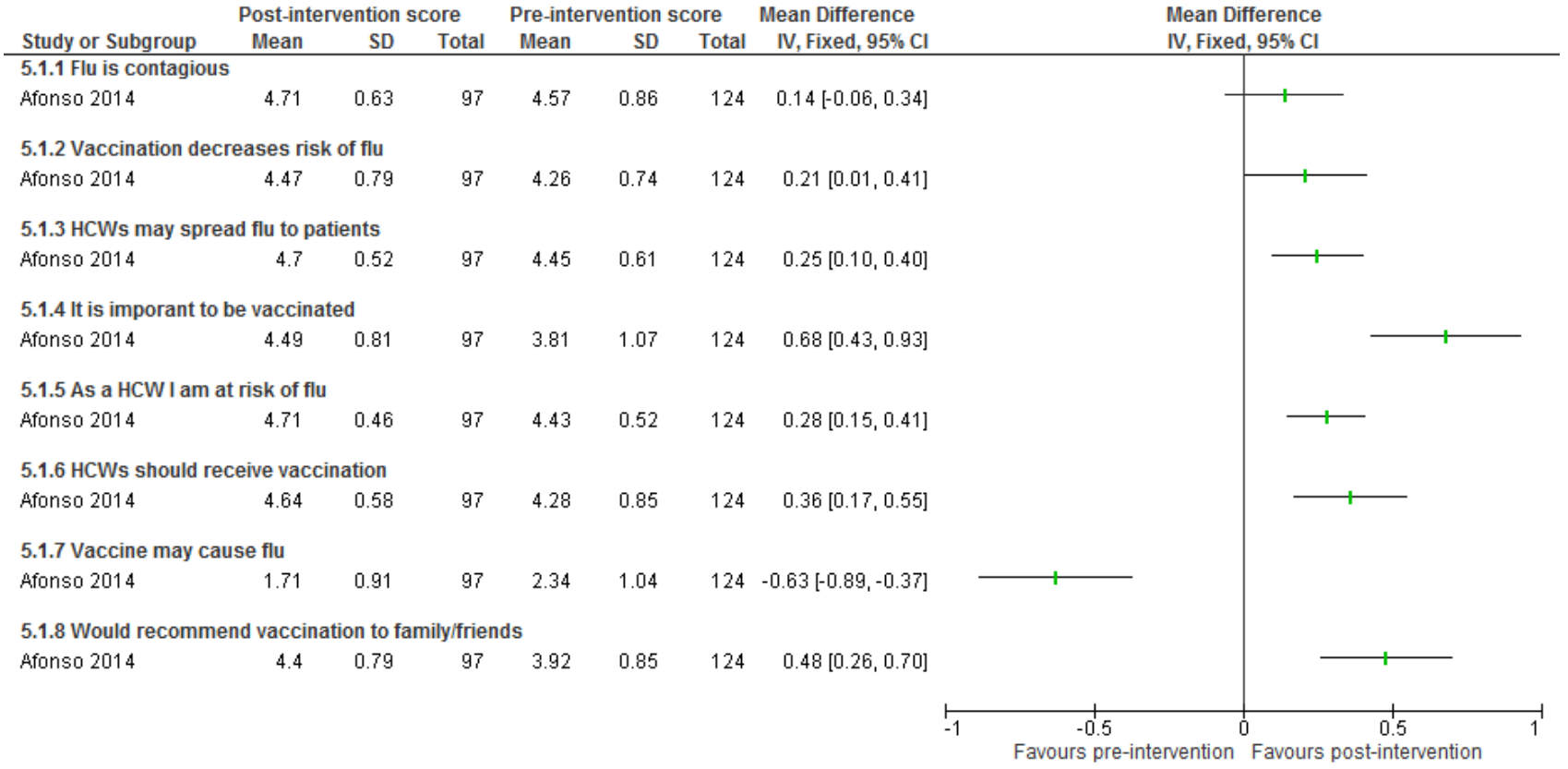


Figure 3: Education: Pre-campaign questionnaire based on question-behaviour effect vs. control (no questionnaire) - flu vaccination uptake [GRADE profile 1; ES 4.3]

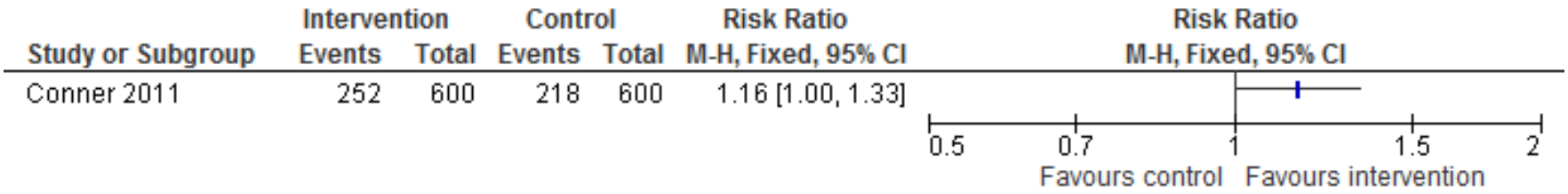


Figure 4: Mandatory vaccination with declination and mask wearing policy and alert system vs. usual care (pre-intervention) for flu vaccination uptake [GRADE profile 1; ES 4.6]

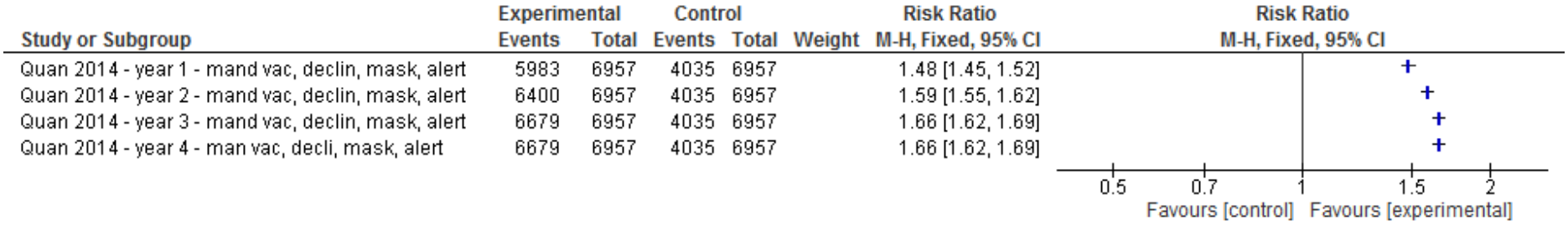


Figure 5: Declination: Opt-out strategy vs opt-in (usual care) for flu vaccination uptake [GRADE profile 1; ES 4.8]

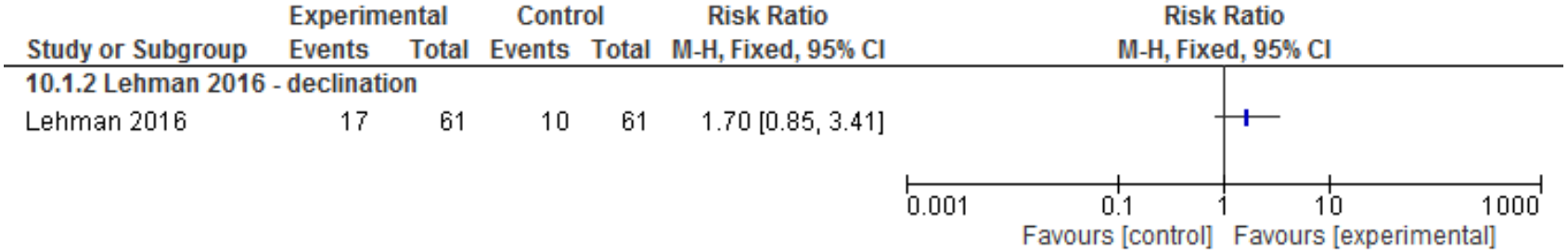


Figure 6: Multicomponent: Educational and access vs. usual care for flu vaccination uptake [GRADE profile 3; ES 45.1]

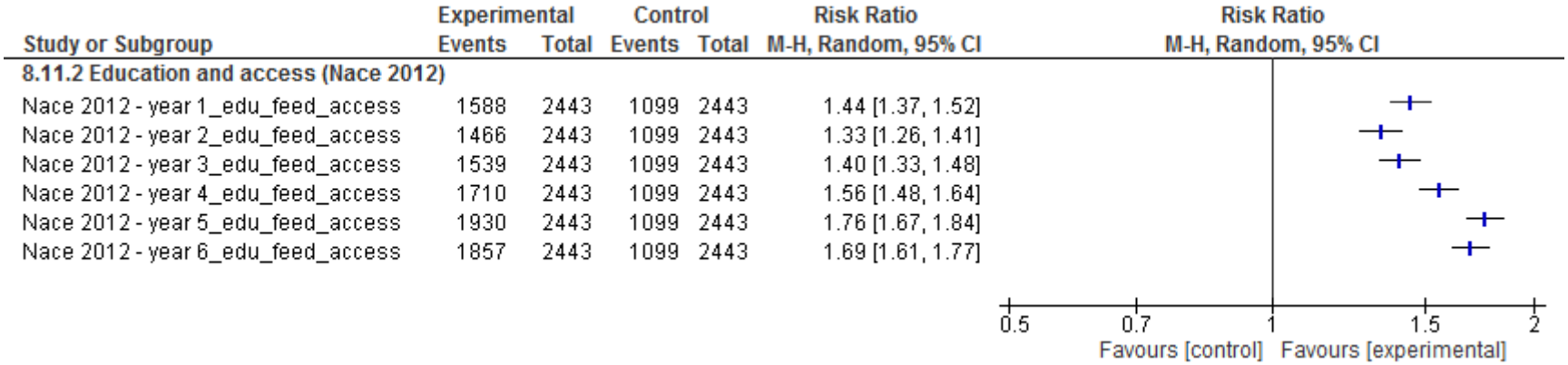


Figure 7: Educational, access and declination vs. no intervention (or intervention without declination) [GRADE profile 3; ES 45.3]

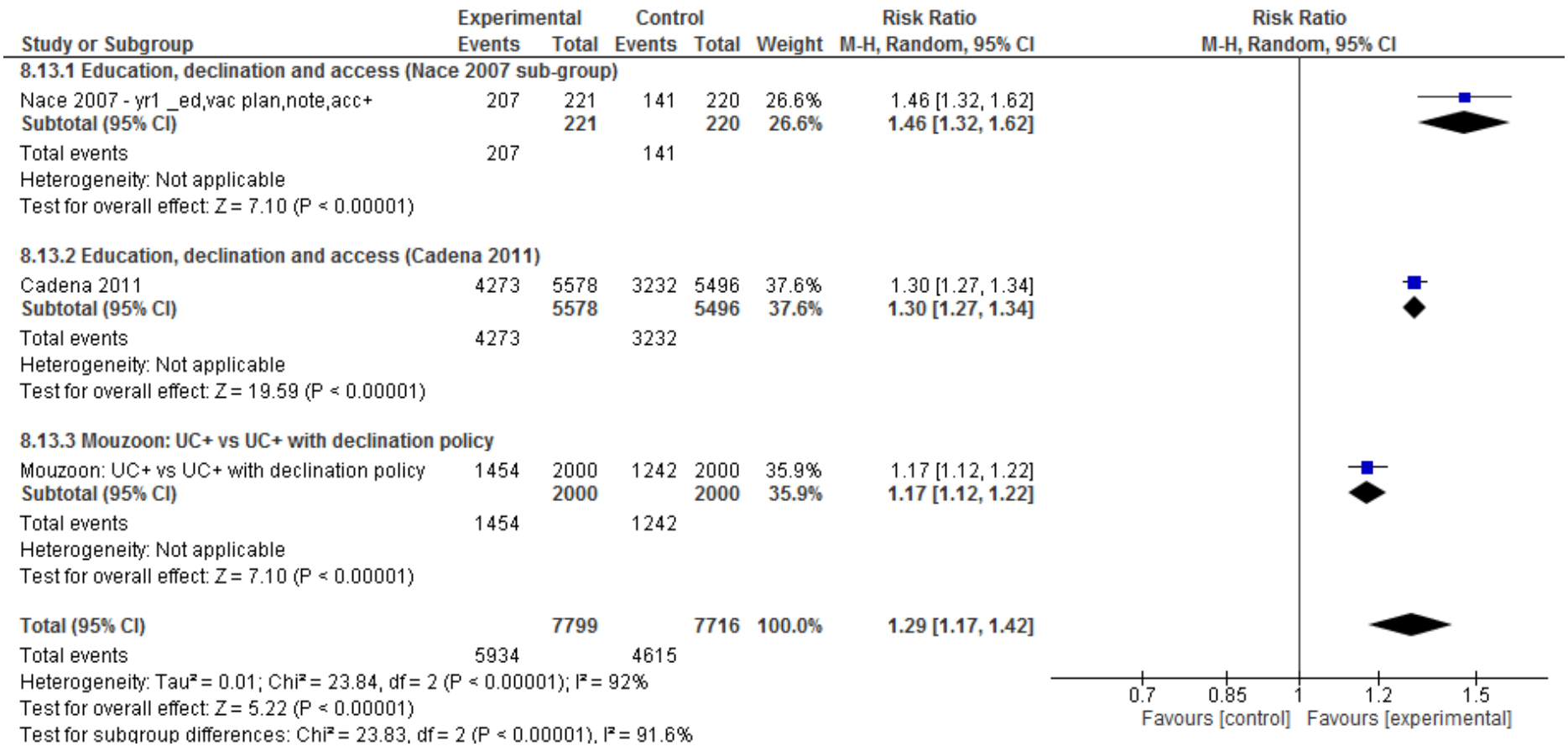


Figure 8: Subgroup analysis: year-on-year effect of education, access and declination vs. no intervention [GRADE profile 3; ES 45.3]

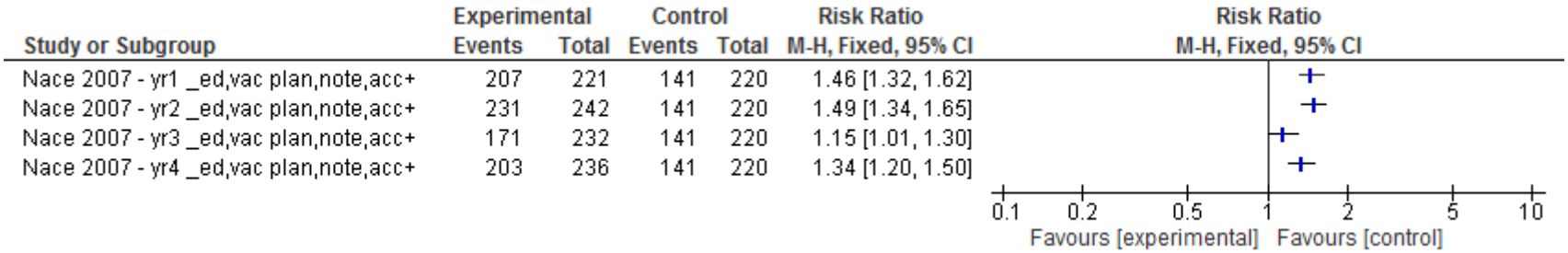


Figure 9: Multicomponent: Education, incentives and access vs. usual care (pre-intervention) [GRADE profile 3; ES 45.7]

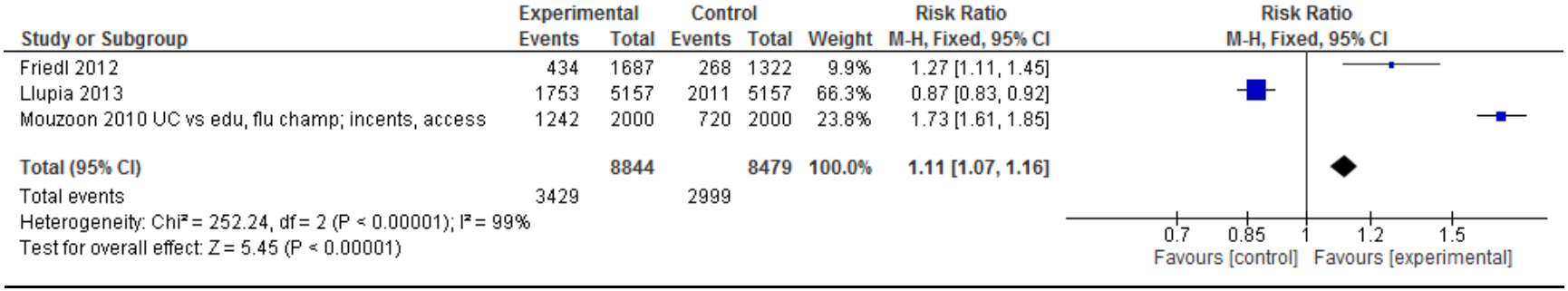


Fig. 9 Subgroup analysis: HCWs with direct vs. indirect contact [GRADE profile 3; ES 45.7]

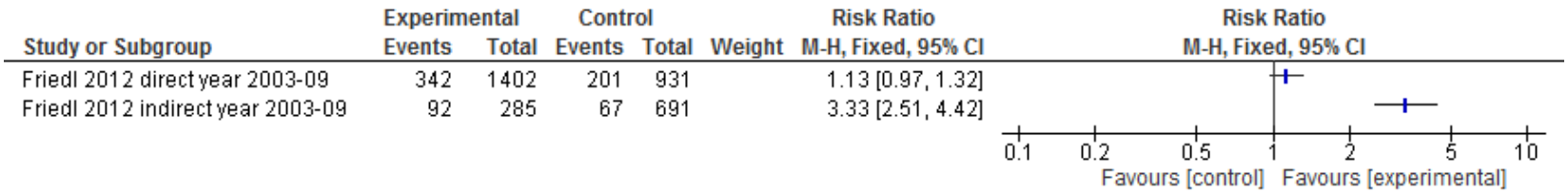


Fig. 9 Subgroup analysis: HCWs by professional group [GRADE profile 3; ES 45.7]

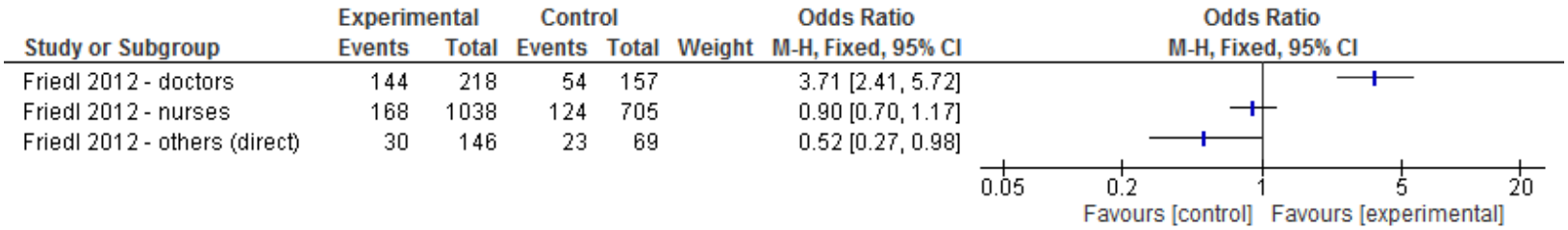


Figure 10: Mandatory flu vaccination + multicomponent intervention vs. baseline (pre-intervention) - vaccination uptake [GRADE profile 3; ES 45.11]

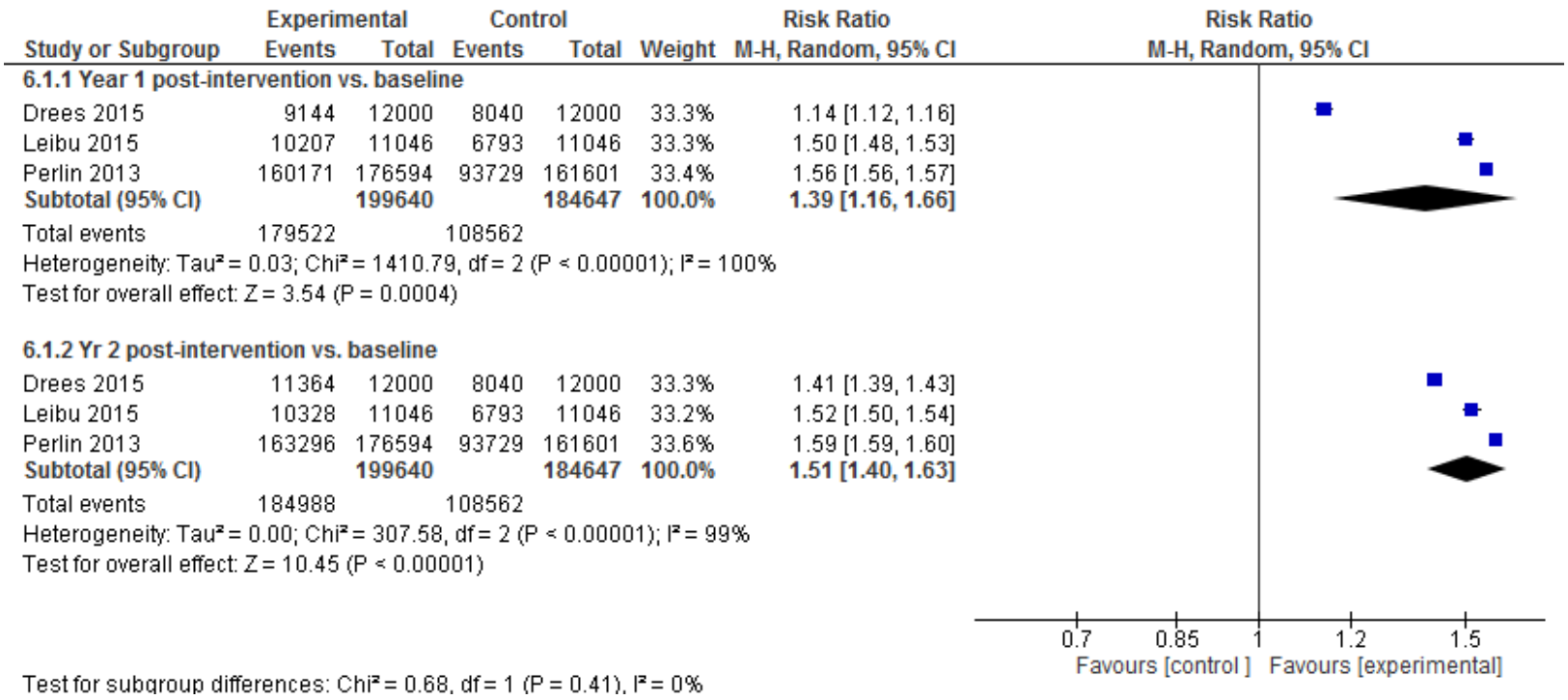
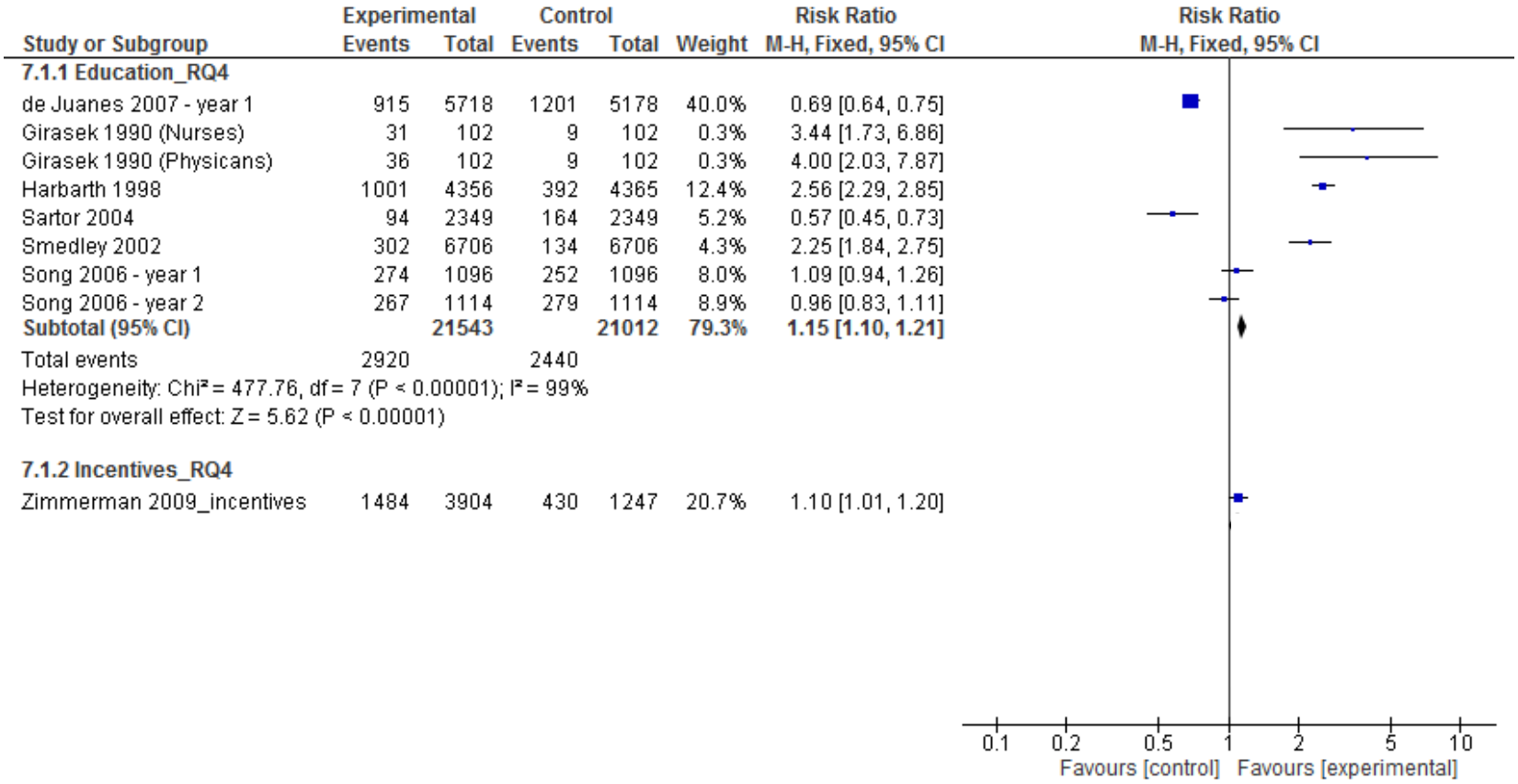


Figure 11: Forest plots: Hollymeyer 2012 (SR) [GRADE profile 4]

RQ 4: Education [SR-ES 4.1]; RQ 4: Incentives [SR-ES 4.3]



Forest plots: Hollymeyer 2012 (SR) [GRADE profile 4]

Figure 12: RQ 4: Education vs incentives vs both [SR-ES 4.2]

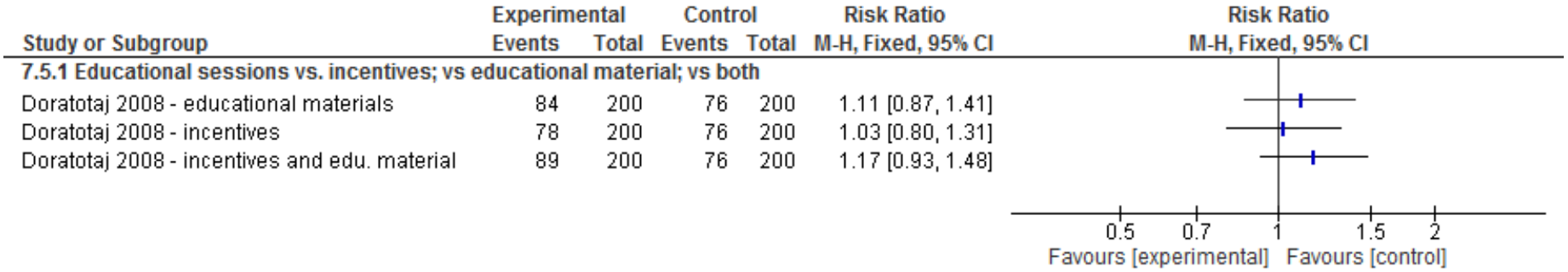
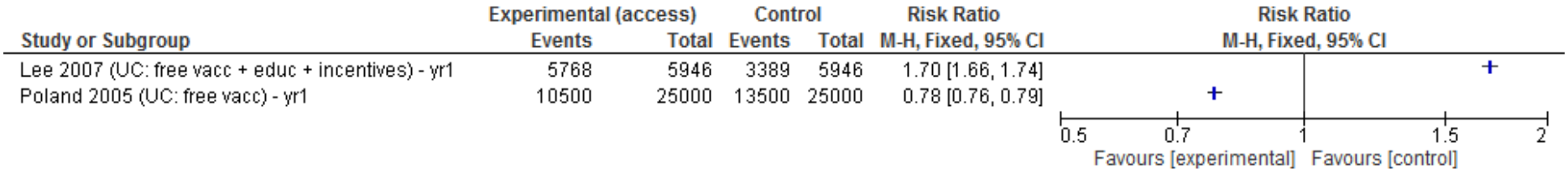
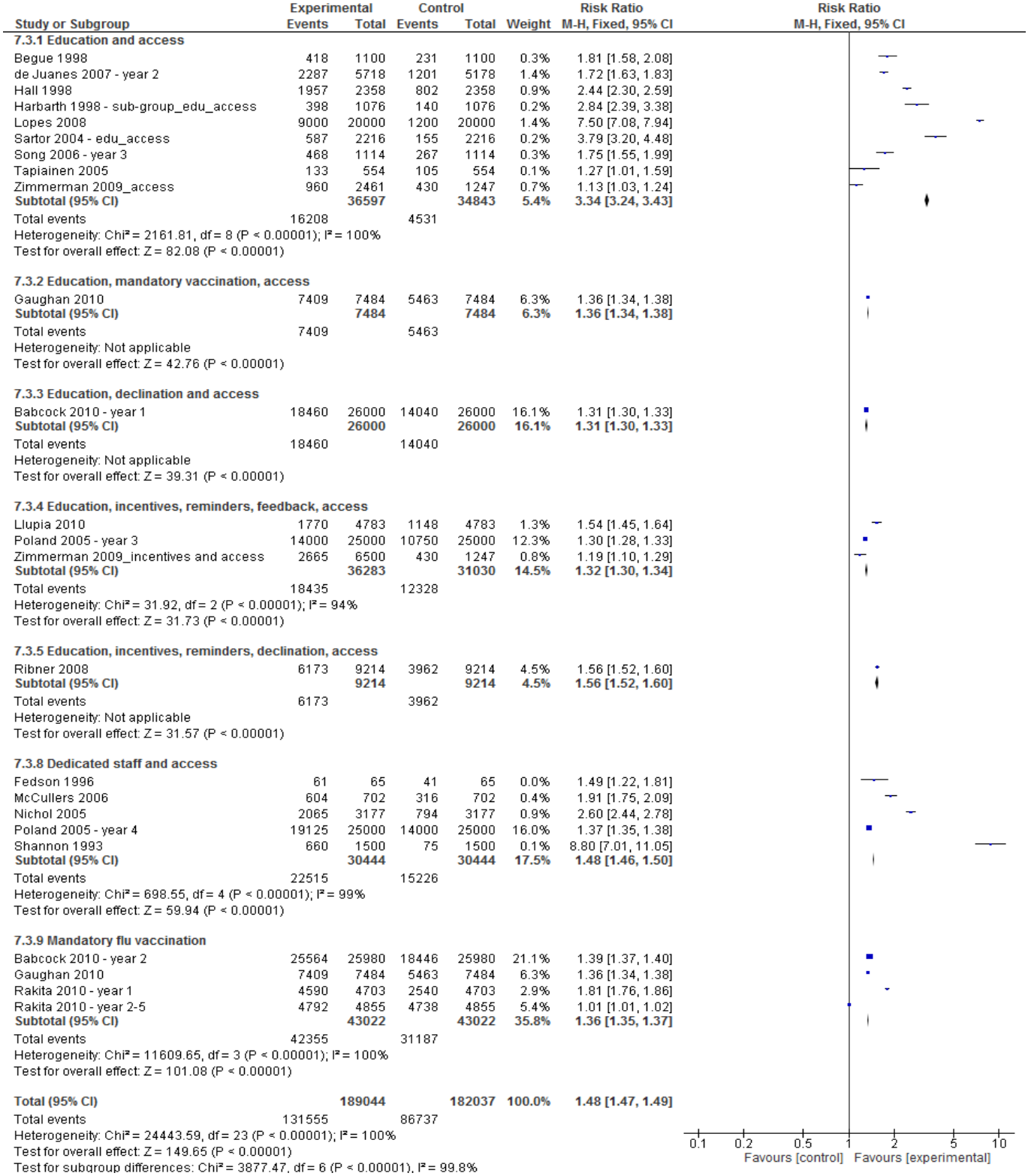


Figure 13: RQ5: Flexible access + usual care vs. usual care (no flexible access) [GRADE profile 4; SR-ES 5.1]



Source: Hollmeyer 2012 (systematic review)

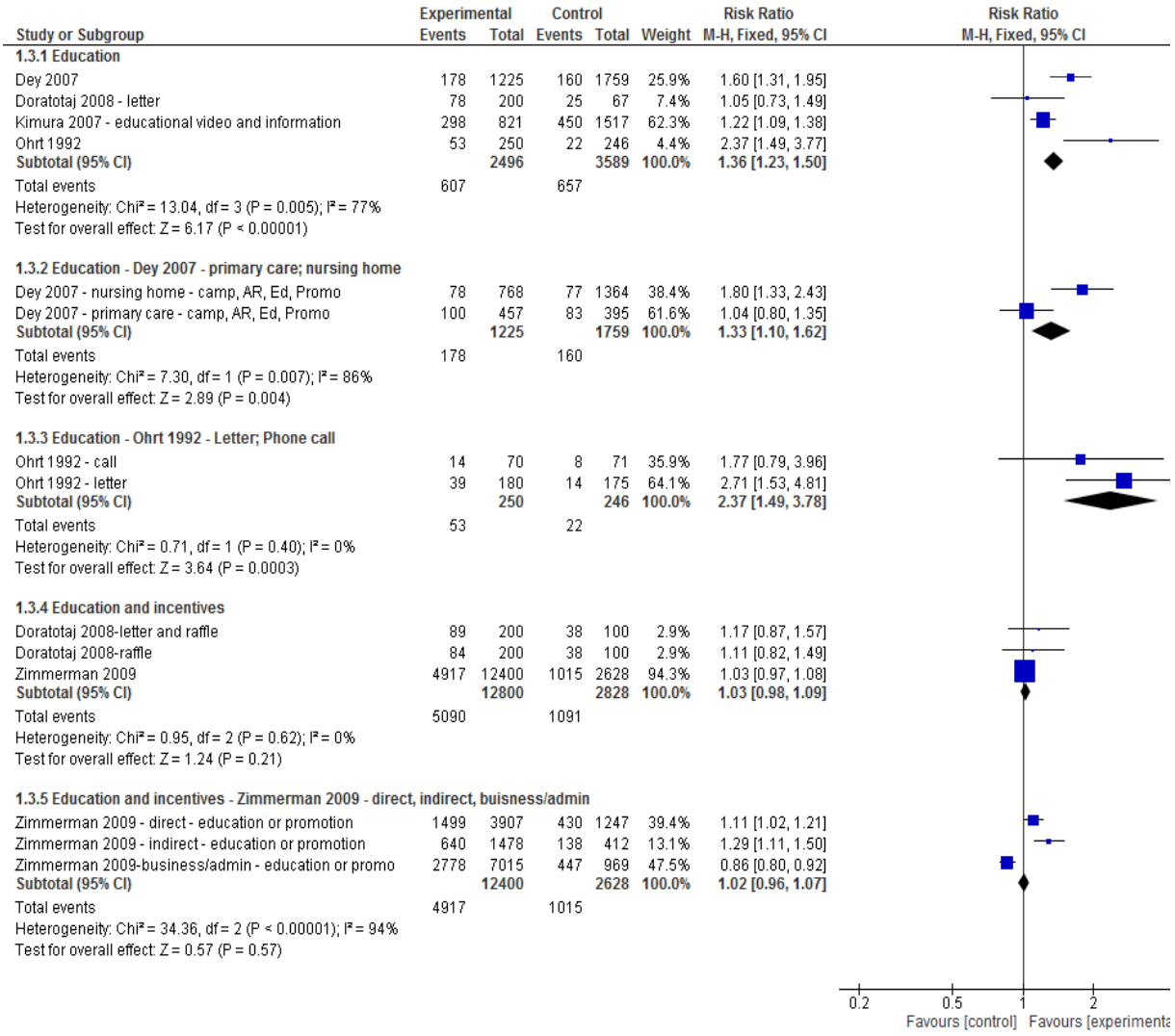
Figure 14: Multicomponent interventions [GRADE profile 4; SR-ES 45.1 to SR-ES 45.6]



Source: Hollmeyer 2012 (systematic review)

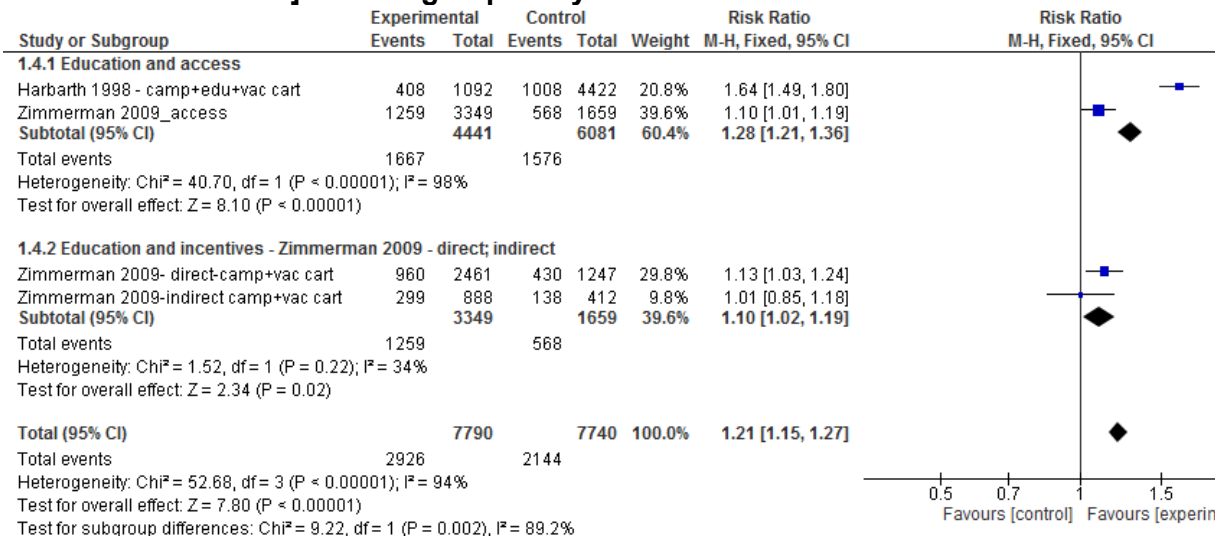
Forest plots: Lam 2010 (SR) [GRADE profile 5]

Figure 15: RQ 4: Education [SR-ES 4.5] and subgroup analyses; RQ 4: Education plus incentives [SR-ES 4.6] and subgroup analyses



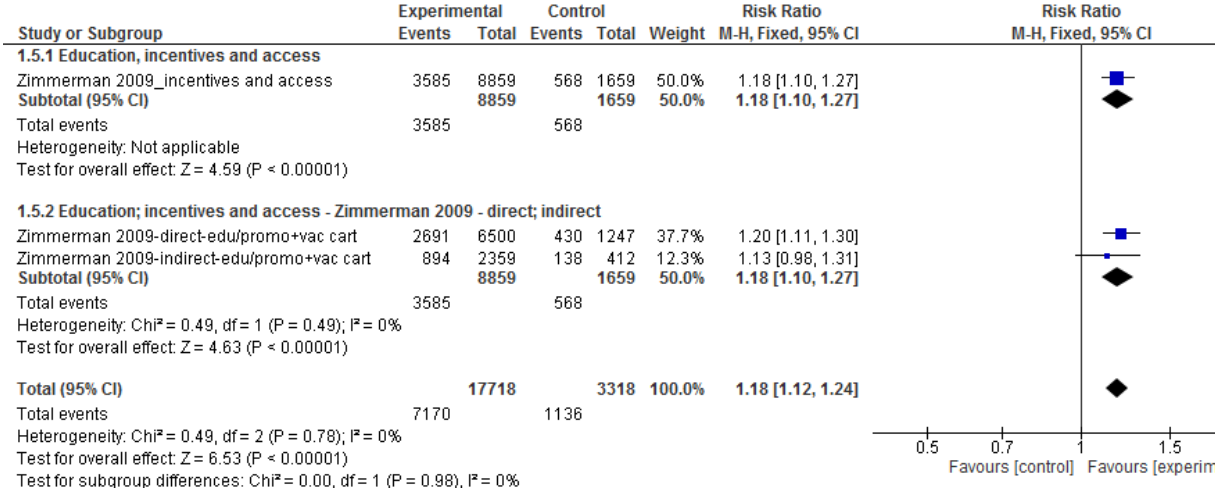
Source: Lam 2010 (systematic review)

Figure 16: Multicomponent interventions: Education and access [GRADE profile 5; SR-ES 45.7] and subgroup analysis



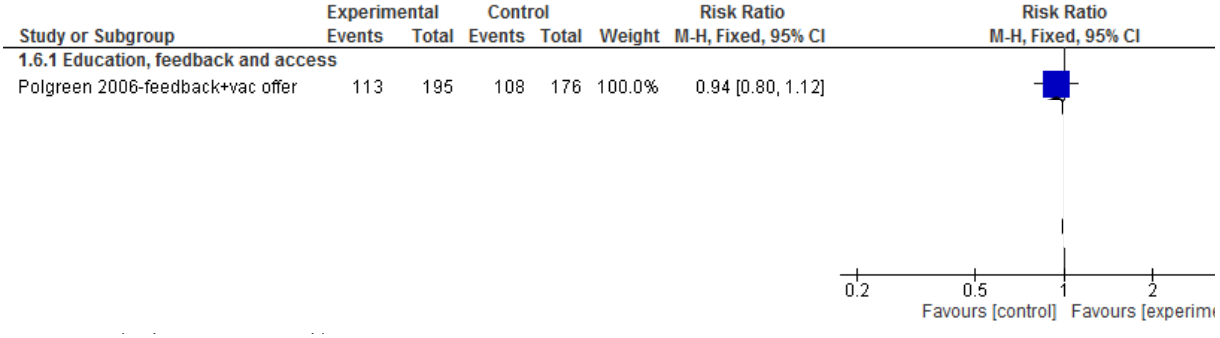
Source: Lam 2010 (systematic review)

Figure 17: Education, incentives and access [GRADE profile 5; SR-ES 45.8] and subgroup analysis



Source: Lam 2010 (systematic review)

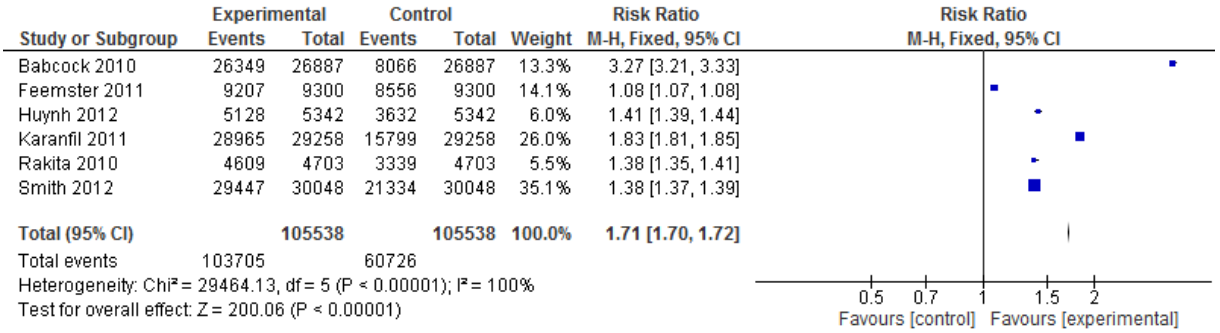
Figure 18: Education, feedback and access [GRADE profile 5; SR-ES 45.9]



Source: Lam 2010 (systematic review)

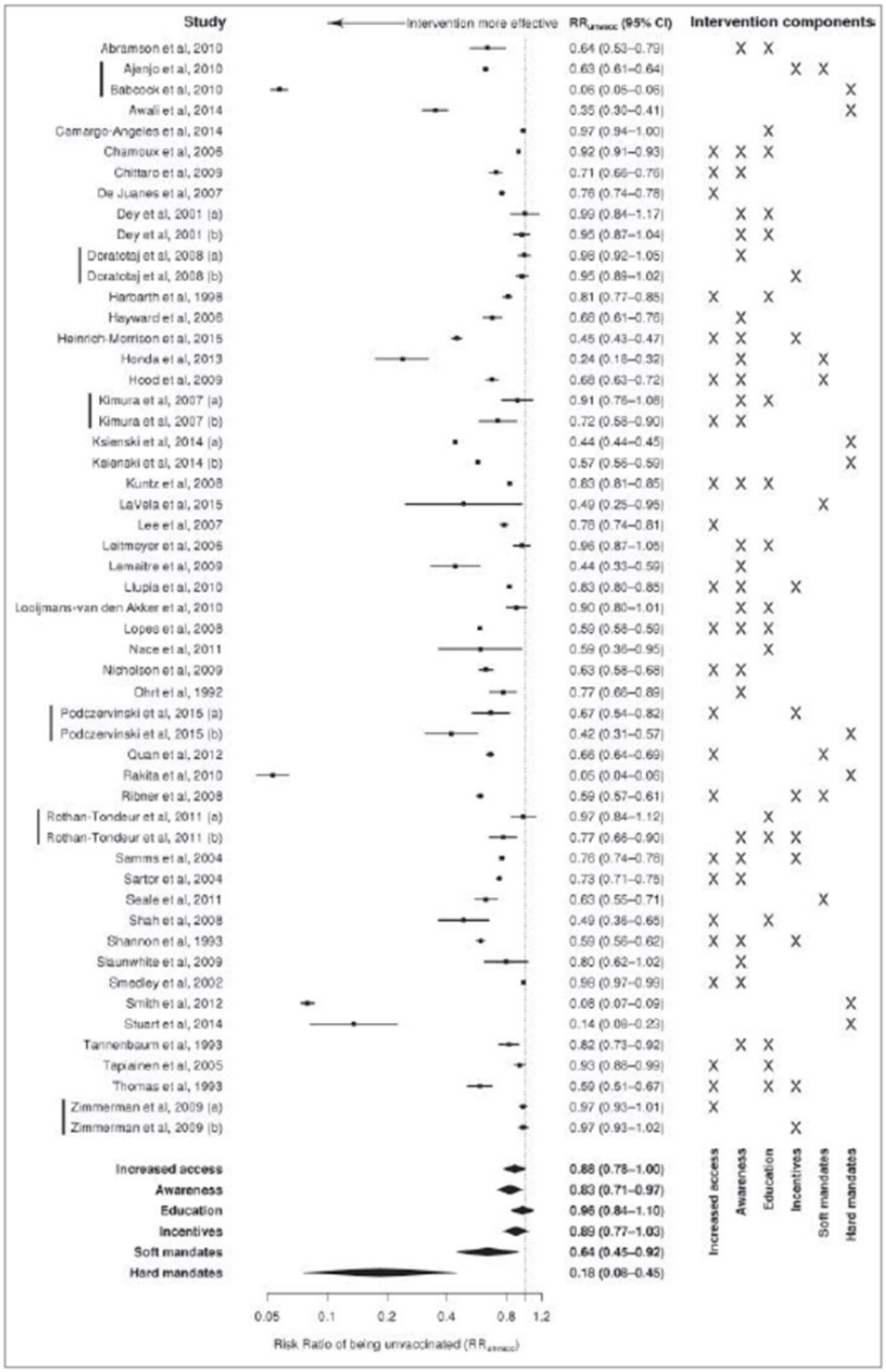
Forest plot: Pitts 2014 (SR) [GRADE profile 6]

Figure 19: RQ 4: Mandatory flu vaccination policy [GRADE profile 6; SR-ES 4.7]



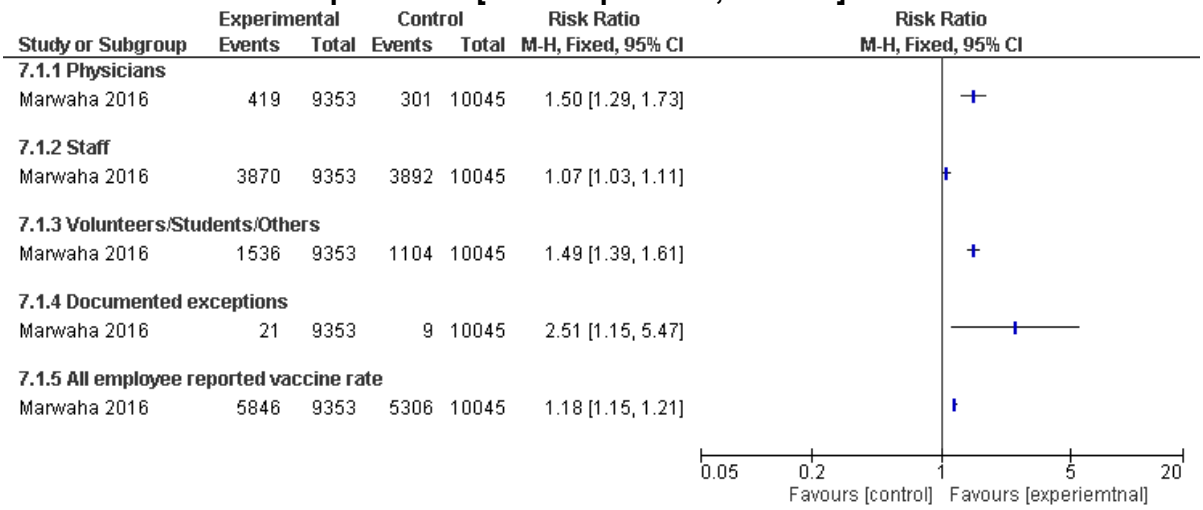
Source: Pitts 2014 (systematic review)

Figure 20: Forest plot: Lytras 2016 (SR) taken directly from the SR [GRADE profile 7 - SR ES 45.8] *taken from individual studies - random-effects meta-regression model (logarithmic scale). Vertical bars before study names indicate comparisons that are clustered together*



Source: Lytras 2016 (systematic review)

Figure 21: Incentive-based flu campaign, plus access and feedback vs. pre-intervention uptake rate [GRADE profile 3; ES 45.8]



Source: Marwaha 2016

Appendix L: Excluded studies

Study citation	Reason for exclusion
Abramson Zvi Howard, and Miskin Ian Nigel (2010) Increasing rates of flu vaccination in primary care staff. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 182(12), 1331	Included within a systematic review included in this review
Ajenjo M Cristina, Woeltje Keith F, Babcock Hilary M, Gemeinhart Nancy, Jones Marilyn, and Fraser Victoria J (2010) Influenza vaccination among healthcare workers: ten-year experience of a large healthcare organization. Infection control and hospital epidemiology 31(3), 233-40	Included within a systematic review included in this review
Allsup S, Gosney M, Haycox A, and Regan M (2003) Cost-benefit evaluation of routine influenza immunisation in people 65-74 years of age. Health technology assessment (Winchester, and England) 7(24), iii-65	Not a relevant population
Awali Reda A, Samuel Preethy S, Marwaha Bharat, Ahmad Nazir, Gupta Puneet, Kumar Vinod, Ellsworth Joseph, Flanagan Elaine, Upfal Mark, Russell Jim, Kaplan Carol, Kaye Keith S, and Chopra Teena (2014) Understanding health care personnel's attitudes toward mandatory influenza vaccination. American Journal of Infection Control 42(6), 649-652	Included within a systematic review included in this review
Aziz Ann-Marie (2013) Improving influenza vaccine uptake in frontline staff. British journal of nursing (Mark Allen Publishing) 22(21), 1214-20	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Babcock Hilary M, Gemeinhart Nancy, Jones Marilyn, Dunagan W Claiborne, and Woeltje Keith F (2010) Mandatory influenza vaccination of health care workers: translating policy to practice. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 50(4), 459-64	Included within a systematic review included in this review
Ballestas T, McEvoy S, and Doyle J (2009) Co-ordinated approach to healthcare worker influenza vaccination in an area health service. Journal of Hospital Infection 73(3), 203-209	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Banach David B, Zhang Cen, Factor Stephanie H, and Calfee David P (2013) Support for mandatory health care worker influenza vaccination among allied health professionals, technical staff, and medical students. American journal of infection control 41(4), 354-6	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Baron-Epel O, Madjar B, Grefat R, and Rishpon S (2013) Trust and the demand for autonomy may explain the low rates of immunizations among nurses. Human Vaccines and Immunotherapeutics 9(1), 100-107	Not a relevant country
Begue R E, and Gee S Q (1998) Improving influenza immunization among healthcare workers. Infection control and hospital epidemiology 19(7), 518-20	Included within a systematic review included in this review
Belisle Pipon, Jean-Christophe , and Frenette Marjolaine (2013) Mandatory influenza vaccination: how far to go and whom to target without evidence?. The American journal of bioethics : AJOB 13(9), 48-50	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)

Study citation	Reason for exclusion
Berkman Nancy D, Sheridan Stacey L, Donahue Katrina E, Halpern David J, Viera Anthony, Crotty Karen, Holland Audrey, Brasure Michelle, Lohr Kathleen N, Harden Elizabeth, Tant Elizabeth, Wallace Ina, and Viswanathan Meera (2011) Health literacy interventions and outcomes: an updated systematic review. Evidence report/technology assessment (199), 1-941	Not a relevant intervention
Bernstein Henry H, Starke Jeffrey R, American Academy of Pediatrics. Committee on Infectious, and Diseases (2010) Policy statement--recommendation for mandatory influenza immunization of all health care personnel. Pediatrics 126(4), 809-15	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Bertin Mary, Scarpelli Michele, Proctor Andrew W, Sharp John, Robitson Ethel, Donnelly Todd, Young Claire, and Gordon Steven M (2007) Novel use of the intranet to document health care personnel participation in a mandatory influenza vaccination reporting program. American journal of infection control 35(1), 33-7	Included within a systematic review included in this review
Betsch C (2014) Overcoming healthcare workers vaccine refusal--competition between egoism and altruism. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 19(48), 20979	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Blank Patricia R, Schwenkglenks Matthias, and Szucs Thomas D (2009) Vaccination coverage rates in eleven European countries during two consecutive influenza seasons. The Journal of infection 58(6), 446-58	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Block Lauren, Pitts Samantha, and Perl Trish M (2014) Barriers and facilitators of implementation of a mandate for influenza vaccination among healthcare personnel. Infection control and hospital epidemiology 35(6), 724-7	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Booy R, Rashid H, Yin J K, Khandaker G, and Leask J (2011) Mandating influenza vaccination in health-care workers. The Lancet 378(9803), 1626	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Borlaug Gwen, Newman Alexandra, Pfister John, and Davis Jeffrey P (2007) Factors that influenced rates of influenza vaccination among employees of Wisconsin acute care hospitals and nursing homes during the 2005-2006 influenza season. Infection control and hospital epidemiology 28(12), 1398-1400	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Born K, Ikura S, and Laupacis A (2015) The evidence, ethics and politics of mandatory health care worker vaccination. Journal of Health Services Research and Policy 20(1), 1-3	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Braxton Jemecia Capri (2011) Do multiple interventions improve influenza vaccination compliance rates among nursing staff at the Hampton Veterans Administration Medical Center?. Dissertation Abstracts International: Section B: The Sciences and Engineering 72(3-B), 1411	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Bronchetti Erin Todd, Huffman David B, and Magenheim Ellen (2015) Attention, intentions, and follow-through in preventive health behavior: Field experimental evidence on flu vaccination. Journal of Economic Behavior & Organization 116, 270-291	Not a relevant population

Study citation	Reason for exclusion
Brusaferro S, Chittaro M, De Carli , G , Raffaele B, and Puro V (2004) Italian hospitals policies for the prevention of influenza in health care workers. Journal of Preventive Medicine and Hygiene 45(1-2), 9-11	Not a relevant intervention
Bryant Kristina A, Stover Beth, Cain Linda, Levine Gail L, Siegel Jane, and Jarvis William R (2004) Improving influenza immunization rates among healthcare workers caring for high-risk pediatric patients. Infection control and hospital epidemiology 25(11), 912-7	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Buchta William G (2012) Research doesn't support mandatory influenza vaccination. WMJ : official publication of the State Medical Society of Wisconsin 111(3), 96	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Butteri Matthew J, Radu Charlotte, Huq Fawzia, Wiglesworth Aileen, Durso Samuel C, and Bellantoni Michele (2010) Flu in 15: a novel 15-minute education program to promote acceptance of the influenza vaccine among health care workers. Journal of the American Medical Directors Association 11(7), 523-7	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Campbell L J, Li Q, and Li Y (2014) Health Care Worker Influenza Vaccination in Oregon Nursing Homes: Correlates of Facility Characteristics. Journal of the American Medical Directors Association 15(11), 847-849	No relevant outcome reported
Campos-Outcalt D (2007) Flu vaccination rates: How can you do better?. Journal of Family Practice 56(10), 825-828	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Caplan Arthur (2011) Time to mandate influenza vaccination in health-care workers. Lancet (London, and England) 378(9788), 310-1	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Caplan Arthur, and Shah Nirav R (2013) Managing the human toll caused by seasonal influenza: New York State's mandate to vaccinate or mask. JAMA 310(17), 1797-8	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Cassells N C. L, and Ball D R (2014) Reactance and dissonance may reduce vaccination rates. Anaesthesia 69(4), 395	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Cella M T, Corona G, Tuccillo E, and Franco G (2005) [Assessment of efficacy and economic impact of an influenza vaccination campaign in the personnel of a health care setting]. Medicina del lavoro 96(6), 483-9	Not in English
Centers for Disease, Control , and Prevention (2005) Interventions to increase influenza vaccination of health-care workers--California and Minnesota. MMWR. Morbidity and mortality weekly report 54(8), 196-9	Included within a systematic review included in this review
Chambers L W, Wilson K, Hawken S, Puxty J, Crowe L, Lam P, Farmanova-Haynes E, McNeil S A, and McCarthy A E (2012) Impact of the Ottawa Influenza Decision Aid on healthcare personnel's influenza immunization decision: a randomized trial. The Journal of hospital infection 82(3), 194-202	Not a relevant intervention
Chan S. W (2008) Influenza vaccination for healthcare workers: Is it really as effective as we claim?. Vaccine 26(26), 3189	Exclude on study type (narrative review, letter,

Study citation	Reason for exclusion
	commentary, opinion piece, conference abstract)
Chapman Gretchen B, Li Meng, Vietri Jeffrey, Ibuka Yoko, Thomas David, Yoon Haewon, and Galvani Alison P (2012) Using Game Theory to Examine Incentives in Influenza Vaccination Behavior. Psychological Science 23(9), 1008-1015	Not a relevant population
Chean R, Ferguson J K, and Stuart R L (2014) Mandatory seasonal influenza vaccination of health care workers: A way forward to improving influenza vaccination rates. Healthcare Infection 19(2), 42-44	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Chittaro M, Turello D, Calligaris L, Farneti F, Faruzzo A, Fiappo E, Panariti M, and Brusaferro S (2009) Impact of vaccinating HCWs on the ward and possible influence of avian flu threat. Infection 37(1), 29-33	Included within a systematic review included in this review
Clarke Christopher E, and McComas Katherine (2012) Seeking and processing influenza vaccine information: a study of health care workers at a large urban hospital. Health communication 27(3), 244-56	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Conner Mark, Godin Gaston, Norman Paul, and Sheeran Paschal (2011) Using the question-behavior effect to promote disease prevention behaviors: two randomized controlled trials. Health psychology : official journal of the Division of Health Psychology, and American Psychological Association 30(3), 300-9	Duplicate
Connolly B, Connolly M, and Rochford S (2009) Uptake of influenza immunisation among GPs in the Cork area. Irish medical journal 102(6), 193-4	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Control European Centre for Disease Prevention and (2013) Review of the scientific literature on drivers and barriers of seasonal influenza vaccination coverage in the EU/EEA. : ,	Included within a systematic review included in this review
Converso A, O'Neal D, and Olsen D (2010) Mandatory flu vaccination for health care workers. American Journal of Nursing 110(1), 26-28	Not a relevant intervention
Converso Ann R (2010) Point counterpoint: mandatory flu vaccination for health care workers. The American journal of nursing 110(1), 27	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Cooper Elizabeth, and O'Reilly Mary (2002) A novel staff vaccination strategy. Infection control and hospital epidemiology 23(5), 232-3	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Couto Carla R, Pannuti Claudio S, Paz Jose P, Jr , Fink Maria C. D, Machado Alessandra A, de Marchi , Michela , and Machado Clarisse M (2012) Fighting misconceptions to improve compliance with influenza vaccination among health care workers: an educational project. PloS one 7(2), e30670	No relevant outcome reported
Crupi Robert S, Di John , David , Mangubat Peter Michael, Asnis Deborah, Devera Jaime, Maguire Paul, and Palevsky Sheila L (2010) Linking emergency preparedness and health care worker vaccination against influenza: a novel approach. Joint Commission journal on quality and patient safety / Joint Commission Resources 36(11), 499-503	Unavailable

Study citation	Reason for exclusion
Davis C (2006) Opportunistic health promotion. Independent Nurse , 41	Unavailable
D'Costa D (2012) Big brother with little evidence for mandatory vaccination of healthcare professionals. BMJ (Online) 344(7862), no pagination	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
De Alwis , K L N. S. K, Dunt D, Bennett N, and Bull A (2010) Increasing vaccination among healthcare workers - Review of strategies and a study of selected Victorian hospitals. Healthcare Infection 15(3), 63-69	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
de Juanes , J R, Garcia de Codes, A , Arrazola M P, Jaen F, Sanz M I, and Gonzalez A (2007) Influenza vaccination coverage among hospital personnel over three consecutive vaccination campaigns (2001-2002 to 2003-2004). Vaccine 25(1), 201-4	Included within a systematic review included in this review
DeAngelis C D, Raszka W V, Jr , Westbrook C D, Chamberlin S M, and Zimmerman J L (1996) Influenza immunization rates among pediatric health care providers. Archives of Pediatrics and Adolescent Medicine 150(12), 1311-1313	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Derber C J, and Shankaran S (2012) Health-care worker vaccination for influenza: Strategies and controversies. Current Infectious Disease Reports 14(6), 627-632	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Dey P, Halder S, Collins S, Benons L, and Woodman C (2001) Promoting uptake of influenza vaccination among health care workers: a randomized controlled trial. Journal of public health medicine 23(4), 346-8	Included within a systematic review included in this review
Doratotaj Shirin, Macknin Michael L, and Worley Sarah (2008) A novel approach to improve influenza vaccination rates among health care professionals: a prospective randomized controlled trial. American journal of infection control 36(4), 301-3	Included within a systematic review included in this review
Duclos A, and Voirin N (2008) High quality evidence from vaccine field studies is needed to recommend influenza vaccination of hospital staff in the acute care setting. Vaccine 26(52), 6741-6742	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Dunais B, Saccomano C, Mousnier A, Roure M C, Dellamonica P, and Roger P M (2006) Influenza vaccination: Impact of an intervention campaign targeting hospital staff [1]. Infection Control and Hospital Epidemiology 27(5), 529-531	Not a relevant intervention
Duncan Ian G, Taitel Michael S, Zhang Junjie, and Kirkham Heather S (2012) Planning influenza vaccination programs: a cost benefit model. Cost effectiveness and resource allocation : C/E 10(1), 10	Not a relevant population
Eisenberg Seth (2011) Would mandatory vaccines protect nurses and patients?. ONS connect 26(2), 13	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Ejeta L T, Ardalan A, and Paton D (2015) Application of behavioral theories to disaster and emergency health preparedness: A systematic review. PLoS Currents 7(DISASTERS), no pagination	Not a relevant intervention
Employers NHS (2015) Good Practice (case studies of flu fighter award winners). ,	Exclude on study type (narrative review, letter,

Study citation	Reason for exclusion
	commentary, opinion piece, conference abstract)
Ernsting Anna, Schwarzer Ralf, Lippke Sonia, and Schneider Michael (2013) 'I do not need a flu shot because I lead a healthy lifestyle': Compensatory health beliefs make vaccination less likely. Journal of Health Psychology 18(6), 825-836	Not a relevant population
Esolen Lisa M, and Kilheeney Kimberly L (2014) Sustaining high influenza vaccination compliance with a mandatory masking program. Infection control and hospital epidemiology 35(5), 603-4	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Esolen Lisa M, Kilheeney Kimberly L, Merkle Richard E, and Bothe Albert (2011) An alternate approach to improving healthcare worker influenza vaccination rates. Infection control and hospital epidemiology 32(7), 703-5	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Falagas M E, and Zarkadoulia E (2008) Factors associated with suboptimal compliance to vaccinations in children in developed countries: A systematic review. Current Medical Research and Opinion 24(6), 1719-1741	Not a relevant population
Fedson D S, and Nichol K L (2006) Influenza vaccination: Policy versus evidence [1]. British Medical Journal 333(7576), 1020	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Ferris Christopher George (2012) Use of intranet and other interventions to increase influenza vaccination among health care workers. Dissertation Abstracts International Section A: Humanities and Social Sciences 72(11-A), 4328	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
FitzSimons David, Hendrickx Greet, Lernout Tinne, Badur Selim, Vorsters Alex, Van Damme , and Pierre (2014) Incentives and barriers regarding immunization against influenza and hepatitis of health care workers. Vaccine 32(38), 4849-54	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Floyd Brian (2013) Mandatory influenza vaccination program proves successful in its first year. North Carolina medical journal 74(5), 426	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Fortunato Francesca, Tafuri Silvio, Cozza Vanessa, Martinelli Domenico, and Prato Rosa (2015) Low vaccination coverage among italian healthcare workers in 2013. Human vaccines & immunotherapeutics 11(1), 133-9	No relevant outcome reported
Foster Donna (2008) Influenza vaccination. AAOHN journal : official journal of the American Association of Occupational Health Nurses 56(10), 409-11	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Franco Giuliano, Cella Maria T, Tuccillo Elvira, Ferrari Francesco, Minisci Emanuele, and Fusetti Leonardo (2002) From risk-based health surveillance to health promotion: an evidence-based experience in a health care setting. International journal of occupational medicine and environmental health 15(2), 117-20	Not a relevant population
Gazmararian Julie A, Coleman Margaret, Prill Mila, Hinman Alan R, Ribner Bruce S, Washington Michael L, Janssen Alan, and Orenstein Walter A (2007) Influenza vaccination of health care workers: policies	No relevant outcome reported

Study citation	Reason for exclusion
and practices of hospitals in a community setting. American journal of infection control 35(7), 441-7	
Gilbert Gwendolyn L, Kerridge Ian, and Cheung Paul (2010) Mandatory influenza immunisation of health-care workers. The Lancet. Infectious diseases 10(1), 3-5	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Girardot C Y, and Weber R J (2011) Director's forum - The role of health system pharmacy in improving influenza vaccination rates among health care workers. Hospital Pharmacy 46(11), 901-904	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Godin Gaston, Vezina-Im Lydi-Anne, and Naccache Hermine (2010) Determinants of influenza vaccination among healthcare workers. Infection control and hospital epidemiology 31(7), 689-93	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Graitcer S B, Kim D, and Lindley M (2014) Comprehensive efforts to increase healthcare personnel immunization. Human Vaccines and Immunotherapeutics 10(9), 2625-2626	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Grandi P, and Franco G (2005) Practising evidence-based occupational health in workers' groups: How to prevent sickness absence caused by influenza. Occupational Medicine 55(1), 7-9	Not a relevant intervention
Guanche Gacell, H , Villanueva Arias, A , Guilarte Garcia, E , Rubiera Jimenez, R , Nonato Alfonso, and R (2015) A Successful Strategy for Improving the Influenza Immunization Rates of Health Care Workers without a Mandatory Policy. The international journal of occupational and environmental medicine 6(3), 184-6	Not a relevant country
Hagemann T M, Johnson E J, and Conway S E (2014) Influenza vaccination by pharmacists in a health sciences center: A 3-year experience. Journal of the American Pharmacists Association 54(3), 295-301	Not a relevant population
Hall D L, and Weber R J (2008) Advanced practice programs in hospital pharmacy: Pharmacy-based immunization. Hospital Pharmacy 43(4), 328-334	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Hall K L, Holmes S, and Evans M E (1998) Increasing hospital employee participation in an influenza vaccine program [5]. American Journal of Infection Control 26(3), 367-368	Included within a systematic review included in this review
Hallauer Johannes F, and Neuschaefer-Rube Nils (2005) Influenza vaccination of hospital staff in Germany: a five-year survey on vaccination coverage and policies: identified deficits in influenza immunisation campaigns for hospital employees. Sozial- und Praventivmedizin 50(1), 38-44	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Harbarth S, Siegrist C A, Schira J C, Wunderli W, and Pittet D (1998) Influenza immunization: improving compliance of healthcare workers. Infection control and hospital epidemiology 19(5), 337-42	Included within a systematic review included in this review
Hayney Mary S, and Bartell Julie C (2005) An immunization education program for childcare providers. The Journal of school health 75(4), 147-9	Not a relevant population
Hayward Andrew C, Harling Richard, Wetten Sally, Johnson Anne M, Munro Susan, Smedley Julia, Murad Shahed, and Watson John M	Included within a systematic review included in this review

Study citation	Reason for exclusion
(2006) Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: cluster randomised controlled trial. BMJ (Clinical research ed.) 333(7581), 1241	
Heim Joseph A, Huang Hao, Zabinsky Zelda B, Dickerson Jane, Wellner Monica, Astion Michael, Cruz Doris, Vincent Jeanne, and Jack Rhona (2015) Design and implementation of a combined influenza immunization and tuberculosis screening campaign with simulation modelling. Journal of Evaluation in Clinical Practice 21(4), 727-734	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Heinrich-Morrison Kristina, McLellan Sue, McGinnes Ursula, Carroll Brendan, Watson Kerrie, Bass Pauline, Worth Leon J, and Cheng Allen C (2015) An effective strategy for influenza vaccination of healthcare workers in Australia: experience at a large health service without a mandatory policy. BMC infectious diseases 15, 42	Included within a systematic review included in this review
Hellwig Jennifer P (2009) Seasonal flu in health care workers: strategies to increase vaccinations. Nursing for women's health 13(5), 441	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Helms Charles, Leask Julie, Robbins Spring Cooper, Chow Maria Yui Kwan, and McIntyre Peter (2011) Implementation of mandatory immunisation of healthcare workers: observations from New South Wales, Australia. Vaccine 29(16), 2895-901	No relevant outcome reported
Helms Charles, Polgreen Philip, Polgreen Linnea, Evans Thomas, Roberts Lance L, Clabaugh Gerd, and Quinlisk Patricia (2011) Voluntary reporting of employee influenza vaccination rates by acute care hospitals in Iowa: the impact of a four year provider-based statewide performance improvement project. Vaccine 29(18), 3483-8	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Hernandez-Garcia I, Dominguez B, and Gonzalez R (2012) Influenza vaccination rates and determinants among Spanish medical students. Vaccine 31(1), 1-2	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Hirsch Pamela, Hodgson Michael, and Davey Victoria (2011) Seasonal influenza vaccination of healthcare employees: results of a 4-year campaign. Infection control and hospital epidemiology 32(5), 444-8	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Hofmann F, Ferracin C, Marsh G, and Dumas R (2006) Influenza vaccination of healthcare workers: a literature review of attitudes and beliefs. Infection 34(3), 142-7	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Honda Hitoshi, Sato Yumiko, Yamazaki Akinori, Padival Simi, Kumagai Akira, and Babcock Hilary (2013) A successful strategy for increasing the influenza vaccination rate of healthcare workers without a mandatory policy outside of the United States: a multifaceted intervention in a Japanese tertiary care center. Infection control and hospital epidemiology 34(11), 1194-200	Included within a systematic review included in this review
Hood Joyce, and Smith Andrea (2009) Developing a "best practice" influenza vaccination program for health care workers--an evidence-based, leadership-modeled program. AAOHN journal : official journal of the American Association of Occupational Health Nurses 57(8), 308-12	Included within a systematic review included in this review
Howard Stella, Foley Jane, and Bradley Karen (2012) Boosting flu vaccination uptake. Kai Tiaki 18(6), 12-13	No relevant outcome reported

Study citation	Reason for exclusion
Hughes Nancy L (2005) Increasing influenza vaccination of health care workers. The American journal of nursing 105(12), 96	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Humphreys H (2014) Vaccination against influenza amongst healthcare workers. Irish medical journal 107(9), 300-1	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Hutt Evelyn, Radcliff Tiffany A, Oman Kathleen S, Fink Regina, Ruscin J Mark, Linnebur Sunny, Fish Doug, Liebrecht Debra, Fish Ron, and McNulty Monica (2010) Impact of NHAP guideline implementation intervention on staff and resident vaccination rates. Journal of the American Medical Directors Association 11(5), 365-70	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Huynh Sheila, Poduska Paul, Mallozzi Terri, and Culler Frances (2012) Mandatory influenza vaccination of health care workers: a first-year success implementation by a community health care system. American journal of infection control 40(8), 771-3	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Isaacson Nicole, Roemheld-Hamm Beatrix, Crosson Jesse C, Dicicco-Bloom Barbara, and Winston Carla A (2009) Organizational culture influences health care workers' influenza immunization behavior. Family medicine 41(3), 202-7	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Johansen Laurie Jo, Stenvig Thomas, and Wey Howard (2012) The decision to receive influenza vaccination among nurses in North and South Dakota. Public health nursing (Boston, and Mass.) 29(2), 116-25	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Johnson James G, and Talbot Thomas R (2011) New approaches for influenza vaccination of healthcare workers. Current opinion in infectious diseases 24(4), 363-9	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Joseph C (2004) Implementing the national influenza vaccine uptake monitoring programme, England. British Journal of Infection Control 5(6), 31-32	Not a relevant intervention
Kalayil E J, Dolan S B, Lindley M C, and Ahmed F (2015) Influenza vaccination of health care personnel: Experiences with the first year of a national data collection effort. American Journal of Infection Control 43(11), 1154-1160	Not a relevant intervention
Kaplan Selena, Bisgaard Soren, Truesdell Donna, and Zetterholm Sharren (2009) Design for Six Sigma in healthcare: developing an employee influenza vaccination process. Journal for healthcare quality : official publication of the National Association for Healthcare Quality 31(3), 36-43	Not a relevant intervention
Karanfil Lynne V, Bahner Jan, Hovatter Joan, and Thomas William L (2011) Championing patient safety through mandatory influenza vaccination for all healthcare personnel and affiliated physicians. Infection control and hospital epidemiology 32(4), 375-9	Included within a systematic review included in this review
Khodyakov Dmitry, Uscher-Pines Lori, Lorick Suchita A, Lindley Megan C, Shier Victoria, and Harris Katherine (2014) A qualitative analysis of the impact of healthcare personnel influenza vaccination requirements in California. Vaccine 32(25), 3082-7	Not a relevant intervention
Kidd Francine, Wones Robert, Momper Adam, Bechtle Mavis, and Lewis Margaret (2012) From 51% to 100%: mandatory seasonal	Included within a systematic review included in this review

Study citation	Reason for exclusion
influenza vaccination. American journal of infection control 40(2), 188-90	
Kimura Akiko C, Nguyen Christine N, Higa Jeffrey I, Hurwitz Eric L, and Vugia Duc J (2007) The effectiveness of vaccine day and educational interventions on influenza vaccine coverage among health care workers at long-term care facilities. American journal of public health 97(4), 684-90	Included within a systematic review included in this review
Koh Howard K, and Gordon Jennifer L (2013) Breaking through the status quo: improving influenza vaccination coverage among health-care personnel. Public health reports (Washington, and D.C. : 1974) 128(1), 26-8	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Kohlhammer Y, Schnoor M, Schwartz M, Raspe H, and Schafer T (2007) Determinants of influenza and pneumococcal vaccination in elderly people: a systematic review. Public health 121(10), 742-51	Not a relevant population
Kong Susie (2011) A winter predicament. Nursing Management (UK) 18(7), 9	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Ksienski Doran S (2014) Mandatory seasonal influenza vaccination or masking of British Columbia health care workers: Year 1. Canadian journal of public health = Revue canadienne de sante publique 105(4), e312-6	Not a relevant intervention
Kuehn B M (2010) Mandatory influenza vaccination urged for clinicians, other health workers. JAMA - Journal of the American Medical Association 304(14), 1545	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Kung Ying Mai (2014) A quality improvement project to increase influenza vaccination in healthcare personnel at a university health center. Journal of the American Association of Nurse Practitioners 26(3), 148-154	No relevant outcome reported
La Torre , Giuseppe , Mannocci Alice, Ursillo Paolo, Bontempi Claudio, Firenze Alberto, Panico Maria Grazia, Sferrazza Antonella, Ronga Chiara, D'Anna Adele, Amodio Emanuele, Romano Nino, and Boccia Antonio (2011) Prevalence of influenza vaccination among nurses and ancillary workers in Italy: systematic review and meta-analysis. Human vaccines 7(7), 728-33	No relevant outcome reported
Lambert Stephen B (2008) Mandatory flu vaccination. Patient care drives mandatory vaccination. BMJ (Clinical research ed.) 337, a2588	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
LaVela Sherri L, Hill Jennifer N, Smith Bridget M, Evans Charlesnika T, Goldstein Barry, and Martinello Richard (2015) Healthcare worker influenza declination form program. American Journal of Infection Control 43(6), 624-628	Included within a systematic review included in this review
Lee Ingi, Thompson Sarah, Lautenbach Ebbing, Gasink Leanne B, Watson Barbara, Fishman Neil O, Chen Zhen, and Linkin Darren R (2008) Effect of accessibility of influenza vaccination on the rate of childcare staff vaccination. Infection control and hospital epidemiology 29(5), 465-7	Not a relevant population
Lehmann Birthe A, Ruiter Robert A. C, Chapman Gretchen, and Kok Gerjo (2014) The intention to get vaccinated against influenza and	Exclude on study type (narrative review, letter,

Study citation	Reason for exclusion
actual vaccination uptake of Dutch healthcare personnel. Vaccine 32(51), 6986-91	commentary, opinion piece, conference abstract)
Leitmeyer Katrin, Buchholz Udo, Kramer Michael, Schenkel Karl, Stahlhut Heike, Kollstadt Michael, Haas Walter, and Meyer Christiane (2006) Influenza vaccination in German health care workers: effects and findings after two rounds of a nationwide awareness campaign. Vaccine 24(47-48), 7003-8	Included within a systematic review included in this review
Lemaitre Magali, Meret Thierry, Rothan-Tondeur Monique, Belmin Joel, Lejonc Jean-Louis, Luquel Laurence, Piette Francois, Salom Michel, Verny Marc, Vetel Jean-Marie, Veyssier Pierre, and Carrat Fabrice (2009) Effect of influenza vaccination of nursing home staff on mortality of residents: a cluster-randomized trial. Journal of the American Geriatrics Society 57(9), 1580-6	Included within a systematic review included in this review
Lin Chyongchiou Jeng, Nowalk Mary Patricia, and Zimmerman Richard K (2012) Estimated costs associated with improving influenza vaccination for health care personnel in a multihospital health system. Joint Commission journal on quality and patient safety / Joint Commission Resources 38(2), 67-72	Duplicate
Lin Chyongchiou Jeng, Nowalk Mary Patricia, Raymund Mahlon, Sweeney Patricia M, and Zimmerman Richard K (2016) Association of State Laws and Healthcare Workers' Influenza Vaccination Rates. Journal of the National Medical Association 108(1), 99-102	Not a relevant intervention
Linay Denise, and Winter Denise (2012) Protect against flu. Midwives 15(5), 21	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Lindley Megan C, Dube Donna, Kalayil Elizabeth J, Kim Hanna, Paiva Kristi, and Raymond Patricia (2014) Qualitative evaluation of Rhode Island's healthcare worker influenza vaccination regulations. Vaccine 32(45), 5962-6	Not a relevant intervention
Llupia Anna, Garcia-Basteiro Alberto L, Olive Victoria, Costas Laura, Rios Jose, Quesada Sebastiana, Varela Pilar, Bayas Jose M, and Trilla Antoni (2010) New interventions to increase influenza vaccination rates in health care workers. American journal of infection control 38(6), 476-81	Included within a systematic review included in this review
Looijmans-van den Akker, I , van Delden , J M, Verheij Th J. M, van der Sande , M A B, van Essen , G A, Riphagen-Dalhuisen J, Hulscher M E, and Hak E (2010) Effects of a multi-faceted program to increase influenza vaccine uptake among health care workers in nursing homes: A cluster randomised controlled trial. Vaccine 28(31), 5086-92	Included within a systematic review included in this review
Looijmans-van den Akker, Ingrid , Hulscher Marlies E, Verheij Theo Jm, Riphagen-Dalhuisen Josien, van Delden , Johan Jm, and Hak Eelko (2011) How to develop a program to increase influenza vaccine uptake among workers in health care settings?. Implementation science : IS 6, 47	No relevant outcome reported
Lynch Janet R, Armistead Nancy, Vinson Brandy B, and Howard Andrew D (2015) Correlates of change in health care worker seasonal influenza vaccination rates among dialysis facilities. American journal of infection control 43(4), 409-11	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)

Study citation	Reason for exclusion
Macdonald Laura, Cairns Georgina, Angus Kathryn, de Andrade , and Marisa (2013) Promotional communications for influenza vaccination: a systematic review. Journal of health communication 18(12), 1523-49	Not a relevant population
MacDougall D M, Halperin B A, MacKinnon-Cameron D, Li L, McNeil S A, Langley J M, and Halperin S A (2015) The challenge of vaccinating adults: Attitudes and beliefs of the Canadian public and healthcare providers. BMJ Open 5(9), no pagination	Not a relevant population
Maltezou Helen C (2008) Nosocomial influenza: new concepts and practice. Current opinion in infectious diseases 21(4), 337-43	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Maltezou Helen C, Maragos Antonios, Raftopoulos Vasilios, Karageorgou Katerina, Halharapi Theopisti, Remoudaki Helen, Papadimitriou Theodoros, and Pierroutsakos Ioannis N (2008) Strategies to increase influenza vaccine uptake among health care workers in Greece. Scandinavian journal of infectious diseases 40(3), 266-8	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Marshall Robert J (2013) Influenza vaccine use among health care workers: Social marketing, policy, and ethics. Social Marketing Quarterly 19(4), 222-229	Not a relevant intervention
Marshall Robert J, Tetu-Mouradjian Linda M, and Fulton John P (2010) Increasing annual influenza vaccinations among healthcare workers in Rhode Island: a social marketing approach. Medicine and health, and Rhode Island 93(9), 271-8	Not a relevant intervention
Maurer Jurgen, and Harris Katherine M (2014) Issuance of patient reminders for influenza vaccination by US-based primary care physicians during the first year of universal influenza vaccination recommendations. American Journal of Public Health 104(6), e60-e62	Not a relevant population
McCarthy Anne E, Lafleur Chantal, Sutherland Jane, Lam Po-Po, Roth Virginia, O'Connor Annette M, and Chambers Larry W (2010) Helping healthcare workers decide: evaluation of an influenza immunization decision tool. The Canadian journal of infection control : the official journal of the Community & Hospital Infection Control Association-Canada = Revue canadienne de prevention des infections / Association pour la prevention des infections a l'hopital et dans la communaute-Canada, and CHICA-CANADA 25(1), 21-4	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
McCullers Jonathan A, Speck Kathleen M, Williams Bonnie F, Liang Hua, and Mirro Joseph Jr (2006) Increased influenza vaccination of healthcare workers at a pediatric cancer hospital: results of a comprehensive influenza vaccination campaign. Infection control and hospital epidemiology 27(1), 77-9	Included within a systematic review included in this review
Mersereau Patricia W, Layton Christine M, Smith Lucia Rojas, Kendrick Juliette S, Mitchell Elizabeth W, Amoozegar Jacqueline B, and Williams Jennifer L (2012) Prenatal care providers and influenza prevention and treatment: Lessons from the field. Maternal and Child Health Journal 16(2), 479-485	Not a relevant population
Middleton Jenni (2012) Aiming for flu immunity in all. Nursing Times 108(37), 31	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)

Study citation	Reason for exclusion
Miller Brady L, Ahmed Faruque, Lindley Megan C, and Wortley Pascale M (2011) Increases in vaccination coverage of healthcare personnel following institutional requirements for influenza vaccination: a national survey of U.S. hospitals. Vaccine 29(50), 9398-403	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Modak Rohit M, Parris Sarah M, Dilisi Jeffrey P, and Premkumar Ajay (2012) Increasing influenza vaccination rates among hospital employees without a mandatory policy. Infection control and hospital epidemiology 33(12), 1288-9	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Moore Brenda S (2009) Why health care workers decline influenza vaccination. AAOHN journal : official journal of the American Association of Occupational Health Nurses 57(11), 475-8	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Moreton J (1998) Immunising against influenza. Community Nurse 4(9), 33-35	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Music T (2012) Protecting patients, protecting healthcare workers: a review of the role of influenza vaccination. International Nursing Review 59(2), 161-167	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Musich S, Adams L, DeWolf G, and Edington D W (2001) A case study of 10-year health risk appraisal participation patterns in a comprehensive health promotion program. American Journal of Health Promotion 15(4), 237-240	Not a relevant population
Nace David A, Perera Subashan, Handler Steven M, Muder Robert, and Hoffman Erika L (2011) Increasing influenza and pneumococcal immunization rates in a nursing home network. Journal of the American Medical Directors Association 12(9), 678-84	Included within a systematic review included in this review
Naz Hasan, Cevik Figen, and Aykin Nevil (2009) Influenza vaccination in healthcare workers. Journal of infection in developing countries 3(1), 50-4	No relevant outcome reported
Ndiaye Serigne M, Hopkins David P, Shefer Abigail M, Hinman Alan R, Briss Peter A, Rodewald Lance, Willis Bayo, Task Force on Community Preventive, and Services (2005) Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults: a systematic review. American journal of preventive medicine 28(5 Suppl), 248-79	Not a relevant population
Ng A N. M, and Lai C K. Y (2011) Effectiveness of seasonal influenza vaccination in healthcare workers: A systematic review. Journal of Hospital Infection 79(4), 279-286	Not a relevant intervention
Nicholson Mary R, Hayes Deborah M, and Bennett Anita M (2009) Partnering with nursing service improves health care worker influenza vaccination rates. American journal of infection control 37(6), 484-9	Included within a systematic review included in this review
Novielli A (2014) Increasing immunization awareness using mobile technology. Pharmacy Times 80(10), no pagination	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Nowak G J, Sheedy K, Bursey K, Smith T M, and Basket M (2015) Promoting influenza vaccination: Insights from a qualitative meta-analysis of 14 years of influenza-related communications research by U.S. Centers for Disease Control and Prevention (CDC). Vaccine 33(24), 2741-2756	Not a relevant population

Study citation	Reason for exclusion
Nowalk Mary Patricia (2010) Establish the habit: Influenza vaccination for health care personnel. Journal for Healthcare Quality 32(2),	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Nowalk Mary Patricia, Lin Chyongchiou Jeng, Raymund Mahlon, Bialor Jamie, and Zimmerman Richard K (2013) Impact of hospital policies on health care workers' influenza vaccination rates. American journal of infection control 41(8), 697-701	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
O'Connor A M, Pennie R A, and Dales R E (1996) Framing effects on expectations, decisions, and side effects experienced: the case of influenza immunization [published erratum appears in J Clin Epidemiol 1997 Jun;50(6):747-8]. Journal of Clinical Epidemiology 49(11), 1271-6	Not a relevant population
Oetgen William J, and Thomas William L (2011) First, do no harm. Mandatory influenza vaccination for health care workers is a matter of patient safety. Trustee : the journal for hospital governing boards 64(9), 39-1	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Olendar L (2008) Ethics of flu vaccine for healthcare workers. RN 71(10), 33-34	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Omer Saad B (2013) Applying Kass's public health ethics framework to mandatory health care worker immunization: the devil is in the details. The American journal of bioethics : AJOB 13(9), 55-7	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Ortolon Ken (2004) Vaccinate yourself. Texas medicine 100(10), 39-43	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Palenik Charles John (2012) Mandatory influenza vaccination. Dental update 39(7), 454	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Paris Bonnie, Arahood Tracey, Asche Carl, and Amundson Gail (2013) Voluntary reporting of health care personnel seasonal influenza vaccination rates and the impact of universal policies in Illinois hospitals. Vaccine 31(3), 514-7	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Pielak K, McIntyre C, and Tu A (2010) Identifying attitudes, beliefs and reported practices of nurses and doctors as immunization providers. Journal of Advanced Nursing 66(7), 1602-1611	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Pitts S I, Maruthur N M, Millar K R, Perl T M, and Segal J (2014) A systematic review of mandatory influenza vaccination in healthcare personnel (Provisional abstract). Database of Abstracts of Reviews of Effects (2), 330-340	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Pitts Samantha I, Maruthur Nisa M, Millar Kathryn R, Perl Trish M, and Segal Jodi (2014) A systematic review of mandatory influenza vaccination in healthcare personnel. American Journal of Preventive Medicine 47(3), 330-340	Duplicate
Podczervinski Sara, Stednick Zach, Helbert Lois, Davies Judith, Jagels Barbara, Gooley Ted, Casper Corey, and Pergam Steven A (2015) Employee influenza vaccination in a large cancer center with high	Included within a systematic review included in this review

Study citation	Reason for exclusion
baseline compliance rates: comparison of carrot versus stick approaches. American Journal of Infection Control 43(3), 228-233	
Poland G A, and Jacobson R M (2007) Protecting Patients from Harm. Legislating Vaccinations for Healthcare Workers. American Journal of Preventive Medicine 32(6), 544-546	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Poland G A, Jacobson R M, Tilburt J, and Wicker S (2012) Mandating influenza vaccination of health care workers: A patient safety, quality of care, and public trust issue. Annals of Respiratory Medicine 2(1), 16-21	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Polgreen Philip M, Polgreen Linnea A, Evans Thomas, and Helms Charles (2009) A statewide system for improving influenza vaccination rates in hospital employees. Infection control and hospital epidemiology 30(5), 474-8	No relevant outcome reported
Preaud Emmanuelle, Durand Laure, Macabeo Berengere, Farkas Norbert, Sloesen Brigitte, Palache Abraham, Shupo Francis, Samson Sandrine I, Vaccines Europe influenza working, and group (2014) Annual public health and economic benefits of seasonal influenza vaccination: a European estimate. BMC public health 14, 813	No relevant outcome reported
Primus Linda (2009) Improving influenza vaccination to health care workers. American journal of infection control 37(5), 430-1	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Quan Kathleen, Tehrani David M, Dickey Linda, Spiritus Eugene, Hizon Denise, Heck Kristie, Samuelson Pamela, Kornhauser Elliott, Zeitany Raja, Mancia Susan, Thrupp Lauri, Tiso Susan M, and Huang Susan S (2012) Voluntary to mandatory: evolution of strategies and attitudes toward influenza vaccination of healthcare personnel. Infection control and hospital epidemiology 33(1), 63-70	Included within a systematic review included in this review
Rakita R M, Hagar B A, and Lammert J K (2010) Vaccination mandates vs opt-out programs and rates of influenza immunization. JAMA - Journal of the American Medical Association 304(16), 1786	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Rakita Robert M, Hagar Beverly A, Crome Patricia, and Lammert Joyce K (2010) Mandatory influenza vaccination of healthcare workers: a 5-year study. Infection control and hospital epidemiology 31(9), 881-8	Included within a systematic review included in this review
Rashid H, Yin J K, Ward K, King C, Seale H, and Booy R (2016) Assessing interventions to improve influenza vaccine uptake among health care workers. Health Affairs 35(2), 284-292	Included within a systematic review included in this review
Rashid Harunor, Yin Jiehui Kevin, Ward Kirsten, King Catherine, Seale Holly, and Booy Robert (2016) Assessing Interventions To Improve Influenza Vaccine Uptake Among Health Care Workers. Health affairs (Project Hope) 35(2), 284-92	Duplicate
Reedy A (2008) Fighting the flu: a vaccination program for healthcare workers. Oncology Nursing Forum 35(2), 171-172	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Regan A K, Tracey L, and Gibbs R (2015) Post-marketing surveillance of adverse events following immunization with inactivated quadrivalent and trivalent influenza vaccine in health care providers in Western Australia. Vaccine 33(46), 6149-6151	No relevant outcome reported

Study citation	Reason for exclusion
Ribner Bruce S, Hall Cynthia, Steinberg James P, Bornstein William A, Chakkalakal Rosette, Emamifar Amir, Eichel Irving, Lee Peter C, Castellano Penny Z, and Grossman Gilbert D (2008) Use of a mandatory declination form in a program for influenza vaccination of healthcare workers. Infection control and hospital epidemiology 29(4), 302-8	Included within a systematic review included in this review
Riphagen-Dalhuisen J, Burgerhof J G, Frijstein G, van der Geest-Blankert , A D, Danhof-Pont M B, de Jager , H J, Bos A, Smeets E, de Vries , M J, Gallee P M, and Hak E (2013) Hospital-based cluster randomised controlled trial to assess effects of a multi-faceted programme on influenza vaccine coverage among hospital healthcare workers and nosocomial influenza in the Netherlands, 2009 to 2011. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 18(26), 20512	Not a relevant intervention
Robichaud Pierre, Hawken Steven, Beard Leslie, Morra Dante, Tomlinson George, Wilson Kumanan, and Keelan Jennifer (2012) Vaccine-critical videos on YouTube and their impact on medical students' attitudes about seasonal influenza immunization: a pre and post study. Vaccine 30(25), 3763-70	No relevant outcome reported
Robinson F (2005) Practice Nurse of the Year 2005. Practice Nurse 30(8), 64-67	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Robinson F (2007) Sharing good practice: immunisation. Practice Nurse 34(5), 31-32	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Rodal Rebecca, Ries Nola M, and Wilson Kumanan (2009) Influenza vaccination for health care workers: towards a workable and effective standard. Health law journal 17, 297-337	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Rothan-Tondeur M, Filali-Zegzouti Y, Golmard J L, De Wazieres , B, Piette F, Carrat F, Lejeune B, and Gavazzi G (2011) Randomised active programs on healthcare workers' flu vaccination in geriatric health care settings in France: the VESTA study. The journal of nutrition, and health & aging 15(2), 126-32	Included within a systematic review included in this review
Royles Dean (2011) Flu fighter: push to vaccinate more NHS staff in the community. Community practitioner : the journal of the Community Practitioners' & Health Visitors' Association 84(10), 42	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Russell Erica J, Roberts Dennis, and Lee Marilyn (2010) Pharmacist-driven seasonal influenza immunization program for health care workers. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists 67(23), 1984-5	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Russell M L (2001) Influenza vaccination in Alberta long-term care facilities. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 164(10), 1423-7	No relevant outcome reported
Russi M B, and Baltimore R S (2012) Mandatory influenza vaccine. Infection Control and Hospital Epidemiology 33(3), 222-223	Exclude on study type (narrative review, letter,

Study citation	Reason for exclusion
	commentary, opinion piece, conference abstract)
Russi M, Buchta W G, Swift M, Budnick L D, Hodgson M J, Berube D, and Kelafant G A (2009) Guidance for occupational health services in medical centers. Journal of Occupational and Environmental Medicine 51(11), 1e-18e	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Sacks H S (2007) Encouraging influenza vaccination for nursing home staff reduced mortality and influenza like illness in the residents: Commentary. Evidence-Based Medicine 12(3), 81	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Sander Beate, Kwong Jeffrey C, Bauch Chris T, Maetzel Andreas, McGeer Allison, Raboud Janet M, and Krahn Murray (2010) Economic appraisal of Ontario's Universal Influenza Immunization Program: a cost-utility analysis. PLoS medicine 7(4), e1000256	No relevant outcome reported
Sartor Catherine, Tissot-Dupont Herve, Zandotti Christine, Martin Francoise, Roques Pierre, and Drancourt Michel (2004) Use of a mobile cart influenza program for vaccination of hospital employees. Infection control and hospital epidemiology 25(11), 918-22	Included within a systematic review included in this review
Sawyer Mark H, Peddecord K Michael, Wang Wendy, DeGuire Michelle, Miskewitch-Dzulynsky Michelle, and Vuong David D (2012) A public health initiative to increase annual influenza immunization among hospital health care personnel: the San Diego Hospital Influenza Immunization Partnership. American Journal of Infection Control 40(7), 595-600	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Scherer Aaron M, Scherer Laura D, and Fagerlin Angela (2015) Getting ahead of illness: Using metaphors to influence medical decision making. Medical Decision Making 35(1), 37-45	Not a relevant population
Schmidt Silvia, Saulle Rosella, Di Thiene , Domitilla , Boccia Antonio, La Torre , and Giuseppe (2013) Do the quality of the trials and the year of publication affect the efficacy of intervention to improve seasonal influenza vaccination among healthcare workers?: Results of a systematic review. Human vaccines & immunotherapeutics 9(2), 349-61	Included within a systematic review included in this review
Scottish Executive Research (2005) Flu and Pnemococcal Wave 3 - 2005 Post Campaign Evaluation. ,	Not a relevant population
Scottish Executive Research (2007) Flu 2006/2007 Campaign Evaluation. ,	Not a relevant population
Seale Holly, and Macintyre C Raina (2011) Seasonal influenza vaccination in Australian hospital health care workers: a review. The Medical journal of Australia 195(6), 336-8	No relevant outcome reported
Septimus Edward J, Perlin Jonathan B, Cormier Scott B, Moody Julia A, and Hickok Jason D (2011) A multifaceted mandatory patient safety program and seasonal influenza vaccination of health care workers in community hospitals. JAMA 305(10), 999-1000	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Shah Shetal I, and Caprio Martha (2008) Availability of trivalent inactivated influenza vaccine to parents of neonatal intensive care unit patients and its effect on the healthcare worker vaccination rate. Infection control and hospital epidemiology 29(4), 309-13	Included within a systematic review included in this review

Study citation	Reason for exclusion
Sickbert-Bennett Emily E (2013) Pitfalls in the development of a standardized measure of influenza vaccination coverage among healthcare personnel. Infection Control and Hospital Epidemiology ,	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Slaunwhite Jason M, Smith Steven M, Fleming Mark T, Strang Robert, and Lockhart Cathy (2009) Increasing vaccination rates among health care workers using unit "champions" as a motivator. The Canadian journal of infection control : the official journal of the Community & Hospital Infection Control Association-Canada = Revue canadienne de prevention des infections / Association pour la prevention des infections a l'hopital et dans la communaute-Canada, and CHICA-CANADA 24(3), 159-64	Included within a systematic review included in this review
Smith D R (2013) Mandatory influenza vaccine for health care workers: 2012 results. Wisconsin Medical Journal 112(1), 6	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Smith D R, Van Cleave , and B (2012) Influenza vaccination as a condition of employment for a large regional health care system. Wisconsin Medical Journal 111(2), 68-71	Included within a systematic review included in this review
Smith P W, Bennett G, Bradley S, Drinka P, Lautenbach E, Marx J, Mody L, Nicolle L, and Stevenson K (2008) SHEA/APIC guideline: Infection prevention and control in the long-term care facility. Infection Control and Hospital Epidemiology 29(9), 785-814	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Snow R, Fuerst R, and Kattoua S (1996) Hospital-based influenza vaccination programs. JAMA 275(14), 1088	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Song Joon Young, Park Cheong Won, Jeong Hye Won, Cheong Hee Jin, Kim Woo Joo, and Kim Sung Ran (2006) Effect of a hospital campaign for influenza vaccination of healthcare workers. Infection control and hospital epidemiology 27(6), 612-7	Included within a systematic review included in this review
Soyemi Kenneth, Howland Julia, and Lee Daniel (2012) Seasonal influenza vaccine compliance and use of declination forms. Infection control and hospital epidemiology 33(9), 962-4	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Staniforth Rachel (2014) Why do health workers decline flu vaccination? Nursing Times 110(49), 16-17	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Stewart Alexandra M (2009) Mandatory vaccination of health care workers. The New England journal of medicine 361(21), 2015-7	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Stewart Alexandra M (2012) Using state laws to vaccinate the health-care workforce. Public Health Reports 127(2), 224-227	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Stewart Alexandra M, and Cox Marisa A (2013) State law and influenza vaccination of health care personnel. Vaccine 31(5), 827-32	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)

Study citation	Reason for exclusion
Stewart Alexandra M, and Rosenbaum Sara (2010) Vaccinating the health-care workforce: state law vs. institutional requirements. Public health reports (Washington, and D.C. : 1974) 125(4), 615-8	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Stewart S, Murray S B, and Skull S A (2002) Evaluation of health-care worker vaccination in a tertiary Australian hospital. Internal Medicine Journal 32(12), 585-592	Not a relevant intervention
Stott D J, Murray G D, Elder A, and Carman W B (1998) Influenza vaccination of health care workers in long-term care protects elderly patients [abstract]. Age and ageing 27(Suppl 2), 45-6	No relevant outcome reported
Stuart Michael J (2012) Review of strategies to enhance the uptake of seasonal influenza vaccination by Australian healthcare workers. Communicable diseases intelligence quarterly report 36(3), E268-76	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Stuart Rhonda L, Gillespie Elizabeth E, and Kerr Peter G (2014) A pilot study of an influenza vaccination or mask mandate in an Australian tertiary health service. The Medical journal of Australia 200(2), 83-4	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Tabarani Christy M, and Domachowske Joseph B (2009) Influenza vaccination of healthcare personnel. Pediatric annals 38(12), 661-6	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot T R (2014) Update on immunizations for healthcare personnel in the United States. Vaccine 32(38), 4869-4875	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot Thomas R (2008) Improving rates of influenza vaccination among healthcare workers: educate; motivate; mandate?. Infection control and hospital epidemiology 29(2), 107-10	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot Thomas R (2009) Do declination statements increase health care worker influenza vaccination rates?. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 49(5), 773-9	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot Thomas R, and Schaffner William (2010) On being the first: Virginia Mason Medical Center and mandatory influenza vaccination of healthcare workers. Infection control and hospital epidemiology 31(9), 889-92	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot Thomas R, Babcock Hilary, Caplan Arthur L, Cotton Deborah, Maragakis Lisa L, Poland Gregory A, Septimus Edward J, Tapper Michael L, and Weber David J (2010) Revised SHEA position paper: influenza vaccination of healthcare personnel. Infection control and hospital epidemiology 31(10), 987-95	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Talbot Thomas R, Dellit Timothy H, Hebden Joan, Sama Danny, and Cuny Joanne (2010) Factors associated with increased healthcare worker influenza vaccination rates: results from a national survey of university hospitals and medical centers. Infection control and hospital epidemiology 31(5), 456-62	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Tapiainen Terhi, Bar Gurli, Schaad Urs B, and Heininger Ulrich (2005) Influenza vaccination among healthcare workers in a university children's hospital. Infection control and hospital epidemiology 26(11), 855-8	Included within a systematic review included in this review

Study citation	Reason for exclusion
Terrie Y C (2011) Preventing and managing influenza. Pharmacy Times 77(2), no pagination	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Thompson Mark G, McIntyre Anne F, Naleway Allison L, Black Carla, Kennedy Erin D, Ball Sarah, Walker Deborah Klein, Henkle Emily M, and Gaglani Manjusha J (2013) Potential influence of seasonal influenza vaccination requirement versus traditional vaccine promotion strategies on unvaccinated healthcare personnel. Vaccine 31(37), 3915-21	No relevant outcome reported
Thomson P, Cuddeford G, and Mitchell P (1999) Hospital staff absenteeism following an influenza immunisation program. Journal of Occupational Health and Safety - Australia and New Zealand 15(3), 231-242	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Toronto Coleen E, and Mullaney Susan M (2010) Registered nurses and influenza vaccination. An integrative review. AAOHN journal : official journal of the American Association of Occupational Health Nurses 58(11), 463-71	Included within a systematic review included in this review
Tosh Pritish K, Jacobson Robert M, and Poland-Gregory A (2006) Mandatory influenza vaccination for health care workers--a timely step forward. Maryland medicine : MM : a publication of MEDCHI, and the Maryland State Medical Society 7(1), 21-3	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Tracey Lauren E, Regan Annette K, Mak Donna B, and Effler Paul V (2015) Adverse events following influenza immunization reported by healthcare personnel using active surveillance based on text messages. Infection control and hospital epidemiology 36(5), 608-10	No relevant outcome reported
Van Buynder , P G, Konrad S, Kersteins F, Preston E, Brown P D, Keen D, and Murray N J (2015) Healthcare worker influenza immunization vaccinate or mask policy: strategies for cost effective implementation and subsequent reductions in staff absenteeism due to illness. Vaccine 33(13), 1625-8	No relevant outcome reported
Venci Diana P, Slain Douglas, Elswick Betsy M, Sarwari Arif R, Ross Ashley L, Smithmyer Ann, Hare Justin T, and Briggs Frank (2015) Inclusion of social media-based strategies in a health care worker influenza immunization campaign. American Journal of Infection Control 43(8), 902-903	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
von Gierke, L, and Wicker S (2014) Flu vaccination goes mobile. Vaccine 32(2), 205-206	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Vondrak Kristin K, Starling Patricia, de Guzman , and Jessica (2013) Mandatory influenza vaccination: Is it part of the answer. Nursing Management (USA) 44(8), 38-42	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Vos H M. M, Adan I M. A, Schellevis F G, and Lagro-Janssen A L. M (2014) Prevention in primary care: Facilitators and barriers to transform prevention from a random coincidence to a systematic approach. Journal of Evaluation in Clinical Practice 20(3), 208-215	Not a relevant population
Walsh J A, and Maher C (2011) Economic implications of influenza and influenza vaccine. Influenza Vaccines for the Future , 425-440	No relevant outcome reported

Study citation	Reason for exclusion
Wang David, Worth Leon, Bull Ann, Bennett Noleen, and Richards Michael (2014) Influenza vaccination of Victorian healthcare workers: will a higher target increase vaccine uptake?. Australian and New Zealand journal of public health 38(5), 490	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Warner Jane Carole (2012) Overcoming barriers to influenza vaccination. Nursing Times 108(37), 25-27	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Warner John Gary, Portlock Jane, Smith Jenifer, and Rutter Paul (2013) Increasing seasonal influenza vaccination uptake using community pharmacies: experience from the Isle of Wight, England. The International journal of pharmacy practice 21(6), 362-7	Not a relevant population
Wendelboe A M, Grafe C, McCumber M, and Anderson M P (2015) Inducing Herd Immunity against Seasonal Influenza in Long-Term Care Facilities through Employee Vaccination Coverage: A Transmission Dynamics Model. Computational and Mathematical Methods in Medicine 2015, no pagination	No relevant outcome reported
Wicker Sabine (2009) Unvaccinated health care workers must wear masks during flu season-a possibility to improve influenza vaccination rates?. Vaccine 27(20), 2631-2	Included within a systematic review included in this review
Wilde J A, McMillan J A, Serwint J, Butta J, O'Riordan M A, and Steinhoff M C (1999) Effectiveness of influenza vaccine in health care professionals: a randomized trial. JAMA 281(10), 908-13	Not a relevant intervention
Witteman Holly O, Dansokho Selma Chipenda, Exe Nicole, Dupuis Audrey, Provencher Thierry, and Zikmund-Fisher Brian J (2015) Risk communication, values clarification, and vaccination decisions. Risk Analysis 35(10), 1801-1819	Not a relevant population
Woeltje K F, and Babcock H M (2013) Mandatory vaccination. CMAJ 185(11), 983-984	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Zepke Jr, J C, and Hayney M S (2012) The vital role of influenza vaccination of health care personnel. Journal of the American Pharmacists Association 52(5), 714-715	Exclude on study type (narrative review, letter, commentary, opinion piece, conference abstract)
Zhang J, While A E, and Norman I J (2010) Knowledge and attitudes regarding influenza vaccination among nurses: A research review. Vaccine 28(44), 7207-7214	Exclude on study type (non-comparative, cross-sectional survey, correlation studies)
Zimmerman Richard K, Lin Chyongchiou Jeng, Raymund Mahlon, Bialor Jamie, Sweeney Patricia M, and Nowalk Mary Patricia (2013) Hospital policies, state laws, and healthcare worker influenza vaccination rates. Infection control and hospital epidemiology 34(8), 854-7	Included within a systematic review included in this review
Zimmerman Richard Kent, Nowalk Mary Patricia, Lin Chyongchiou J, Raymund Mahlon, Fox Dwight E, Harper Jay D, Tanis Mark D, and Willis Bayo C (2009) Factorial design for improving influenza vaccination among employees of a large health system. Infection control and hospital epidemiology 30(7), 691-7	Included within a systematic review included in this review

Appendix M: PRISMA