



Supplemental Material to:

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**Influenza vaccines in low and middle income countries: A
systematic review of economic evaluations**

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Appendix 1. Search strategy (example PubMed)

- #1 Low and Middle Income Countries search filter (available at <http://epocoslo.cochrane.org/Imic-databases>, last update November 2010, accessed at 5 May 2011)
- #2 Search terms for human influenza
- #3 Search terms for influenza vaccines
- #4 Search terms for laboratory-confirmed influenza and influenza-related outcomes
- #5 Search terms for effectiveness
- #6 Search terms for economic evaluations
- #7 #1 AND #2 AND #3 AND #4
- #8 #1 AND #2 AND #3 AND #5
- #9 #1 AND #2 AND #3 AND #6
- #10 #9 NOT (#7 OR #8)

Search ID	Search terms
#1 Search terms LMICs filter	("developing country"[tiab] OR "developing countries"[tiab] OR "developing nation"[tiab] OR "developing nations"[tiab] OR "developing population"[tiab] OR "developing populations"[tiab] OR "developing world"[tiab] OR "less developed country"[tiab] OR "less developed countries"[tiab] OR "less developed nation"[tiab] OR "less developed nations"[tiab] OR "less developed population"[tiab] OR "less developed populations"[tiab] OR "less developed world"[tiab] OR "lesser developed country"[tiab] OR "lesser developed countries"[tiab] OR "lesser developed nation"[tiab] OR "lesser developed nations"[tiab] OR "lesser developed population"[tiab] OR "lesser developed populations"[tiab] OR "lesser developed world"[tiab] OR "under developed country"[tiab] OR "under developed countries"[tiab] OR "under developed nation"[tiab] OR "under developed nations"[tiab] OR "under developed population"[tiab] OR "under developed populations"[tiab] OR "under developed world"[tiab] OR "underdeveloped country"[tiab] OR "underdeveloped countries"[tiab] OR "underdeveloped nation"[tiab] OR "underdeveloped nations"[tiab] OR "underdeveloped population"[tiab] OR "underdeveloped populations"[tiab] OR "underdeveloped world"[tiab] OR "middle income country"[tiab] OR "middle income countries"[tiab] OR "middle income nation"[tiab] OR "middle income nations"[tiab] OR "middle income population"[tiab] OR "middle income populations"[tiab] OR "low income country"[tiab] OR "low income countries"[tiab] OR "low income nation"[tiab] OR "low income nations"[tiab] OR "low income population"[tiab] OR "low income populations"[tiab] OR "lower income country"[tiab] OR "lower income countries"[tiab] OR "lower income nation"[tiab] OR "lower income nations"[tiab] OR "lower income population"[tiab] OR "lower income populations"[tiab] OR "underserved country"[tiab] OR "underserved countries"[tiab] OR "underserved nation"[tiab] OR "underserved nations"[tiab] OR "underserved population"[tiab] OR "underserved populations"[tiab] OR "underserved world"[tiab] OR "under served country"[tiab] OR "under served countries"[tiab] OR "under served nation"[tiab] OR "under served nations"[tiab] OR "under served population"[tiab] OR "under served populations"[tiab] OR "under served world"[tiab] OR "deprived

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"low income economies"[tiab] OR "lower income economy"[tiab] OR "lower income economies"[tiab] OR "low gdp"[tiab] OR "low gnp"[tiab] OR "low gross domestic"[tiab] OR "low gross national"[tiab] OR "lower gdp"[tiab] OR "lower gnp"[tiab] OR "lower gross domestic"[tiab] OR "lower gross national"[tiab] OR lmic[tiab] OR lmic[tiab] OR "third world"[tiab] OR "lami country"[tiab] OR "lami countries"[tiab] OR "transitional country"[tiab] OR "transitional countries"[tiab] OR ("developing country"[ot] OR "developing countries"[ot] OR "developing nation"[ot] OR "developing nations"[ot] OR "developing population"[ot] OR "developing populations"[ot] OR "developing world"[ot] OR "less developed country"[ot] OR "less developed countries"[ot] OR "less developed nation"[ot] OR "less developed nations"[ot] OR "less developed population"[ot] OR "less developed populations"[ot] OR "less developed world"[ot] OR "lesser developed country"[ot] OR "lesser developed countries"[ot] OR "lesser developed 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Albania[Mesh:noexp] OR Algeria[Mesh:noexp] OR American Samoa[Mesh:noexp] OR Angola[Mesh:noexp] OR "Antigua and Barbuda"[Mesh:noexp] OR Argentina[Mesh:noexp] OR Armenia[Mesh:noexp] OR Azerbaijan[Mesh:noexp] OR Bahrain[Mesh:noexp] OR Bangladesh[Mesh:noexp] OR Barbados[Mesh:noexp] OR Benin[Mesh:noexp] OR Byelarus[Mesh:noexp] OR Belize[Mesh:noexp] OR Bhutan[Mesh:noexp] OR Bolivia[Mesh:noexp] OR Bosnia-Herzegovina[Mesh:noexp] OR Botswana[Mesh:noexp] OR Brazil[Mesh:noexp] OR Brasil[Mesh:noexp] OR Bulgaria[Mesh:noexp] OR Burkina Faso[Mesh:noexp] OR Burundi[Mesh:noexp] OR Cambodia[Mesh:noexp] OR Cameroon[Mesh:noexp] OR Cape Verde[Mesh:noexp] OR Central African Republic[Mesh:noexp] OR Chad[Mesh:noexp] OR Chile[Mesh:noexp] OR China[Mesh:noexp] OR Colombia[Mesh:noexp] OR Comoros[Mesh:noexp] OR Congo[Mesh:noexp] OR Costa Rica[Mesh:noexp] OR Cote d'Ivoire[Mesh:noexp] OR Croatia[Mesh:noexp] OR Cuba[Mesh:noexp] OR Cyprus[Mesh:noexp] OR Czechoslovakia[Mesh:noexp] OR Czech Republic[Mesh:noexp] OR Slovakia[Mesh:noexp] OR Djibouti[Mesh:noexp] OR "Democratic Republic of the Congo"[Mesh:noexp] OR Dominica[Mesh:noexp] OR Dominican Republic[Mesh:noexp] OR East Timor[Mesh:noexp] OR Ecuador[Mesh:noexp] OR Egypt[Mesh:noexp] OR El Salvador[Mesh:noexp] OR Eritrea[Mesh:noexp] OR Estonia[Mesh:noexp] OR Ethiopia[Mesh:noexp] OR Fiji[Mesh:noexp] OR Gabon[Mesh:noexp] OR Gambia[Mesh:noexp] OR "Georgia (Republic)"[Mesh:noexp] OR Ghana[Mesh:noexp] OR Greece[Mesh:noexp] OR

	Grenada[Mesh:noexp] OR Guatemala[Mesh:noexp] OR Guinea[Mesh:noexp] OR Guinea-Bissau[Mesh:noexp] OR Guam[Mesh:noexp] OR Guyana[Mesh:noexp] OR Haiti[Mesh:noexp] OR Honduras[Mesh:noexp] OR Hungary[Mesh:noexp] OR India[Mesh:noexp] OR Indonesia[Mesh:noexp] OR Iran[Mesh:noexp] OR Iraq[Mesh:noexp] OR Jamaica[Mesh:noexp] OR Jordan[Mesh:noexp] OR Kazakhstan[Mesh:noexp] OR Kenya[Mesh:noexp] OR Korea[Mesh:noexp] OR Kosovo[Mesh:noexp] OR Kyrgyzstan[Mesh:noexp] OR Laos[Mesh:noexp] OR Latvia[Mesh:noexp] OR Lebanon[Mesh:noexp] OR Lesotho[Mesh:noexp] OR Liberia[Mesh:noexp] OR Libya[Mesh:noexp] OR Lithuania[Mesh:noexp] OR Macedonia[Mesh:noexp] OR Madagascar[Mesh:noexp] OR Malaysia[Mesh:noexp] OR Malawi[Mesh:noexp] OR Mali[Mesh:noexp] OR Malta[Mesh:noexp] OR Mauritania[Mesh:noexp] OR Mauritius[Mesh:noexp] OR Mexico[Mesh:noexp] OR Micronesia[Mesh:noexp] OR Middle East[Mesh:noexp] OR Moldova[Mesh:noexp] OR Mongolia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Morocco[Mesh:noexp] OR Mozambique[Mesh:noexp] OR Myanmar[Mesh:noexp] OR Namibia[Mesh:noexp] OR Nepal[Mesh:noexp] OR Netherlands Antilles[Mesh:noexp] OR New Caledonia[Mesh:noexp] OR Nicaragua[Mesh:noexp] OR Niger[Mesh:noexp] OR Nigeria[Mesh:noexp] OR Oman[Mesh:noexp] OR Pakistan[Mesh:noexp] OR Palau[Mesh:noexp] OR Panama[Mesh:noexp] OR Papua New Guinea[Mesh:noexp] OR Paraguay[Mesh:noexp] OR Peru[Mesh:noexp] OR Philippines[Mesh:noexp] OR Poland[Mesh:noexp] OR Portugal[Mesh:noexp] OR Puerto Rico[Mesh:noexp] OR Romania[Mesh:noexp] OR Russia[Mesh:noexp] OR "Russia (Pre-1917)"[Mesh:noexp] OR Rwanda[Mesh:noexp] OR "Saint Kitts and Nevis"[Mesh:noexp] OR Saint Lucia[Mesh:noexp] OR "Saint Vincent and the Grenadines"[Mesh:noexp] OR Samoa[Mesh:noexp] OR Saudi Arabia[Mesh:noexp] OR Senegal[Mesh:noexp] OR Serbia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Seychelles[Mesh:noexp] OR Sierra Leone[Mesh:noexp] OR Slovenia[Mesh:noexp] OR Sri Lanka[Mesh:noexp] OR Somalia[Mesh:noexp] OR South Africa[Mesh:noexp] OR Sudan[Mesh:noexp] OR Suriname[Mesh:noexp] OR Swaziland[Mesh:noexp] OR Syria[Mesh:noexp] OR Tajikistan[Mesh:noexp] OR Tanzania[Mesh:noexp] OR Thailand[Mesh:noexp] OR Togo[Mesh:noexp] OR Tonga[Mesh:noexp] OR "Trinidad and Tobago"[Mesh:noexp] OR Tunisia[Mesh:noexp] OR Turkey[Mesh:noexp] OR Turkmenistan[Mesh:noexp] OR Uganda[Mesh:noexp] OR Ukraine[Mesh:noexp] OR Uruguay[Mesh:noexp] OR USSR[Mesh:noexp] OR Uzbekistan[Mesh:noexp] OR Vanuatu[Mesh:noexp] OR Venezuela[Mesh:noexp] OR Vietnam[Mesh:noexp] OR Yemen[Mesh:noexp] OR Yugoslavia[Mesh:noexp] OR Zambia[Mesh:noexp] OR Zimbabwe[Mesh:noexp]
#2 Search terms for Human Influenza	"Influenza, Human"[Mesh] OR "Influenzavirus A"[Mesh] OR "Influenza B virus"[Mesh] OR influenza*[tiab] OR flu[tiab] OR h1n1[tiab] OR gripe[tiab]
#3 Search terms for influenza vaccines	"Influenza Vaccines"[Mesh] OR vaccin*[tiab] OR immunis*[tiab] OR immuniz*[tiab] OR tiv[tiab] OR laiv[tiab] OR "caiv t"[tiab] OR "Immunization Programs"[Mesh] OR celvapan[tiab] OR focetria[tiab] OR celtura[tiab] OR prepandrix[tiab] OR arepandrix[tiab] OR fluzone[tiab] OR vaxigrip[tiab] OR inlufect[tiab] OR fluvirin[tiab] OR agriflu[tiab] OR optaflu[tiab] OR inluvac[tiab] OR flumist[tiab] OR fluarix[tiab] OR flulaval[tiab] OR afluaria[tiab]
#4 Search terms for laboratory-confirmed influenza and influenza-related outcomes	"influenza like illness"[tiab] OR ili[tiab] OR diagnosis[tiab] OR "diagnosis" [Subheading] OR "Diagnosis"[Mesh] OR clinical*[tiab] OR laboratory[tiab] OR confirmed[tiab] OR "Hospitalization"[Mesh] OR hospital*[tiab] OR "mortality" [Subheading] OR "Mortality"[Mesh] OR mortality[tiab] OR "Death"[Mesh] OR death[tiab] OR deaths[tiab] OR symptom*[tiab] OR respirator*[tiab] OR "Lung Diseases"[Mesh] OR "Respiratory Tract Diseases"[Mesh] OR pneumoni*[tiab] OR "Otitis Media"[Mesh] OR "otitis media"[tiab] OR "Croup"[Mesh] OR croup[tiab] OR "complications"[Subheading] OR complication*[tiab] OR infection*[tiab] OR exacerbation*[tiab] OR asymptomatic*[tiab] OR serolog*[tiab] OR seroconversion*[tiab] OR neurolog*[tiab] OR (("general practitioner"[tiab] OR outpatient[tiab] OR physician*[tiab]) AND (visit[tiab] OR visits[tiab] OR consultation*[tiab] OR "medical attention"[tiab]))
#5 Search terms for effectiveness	"Outcome assessment (Health Care)" [Mesh] OR "Treatment Outcome"[Mesh] OR "Program Evaluation"[Mesh] OR "Evaluation Studies" [Publication Type] OR effectiv*[tiab] OR efficac*[tiab] OR risk*[tiab] OR "odds ratio"[tiab] OR "odds ratios"[tiab]
#6 Search terms for economic evaluations	"Economics"[Mesh] OR pharmacoeconomic*[tiab] OR price[tiab] OR prices[tiab] OR pricing[tiab] OR value*[tiab] OR budget*[tiab] OR ((cost[tiab] OR costs[tiab] OR costed[tiab] OR costly[tiab] OR economic*[tiab]) AND (effectiv*[tiab] OR benefit*[tiab] OR utility[tiab] OR analys*[tiab] OR analyz*[tiab] OR evaluation*[tiab] OR burden[tiab]))

#7	#1 AND #2 AND #3 AND #4
#8	#1 AND #2 AND #3 AND #5
#9	#1 AND #2 AND #3 AND #6
#10	#9 NOT (#7 OR #8)

Appendix 2. Low and middle income countries

Countries are categorized according to the definitions set up by the World Bank (<http://data.worldbank.org/about/country-classifications/country-and-lending-groups>). Low income countries are defined to have a a GNI per capita of \$995 or less. Low and upper middle income countries are defined to have a GNI per capita of \$996 to \$12,195.

Low income countries

Afghanistan	Guinea	Myanmar
Bangladesh	Guinea-Bissau	Nepal
Benin	Haiti	Niger
Burkina Faso	Kenya	Rwanda
Burundi	Korea, Dem Rep.	Sierra Leone
Cambodia	Kyrgyz Republic	Solomon Islands
Central African Republic	Lao PDR	Somalia
Chad	Liberia	Tajikistan
Comoros	Madagascar	Tanzania
Congo, Dem. Rep	Malawi	Togo
Eritrea	Mali	Uganda
Ethiopia	Mauritania	Zambia
Gambia, The	Mozambique	Zimbabwe
Ghana		

Low middle and upper middle income countries

Albania	Guatemala	Paraguay
Algeria	Guyana	Peru
American Samoa	Honduras	Philippines
Antigua and Barbuda	Indonesia	Romania
Angola	India	Russian Federation
Argentina	Iran, Islamic Rep.	Samoa
Armenia	Iraq	São Tomé and Príncipe
Azerbaijan	Jamaica	Senegal
Belarus	Jordan	Serbia
Belize	Kazakhstan	Seychelles
Bhutan	Kiribati	South Africa
Bolivia	Kosovo	Sri Lanka
Bosnia and Herzegovina	Lebanon	St. Kitts and Nevis
Botswana	Lesotho	St. Lucia
Brazil	Libya	St. Vincent and the Grenadines
Bulgaria	Lithuania	Sudan
Cameroon	Macedonia, FYR	Suriname
Cape Verde	Malaysia	Swaziland
Chile	Maldives	Syrian Arab Republic
China	Marshall Islands	Thailand
Colombia	Mauritius	Timor-Leste
Congo, Rep.	Mayotte	Tonga
Costa Rica	Micronesia, Fed. Sts.	Tunisia
Côte d'Ivoire	Mexico	Turkmenistan
Cuba	Moldova	Tuvalu
Djibouti	Mongolia	Turkey
Dominica	Montenegro	Ukraine
Dominican Republic	Morocco	Uruguay
Ecuador	Namibia	Uzbekistan
Egypt, Arab Rep.	Nicaragua	Vanuatu
El Salvador	Nigeria	Venezuela, RB
Fiji	Pakistan	Vietnam
Gabon	Palau	West Bank and Gaza
Georgia	Panama	Yemen, Rep.
Grenada	Papua New Guinea	

Appendix 3. Study characteristics of cost analysis conducted from an employer's perspective

SOURCE (publication year)	OBJECTIVE	COUNTRY / EMPLOYER	CURR ENCY	ANALYTIC HORIZON	COST SAVINGS			UNCERTAINTY ANALYSIS	FUNDING SOURCE
					Prod.rate when working ill 30%	Prod.rate when working ill 50%	Prod.rate when working ill 70%		
At'kov (2011) [36]	Comparison of costs of absenteeism and presenteeism with versus without vaccination program.	Russia. Railways public corporation.	EURO	8 months	10.80	9.20	7.50	Productivity rate	Sanofi Pasteur
Morales (2004) [38]	Comparison of costs of absenteeism and presenteeism with versus without vaccination program.	Colombia. Bank.	US\$ dollars	6-8 months	25.80 (labour costs) 237.85 (labour costs + OI)	16.11 (labour costs) 163.58 (labour costs + OI)	6.43 (labour costs) 89.30 (labour costs + OI)	Vaccination coverage and ILI incidence	Aventis Pasteur

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Samad (2006) [39]	Comparison of costs of absenteeism and presenteeism with versus without vaccination program.	Malaysia. Petrochemical company.	US\$ dollars	6 months	Labour costs (p. vaccinated employee) 53.0 ^a and 96.4 ^b Labour costs + OI: 900 ^a and 353 ^b	Labour costs 46.5 ^a and 89.8 ^b Labour costs + OI: 817 ^a and 270 ^b	Labour costs 39.9 ^a and 83.3 ^b Labour costs + OI: 734 ^a and 187 ^b	Vaccination coverage	Sanofi Pasteur
Burckel et al. [37]	Assessment of differences between expenditures and cost savings per vaccinated employee.	Brazil. Pharmaceutical conglomerate.	US\$ dollars	Not reported	121,441 company's net benefit. 35.45 saved per vaccinated employee.		Influenza incidence; vaccine efficacy, coverage, and price; marginal added value costs; labour costs; incidence of adverse events.	Not reported	
Ivannikov et al. [34]	Evaluation of effectiveness of mass influenza immunization.	Russia. Industrial companies.	Russian Rubles	One year.	Economic loss for one case of influenza was estimated to be 12,813 rubles. The total economic effect and costs saved by the employer was 7 million rubles.		None performed.	National Influenza Research Institute, Health administrat	

							ion of Leningrad.
Sharipova et al. [35]	Evaluation of influenza vaccine effectiveness from an epidemiologic and economic point of view.	Russia. Bread- baking plants.	Russia n Rubles	One year.	Actual economic loss/burden was estimated to be 210,386,000 rubles. The economic net effect achieved by vaccination, i.e. the costs saved by the employer with 43.8% vaccination coverage was 66,742,600 rubles and was thus 6 times higher than the vaccination costs (10,595,000). Cost parameter included were days of absenteeism, cost of one day of absenteeism; number of days to issue a sick leave certificate, and sick leave payment per day.	Unclear.	City Centre of the State Sanitary and Epidemiolo gical Surveillanc e, State Medical Academy, Perm.

OI = operating income

^aEmployees not replaced when ill

^bEmployees replaced when ill