Vaccination Programs: Requirements for Child Care, School, and College Attendance

Summary Evidence Tables (search period: 1997-2015)

Evidence from the Interval Update Review of Vaccination Requirements for Child Care

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Davis (2005) **Study Period:** 1997-2002 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in varicella vaccination rates	**Location:** USA, States and DC **Intervention:** Vaccination requirements (school, daycare) **Comparison:** Cross-sectional (mandates vs o mandates)	**Study population:** 19-35 month-old children in the National Immunization Survey (NIS) N eligible=not reported Children with NIS immunization dates confirmed with record checks N=21,410 considered; 884 exclusions N=20,526 (95.9%) with record-verified vaccination data eligible for this analysis See Table 1 for 2002 NIS characferistics: age, gender, race/ethnicity, SES	Weighted proportion of 19-35m old children up-to-date (UTD) for varicella vaccination (one dose) *no differences in effects from regressions for daycare entry and school entry: therefore, analysis reported in terms of "any entry"	Assume 77%	Overall UTD varicella comparison, 2002 NIS Coverage Gp1: any mandate 84.9% (83.9%-85.9%) Vs Gp2: no mandate 76.8% (75.3%-78.4%)	Absolute pct pt difference = +8.1	n/a

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Duggirala (2005) **Study Period:** 1999-2000 **Design Suitability (Design):** Moderate (Case control) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in hepatitis A vaccination rates	**Location:** USA, Maricopa Co. AZ **Intervention:** Day care entry requirement for hepatitis A vaccine **Comparison:** Post only assessment Also: Case-control study of hepatitis A among community residents' status post-entry requirement	Case-Control Study Case: Maricopa Co. resident meeting surveillance case definition during August 1,1999 and April 30, 2000 N=72 (mean age 26.7 years) Controls: Residents of Maricopa Co. during the study period. Excluded if immunized, known hx of hep A, o received im globulin N=144 age- and neighborhood- matched Characteristics of targeted Maricopa Co. children Est. 191,656 as of 2000 Est.76,320 children 2-5 y o in childcare Age: 2-5 years Gender, race/ethnicity, SES: NR	Vaccination coverage estimates between Feb 1999 and June 2000	NR (presumed to be low)	Doses administered: 23,817 children received 1 dose. Of these 4051 received 2nd dose in this time period. Of estimated 76,320 chilldren aged 2-5 yrs attending licensed childcare centers, as of October 1999, authors estimate mx. 23,817 (31.2%) received at least 1 dose of hep A.. Post mandate case control: previously observed risk association with direct or indirect childcare center contact were no longer significantly associated with hep A illness.		1 year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Hadler (2014) **Study Period:** 2007-2013 **Design Suitability (Design):** Least (Before-After) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase in seasonal influenza vaccination rates	**Location:** USA, Connecticut **Intervention:** vaccination requirement in licensed child care centers for at least 1 dose of influenza vaccine by January 1st of each year, beginning September 2010 **Comparison:** Before-after	**Study population:** 6-59 month olds attending licensed child care or preschool programs	Influenza vaccination rates	2009-2010 67.8% 95% CI: [61.1%-74.5%]	2012-2013 84.1%	+16.3 pct pts was greater than the national increase of 11.9 pct pts	
Author (Year): Kolasa (2003) **Study Period:** 1999 **Design Suitability (Design):** Moderate (Retrospective cohort, subset analysis) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase in childhood series vaccination rates	**Location:** USA, Philadelphia PA **Intervention:** Vaccination requirement – childcare centers **Comparison:** Before-after	**Study population:** Childlren 59 mos or younger enrolled in commercial childcare centers in Philadephia **Sample size:** (based on multistage probability sampling): N=440 commercial CCCs childcare centers) N=2847 children aged 0-59m N=2740 (95%) with at least some immunization info **Characteristics:** N=2847 0-18 m 13% 19-35m 27% 36-59m 60% Gender, race/ethnicity, SES: not reported	Change in UTD status of enrolled children after 60 day grace period (i.e., required to be UTD by 60 days after enrollment)	Authors noted that up to ¼ of children in CCC not UTD	UTD among 335 children (19-35 mos), for DTap, polio, MMR, Hib: At 60 days 252 (75%) At enrollm 241 (72%) UTD among 1412 children (36-59 mos), for DTap, polio, MMR, Hib: At 60 days (71%) At enrollm (73%)	Difference = +3 pct pts P<.38 Difference = +2 pct pts P<.240	Assessent July-Sept 1999

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Lopez (2008) **Study Period:** 1997-2005 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase vaccination rates	**Location:** USA, States and DC **Intervention:** Vaccination requirement (daycare entry) for Varicella **Comparison:** Year of requirement adoption	**Study population:** States grouped by year they adopted law Pre-2000 9 States + DC 2001-02 35 States 2003-05 2 States None 4 States No State demographic information * 2002 estimates: about ¼ of children <5 years of age were regularly cared for in licensed day care facilities	Correlation between varicella coverage and year of implementation fo childcare entry requirements Varicella vaccination coverage	Pre=25.8%	National varicella vaccination coverage for children 19-35 months (overall): 1997 (pre) 25.8% 2005 (post) 87.9%	Pearson's r: r=0.45; P=.002	8 years
Author (Year): Stanwyck (2004) **Study Period:** 2001-2002 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase vaccination rates; Childcare enrollment as proxy for entry laws; Childhood series; 4.3.1.3.3	**Location:** USA, States **Intervention:** Enrolled in childcare (law also specifies enforcement)* * Assumption here is that enrollment in childcare would be associated with higher vaccination coverage because of entry requirement (if enforced) **Comparison:** Not enrolled in childcare	**Study population:** Children aged 19-35m of parents/guardians participating in National Immunization Survey (NIS) N enrolled=NR N=3120 at analysis 19-35m sample Enrolled N=1483 Not enrolled N=1637 Characteristics Age: 19-35, Gender, race/ethnicity. SES: NR	NIS determined vaccination coverage (at age 24 mo) NIS determined enrollment in childcare Percentage of children UTD on the ACIP recommended 4.3.1.3.3 (p.162)		24 mos UTD status of survey participants in children enrolled in childcare vs never enrolled: N UTD% Enrolled 952 73.1 Never 1090 71.9 19-35m UTD (age appropriate) in enrolled vs never enrolled: N UTD% Enrolled 1483 76.4 Never 1637 72.6	Absolute percent difference 1.2 pct pts (96%CI=-4.3,+6.7) Absolute percent difference +3.8 pct pts (95%CI=-0.7, +8.3)	n/a

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Weiss (2015) **Study Period:** 2005-2009 **Design Suitability (Design):** Moderate (retrospective cohort) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase in hepatitis A vaccination rates	**Location:** USA **Intervention:** states with vaccination requirements **Comparison:** no requirements	**Study population:** Children born between years 2005 and 2009 that were continuously enrolled in three healthcare databases for at least 3.5 years from the date of birth	Factors associated with hepatitis A vaccine series initation - Reside in states with school/day care entry requirements of hepatitis A vaccine Cliniformatics Data Mart MarketScan Commnercial		OR: 0.28 [95% CI: 0.27-0.30] OR: 0.3 [95% CI: 0.29-0.32]	Residing in states with school/ day care entry require-ments of hepatitis A vaccine was associated with hep A initation and comp-letion	

Evidence from the Interval Update Review of Vaccination Requirements for Schools

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Averhoff (2004) **Study Period:** 1997-2001 **Design Suitability (Design):** Greatest (ODCC, pre-post with post-comparison group) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in hepatitis B and MMR vaccination rates among 7th grade students	**Location:** USA, San Diego CA **Intervention:** Vaccination requirement for entering 7th graders **Comparison:** Pre/post surveys Also 8th-12th grade post sample considered as a second comparison	3 samples: pre-survey, post-survey 7th grade (P1), post-survey 8th-12th grade (P2) Characteristics (NS differences except age) *Pre* *P1* *P2* N subs 205 166 212 % Male 46.8 41.6 49.5 %Hispanic 38.5 41.6 46.2 SES % Mother hs school ed or less 44.9 49.4 50.9	UTD hep3 and mmr2 by 7th grade		7th grade post1: 100 (61.7%) of 162 7th grade post2: 58 (27.4%) of 212	+48.5 pct pts +34.3 pct pts	1 year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Bardenheier (2008) **Study Period:** 1999-2002 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in MMR, hepatitis B, and varicella vaccination rates	**Location:** United States **Intervention:** Relationship between proportion of states with vaccination requirements for HEDIS plans and changes in adolescent vaccination coverage over the period 1999-2002	**Study population:** sampled records of adolescents 13 y o in participationg health plans; excluded kids with contraindications to vaccination and with gaps of 45 or more days in previous year's coverage Sampled (by chart review) 411 records per plan or all eligibles, if less than 411 Demographic characteristics not reported.	Adolescent immunization rates for MMR, hep B, and varicella	n/a	Beta (SE) and p for proportion of plans operating in states with school entry laws for each vaccine, as estimated in multivariate analysis of factors associated with the proportion immunuzed by antigen	MMR: beta=.05 (.02), p=.0008 Hep B: beta=.28 (.03); p<.0001 Varicella: Beta=.14 (.03) P<.0001	3 years
Author (Year): Bugenske (2012) **Study Period:** 2008-2009 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase rates of recommended vaccination for adolescents	**Location:** United States **Intervention:** vaccination requirements for middle school entry (2008-2009) **Comparison:** no school requirement	**Study population:** -Students in grades 6-8 N=17, 835 adolescents with provider-reported immunization history made up the analytic sample Groups N States w/requirements 32 States w/o requirements 12	UTD Adolescent immunization rates for Td/TdaP, MenACWY and HPV ≥1 MCV4 ≥1 Td/TdaP	States w/o require-ments 42.1% [95% CI: 38.4-45.9] 53.4% [95% CI:51.8-55.0] 69.5% [95% CI: 67.3-71.1]	States w/requirements 42.2% [95% CI: 40.7-43.7] 70.5% [95% CI: 66.5-74.2] 79.8% [95% CI: 78.7-80.9]	+0.1 pct pts NS +17.1 pct pts +10.3 pct pts	1 school year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Fogarty (2004) **Study Period:** 1997-2000 **Design Suitability (Design):** Least (Post only) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in hepatitis B, MMR, and Td booster vaccination rates among 7th graders	**Location:** USA, Florida **Intervention:** Implementation of state-wide 7th grade school entry law **Comparison:** Change in proportion from 1st to 4th year post-implementation (1st year used as proxy for pre-requirement period)	**Study population:** 177,903 7th graders enrolled in 617 public schools 18,171 7th graders enrolled in 669 private schools	Percentage 7th graders fully vaccinatied (overall)	October 1997 (proxy for pre-law): 61.8%	October 2000: 66%	+4.2 pct pts	4 years
Author (Year): Jacobs (2004) **Study Period:** NR **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in hepatitis B vaccination rates among 11-15 year olds	**Location:** USA, National **Intervention:** States with middle school entry requirements for hepatitis B **Comparison:** States without middle school entry requirements for hepatitis B	Evaluation of intervention impact on disparities in childhood immunization rates by region (urban vs. suburban) and among blacks, whites, and Hispanics. **Setting:** 10 large primary care practices **Study Population:** Children 2 y or younger Region: N/% birth cohort Inner city 1653 (74%) Rest of city 938 (61%) Suburbs 598 (9%)	Proportion of sampled adolescents 11-15 years of age with completion of hepatitis B series (2 or 3 doses)	Baseline: Assume pre=39%	Gp* Nsample %UTD 1 506 75 2 476 39 *Group 1= states with mandate; Group 2=states without mandate	Absolute pct point difference = +36 pct pt P<0.001	n/a

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): James (2001) **Study Period:** 1999-2000 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (2) **Outcome Measure:** Increase in hepatitis B vaccination rates among 7th-9th graders	**Location:** USA, Gainesville FL **Intervention:** Immunization rate among students in grades 7th-9th, for whom hep b vaccination was required for school entry **Comparison:** Immunization rates in grades 10-12, among students who had not been subject to 7th grade school entry hep B vaccination requirement	A door-to-door hep B coverage survey was conducted in 1999-2000 among AAPI students living in Alachua Co. Sample: 246 students (of 288 AAPIs) Middle school 96 (59%) High school 150 (41%) Born in US 55 (47%) Female (52%)	Proportion 7-9th graders UTD for hep B, compared to 10th-12th graders	Assume pre=16%	Subsample Grade N %UTD 7-9th 104 99(95%) 10-12 76 12(16%)	Difference =+79.0 pct pts 95%CI= +70.0%, +88.0%	n/a
Author (Year): Liu (2001) **Study Period:** 1997 **Design Suitability (Design):** Greatest (ODCC) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in hepatitis B vaccination rates	**Location:** USA, Chicago, Illinois **Intervention:** School-based vaccination program (client education, provider education, consent, provision) + vaccination requirement **Comparison:** No school program Grades not under vaccination requirement in 1999	All AAPI students enrolled in Chicago Public Schools (CPS) as of November 1999 N=14,882 By comparisons School program N=NR No school program N=NR Intervention targeted CPS schools N=38 Not targeted schools N=NR Characteristics: NR (schools or AAPI students) Age: pre-K – 12th grade Gender, SES: NR Race/ethnicity: all AAPI	Proportion of pre-K, K, 1st graders HBV3 exposed to vaccination requirement, as of November 1999, compared to Grades 2-4 Proportion of 5-7th graders HBV3 exposed to as of November 1999, compared to 8th-12 graders	For preK law, assume pre=35% For 5th grade entry, assume pre=22%	Group HBV3 by 11/99 preK-1 72% 2-4th 35% 5-7th 77% 8-12 22 %	Absolute percent difference = +42.0 pct pts Absolute percent difference = +55 pct pts	n/a

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Morita (2008) **Study Period:** 2000-2005 **Design Suitability (Design):** Greatest (ODCC, interrupted time series) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase in hepatitis B vaccination rates among 5th grade students	**Location:** US, Chicago, Illinois **Intervention:** Vaccination requirement **Comparison:** Pre-post (time series)	**Study population:** Chicago public school students in 12th grade over 6 retrospective years Each student cohort was identified by year that students entered 5th grade. N=106,541 students Mean cohort size=17,757 Characteristics: Age – mean age 5th gr.; 10.4 yrs Race/ethnicity: Black – 50% Hispanic – 30-34% White – 13-11% Asian – 6-5% SES: NR	Proportion of 1996 pre-req cohort of 5th graders with HBV3 by Oct 15 of same year compared to proportion of 199 post-req cohort of 5th graders with HBV3	Assume Pre=4.3%	Pre-post difference: (96 pre vs. 97 post) Cohort %HBV3 96-pre 4.3% 97-post 38.3%	Difference = 34.0% pct pts 95%CI=33.5%, 34.3% P=<.001	1 year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Olshen (2007) **Study Period:** 2003 **Design Suitability (Design):** Least (Cross sectional) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Increase in hepatitis B and varicella vaccination rates	**Location:** US, nation-wide **Intervention:** Coverage for 2 types of vaccine in plans located in states with school entry vaccination requirement **Comparison:** Coverage for plans in states without school entry vaccination requirements	**Study Population:** Selected database: Health Plan Employer Data and Information Set Adolescent Immunization Survey: data available for 28 states and DC (excluding Utah) leaving 28 study regions Characteristics: NR Age: status at age 13 Gender: NR Race/ethnicity: NR SES: NR Note: analysis incorporated State-level measures of population (2000 Census data)	Mean proportion adolescent UTD HBV in states with mandate vs states without mandate Mean proportion adolescent UTD Varicella in states with mandate vs. states without mandate	Assume pre=49% HBV baseline Assume pre=39% Varicella baseline	HBV Mandate n Mean With 17 59.3% Without 11 49.1% Varicella Mandate n Mean With 5 56.1% Without 23 39.3%	Difference = +10.2 pct pts Difference = +16.3 pct pts	N/A
Author (Year): Potter (2014) **Study Period:** 2009-2010 **Design Suitability (Design):** Least (Before-after) **Quality of Execution (# of Limitations):** Fair (2) **Outcome Measure:** Increase in adolescent recommended vaccination rates	**Location:** USA, Michigan **Intervention:** vaccination requirements for newly recommended adolescent vaccines; enacted in January 2010 **Comparison:** no requirement for adolescent recommended vaccination (2009)	**Study population:** 264,789 Michigan adolescents enrolled in sixth grade as of September 2009 or September 2010 and still residing in Michigan in September 2013 -enrolled in the 6th grade Group N 2010 131,051 2009 133,738	Vaccination coverage with newly adolescent recommended vaccines Tdap MCV4 Vaccination coverage for all school-required vaccines	2009 63.0% 60.6% 46.3%	2010 81.9% 82.1% 73.1%	 +18.9 pct pts +21.5 pct pts +26.8 pct pts	1 year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Rickert (2004) **Study Period:** 1996-1999; 1999 **Design Suitability (Design):** Least (Cross-sectional) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in MMR and hepatitis B vaccination rates among adolescents (age 13)	**Location:** USA, nation-wide **Intervention:** State vaccination requirements for middle school entry (MMR2; hep B3; both) **Comparison:** No vaccination requirements	**Study population:** Adolescents enrolled in managed care organizations (MCOs) participating in HEDIS Subset of adolescents who turned 13 and had been followed for 12 months preceeding Client characteristics: NR Age: age 13 in study year Gender: NR Race/ethnicity: NR SES: insured clients	MCO reported vaccination coverage of 13 year old clients for MMR (2 doses) ; hep B (3 doses)	Assume pre=61% MMR2 baseline Assume pre=34% HBV3 baseline	School entry laws for MMR2 Gp* N Mean Coverage 1 174 66.2% 2 89 61.0% School entry laws for HepB3 Gp* N Mean Coverage 1 45 58.4% 2 218 33.8% * Gp1=MCOs in states with school entry laws; Gp 2=MCOs in states without	Difference = 5.2 pct pts P<0.05 Difference = 24.6 pct pts P<0.05	n/a

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Simpson (2013) **Study Period:** 2007-2010 **Design Suitability (Design):** Least (Before-after) **Quality of Execution (# of Limitations):** Fair (2) **Outcome Measure:** Increase in meningococcal vaccination rates among adolescents (ages 11 and 12)	**Location:** Arizona, state-wide **Intervention:** Amended state vaccination requirements + community-wide education **Comparison:** Before-after	Study population: -11 and 12 year olds Characteristics: NR Ages: 11and 12 grade; 6 Gender: NR Race/ethnicity: NR SES: NR 11 yo Group N 07-08 135,107 09-10 139,747 12 yo Group N 07-08 133,306 09-10 138,634	Percentage of Arizona children with at least one dose of MCV4 11 year olds 12 year olds	2007-08 48.2% 40.3%	2009-10 48.8% 54.8%	+0.6 pct pts 95% CI[0.2, 1] +14.3 pct pts 95% CI [14.1, 14.9]	1 school year

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Wilson (2005) **Study Period:** 1998-2003 **Design Suitability (Design):** Greatest (ODCC) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in adolescent recommended vaccination rates among 9th graders	**Location:** USA, Kansas City MO **Intervention:** Vaccination requirements for hep B (Missouri) + ROPC + School-based vaccination programs **Comparison:** No vaccination requirement for hep B (Kansas)	**Study population:** Selected schools in study region N=27 contacted N=12 accepted; 11 at analysis Samples of students in selected study schools in region A total of 2241 student records were evaluated, among which 2230 (99.5%) had immunization data. Characteristics: NR Age: 9th grade; 12th grade Gender: NR Race/ethnicity: NR SES: NR	Average proportion of sampled students in selected study schools with completed hep B (3 doses) vaccinations	Assume pre=25% HBV3 baseline	KCMO grade HepB3 9th 72.8% 12th 24.7%	Difference = +48.1 pct pts T=3.51 P<0.01	n/a

Evidence from Updated Review of Vaccination Requirements for College/University Attendance

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Castel (2007) **Study Period:** 2000-2004 **Design Suitability (Design):** Least (Post Only) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Increase in N. meningitidis vaccination rates among college students living on campus	**Location:** US, Maryland **Intervention:** Vaccination requirement (law requiring client notification and education) **Comparison:** Post only	**Aim:** to examine impact on vaccination uptake during 2000-2004 **Study population:** 28 (96%) of 32 colleges in MD with on-campus housing	Mean proportion of students vaccinated or obtaining waivers among schools able to provide data	NR	Year %vac %waiv 00-01 66 17 01-02 73 14 02-03 72 12 03-04 76 13	Chi-sq for trend p<0.001 for both coverage and waivers	4 years

Evidence from Studies Providing Measurements of Change in Disease Rates, Morbidity, or Mortality

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Hadler (2014) **Study Period:** 2007-2013 **Design Suitability (Design):** Least (Before-After) **Quality of Execution (# of Limitations):** Fair (3) **Outcome Measure:** Influenza-associated hospitalization rates	**Location:** USA, Connecticut **Intervention:** vaccination requirement in licensed child care centers for at least 1 dose of influenza vaccine by January 1st of each year, beginning September 2010 **Comparison:** Before-after	**Study population:** 6-59 month olds attending licensed child care or preschool programs	Influenza-associated hospitalization rates	2007-2008 58.6%	2012-2013 51.5%	-12%	

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Mele (2008, 2002) **Study Period:** 1987-2000 **Design Suitability (Design):** Moderate (Interrupted Time Series) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Change in rates of acute hepatitis B among persons 15-24 years of age	**Location:** Italy (national study) **Intervention:** (Hepatitis B vaccine) Vaccination requirements (for infants, and for 12 year old adolescents) + School and community-based vaccination programs for 12 year old adolescents **Comparison:** Time Series (before-after)	**Study population:** Population of Italy 1987-2000 **Study subset:** Persons 15-24 years of age in this period (note: this subset most directly affected in the 10 years following the national program targeting 12 year old adolescents) N=Not reported	Incidence rates of reported cases of acute hepatitis B among persons 15-24 years of age (National Surveillance System, SEIEVA) Note: There was a large secular trend downwards in incidence rates in the pre-period 1987-1991 (period of targeting persons at high-risk)	Pre (1991) 11.9 per 100,000	Post (2000) 2.0 per 100,000	-9.9 cases per 100,000 (relative change -83%) No measures of trend	10 years

Study	Location and Intervention	Study Population, Setting, Sample	Effect measure	Reported baseline	Reported effect	Value used in summary [95%CI]	Follow-up time
Author (Year): Sugaya (2005), Reichert (2001) **Study Period:** 1975-2003 **Design Suitability (Design):** Moderate (Interrupted Time Series) **Quality of Execution (# of Limitations):** Fair (4) **Outcome Measure:** Change in calculated excess mortality rates among children 1-4 yrs of age	**Location:** Japan **Intervention:** (Influenza vaccine) Vaccination requirements for schoolchildren 6-15 years + school-based vaccination programs **Comparison:** Time Series Note: This study examined change in excess mortality with removal of the vaccination requirements (relaxed 1987) and school vaccination program (ended 1994)	**Study population:** Population of Japan: 1975-2003 **Study Subset:** Excess mortality rate results reported here are for the subset of children 1-4 years of age in Japan over this study period N=Not reported Note: Reichert 2001 study examined change in overall excess mortality rates (not reported here) Sugaya also examined excess mortality rates among infants and school-aged children (results not reported here)	Changes in annual number of doses of influenza vaccine administered 1975-1994- almost all doses given to school children 1994-2003 most doses for young children and for elderly persons Calculated annual all cause excess mortality rates (per 100,000 population) for children ages 1-4 in Japan	1985 (plot) (33) million 1990	1988 (plot) 1994(plot) (20) million (1) million 2003 Increased 1990-99 Decreased 1999-03	Narrative descript. in evidence review Narrative descript. in evidence review	3-9 years