Curriculum Vitae

Personal information

Eamon O Murchu

Work experience

Health Products Regulatory Authority (HPRA), Ireland

May 2021 - PRESENT

Position: **Medical Officer** (HPRA) and Irish delegate for EMA PRAC (alternate member)

Activities: Clinical Vigilance Assessment, Human Products Monitoring

Health Information and Quality Authority (HIQA), Ireland

June 2016 - May 2021

Positions:

- **Senior Health Technology Assessment Analyst** (February 2018 - May 2021)
- Health Technology Assessment Analyst (June 2016 - February 2018)

Activities: The assessment of the clinical effectiveness, safety, cost-effectiveness and budget impact analysis of new technologies, including pharmaceuticals. *HIQA is a government-funded agency with statutory authority to assess the clinical and cost-effectiveness of health technologies in Ireland.*

National Cancer Registry Ireland (NCRI)

January 2016 - June 2016

Position: Clinical researcher for HPV-related cancer epidemiology

Activities: Epidemiological evaluation of the prevalence of HPV-related oropharyngeal cancers in Ireland

St Luke's Hospital, Roosevelt Hospital, Saint Vincent Hospital, USA

July 2011 - July 2014

Positions: Resident Physician: Anaesthesiology & Internal Medicine Preliminary Program

- Anaesthesiology: General Anaesthesia and subspecialties, Critical Care
- Preliminary year: Internal Medicine subspecialties

St Luke's Hospital, Roosevelt Hospital, Saint Vincent Hospital

Massachusetts and New York City, USA

James Connolly Memorial Hospital, Ireland

July 2009 - July 2010

Positions: Medicine and Surgery Internships

Activities: Clinical rotations in Geriatrics, Respiratory Medicine, Urology, Gynaecology, General Surgery.

Education and training

Post-graduate Diploma in Pharmaceutical Medicine (DPM)

January 2025 – December 2025

- Faculty of Pharmaceutical Medicine (FPM)
- FPM is a Faculty of the Royal Colleges of Physicians (RCP) of the UK (Edinburgh, Glasgow and London)
- Since 13/1/2026, granted Membership of the Faculty of Pharmaceutical Medicine (MFPM) of the RCP *[Membership Number MEM-4172]*

Doctor of Philosophy (PhD)

September 2016 – November 2021

- Thesis: *"Clinical and cost-effectiveness of a Pre-Exposure Prophylaxis (PrEP) programme to prevent HIV"*
- Scholar of SPHeRE programme - Trinity College School of Medicine
- Award for highest achieving 1st year PhD Scholar

Trinity College Dublin, Ireland

Master of Public Health (MPH)

September 2014 – December 2015

First Class Honours

University College Dublin, Ireland

Medicine (Bachelor of Medicine, Surgery and the Art of Obstetrics: MB BCh BAO)

October 2004 – May 2009

- Honours (2:1)
- International clinical clerkships: Cedars-Sinai Medical Center (Los Angeles USA), Memorial Sloan-Kettering Cancer Center & Weill-Cornell Medical Center (New York City, USA)

The Royal College of Surgeons in Ireland

Additional information

Publications

FIRST AUTHOR:

1. O Murchu E, Marshall L, Teljeur C, Harrington P, Hayes C, Moran P, Ryan M. **Oral pre-exposure prophylaxis (PrEP) to prevent HIV: a systematic review and meta-analysis of clinical effectiveness, safety, adherence and risk compensation in all populations. BMJ Open.** 2022 May 11;12(5):e048478. doi: 10.1136/bmjopen-2020-048478. PMID: 35545381; PMCID: PMC9096492.

Abstract: Objective: To conduct a systematic review and meta-analysis of randomised controlled trials (RCTs) of the effectiveness and safety of oral pre-exposure prophylaxis (PrEP) to prevent HIV. Methods: Databases (PubMed, Embase and the Cochrane Register of Controlled Trials) were searched up to 5 July 2020. Search terms for 'HIV' were combined with terms for 'PrEP' or 'tenofovir/emtricitabine'. RCTs were included that compared oral tenofovir-containing PrEP to placebo, no treatment or alternative medication/dosing schedule. The primary outcome was the rate ratio (RR) of HIV infection using a modified intention-to-treat analysis. Secondary outcomes included safety, adherence and risk compensation. All analyses were stratified a priori by population: men who have sex with men (MSM), serodiscordant couples, heterosexuals and people who inject drugs (PWIDs). The quality of individual studies was assessed using the Cochrane risk-of-bias tool, and the certainty of evidence was assessed using GRADE. Results: Of 2803 unique records, 15 RCTs met our inclusion criteria. Over 25 000 participants were included, encompassing 38 289 person-years of follow-up data. PrEP was found to be effective in MSM (RR 0.25, 95% CI 0.1 to 0.61; absolute rate difference (RD) -0.03, 95% CI -0.01 to -0.05), serodiscordant couples (RR 0.25, 95% CI 0.14 to 0.46; RD -0.01, 95% CI -0.01 to -0.02) and PWID (RR 0.51, 95% CI 0.29 to 0.92; RD -0.00, 95% CI -0.00 to -0.01), but not in heterosexuals (RR 0.77, 95% CI 0.46 to 1.29). Efficacy was strongly associated with adherence ($p<0.01$). PrEP was found to be safe, but unrecognised HIV at enrolment increased the risk of viral drug resistance mutations. Evidence for behaviour change or an increase in sexually transmitted infections was not found. Conclusions: PrEP is safe and effective in MSM, serodiscordant couples and PWIDs. Additional research is needed prior to recommending PrEP in heterosexuals. No RCTs reported effectiveness or safety data for other high-risk groups, such as transgender women and sex workers.
Prospero registration number: CRD42017065937.

DOI: 10.1136/bmjopen-2020-048478

2. O Murchu E, Teljeur C, Hayes C, Harrington P, Moran P, Ryan M. **Cost-Effectiveness Analysis of a National Pre-Exposure Prophylaxis (PrEP) Program in Ireland. Value in Health.** 2021 Jul;24(7):948-956. doi: 10.1016/j.jval.2021.02.005. Epub 2021 Apr 15. PMID: 34243838.

Abstract: Objectives: To estimate the cost-effectiveness of introducing a publicly funded pre-exposure prophylaxis (PrEP) program in Ireland. Methods: We constructed a state-transition Markov model. This was a cross-sectional population model that tracked all HIV-negative men who have sex with men (MSM) in Ireland over their lifetime. Access to a publicly funded PrEP program (medications + frequent monitoring) in high-risk MSM was compared with no PrEP. The primary outcome measure was the incremental cost-effectiveness ratio (ICER). Results: In the base case, introducing a PrEP program was considered cost saving and provided significant health benefits to the population. Univariate sensitivity analysis demonstrated that PrEP efficacy and HIV incidence had the greatest impact on cost-effectiveness. Including an increase in sexually transmitted infections had a negligible impact on the results. Efficacy was a significant driver in the model. PrEP was cost saving at all efficacy values above 60%, and at the lowest reported efficacy in MSM (44% in the iPrEX trial), the ICER was €4711/QALY (highly cost-effective). Event-based dosing (administration during high-risk periods only) was associated with additional cost savings. We estimated that 1705 individuals (95% CI: 617-3452) would join the program in year 1. The incremental budget impact was €1.5m (95% CI: €0.5m to €3m) in the first year and €5.4m over 5 years (95% CI: €1.8m to €11.5m), with 173 cases of HIV averted over 5 years. Conclusion: We found that the introduction of a PrEP program would be considered cost saving in the first cost-effectiveness analysis of its kind in Ireland.

DOI: 10.1016/j.jval.2021.02.005

3. O Murchu E, Comber L, Jordan K, Hawkshaw S, Marshall L, O'Neill M, Ryan M, Teljeur C, Carnahan A, Pérez JJ, Robertson AH, Johansen K, Jonge J, Krause T, Nicolay N, Nohynek H, Pavlopoulou I, Pebody R, Penttinen P, Soler-Soneira M, Wichmann O, Harrington P. **Systematic review of the efficacy, effectiveness and safety of recombinant haemagglutinin seasonal influenza vaccines for the prevention of laboratory-confirmed influenza in individuals ≥18 years of age.** Rev Med Virol. 2023 May;33(3):e2331. doi: 10.1002/rmv.2331. Epub 2022 Feb 2. PMID: 35106885.

Abstract: The most effective means of preventing seasonal influenza is through vaccination. In this systematic review, we investigated the efficacy, effectiveness and safety of recombinant haemagglutinin (HA) seasonal influenza vaccines to prevent laboratory-confirmed influenza. A systematic literature search was conducted in electronic databases and grey literature sources up to 7 February 2020. Randomised controlled trials and non-randomised studies of interventions were eligible for inclusion. The search returned 28,846 records, of which 10 studies on recombinant HA influenza vaccine met our inclusion criteria. One study found that the quadrivalent recombinant HA influenza vaccine had higher relative vaccine efficacy (rVE) in preventing laboratory-confirmed influenza during the 2014-15 season compared with traditional quadrivalent vaccination in adults aged ≥50 years (rVE = 30%, 95% CI 10%-47%, moderate-certainty evidence). In a subgroup analysis, higher rVE was reported for

influenza A (rVE = 36%, 95% CI 14% to 53%), but not for B (non-significant). Another study reported higher efficacy for the trivalent recombinant HA vaccine compared with placebo (VE = 45%, 95% CI 19-63, 1 RCT, low-certainty evidence) in adults aged 18-55 years. With the exception of a higher rate of chills (RR = 1.33, 95% CI 1.03-1.72), the safety profile of recombinant HA vaccines was comparable to that of traditional influenza vaccines. The evidence base for the efficacy and effectiveness of recombinant HA influenza vaccines is limited at present, although one study found that the quadrivalent recombinant HA influenza vaccine had higher rVE compared with traditional quadrivalent vaccination in adults aged ≥50 years.

DOI: 10.1002/rmv.2331

4. O Murchu E, Spillane S, Byrne P, O'Neill M, Harrington P, Ryan M**. Interventions in an Ambulatory Setting to Prevent Progression to Severe Disease in Patients With COVID-19: A Systematic Review. Ann Pharmacother.** 2022 Mar;56(3):309-318. doi: 10.1177/10600280211028242. Epub 2021 Jun 22. PMID: 34157890.

Abstract: Objective: To conduct a systematic review on the effectiveness and safety of pharmacological and nonpharmacological interventions, in the ambulatory setting, aimed at preventing severe disease in patients with COVID-19. Data sources: Electronic databases (PubMed, EMBASE, and EuropePMC) were searched on January 6, 2021. Study selection and data extraction: A systematic review was conducted, adhering to PRISMA guidelines. The quality of individual trials was assessed using the Cochrane Risk-of-Bias Tool 2, and the certainty of evidence was assessed using GRADE. Data synthesis: The collective search retrieved 3818 citations. Eight trials relating to 9 pharmacological interventions were identified. No evidence for nonpharmacological interventions was identified. Low certainty evidence of effectiveness in preventing severe disease was found for fluvoxamine (absolute difference: -8.7%; 95% CI: -1.8% to -16.4%) and bamlanivimab plus etesevimab (absolute difference: -4.9%; 95% CI: -0.8% to -8.9%). Both trials were limited by small sample sizes and short durations of follow-up. In addition, very low certainty evidence of effect was found for ivermectin plus doxycycline and sulodexide. Based on published data, insufficient evidence of effect was found for bamlanivimab (monotherapy), casirivimab plus imdevimab, ivermectin (monotherapy), nitazoxanide, and peginterferon lambda. Relevance to patient care and clinical practice: This review assessed all ambulatory treatments for COVID-19 that may improve patient outcomes and reduce hospitalizations. Conclusion: Recent trials have shown promising results for a number of pharmacological agents to treat COVID-19 in the ambulatory setting. However, larger, more robust trials are needed to support the routine use of these agents outside of monitored clinical trials.

DOI: 10.1177/10600280211028242

5. O Murchu E, Byrne P, Carty PG, De Gascun C, Keogan M, O'Neill M, Harrington P, Ryan M. **Quantifying the risk of SARS-CoV-2 reinfection over time. Rev Med Virol.** 2022 Jan;32(1):e2260. doi: 10.1002/rmv.2260. Epub 2021 May 27. PMID: 34043841; PMCID: PMC8209951.

Abstract: Despite over 140 million SARS-CoV-2 infections worldwide since the beginning of the pandemic, relatively few confirmed cases of SARS-CoV-2 reinfection have been reported. While immunity from SARS-CoV-2 infection is probable, at least in the short term, few studies have quantified the reinfection risk. To our knowledge, this is the first systematic review to synthesise the evidence on the risk of SARS-CoV-2 reinfection over time. A standardised protocol was employed, based on Cochrane methodology. Electronic databases and preprint servers were searched from 1 January 2020 to 19 February 2021. Eleven large cohort studies were identified that estimated the risk of SARS-CoV-2 reinfection over time, including three that enrolled healthcare workers and two that enrolled residents and staff of elderly care homes. Across studies, the total number of PCR-positive or antibody-positive participants at baseline was 615,777, and the maximum duration of follow-up was more than 10 months in three studies. Reinfection was an uncommon event (absolute rate 0%-1.1%), with no study reporting an increase in the risk of reinfection over time. Only one study estimated the population-level risk of reinfection based on whole genome sequencing in a subset of patients; the estimated risk was low (0.1% [95% CI: 0.08-0.11%]) with no evidence of waning immunity for up to 7 months following primary infection. These data suggest that naturally acquired SARS-CoV-2 immunity does not wane for at least 10 months post-infection. However, the applicability of these studies to new variants or to vaccine-induced immunity remains uncertain.

DOI: 10.1002/rmv.2260

6. O Murchu E, Byrne P, Walsh KA, Carty PG, Connolly M, De Gascun C, Jordan K, Keoghan M, O'Brien KK, O'Neill M, Smith SM, Teljeur C, Ryan M, Harrington P. **Immune response following infection with SARS-CoV-2 and other coronaviruses: A rapid review. Rev Med Virol.** 2021 Mar;31(2):e2162. doi: 10.1002/rmv.2162. Epub 2020 Sep 23. PMID: 32964627; PMCID: PMC7536965.

Abstract: In this review, we systematically searched and summarized the evidence on the immune response and reinfection rate following SARS-CoV-2 infection. We also retrieved studies on SARS-CoV and MERS-CoV to assess the long-term duration of antibody responses. A protocol based on Cochrane rapid review methodology was adhered to and databases were searched from 1/1/2000 until 26/5/2020. Of 4744 citations retrieved, 102 studies met our inclusion criteria. Seventy-four studies were retrieved on SARS-CoV-2. While the rate and timing of IgM and IgG seroconversion were inconsistent across studies, most seroconverted for IgG within 2 weeks and 100% (N = 62) within 4 weeks. IgG was still detected at the end of follow-up (49-65 days) in all patients (N = 24). Neutralizing antibodies were detected in 92%-100% of patients (up to 53 days). It is not clear if reinfection with SARS-CoV-2 is possible, with studies more suggestive of intermittent detection of residual RNA. Twenty-five studies were retrieved on SARS-CoV. In general, SARS-CoV-specific IgG was maintained for 1-2 years post-infection and declined thereafter, although one study detected IgG up to 12 years post-infection. Neutralizing antibodies were detected up to 17 years in another study. Three studies on MERS-CoV reported that IgG may be detected up to 2 years. In conclusion, limited early data suggest that most patients seroconvert for SARS-CoV-2-specific IgG within 2 weeks. While the long-term duration of antibody responses is unknown, evidence from SARS-CoV studies suggest SARS-CoV-specific IgG is sustained for 1-2 years and declines thereafter.

DOI: 10.1002/rmv.2162

7. O Murchu E, Comber L, Jordan K, Hawkshaw S, Marshall L, O'Neill M, Ryan M, Teljeur C, Carnahan A, Pérez JJ, Robertson AH, Johansen K, Jonge J, Krause T, Nicolay N, Nohynek H, Pavlopoulou I, Pebody R, Penttinen P, Soler-Soneira M, Wichmann O, Harrington P. **Systematic review of the efficacy, effectiveness and safety of MF59® adjuvanted seasonal influenza vaccines for the prevention of laboratory-confirmed influenza in individuals ≥18 years of age**. Rev Med Virol. 2023 May;33(3):e2329. doi: 10.1002/rmv.2329. Epub 2022 Feb 10. PMID: 35142401.

Abstract: The most effective means of preventing seasonal influenza is through vaccination. In this systematic

review, we investigated the efficacy, effectiveness and safety of MF59® adjuvanted trivalent and quadrivalent influenza vaccines to prevent laboratory-confirmed influenza. A systematic literature search was conducted in electronic databases and grey literature sources up to 7 February 2020. Randomised controlled trials and non-randomised studies of interventions (NRSIs) were eligible for inclusion. The search returned 28,846 records, of which 48 studies on MF59® adjuvanted vaccines met our inclusion criteria. No efficacy trials were identified. In terms of vaccine effectiveness (VE), MF59® adjuvanted trivalent influenza vaccines were effective in preventing laboratory-confirmed influenza in older adults (aged ≥65 years) compared with no vaccination (VE = 45%, 95% confidence interval (CI) 23%-61%, 5 NRSIs across 3 influenza seasons). By subtype, significant effect was found for influenza A(H1N1) (VE = 61%, 95% CI 44%-73%) and B (VE = 29%, 95% CI 5%-46%), but not for A(H3N2). In terms of relative VE, there was no significant difference comparing MF59® adjuvanted trivalent vaccines with either non-adjuvanted trivalent or quadrivalent vaccines. Compared with traditional trivalent influenza vaccines, MF59® adjuvanted trivalent influenza vaccines were associated with a greater number of local adverse events (RR = 1.90, 95% CI 1.50-2.39) and systemic reactions (RR = 1.18, 95% CI 1.02-1.38). In conclusion, MF59® adjuvanted trivalent influenza vaccines were found to be more effective than 'no vaccination'. Based on limited data, there was no significant difference comparing the effectiveness of MF59® adjuvanted vaccines with their non-adjuvanted counterparts.

DOI: 10.1002/rmv.2329

8. O Murchu E, O'Neill S, Byrne P, De Gascun C, O'Neill M, Ryan M, Harrington P. **Comparative genomic analysis demonstrates that true reinfection following SARS-CoV-2 infection is possible. J Clin Virol Plus.** 2021 Jun;1(1):100015. doi: 10.1016/j.jcvp.2021.100015. Epub 2021 May 4. PMID: 35262003; PMCID: PMC8093002.Abstract

Abstract: Background: In recent months, multiple cases of confirmed SARS-CoV-2 reinfection have been reported. However, accurate epidemiological and virological data, including genomic analysis where possible, are required to differentiate cases of prolonged viral RNA shedding (i.e. intermittent detection) from true reinfection. The objective of this review was to systematically identify and summarise all cases of SARS-CoV-2 reinfection confirmed by comparative genomic analysis. Methods: A protocol based on Cochrane rapid review methodology was employed. Databases and pre-print servers were searched until 9/11/2020. Results: Ten studies, representing 17 patients, were identified (mean age=40; 71% male). The time interval between primary infection and reinfection ranged from 13 to 142 days (median: 60).Comparative whole genome sequencing confirmed reinfection in 14 patients (the primary and secondary infections were caused by different viruses). A further three cases had strong, but not confirmed evidence of reinfection, as only partial genomes were retrieved on primary infection.Across 12 studies that reported the number of single nucleotide polymorphisms (SNPs) comparing the first and second genomes, between 8 and 24 SNPs were discovered. With an average SARS-CoV-2 mutation acquisition rate of 1-2 per month, in all cases it is likely that the secondary infection was caused by a different SARS-CoV-2 virus, rather than prolonged shedding of viral RNA from the primary infection.In five reinfection cases, the primary and secondary infections were caused by different SARS-CoV-2 lineages/clades, strongly indicating that infections were caused by different viruses. Conclusion: Comparative genomic analyses from 14 patients confirm that SARS-CoV-2 reinfection can occur.

DOI: 10.1016/j.jcvp.2021.100015

Co-author:

9. Jordan K, **O Murchu E,** Comber L, Hawkshaw S, Marshall L, O'Neill M, Teljeur C, Harrington P, Carnahan A, Pérez-Martín JJ, Robertson AH, Johansen K, Jonge J, Krause T, Nicolay N, Nohynek H, Pavlopoulou I, Pebody R, Penttinen P, Soler-Soneira M, Wichmann O, Ryan M. **Systematic review of the efficacy, effectiveness and safety of cell-based seasonal influenza vaccines for the prevention of laboratory-confirmed influenza in individuals ≥18 years of age.** Rev Med Virol. 2023 May;33(3):e2332. doi: 10.1002/rmv.2332. Epub 2022 Feb 8. PMID: 35137512.

Abstract: The most effective means of preventing seasonal influenza is through strain-specific vaccination. In this study, we investigated the efficacy, effectiveness and safety of cell-based trivalent and quadrivalent influenza vaccines. A systematic literature search was conducted in electronic databases and grey literature sources up to 7 February 2020. Randomised controlled trials (RCTs) and non-randomised studies of interventions (NRSIs) were eligible for inclusion. Two reviewers independently screened, extracted data and assessed the risk of bias of included studies. Certainty of evidence for key outcomes was assessed using the GRADE methodology. The search returned 28,846 records, of which 868 full-text articles were assessed for relevance. Of these, 19 studies met the inclusion criteria. No relative efficacy data were identified for the direct comparison of cell-based vaccines compared with traditional vaccines (egg-based). Efficacy data were available comparing cell-based trivalent influenza vaccines with placebo in adults (aged 18-49 years). Overall vaccine efficacy was 70% against any influenza subtype (95% CI 61%-77%, two RCTS), 82% against influenza A(H1N1) (95% CI 71%-89%, 2 RCTs), 72% against influenza A(H3N2) (95% CI 39%-87%, 2 RCTs) and 52% against influenza B (95% CI 30%-68%, 2 RCTs). Limited and heterogeneous data were presented for effectiveness when compared with no vaccination. One NRSI compared cell-based trivalent and quadrivalent vaccination with traditional trivalent and quadrivalent vaccination, finding a small but significant difference in favour of cell-based vaccines for influenza-related hospitalisation, hospital encounters and physician office visits. The safety profile of cell-based trivalent vaccines was comparable to traditional trivalent influenza vaccines. Compared with placebo, cell-based trivalent influenza vaccines have demonstrated greater efficacy in adults aged 18-49 years. Overall cell-based vaccines are well-tolerated in adults, however, evidence regarding the effectiveness of these vaccines compared with traditional seasonal influenza vaccines is limited.

DOI: 10.1002/rmv.2332

10. Teljeur, C., **O Murchu E.,** Harrington, P., & Ryan, M. (2019). **Cost-utility of gender-neutral HPV vaccination in Ireland**. Int J Technol Assess Health Care, 35, 34.

Abstract: Introduction: A number of economic evaluations of gender-neutral human papillomavirus (HPV) vaccination have been published, generally finding that the cost-effectiveness is sensitive to the uptake rate in girls. In Ireland there is a girls-only program in place, but the initial high uptake rate (>85 percent) was substantially impacted by high profile negative publicity concerning perceived vaccine safety issues. Efforts to address perceived safety concerns have recently yielded a partial recovery in uptake rates. The aim of this study was to estimate the cost-utility of extending the program to include boys and explore the impact of fluctuating uptake rates. Methods: A previously published cost-utility model used in the United States of America and Norway was adapted to the Irish setting and populated with Irish epidemiological and cost data. Comparators included no vaccination, and girls-only and gender-neutral vaccination, both with either a 4-valent or 9-valent vaccine. Vaccination is at age 12 years and oropharyngeal and penile cancers were excluded in the base case analysis. Additional analyses were used to incorporate fluctuating uptake rates into the model. Results: A 9-valent girls-only program dominated the existing

girls-only 4-valent program. The incremental cost-effectiveness ratio (ICER) for a gender-neutral 9-valent program was EUR 50,823/quality-adjusted life year (QALY). Gender-neutral vaccination would be cost-effective at a willingness-to-pay threshold of EUR 45,000/QALY when the uptake rate is below 78 percent. The ICER decreased to between EUR 41,000 and EUR 42,000/QALY when the uptake rate was allowed to fluctuate across six to 12 yearly cycles. Conclusions: The cost-effectiveness of gender-neutral HPV vaccination is highly sensitive to the assumed uptake rate in girls. Large fluctuations in HPV vaccine uptake rates have been observed in a number of countries in the last decade. Incorporating fluctuating uptake rates in the model shows that a gender-neutral program may be more cost-effective than when a stable uptake is assumed.

DOI: https://doi.org/10.1017/S0266462319001727

11. Comber L, **O Murchu E,** Jordan K, Hawkshaw S, Marshall L, O'Neill M, Teljeur C, Ryan M, Carnahan A, Pérez Martín JJ, Robertson AH, Johansen K, de Jonge J, Krause T, Nicolay N, Nohynek H, Pavlopoulou I, Pebody R, Penttinen P, Soler-Soneira M, Wichmann O, Harrington P. **Systematic review of the efficacy, effectiveness and safety of high-dose seasonal influenza vaccines for the prevention of laboratory-confirmed influenza in individuals ≥18 years of age.** Rev Med Virol. 2023 May;33(3):e2330. doi: 10.1002/rmv.2330. Epub 2022 Feb 4. PMID: 35119149.

Abstract: This review sought to assess the efficacy, effectiveness and safety of high-dose inactivated influenza vaccines (HD-IIV) for the prevention of laboratory-confirmed influenza in individuals aged 18 years or older. A systematic literature search was conducted in electronic databases and grey literature sources up to 7 February 2020. Randomised controlled trials (RCTs) and non-randomised studies of interventions (NRSIs) were included. The search returned 28,846 records, of which 36 studies were included. HD-IIV was shown to have higher relative vaccine efficacy in preventing influenza compared with standard-dose influenza vaccines (SD-IIV3) in older adults (Vaccine effectiveness (VE) = 24%, 95% CI 10-37, one RCT). One NRSI demonstrated significant effect for HD-IIV3 against influenza B (VE = 89%, 95% CI 47-100), but not for influenza A(H3N2) (VE = 22%, 95% CI -82 to 66) when compared with no vaccination in older adults. HD-IIV3 showed significant relative effect compared with SD-IIV3 for influenza-related hospitalisation (VE = 11.8%, 95% CI 6.4-17.0, two NRSIs), influenza- or pneumonia-related hospitalisation (VE = 13.7%, 95% CI 9.5-17.7, three NRSIs), influenza-related hospital encounters (VE = 13.1%, 95% CI 8.4-17.7, five NRSIs), and influenza-related office visits (VE = 3.5%, 95% CI 1.5-5.5, two NRSIs). For safety, HD-IIV were associated with significantly higher rates of local and systemic adverse events compared with SD-IIV (combined local reactions, pain at injection site, swelling, induration, headache, chills and malaise). From limited data, compared with SD-IIV, HD-IIV were found to be more effective in the prevention of laboratory-confirmed influenza, for a range of proxy outcome measures, and associated with more adverse events.

DOI: 10.1002/rmv.2330

12. Cardwell K, **O Murchu E,** Byrne P, Broderick N, O'Neill S, Smith SM, Harrington P, O'Neill M, Ryan M. **COVID-19 - Interventions and lifestyle factors that prevent infection or minimise progression to severe disease.** Eur J Public Health. 2021 Oct 20;31(Suppl 3):ckab164.739. doi: 10.1093/eurpub/ckab164.739. PMCID: PMC8574924.

Abstract: Background: This evidence summary synthesised the evidence relating to pharmacological and non-pharmacological interventions in the community to prevent COVID-19/progression to severe disease. An additional aim was to identify potentially modifiable lifestyle factors associated with reduced risk of infection/progression to severe disease. Methods: A systematic search of published peer-reviewed articles and non-peer-reviewed pre-prints was undertaken from 1 January 2020 to 19 April 2021; no language restrictions were applied. All potentially eligible papers were exported to Covidence. Titles/abstracts and full texts were single screened for relevance. Data extraction and quality appraisal of included studies was completed by a single reviewer and checked by a second. Results: In total, 50 studies, three randomised controlled trials (RCTs), one non-RCT and 46 cohort studies were included. The four included controlled trials tested variations of the pharmacological intervention, ivermectin. While these controlled trials reported a protective effect for ivermectin use, these trials were of poor quality and had serious risk of bias. Across 46 cohort studies, the modifiable lifestyle risk factors identified were obesity, smoking, vitamin D status, physical activity, alcohol consumption and processed meat consumption. These studies reported mixed results in terms of the association between modifiable lifestyle risk factors and poor COVID-19 outcomes. Conclusions: At the time of writing there is no high quality evidence of benefit to support pharmacological interventions to prevent COVID-19. Although there were mixed results for the risk factors identified, maintenance of healthy weight, smoking cessation, engaging in physical activity and moderation of alcohol and processed meat consumption are likely to be beneficial to health and should continue to be encouraged.

DOI: 10.1093/eurpub/ckab164.739

13. Clyne B, Walsh KA, **O Murchu E,** Sharp MK, Comber L, O' Brien KK, Smith SM, Harrington P, O'Neill M, Teljeur C, Ryan M. **Using preprints in evidence synthesis: Commentary on experience during the COVID-19 pandemic.** J Clin Epidemiol. 2021 Oct;138:203-210. doi: 10.1016/j.jclinepi.2021.05.010. Epub 2021 May 19. PMID: 34022394; PMCID: PMC8132503.

Key findings: Evidence syntheses are increasingly drawing on preprint servers as a source for emergent literature on COVID-19. Our research group, has conducted a large number of rapid reviews of a broad range of public health topics related to COVID-19. We outline several considerations when including preprints in rapid reviews and lessons learned from this process. What this adds to what is known? Including preprints in rapid reviews has implications for the rapid review process and review teams should have clear protocol regarding the selection and coverage of bibliographic databases, indication within reviews where an included study is a preprint and prespecifying any sensitivity analysis (quantitative or narrative) to assess the impact of inclusion of preprints on the overall results and conclusions. Specific challenges encountered in including preprints in rapid reviews such as those related to matching preprints to subsequent peer review publications and dealing with changes between preprints and peer review publications are presented using three exemplar review, and suggestions for study authors and review teams are provided. What is the implication and what should change now? We suggest that preprint study authors include a statement in the final peer-reviewed version of the manuscript with the citation of the preprint version. Rapid review teams should have a clear policy around whether they will or will not check peer review status of preprints included in a rapid review, and at what point in the review process this would occur.

DOI: 10.1016/j.jclinepi.2021.05.010

14. Walsh KA, O'Donnell H, O'Loughlin M, Eames H, Jiang J, O'Brien KM, Broderick N, O'Brien KK, Carrigan M, Comber L, Cardwell K, Quigley J, Smith SM, **Ó Murchú É,** Butler K, Corcoran B, Connolly K, Harrington P, Ryan M, O'Neill M. **Duration of protective immunity following COVID-19 vaccination of individuals with underlying health conditions: A rapid review.** Rev Med Virol. 2024 Mar;34(2):e2504. doi: 10.1002/rmv.2504. PMID: 41063671.

Abstract: The World Health Organization has stated that the primary goal of immunisation in the COVID-19 pandemic remains to protect against hospitalisation, severe disease and death. Vaccination is particularly important for those with underlying health conditions given the high risk of severe disease in this population. The aim of this review was to examine the change in efficacy and effectiveness of COVID-19 vaccination over time in individuals with underlying conditions. A rapid review was undertaken in Cochrane, Embase, Medline, Europe PMC, MedRxiv and Google Scholar from 01/01/2020 to 27/10/2021. A total of 14 unique studies (3 randomised controlled trials and 11 observational studies) were included. Overall, there was limited and inconsistent evidence regarding vaccine efficacy and effectiveness in those with underlying health conditions. However, the evidence suggests potentially faster waning of vaccine effectiveness against infection, severe disease and death in individuals with underlying conditions, particularly for older adults with these conditions, and in those who are immunocompromised. Protection in younger age groups with underlying conditions who are not immunocompromised, may be largely comparable to that observed in the general population, though this is uncertain. Given the significant burden of infection on individuals with underlying conditions, any small decrease in protection is likely to have a substantial impact in this population. Hence, the evidence supports a policy of providing additional doses to those who are immunocompromised, and boosters to all those with underlying health conditions. Further research is required to understand the impact of new variants on vaccine efficacy/effectiveness in this population.

DOI: 10.1002/rmv.2504

15. Walsh KA, Jordan K, Clyne B, Rohde D, Drummond L, Byrne P, Ahern S, Carty PG, O'Brien KK, **O Murchu E,** O'Neill M, Smith SM, Ryan M, Harrington P. **SARS-CoV-2 detection, viral load and infectivity over the course of an infection.** J Infect. 2020 Sep;81(3):357-371. doi: 10.1016/j.jinf.2020.06.067. Epub 2020 Jun 29. PMID: 32615199; PMCID: PMC7323671.

Abstract: Objectives: To summarise the evidence on the detection pattern and viral load of SARS-CoV-2 over the course of an infection (including any asymptomatic or pre-symptomatic phase), and the duration of infectivity. Methods: A systematic literature search was undertaken in PubMed, Europe PubMed Central and EMBASE from 30 December 2019 to 12 May 2020. Results: We identified 113 studies conducted in 17 countries. The evidence from upper respiratory tract samples suggests that the viral load of SARS-CoV-2 peaks around symptom onset or a few days thereafter, and becomes undetectable about two weeks after symptom onset; however, viral loads from sputum samples may be higher, peak later and persist for longer. There is evidence of prolonged virus detection in stool samples, with unclear clinical significance. No study was found that definitively measured the duration of infectivity; however, patients may not be infectious for the entire duration of virus detection, as the presence of viral ribonucleic acid may not represent transmissible live virus. Conclusion: There is a relatively consistent trajectory of SARS-CoV-2 viral load over the course of COVID-19 from respiratory tract samples, however the duration of infectivity remains uncertain.

DOI: 10.1016/j.jinf.2020.06.067

16. Sharp MK, Forde Z, McGeown C, **O Murchu E,** Smith SM, O'Neill M, Ryan M, Clyne B. **Irish Media Coverage of COVID-19 Evidence-Based Research Reports From One National Agency.** Int J Health Policy Manag. 2022 Dec 6;11(11):2464-2475. doi: 10.34172/ijhpm.2021.169. Epub 2021 Dec 13. PMID: 35042323; PMCID: PMC9818095.

Abstract: Background: How research findings are presented through domestic news can influence behaviour and risk perceptions, particularly during emergencies such as the coronavirus disease 2019 (COVID-19) pandemic. Monitoring media communications to track misinformation and find information gaps is an important component of emergency risk communication. Therefore, this study investigated the traditional media coverage of nine selected COVID-19 evidence-based research reports and associated press releases (PRs) published during the initial phases of the pandemic (April to July 2020) by one national agency. Methods: NVivo was used for summative content analysis. 'Key messages' from each research report were proposed and 488 broadcast, print, and online media sources were coded at the phrase level. Manifest content was coded and counted to locate patterns in the data (what and how many) while latent content was analysed to further investigate these patterns (why and how). This included the coding of the presence of political and public health actors in coverage. Results: Coverage largely did not misrepresent the results of the reports, however, selective reporting and the variability in the use of quotes from governmental and public health stakeholders changed and contextualised results in different manners than perhaps originally intended in the PR. Reports received varying levels of media attention. Coverage focused on more 'human-interest' stories (eg, spread of COVID-19 by children and excess mortality) as opposed to more technical reports (eg, focusing on viral load, antibodies, testing, etc). Conclusion: Our findings provide a case-study of European media coverage of evidence reports produced by a national agency. Results highlighted several strengths and weaknesses of current communication efforts.

DOI: 10.34172/ijhpm.2021.169

17. Teljeur C, Comber L, Jordan K, **O Murchu E,** Harrington P, O'Neill M, Ryan M. **Challenges encountered during the systematic review of newer and enhanced influenza vaccines and recommendations for the future.** Rev Med Virol. 2022 Sep;32(5):e2335. doi: 10.1002/rmv.2335. Epub 2022 Feb 22. PMID: 35191127.

Abstract: There are a variety of challenges in the conduct of systematic reviews of influenza vaccines. We describe our experience of completing four systematic reviews of newer and enhanced inactivated seasonal influenza vaccines. The reporting of the included studies created significant challenges for study identification, data extraction and analysis. Those challenges have implications for the resources required to conduct reviews and, more significantly, for the accuracy of the estimated treatment effect. There is a substantial burden of morbidity and mortality associated with seasonal influenza, and the evidence used to support vaccination strategies requires regular review. An improved review process will facilitate robust decision-making both nationally and internationally. We recommend the development of reporting guidelines, increased engagement between researchers and decision makers, a database of identified trials, and research into search optimisation.

DOI: 10.1002/rmv.2335

18. Sharkey Ochoa I, O'Regan E, Toner M, Kay E, Faul P, O'Keane C, O'Connor R, Mullen D, Nur M, **O Murchu E,** Barry-O'Crowley J, Kernan N, Tewari P, Keegan H, O'Toole S, Woods R, Kennedy S, Feeley K, Sharp L, Gheit T, Tommasino M, O'Leary JJ, Martin CM. **The Role of HPV in Determining Treatment, Survival, and Prognosis of Head and Neck Squamous Cell Carcinoma**. Cancers (Basel). 2022 Sep 3;14(17):4321. doi: 10.3390/cancers14174321. PMID: 36077856; PMCID: PMC9454666.

Abstract: Human papillomavirus (HPV) infection has been identified as a significant etiological agent in the development of head and neck squamous cell carcinoma (HNSCC). HPV's involvement has alluded to better survival and prognosis in patients and suggests that different treatment strategies may be appropriate for them. Only some data on the epidemiology of HPV infection in the oropharyngeal, oral cavity, and laryngeal SCC exists in Europe. Thus, this study was carried out to investigate HPV's impact on HNSCC patient outcomes in the Irish population, one of the largest studies of its kind using consistent HPV testing techniques. A total of 861 primary oropharyngeal, oral cavity, and laryngeal SCC (OPSCC, OSCC, LSCC) cases diagnosed between 1994 and 2013, identified through the National Cancer Registry of Ireland (NCRI), were obtained from hospitals across Ireland and tested for HPV DNA using Multiplex PCR Luminex technology based in and sanctioned by the International Agency for Research on Cancer (IARC). Both overall and cancer-specific survival were significantly improved amongst all HPV-positive patients together, though HPV status was only a significant predictor of survival in the oropharynx. Amongst HPV-positive patients in the oropharynx, surgery alone was associated with prolonged survival, alluding to the potential for de-escalation of treatment in HPV-related OPSCC in particular. Cumulatively, these findings highlight the need for continued investigation into treatment pathways for HPV-related OPSCC, the relevance of introducing boys into national HPV vaccination programs, and the relevance of the nona-valent Gardasil-9 vaccine to HNSCC prevention.

DOI: 10.3390/cancers14174321

OPEN ACCESS - DOCTORAL THESIS

O Murchu, Eamon, Clinical and Cost-effectiveness of a Pre-exposure Prophylaxis (PrEP) Programme to prevent HIV, Trinity College Dublin. School of Medicine, 2021

Abstract

Introduction

There has been an increase in HIV notifications in recent years in Ireland. PrEP is a form of HIV prevention whereby oral antiretrovirals are taken by HIV-negative individuals to prevent infection. The aim of this study is to assess the clinical and cost-effectiveness of providing a publicly funded PrEP programme in Ireland.

Methods

A Health Technology Assessment was undertaken, following both national (HIQA) and international (EUnetHTA and ISPOR) methodological and reporting guidelines. A systematic review and meta-analysis of randomised controlled trials (RCTs) was undertaken to assess the clinical effectiveness and safety of PrEP. A full economic evaluation was undertaken to assess the cost-effectiveness and budget impact of introducing a national PrEP programme. The economic evaluation included an original state transition Markov model populated with Irish cost and epidemiological parameter data.

Results

Clinical effectiveness: The systematic review retrieved fifteen RCTs that met our inclusion criteria. Included studies involved 25,051 participants encompassing 38,289 person-years of follow-up data. Populations included Men who have Sex with Men (MSM), serodiscordant couples (where one person is HIV positive and the other HIV negative), People Who Inject Drugs (PWID) and heterosexuals at high risk. Risk of bias was judged to be low in all studies. PrEP was found to be effective in MSM (relative risk [RR] 0.25, 95% CI: 0.1 to 0.61, 5,103 person-years of data, high certainty), serodiscordant couples (RR 0.25, 95% CI: 0.14 to 0.46, 5,237 person-years of data, high certainty) and PWID (RR 0.51, 95% CI: 0.29 to 0.92, 9,666 person-years of data, high certainty), but not in heterosexuals (non-significant). With high adherence (>80%), risk in MSM was reduced to 0.14 (95% CI: 0.06 to 0.35). Efficacy was strongly associated with adherence ($p<0.01$); on average, a 10% increase in adherence increased efficacy by 13%. PrEP was found to be safe, however unrecognised acute HIV at enrolment increased the risk of viral drug mutation (RR 3.53, 95% CI: 1.18 to 10.56). Evidence for risk compensation was not found.

Cost-effectiveness: In the base case, PrEP was found to be more effective and less costly than not providing PrEP (cost saving). Univariate deterministic sensitivity analysis demonstrated that the efficacy of PrEP and the incidence of HIV in high-risk individuals had the greatest impact on the cost-effectiveness. The inclusion of an increase in STIs due to risk compensation had a negligible impact on the results. Two-way sensitivity analysis demonstrated that incremental cost-effectivenss ratios (ICERs) were negatively associated with both the uptake rate and the size of the eligible population (proportion of MSM who are at high risk). Efficacy was a significant driver in the model. PrEP was cost saving at all efficacy values above 60%, and at an efficacy of 44% (the lowest recorded efficacy in MSM [iPrEX trial]), the ICER was 4,711/QALY (highly cost-effective). A scenario analysis was performed where the PrEP regimen followed event-based dosing (administration during high risk periods only). As expected, event-based dosing was associated with a lower ICERs.

Budget impact: The incremental budget impact was estimated at almost 1.5m in the first year (95% CI: 0.5m to 3m) and 5.4m over five years (95% CI: 1.8m to 11.5m). Also modelled was the number of HIV infections estimated to occur with and without a PrEP programme in place. Overall, 173 HIV infections were estimated to be averted over the course of five years. Extending beyond five years, the yearly incremental budget impact becomes negative (cost saving) by Year 8 (- 0.2m; 95% CI: - 2m to 1.7m). In terms of the aggregate budget impact, the break even point is reached in Year 14 (all programme and medication costs will have been recovered).

Conclusions: High certainty evidence exists that PrEP is safe and effective in MSM, serodiscordant couples and PWID. Additional research may be needed prior to recommending PrEP in heterosexual individuals. PrEP was found to be cost saving in the first cost-effectiveness analysis of a population-based PrEP programme in Ireland. Including a potential increase in STIs (other than HIV) due to risk compensation had a negligible impact on the results. The adoption of event-based dosing could lead to additional cost savings. The incremental budget impact is modest, with evidence of cost savings in as little as eight years.
Description

URL: http://hdl.handle.net/2262/96219

Publisher: Trinity College Dublin. School of Medicine. Discipline of Public Health & Primary Care

Files: Cost-effectiveness analysis of a PrEP programme.pdf (4.87 MB)

Projects

PROJECT LEAD: NATIONAL HEALTH TECHNOLOGY ASSESSMENTS (Health Information and Quality Authority)

1. Dr Éamon Ó Murchú (project lead), Dr Patricia Harrington, Mr Liam Marshall, Ms Debra Spillane, Dr Conor

Teljeur and Dr Máirín Ryan. **Health technology assessment of a PrEP programme for populations at substantial risk of sexual acquisition of HIV.** Health Information and Quality Authority. 14 June 2019.

Full report: https://www.hiqa.ie/sites/default/files/2019-06/PrEP-HTA.pdf.

Press release: https://www.hiqa.ie/hiqa-news-updates/hiqa-advises-minister-health-introduce-prep-programme-prevent-hiv

2. **Dr Éamon Ó Murchú (project lead),** Mr Paul Carty, Dr Barbara Clyne, Dr Patricia Harrington, Ms Karen Jordan, Mr Desmond Lucey, Dr Kirsty O'Brien, Dr Sinead O'Neill, Dr Máirín Ryan, Ms Debra Spillane and Dr Conor Teljeur. H**ealth technology assessment (HTA) of extending the national immunisation schedule to include HPV vaccination of boys.** The Health Information and Quality Authority (HIQA). 4 December 2018.

Full report: https://www.hiqa.ie/sites/default/files/2018-12/HTA-for-HPV-Vaccination-boys.pdf

Press release: https://www.hiqa.ie/hiqa-news-updates/hiqa-advises-changing-more-effective-hpv-vaccine-and-extending-vaccine-boys

PROJECT LEAD: NATIONAL PUBLIC CONSULTATIONS (Health Information and Quality Authority)

1. **Dr Éamon Ó Murchú (project lead),** Dr Patricia Harrington, Mr Liam Marshall, Ms Debra Spillane, Dr Conor Teljeur and Dr Máirín Ryan. **Report on the results of the public consultation on the draft health technology assessment (HTA) of a PrEP programme for populations at substantial risk of sexual acquisition of HIV.** The Health Information and Quality Authority (HIQA).14 June 2019.

Statement of outcomes: https://www.hiqa.ie/sites/default/files/2019-06/Statement-of-Outcomes_Public-consultation-on-PrEP-to-prevent-HIV.pdf

2. **Dr Éamon Ó Murchú (project lead),** Mr Paul Carty, Dr Barbara Clyne, Dr Patricia Harrington, Ms Karen Jordan, Mr Desmond Lucey, Dr Kirsty O'Brien, Dr Sinead O'Neill, Dr Máirín Ryan, Ms Debra Spillane and Dr Conor Teljeur. 4 The Health Information and Quality Authority (HIQA). **Report on the results of the public consultation on the draft health technology assessment (HTA) of extending the national immunisation schedule to include HPV vaccination of boys.** The Health Information and Quality Authority (HIQA).14 June 2019. 4 December 2018.

Statement of outcomes: https://www.hiqa.ie/sites/default/files/2018-12/Statement-of-Outcomes_HTA-for-HPV-Vaccination-boys.pdf

OTHER NATIONAL COLLABORATIONS
1. Health Research Board (HRB): Collaboration in Ireland for Clinical Effectiveness Reviews (CICER) (2016-2021)
2. CERVIVA: Irish Cervical Screening Research Consortium (2016)

Memberships

Membership of the Faculty of Pharmaceutical Medicine (MFPM)

Member of the Faculty of Pharmaceutical Medicine of the Royal Colleges of Physicians of the UK (Edinburgh, Glasgow and London)

Membership start date: 13/01/2026

WILEY Top Cited Article 2022-2023
Top cited publication: O Murchu E, et al. Quantifying the risk of SARS-CoV-2 reinfection over time. Rev Med Virol. 2022; 32(1):e226 https://doi.org/10.1002/rmv.2260. (awarded 2024)

Shani Rushin Prize for Academic Excellence 2017
Highest scoring 1st year PhD scholar (2017); Trinity College Dublin

United States Medical Licensure Examinations
USMLE Step 1: 99th percentile; Step 2: 99th percentile; Step 3: 99th percentile (2007 - 2011)

Academic Scholarships:

1. From the **Royal College of Surgeons Ireland** (2004 – 2009)
2. From the **Department of Education & Science, Ireland** (2004 – 2009): *Highest leaving certificate in Ireland 2004*

Other Relevant Information

Research profile statistics:
Google Scholar statistics 1/1/2021 to 2/3/2026 (last 5 years): Citations=1,452; h-index=12; i10-index=13.

Languages:
- Native Languages: Irish (Gaeilge) and English
- Other languages: Portuguese, Spanish