8th Canadian Immunization Conference

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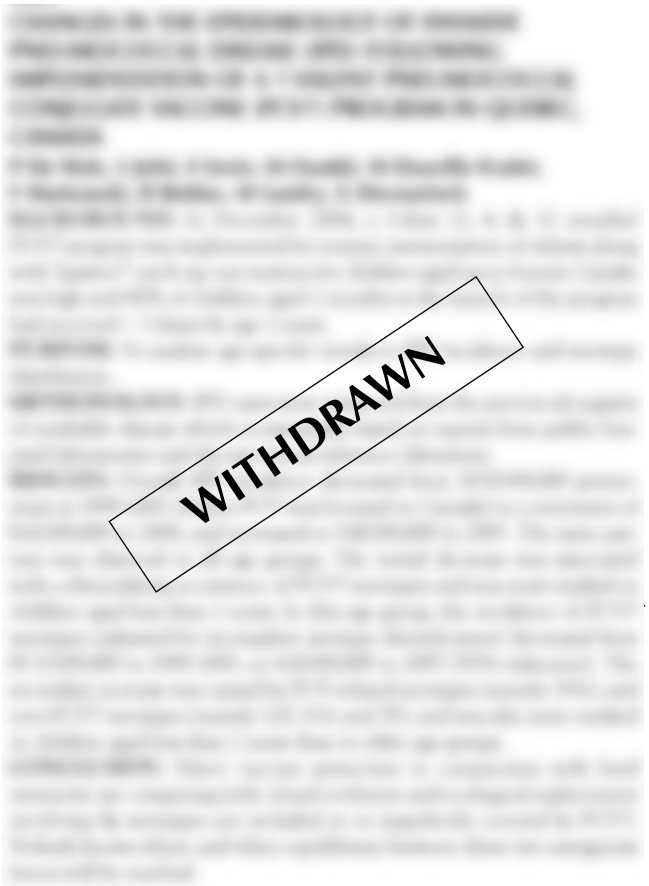
ORAL PRESENTATIONS
Public

O01



ORAL PRESENTATIONS
Clinical

O02

THE EFFECT OF ROUTINE VACCINATION ON INVASIVE PNEUMOCOCCAL INFECTION IN CANADIAN CHILDREN: 2000-2007, A REPORT FROM THE IMPACT NETWORK

J Bettinger, DW Scheifele, SA Halperin, W Vaudry, B Law, G Tyrell

BACKGROUND: *Streptococcus pneumoniae* (pneumococci) are the leading cause of invasive bacterial infection in children. A 7-valent pneumococcal conjugate vaccine (PCV7) has the potential to prevent over 80% of invasive infections in children 0-4 years old, who experience over 80% of the cases among children 0-16 years old. All provinces implemented PCV7 vaccination for infants by 2005; the earliest users (AB, BC) reported rate reductions in infants >80% within a year of program inception.

PURPOSE: To assess the impact of PCV7 vaccination Canada-wide, using an active surveillance network.

METHODS: Active case finding was conducted at the 12 children's hospitals of the IMPACT network from 2000 to 2007. Eligible cases had pneumococci isolated from a normally sterile body site, mainly blood and spinal fluid. Case-finding involved both laboratory monitoring and reviews of discharge diagnosis codes. Local and referred cases were included, as were inpatient and outpatient cases. Isolates were serotyped at the National Centre for Streptococcus, Edmonton. Case information was abstracted in standardized report forms and collated at a data center.

RESULTS: Case total was 2,053 for the 8 year period, with 1,667 cases in 0-4 year olds. In the baseline years 2000-2002, the mean annual caseload for 0-4 year olds was 273.3, of which 223.7 cases (81.8%) were caused by types matched by PCV7 vaccine. By 2006, dramatic changes had occurred: only 18 cases had PCV7 matching isolates, a reduction of 205.7 cases or 92%. The overall case reduction in 2006 was 65.9%. The number of non-vaccine isolates increased from the baseline mean of 49.7 cases per year to 70, a 40.8% increase. Only 5 isolates were untyped. Less effect was evident in 5-16 year olds: in 2006 the case total was 46, only 4.3 cases (8.5%) fewer than the baseline annual mean. The reduction in PCV7-matching isolates (~38%) was largely offset by an increase in other types. Among 0-4 year olds the most prevalent non-vaccine types in 2006-7 were 19A, 5 and 7F.

CONCLUSIONS: PCV7 vaccination programs had a rapid and dramatic effect on cases in young children caused by the targeted types. However, cases caused by non-vaccine types are slowly increasing in frequency, eroding the overall benefit.

O03

ANTI-HBS AND IMMUNE MEMORY 10 YEARS AFTER THE VACCINATION OF PREADOLESCENTS WITH ENGERIX-B

V Gilca, B Duval, N Boulianne, PH De Wals, M Dionne, R Masse, G Trudeau, G De Serres

BACKGROUND: Antibody titers after vaccination against hepatitis B decline and eventually disappear in some vaccinees. Neither the duration of protection nor the need of booster is known. If a booster dose is needed, it should be administered before the loss of immune memory.

PURPOSE: To measure the persistence of anti-HBs and the effect of a booster dose of Engerix-B given 10 years post-vaccination.

METHODS: 281 children vaccinated at 8-10 years of age with 3 doses of Engerix-B 10 µcg were given a booster dose of the same vaccine 10 years later (age 18-20 years). Antibody testing was performed on sera collected before vaccination, one month post-third dose, before booster, and one month post-booster.

RESULTS: All children were anti-HBs and anti-HBc negative before vaccination. One month after vaccination 100% of vaccinees had a seroprotective level (=10mIU/ml) of anti-HBs; 98% had =100mIU/ml and 87% =1000mIU/ml (GMT 7906mIU/ml). Ten years post-vaccination 85% had a seroprotective antibody level, 60% had =100mIU/ml and 26% =1000mIU/ml (GMT 159mIU/ml). All five vaccinees who had <100mIU/ml post-third dose were under seroprotective antibody level ten years later (3 had no detectable antibodies and 2 had 1mIU/ml). One month post-booster all vaccinees had a seroprotective antibody titer, 97% had =100mIU/ml and 92% had =1000mIU/ml(GMT 30998mIU/ml). Among 42 participants who had anti-HBs titers <10mIU/ml before the booster dose administration 35 (83%) had =100mIU/ml, and 21 (50%) had =1000mIU/ml anti-HBs. All vaccinees were anti-HBc negative.

CONCLUSION: The good response to a booster dose given 10 years after vaccination demonstrates the presence of immune memory in virtually all vaccinees. The results suggest no need for a booster. Longer follow-up is needed to determine the duration of persistence of immune memory.

O04

DOSE-RANGING STUDY OF A SUBUNIT RSV VACCINE IN THE ELDERLY

J Langley, V Sales, A McGeer, R Guasparini, G Predy, W Meekison, J Capellan, M Li, E Wang

BACKGROUND: In high-risk persons (≥ 65 y, immunocompromised, underlying cardiopulmonary disease) RSV (Respiratory Syncytial Virus) is associated with similar morbidity to influenza virus.

PURPOSE: We conducted a randomized, dose-ranging, placebo-controlled, single-blind, phase II trial of a RSV A-alum vaccine containing subunits antigen F, G and M to determine its safety and immunogenicity in older persons, and its effect on influenza vaccine immunogenicity.

METHODS: 561 adults >65 years of age at 5 Canadian sites were randomized to one intramuscular injection (IM) of either 100, 50 or 25 micrograms RSV-A-alum or 100 micrograms non-adjuvanted RSV-A, or alum-placebo. All subjects were offered Influenza vaccine on day (d) 32. RSV serology (neutralization assay by plaque reduction method (NA) v. RSV A and B; ELISA titres v RSV F, G, M) were done days 0, 32, 60, 180 and 360. Influenza serology (serum hemagglutinin inhibition (HAI) reciprocal titers) was done d32, d60, d120. Adverse events (AE) were assessed d0-8, d120, 180 and 360 and severe/serious AE throughout the study.

RESULTS: Immunization was well tolerated, with a similar reactogenicity to alum-placebo and influenza. Five serious AE were unrelated to vaccine. Only the 100 microgram non-adj RSV V achieved ≥ 4 fold antibody rise (FAR) in NA v RSV-A in ≥ 50% of subjects at d32. Dose-response was seen at d32 for adjuvanted vaccines. GMTs v RSV-A and B at all points were comparable in 100 microgram-adj and non-adj groups NA titres were maintained by >75% of these participants on d180. A d32 ≥ 4-FAR or HI ≥ 40 to Influenza (A-H3N2) was seen in >74% of subjects; no difference was seen between groups.

CONCLUSIONS: A subunit RSV-A V was well tolerated in a large population >65 y and did not interfere with InfV immunogenicity. Both adjuvanted and non-adjRSV vaccine containing F, G, and M antigens at the 100 microgram dose showed encouraging results with respect to antibody titers compared to placebo.

O05

REAL TIME POST MARKETING SURVEILLANCE OF INFLUENZA VACCINE SAFETY AND IMMUNOGENICITY

B Law, C Doherty, A McGeer, D Scheifele, G De Serres, V Beynon, Y Li, N Bastien, K Green

BACKGROUND: The trivalent inactivated influenza vaccine makeup changes from year to year in anticipation of predicted annual epidemic circulating strains. As Canada's largest mass immunization program, the annual influenza campaign provides an opportunity for enhancing post-marketing surveillance programs that will provide needed information in the event of pandemic influenza.

PURPOSE: To enhance Canadian capacity for real-time postmarketing surveillance of influenza vaccine safety and immunogenicity during the annual campaign as well as during a pandemic.

METHODS: This was an observational cohort study of adults immunized with the influenza vaccine as distributed for use in the annual campaign. Subjects were enrolled in 4 provinces and were followed actively for safety outcomes and, in a subgroup, for immunogenicity outcomes, during the 21 days post immunization. Subjects kept a diary of solicited and unsolicited adverse events and were actively followed up, in person or by phone, on days 3, 7 and 21. Paired sera were assayed for hemagglutination inhibition activity against each of the 2007 vaccine strains at the National Microbiology Laboratory.

RESULTS: A total of 379 subjects were immunized and 123 subjects had paired acute (Day 0) and convalescent (Day 21-24) sera collected. Injection site reactions were the most frequently reported events but were short lived and mild in nature. Six adverse events met the Provincial/Territorial reporting criteria but none were considered serious. The post-immunization seroprotection rates for A Solomon Island, A Wisconsin and B Malaysia strains were, respectively, 97.4%, 95.7% and 45.1%.

CONCLUSION: No safety signals were detected. Immunogenicity was good for both A components of the 2007 vaccine but less so for the B Malaysia component. The timely completion of the studies prior to the start of the annual campaign in the rest of Canada remains a goal for the 2008 campaign. Additional modifications to the 2008 protocol include expansion to additional centres, inclusion of pediatric and geriatric age groups, the addition of a control period and electronic case reporting to enhance feasibility for use in a pandemic situation.

ORAL PRESENTATIONS
Public

O06

SELECTION BIAS IN THE MEASURE OF VACCINE PROTECTION AGAINST SERIOUS BUT NON-SPECIFIC INFLUENZA OUTCOMES IN SENIORS: EXAMINATION THROUGH LINKED MANITOBA DATABASES

TS Hottes, DM Skowronski, B Hiebert, TS Hottes, LL Roos, P Van Caeseele, G De Serres

BACKGROUND: Observational studies based on administrative databases have provided implausibly high estimates of influenza vaccine effectiveness (IVE) against serious but non-specific outcomes in seniors.

PURPOSE: To explore influences on IVE against serious outcomes in seniors when estimated through administrative databases.

METHODS: Primary (pneumonia/influenza/acute respiratory illness) hospitalization and all-cause mortality were compared between vaccinated/non-vaccinated community-dwelling seniors =65years through linked administrative databases of the Manitoba Immunization Monitoring System and the Manitoba Centre for Health Policy data repository between 2003-04 and 2005-06. Separate annual IVE estimates were compared during pre-, influenza-, peak- and post-season periods through combinations of exclusion/regression/stratification/propensity score analyses. Covariates explored included age/sex/income/urban or rural residence/prior influenza or pneumococcal immunization/prior medical visits/homecare use/and Elixhauser (comorbidity) index.

RESULTS: Study population included ~140,000 seniors, of whom ~60-65% were immunized annually. Unadjusted point estimates of IVE ranged from 0-10% for primary hospitalization and 15-60% for all-cause mortality during the influenza-season, unaffected by peak-periods. Only adjustment for prior influenza immunization history influenced IVE estimates, increasing to as high as 40% for primary hospitalization and 80% for all-cause mortality. IVE estimates were paradoxically highest in the pre-season period, a finding only exacerbated through standard regression and propensity score adjustment. Exclusion of persons hospitalized during the fall immunization period minimally corrected for pre-season differences. Stratified analysis showed that habitual immunizers who failed to be immunized during the study year had the highest risk of hospitalization/death pre-season, which persisted through subsequent analysis periods.

CONCLUSION: IVE against serious outcomes in seniors appears to be largely explained by selection bias, as evidenced by persistent pre-season differences in vaccinated/unvaccinated cohorts. The failure of repeatedly vaccinated seniors to be immunized is a flag for acute hospitalization/death, and no readily-available covariate properly adjusts for this "negative confounding-by-indication". Selection bias precludes reliable interpretation of vaccine protection in seniors when measured through administrative databases.

O07

PUBLIC HEALTH GOVERNANCE 1997-2008: THE CASE OF CANADIAN IMMUNIZATION POLICY

C Mah, RB Deber

PURPOSE: Five years after the Naylor Commission called for greater coordination in public health, is Canada better equipped to implement immunization policies?

BACKGROUND: This research is part of a larger study on public health governance as seen through Canadian immunization policy over the last decade. Through this research, we hope to improve policymakers' understanding of the best ways to implement immunization programs, given trends in public policy and public health governance.

METHODS: We undertook a systematic text analysis of policy documents from federal departments and agencies, federal-provincial/territorial (FPT) working groups, and national-level non-governmental actors from 1997-2008. The influence of two independent variables on policy instrument choice in the area of immunizations was investigated: structural-institutional factors (political, economic, and legal context) and ideational factors (values/goals of policy actors; framing/symbolic representation in policy). We then looked at how these choices fit into public health governance strategies.

RESULTS: Over the decade, we observed: an ongoing emphasis on fiscal prudence and accountability mechanisms; the emergence of risk-based regulation; and an increasing reliance on informal policy networks and decentralized governance outside of the traditional arrangements of federalism. Consequently, substantial barriers to successful coordination of immunization programs continue to exist. These findings parallel similar governance trends in other areas of public policy.

CONCLUSIONS: Calls for greater coordination of public health have resulted in structural changes at the FPT interface over the last decade, including the recent establishment of the Public Health Agency of Canada and the National Immunization Strategy. Despite these changes, our research reveals that a continuing tension exists between immunization policy goals at the national level and the political context in which immunization programs need to be implemented. Further research within this project will demonstrate specific policy issues where we might be best suited to make immunization gains, given this governance climate.

ORAL PRESENTATIONS
Clinical

O08

EPIDEMIOLOGY OF MEASLES OUTBREAK IN TORONTO 2008

M Finkelstein, N Crowcroft, O Kadri, B Yaffe, V Dubey

BACKGROUND: While endemic transmission of measles has been interrupted in Canada, imported cases continue to be reported. Despite a high measles vaccination rate in the population at large, a measles outbreak occurred in Toronto in spring 2008 that spread to eight Ontario health regions.

PURPOSE: Describe the epidemiology of a measles outbreak to evaluate measles control and inform possible changes to provincial vaccination strategies.

METHODS: Descriptive epidemiology of measles cases reported in Toronto from March to June 2008 including information on demographics, source of infection, vaccine status, transmissibility and clinical course.

RESULTS: Twenty-six confirmed and probable outbreak cases were reported between March 17th and June 30th, 2008. The index case was not travel related and no source of the outbreak was found. During the outbreak, two additional imported cases were reported but no local transmission occurred from these two cases. The average (mean) age of cases was 28 years (median = 33 years): 23% were born before 1970, 50% between 1970 and 1980, and 27% after 1980. Genotyped outbreak cases were D8. There were no cases of severe complications from measles. Vaccination status of cases included: 4% (n=1) received two doses, 27% (n=7) received one dose, 38% (n=10) had not been vaccinated and 31% (n=8) had unknown vaccine status. Vaccine efficacy, estimated from the 4,304 contacts identified during the outbreak, was 88.5%.

CONCLUSION: The largest outbreak of measles in Toronto since 1995 identified a cohort of adults born in the 1970's who are susceptible to measles. This cohort was too old to benefit from the 1996 province-wide measles vaccine campaign but was too young to acquire natural immunity. This highlights the importance of adult immunization and suggests that Ontario's routine immunization schedule for those born in 1970 or later should include a second does of MMR vaccine. The outbreak also showed that unvaccinated children continue to be at risk for measles infection. Ensuring two doses of measles vaccine is an important strategy to maintain measles elimination.

ORAL PRESENTATIONS
Public

O09

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WITHDRAWN

ORAL PRESENTATIONS
Clinical

O10
KINETICS OF THE IGG AND IGA ANTIBODY RESPONSE IN POST-PARTUM WOMEN AFTER IMMUNIZATION WITH TDAP

B Halperin, SA McNeil, JM Langley, J Mutch, D MacKinnon-Cameron, SA Halperin

BACKGROUND: Pertussis is a life-threatening disease in the first six months of life, but completion of the primary vaccine series does not occur until the end of this period. Passive immunization via transfer of maternal antibodies could potentially protect the infant until immunity has developed. We sought to determine if immunization with Tdap in the immediate post-partum period would result in a rapid rise of maternal serum and breast milk levels sufficient to achieve the transfer of anti-pertussis antibodies into breast milk.

METHODS: Within 24 hours of delivery, 50 postpartum women were randomized in a 4:1 ratio to receive either Tdap or no vaccine. Serum, salivary and breast-milk antibodies against pertussis toxin (PT), filamentous hemagglutinin (FHA), pertactin (PRN) and fimbriae-2/3 (FIM) were measured on days 0, 7, 10, 14, and 28 post-immunization.

RESULTS: Maternal serum IgG antibody levels for all antigens approached peak levels by day 10 and remained at these levels through day 28. Serum IgA antibody-response followed a similar pattern approaching peak response by day 10; however, IgA antibodies to all antigens began to noticeably decline between days 14 and 28. In contrast, breast milk IgA antibody response was variable, with some women not producing any antibody to any of the antigens, while others made antibody to one or more of the four pertussis antigens. In those women who produced antibody, the kinetics of the response was similar to that observed with serum IgA.

CONCLUSIONS: Although the serum antibody-response to Tdap in post-partum women is suggestive of an anamnestic immune response, it may not be sufficiently rapid, and the transfer of antibody into breast milk may not be sufficiently consistent to result in transfer of immunity to the infant, particularly in the first 10 days of life.

ORAL PRESENTATIONS
Immunization

O11
IMPACT OF A 2-DAY INTERACTIVE INSTRUCTIONAL INTERVENTION ON THE USE OF PROACTIVE VACCINATION PRACTICES AMONG NURSES WORKING IN COMMUNITY HEALTH CENTERS

G Petit, L Gauvin, M Letellier, C Guimond, C Larue, L Valiquette, N Boulianne

BACKGROUND: Immunization is an important public health intervention to prevent illness and protect population health. Health professionals play an important role in vaccine uptake but do not systematically show strong support for the promotion of this intervention in the population.

PURPOSE: The purpose of this study was to examine the impact of a 2-day interactive instructional intervention on the use of proactive vaccination practices among nurses working in community health centers.

METHODS: We conducted a quasi-experimental study wherein local community health centers from four regions in the province of Quebec were randomized into experimental and control groups. Nurses working in experimental organizations (n=87) participated in a 2-day interaction instructional intervention and completed self-reported questionnaires tapping into proactive immunization practices and socio-demographic characteristics before and 3 to 4-months after the intervention. Nurses from control organizations (n=84) received no intervention and completed identical self-report questionnaires at similar time intervals as experimental groups participants. The intervention included four consecutive models which involved active nurse participation in pedagogical activities (e.g., brainstorming, responding to vignettes, role playing) which focused on: (1) grasping the breadth of the role of the immunizing nurse both individually and collectively; (2) taking a strong position in favour of immunization; (3) demonstrating a capacity to mobilise parents favourably toward immunization; and (4) believing in one's capability of committing to reducing barriers related to the practice of immunization by nurses.

RESULTS: Multivariate analyses showed that nurses from experimental organizations significantly increased the frequency of use of proactive vaccination practices both in comparison to pre-intervention levels and in comparison to control organization nurses. Between group differences across time were not attenuated by controlling for socio-demographic characteristics and pre-intervention frequency of use of proactive immunization practice.

CONCLUSION: We conclude that a 2-day interactive instructional intervention can successfully improve nurses' ability to promote vaccination in the population.

O12
COMMUNICATION SKILLS TRAINING IN VACCINE RELATED ISSUES DURING PEDIATRIC RESIDENCY

A McConnell, J Lockyer

BACKGROUND: Parents identify poor communication of vaccine risks and benefits as a barrier to immunization. Pediatric residents should be taught about immunization counseling during their training. These competencies are under the CanMEDs roles of Communicator, Advocate, and Medical Expert.

PURPOSE: To explore the process whereby communication skills regarding vaccine risks and benefits are taught and learned during pediatric residency.

METHODS: General pediatric residents from the Universities of Calgary, Alberta and Saskatchewan were invited to participate in focus groups. Four open-ended questions centering on communication skills and vaccine risk and benefit discussion were developed. Informed consent was obtained. Audio-taped recordings of the focus groups were transcribed verbatim, and rendered anonymous. The word documents were analyzed using QSR NVivo 7. The principal investigator coded the data. The codes were discussed between the two investigators and discrepancies were resolved by re-examining the transcripts. Grounded theory methods were used. The University of Calgary Conjoint Health Research Ethics Board approved the study.

RESULTS: Five focus groups were held (n=25). Pediatric residents were aware of the process skills that characterize good communications skills. They knew in general terms what to discuss about immunizations, but confessed to a lack of knowledge with respect to specific questions they anticipated parents would ask. The current system of teaching and learning about immunizations and vaccine risk and benefit counseling was described as being based on presumed competency. This assumption leads to a lack of an organized curriculum. Learning about immunizations tended to be self-initiated. Opportunities to initiate immunization discussions in the in-patient setting were limited. Trainees have few occasions to have their communication and counseling skills observed, and obtain feedback.

CONCLUSION: Pediatric residents feel ill prepared to address vaccine related issues. Communications and counselling skills training should be explicitly taught, with formal assessment and feedback being essential components.

ORAL PRESENTATIONS
Public

O13
QUALITY-OF-LIFE-YEARS (QALY) LOST DURING THE FIRST 90 DAYS AFTER THE ONSET OF HERPES ZOSTER (HZ)

M Drolet, RW Johnson, MJ Levine, MN Oxman, DM Patrick, KE Schmader, JA Mansi

BACKGROUND: Vaccination against HZ is being considered in many countries. Although valid QALY estimates are needed to assess the cost-effectiveness of vaccination, most analyses use QALY data calculated from cross-sectional studies using population norms as reference values.
PURPOSE: Using data from Master, a prospective multi-center Canadian study conducted to provide a thorough understanding of the burden of HZ and post-herpetic neuralgia (PHN), we estimated the QALY lost to acute HZ prospectively.
METHODS: From 10/2005 – 08/2006, 277 incident cases of HZ were recruited across Canada and followed for 6 months. Their health-related quality of life (HRQoL) (EQ-5D and VAS) and pain severity (Zoster Brief Pain Inventory) were measured at 10 time points. Both pre-HZ HRQoL (measured retrospectively at baseline) and population norms were available as reference values. Here, we defined acute HZ associated pain as pain from rash onset to 90 days, and PHN as worst pain ≥3 persisting after 90 days.We estimated QALY lost to acute HZ by aggregating the difference between the HRQoL and the reference value over time until pain cessation. QALY lost to acute HZ was calculated separately for cases subsequently developing PHN or not.
RESULTS: Using the EQ-5D, QALY lost to acute HZ was 0.023. Patients who subsequently developed PHN lost substantially greater QALYs during the first 90 days after rash onset (50-59 yrs: 0.049, 60-69 yrs: 0.056, ≥70 yrs: 0.079) than those who did not subsequently develop PHN (50-59 yrs: 0.012, 60-69 yrs: 0.016, ≥70 yrs : 0.011). Results varied similarly when using the VAS, although estimates were lower (QALY lost to acute HZ with VAS: 0.013).
CONCLUSION: These results will provide important information for the assessment of the cost-effectiveness of HZ vaccination. Further analysis will also determine QALY lost to PHN.

ORAL PRESENTATIONS
Immunization

O14
POURQUOI LES COUVERTURES VACCINALES DES 0-2 ANS EN ESTRIE SONT-ELLES FAIBLES?

M Guay, F Gallagher, G Petit, S Ménard, P Clément, G Boyer

CONTEXTE: Malgré beaucoup d'efforts, les couvertures vaccinales (CV) des nourrissons en Estrie (région du sud-est québécois de 300 000 habitants avec 3 000 naissances/an) étaient jugées insuffisantes (77 % pour coqueluche à 2 ans en 2005).
OBJECTIF: Identifier les raisons des faibles CV pour convenir ensuite d'un plan d'action.
MÉTHODE: Étude en trois volets, réalisée en 2007-2008, selon un devis descriptif mixte (quantitatif et qualitatif avec approche participative) : 1) analyse des CV et des facteurs associés au statut vaccinal incomplet (SVI) (jumelage du registre régional de vaccination et du Fichier des naissances 2003 à 2006 et analyses multivariées multiniveaux); 2) portrait des services de vaccination (enquêtes auprès des cliniques médicales (CM), des Centres de santé et des services sociaux (CSSS; cliniques publiques) et de la Direction de santé publique (DSP; instance régionale)); 3) perceptions de 18 parents d'enfants avec SVI et de 12 intervenants (entrevues semi-structurées).
RÉSULTATS: Les CV diminuent de 83 % à 3 mois à 62 % à 24 mois. La monoparentalité et certaines caractéristiques maternelles (faible scolarité, jeune âge, accouchement assisté par une sage-femme) sont associées au SVI (OR ajustés : 1,3 à 7). Les services de vaccination en CM et en CSSS sont semblables, mais on trouve davantage de moyens agissant sur la demande, l'accessibilité et l'offre en CSSS. La DSP soutient plus intensivement les CSSS. Deux profils de parents d'enfants avec SVI émergent : parents adoptant des approches naturelles jugées préférables aux vaccins et parents acceptant, avec quelques doutes, la vaccination comme moyen de prévention. Les professionnels reconnaissent les bienfaits de la vaccination, mais expriment certaines réticences. Ils déplorent les difficultés liées à l'acte vaccinal et à la promotion de la vaccination.
CONCLUSION: Plusieurs raisons expliquent les faibles CV et incitent les acteurs à se concerter afin d'adopter de multiples stratégies pour les améliorer.

ORAL PRESENTATIONS
Laboratory

O15
INDUCTION OF BROADLY REACTIVE MUCOSAL AND SYSTEMIC IMMUNE RESPONSES BY A NOVEL HIV-1 VACCINE COCKTAIL ENTRAPPED INTO A LIPID VESICLE

A Azizi, T Le, D Anderson, C Soare, J Torres, F Diaz-Mitoma

BACKGROUND: HIV infection is predominantly transmitted via mucosal surfaces, and this warrants the exploration and characterization of protective immune responses in mucosal tissues. We have previously developed an innovative vaccine based on the genetic mutability and diversity of variable HIV-1 epitopes. This polyvalent peptide vaccine has been shown to induce a broadly reactive peripheral immune response in mice and macaques, however, the level of mucosal immune responses were not sub-optimal. In this study, we take advantage of this distinctive polyvalent immunogen cocktail paired with a well studied lipid-bile salt vesicles, to develop a novel orally-administered vaccine system which enhances both peripheral and mucosal immune responses.
PURPOSE: Herein, we propose that induction of a broad cross-subtype specific HIV-1 mucosal and systemic immune response may correlate with the prevention of disease and facilitate the development of an effective HIV vaccine.
METHODS: Retention and stability of Variosite formulations within the lipid vesicles were determined using quantitative and qualitative biochemical assays. Mice were primed orally with the two different forms of entrapped lipopeptides plus CT adjuvant, followed by an intra-muscular boost with the naked lipopeptides plus TLR7/8 agonist as adjuvant. Control groups were immunized with empty lipid vesicles or/and adjuvants. The breadth of cross-subtype humoral and cellular immunity was determined in mucosal and peripheral sites.
RESULTS: A high level of IgA antibody response was detected in sera, feces and lung lavages of immunized animals after oral immunization. The developed formulations also elicited a broadly reactive cellular response against a panel of HIV-1 subtypes after the last boost, suggesting that the vaccine was capable of eliciting both humoral and cell-mediated immune responses.
CONCLUSION: The data indicate that the incorporation of multiple HIV-1 Variosites into a lipid based oral delivery system is a suitable strategy to generate IgA response in mucosal compartments. Our findings suggest that induction of mucosal and peripheral immune responses at different sites can be controlled by choosing appropriate vaccination routes.

ORAL PRESENTATIONS
Clinical

O16
FACING THE PANDEMIC THREAT: PRECLINICAL DEVELOPMENT OF INNOVATIVE CROSS-PROTECTIVE H5N1 INFLUENZA VIRUS-LIKE PARTICLES

N Landry, S Trépanier, JM Guay, MA D'aoust, M Dargis, LP Vézina

BACKGROUND & PURPOSE: Medicago has adapted its proprietary transient expression technology to the production of influenza antigens in plant biomass. It is the first demonstration that influenza virus-like particles (VLPs) structures can form in plants and from the sole expression of the hemagglutinin antigens. The transient technology could deliver vaccines in about a month after the identification and reception of genetic sequences from the pandemic strain.

METHODS & RESULTS: Mice studies with H5N1 (A/Indonesia/5/2005) influenza VLPs showed that the plant-made vaccine induces cross-protection against lethal challenges with highly pathogenic H5N1 influenza strains of different clades and subclades. Results from studies with ferrets demonstrated that immunization with a single 5-microgram dose of the H5N1 VLP vaccine induced high levels of antibodies in 100% of ferrets and met all required immunogenicity criteria of the European Union Committee for Medicinal Products for Human Use (CHMP) for influenza vaccines. Two 5-µg doses of the VLP vaccine induced high levels of antibodies that neutralized strains of H5N1 circulating viruses beyond the strain used to develop the original vaccine. Cross-reactivity was demonstrated against three of the deadliest strains of H5N1: the Turkey strain (clade 2.2), the Anhui strain (clade 2.3) and the Vietnam strain (clade 1).

CONCLUSION: These data demonstrate the potential of Medicago's technology for the production of a highly immunoprotective vaccine combined with fast response, dose-sparing and critical surge capacity in an efficient and cost-effective manner in the event of a pandemic outbreak.

O17
IMPACT OF CHANGING LABORATORY DIAGNOSTICS ON INFLUENZA SURVEILLANCE

M Garner, R Garner, J Macey, T Tam, S Aziz, M Smieja, T Hatchette

BACKGROUND: Laboratory confirmation is a critical component of infectious disease surveillance. However, laboratory diagnostic methods are subject to classification error of varying degrees depending on the diagnostic method used. Classification error occurs when inherent limitations (sensitivity, specificity) of a diagnostic method result in a proportion of samples being incorrectly classified (i.e. false positive or false negative). Failing to account for classification error may result in inaccurate and poorly comparable surveillance data as well as misinform public health interventions.

PURPOSE: This study was undertaken to demonstrate the impact of classification error on influenza surveillance data and influenza epidemiology.

METHODS: Two years of Canadian laboratory surveillance data (2005/06, 2006/07) were examined. Known sensitivities and specificities of four influenza diagnostic methods – viral culture, direct fluorescent-antibody assay, rapid antigen tests, and reverse transcription-polymerase chain reaction – were used to adjust the reported number of positive influenza tests. An epidemic curve of a typical influenza season was plotted using the same method in order to describe the impact of diagnostic method on the epidemiologic description of the season.

RESULTS: Approximately 100,000 influenza tests were reported nationally in each of 2005/06 and 2006/07. After adjusting for known diagnostic method sensitivities and specificities, observed values indicated over-estimation of influenza detections in both years. However, the magnitude and direction of misclassification varied by province of testing: from a 47.0% over-report to a 32.9% under-report of positives, depending on diagnostic method(s) used. The description of a typical influenza season revealed that severity and length of the season is dependent on diagnostic method used.

CONCLUSIONS: Variations in the diagnostic methods and degree of classification error have an important effect on the interpretation of current influenza data, influenza epidemiology, and comparability between seasons. This information should be used by epidemiologists in order to better interpret surveillance data between provinces and over time.

ORAL PRESENTATIONS
Public

O18
UNIVERSAL INFLUENZA IMMUNIZATION COVERAGE RATES IN ONTARIO CHILDREN

K Moran, S Maaten, J Kwong, A Guttmann, D Northrup

BACKGROUND: Ontario is the only province in Canada with a universal influenza immunization program. Coverage rates for Ontario children have never been assessed.

PURPOSE: To estimate influenza immunization coverage rates in Ontario children aged 12 years or younger for the 2006-07 influenza season and to compare Ontario rates with those in other provinces that have targeted programs.

METHODS: From April to September 2007, a household telephone survey was conducted and responses to the question "Since September 2006, has [child] received a flu shot?" were obtained from the person most responsible for caring for the children. Survey estimates for children aged 6 to 23 months were compared with vaccination rates derived from physician billing claims from health administrative data and also with vaccination rates achieved in other provinces.

RESULTS: The study sample included 5,063 children from 3,029 households. The coverage rate (complete and partial combined) was highest in children aged 2 to 11 years with chronic conditions at 36.8% (95% CI, 31-43%). The coverage rate in healthy children aged 2 to 11 years was 28.3% (95% CI, 26-31%). Children aged 6 to 23 months had the lowest coverage rate at 24.0% (95% CI, 21-28%). The rate of vaccination for children aged 6 to 23 months based on physician billing claims was 11.0%. The Ontario estimate for children aged 6 to 23 months was lower than those obtained in other provinces.

CONCLUSION: Coverage rates in Ontario children in high-risk groups are below the provincial target of 70%. Parent-reported coverage rates for children aged 6 to 23 months are higher than those from administrative data. Under Ontario's universal program, results show that a higher coverage rate in children aged 6 to 23 months has not been realized when compared to estimates from provinces that specifically target this risk group.

POSTER PRESENTATIONS
Clinical

P01
TRIVALENT INFLUENZA VACCINE EFFECTIVENESS AGAINST INFANT/TODDLER HOSPITALIZATION DURING THREE CANADIAN WINTERS: A REPORT FROM THE IMMUNIZATION MONITORING PROGRAM – ACTIVE (IMPACT)

G De Serres, DL Moore, W Vaudry, DW Scheifele, SA Halperin, P Déry, A McGeer, J Embree, MH Lebel, N Le Saux, BJ Law

BACKGROUND: Since 2004, trivalent inactivated influenza vaccine has been recommended for children 6-23 months of age to protect against their high risk of hospitalization. We estimate vaccine effectiveness (VE) against influenza hospitalization in this age group among during three winters.

METHODS: This prospective case-control study was conducted in

10 IMPACT centres and 2 community hospitals across Canada during 2005-06, 2006-07 and 2007-08. Study participants were <24 months old on November 1 and =6 months old on January 31 of the same season. Cases were hospitalized for laboratory-confirmed influenza. Controls were hospitalized for acute respiratory illness and test-negative for influenza. Seasonal influenza activity was characterized based on national laboratory surveillance.

RESULTS: For the 2005-06, 2006-07 and 2007-08 seasons, 41 (28 fluA, 13B), 62 (58A, 4B) and 54 (39A, 15B) cases and 64, 99 and 140 controls respectively, participated in this study. More than two-thirds of participants were previously healthy and less than one-third were vaccinated. VE varied substantially: –11% (95%CI –194%-58%) in 2005-06; 78% (95%CI 32%-93%) in 2006-07 and 52% (95%CI –6%-79%) in 2007-08. During 2005-06, 2006-07 and 2007-08, national laboratory surveillance characterized circulating influenza viruses in the following approximate proportions, respectively: H1N1 (10%, 25%, 35%); H3N2 (45%, 60%, 15%) and B (45%, 15%, 50%). During each season, the H1N1 vaccine component was considered well-matched to circulating H1N1 virus whereas the H3N2 component was relatively strain-level mismatched and the B component was significantly lineage-level mismatched.

DISCUSSION: Variation in VE estimates across study seasons may in part reflect variation in the degree of vaccine match to circulating influenza strains. Young, influenza-naïve children may be especially prone to reduced VE during seasons of significant antigenic mismatch. Low numbers of participants each season and wide confidence intervals preclude definitive conclusions based on this study. Further evaluation, including antigenic strain characterization is needed.

P02

SUSCEPTIBILITY TO MEASLES, MUMPS AND RUBELLA IN REFUGEES AND IMMIGRANTS IN TORONTO

M Rashid, YB Shakya, N Sadiq, C Foo

BACKGROUND: Immigrants and refugees are at increased risk of having incomplete immunizations. There is a paucity of literature examining the susceptibility of new immigrants to vaccine preventable diseases.

PURPOSE: The objective of this study was to determine the susceptibility to measles, mumps and rubella among refugees and immigrants arriving in Toronto, Canada.

METHODS: A retrospective chart review was conducted on new patients at a refugee and immigrant health clinic between January 2004 and December 2006. Socio-demographic and seroprevalence data were extracted and analysed.

RESULTS: A percentage of newcomer patients displayed susceptibility to measles (17/285; 5.8%), mumps (34/283; 12.0%) and rubella (33/417; 7.9%). When these data are combined, 17.8% were non-immune to at least one of the three diseases. Immigration status, age and birth region were associated with susceptibility. Immunity was consistently lower among Government Assisted Refugees when compared to 'non-status' newcomers (2.2% versus 9.9%, 9.3% versus 20.5%, 6.7% versus 12.2% respectively). Measles susceptibility declined with age and no patients over 40y.o. were susceptible. Mumps susceptibility also was found to decline with age. Additionally, birth region was a predictor of immunity to measles and mumps, but not rubella. Greater susceptibility to mumps was observed among patients born in Central America and the Caribbean (24.2%) and South America (18.0%) when compared to those born in Africa (10.4%) and South Asia (6.2%). Gender was not related to immunity.

CONCLUSION: A substantial percentage of newcomer patients are susceptible to measles, mumps or rubella. Immunization programs in Canada should carefully consider these variations in susceptibility to infectious diseases among newcomers.

P03

VACCINE PREVENTABLE DISEASES AND MULTIPLE ORGAN DYSFUNCTION SYNDROME IN A PICU IN CHINA

N MacDonald, QL Zhang, CM Wan

BACKGROUND: Multiple organ dysfunction syndrome (MODS) is a major cause of mortality in PICUs in industrialized countries. As developing countries become more advanced, PICU care comes into reach.

PURPOSE: This study examines the epidemiology of MODS in a PICU in China, a country with an advancing economy, in comparison to MODS in industrialized and developing countries.

METHODS: A retrospective 5 yr audit (01-06) of admissions to 6 bed PICU in the Second Hospital of Lan Zhou University, China to examine patients with MODS using standard case definition.

RESULTS: Of the 332 patients cared for in the PICU in the time interval, 176 (53%) met MODS criteria. The age range was 2 mo to 14yr; mean 35mo. Infectious diseases were the predominate factor underlying MODS (128/176 (73%)) with 24% attributable to vaccine preventable infections (14 to *Haemophilus influenzae* b, 13 to *Streptococcus pneumoniae* and 4 to *Neisseria meningitides*). The MODS mortality rate was 49%, with no difference in infectious vs non infectious causes (48% vs 52%) ($p>0.05$). The frequency of organ dysfunction in MODS was in decreasing order: respiratory, cardiovascular, GI, neurologic, renal, hematological and hepatic systems ($p<0.01$). Mortality rose with increasing number of organs involved. GI system failure was more common in children with MODS due to infection than noninfection (44% vs 23%- $p < 0.01$) and had a higher mortality rate (73% vs 43% $p<0.01$). The mortality rate for MODS in this PICU in China was comparable to rates in other developing countries but higher than in industrialized countries. Primary infection was major cause of MODS in China and in other developing countries but not in industrialized countries.

CONCLUSIONS: MODS is a major cause of mortality in critically ill children in China. In China, infection related PICU MODS cases could be reduced to rates closer to those seen in industrialized countries if vaccines such as conjugated H. influenza b, and conjugated pneumococcal vaccines were introduced into routine practice.

P04

MMR VACCINE REACTIONS: THE ALBERTA EXPERIENCE

C Dribnenki, L Mcdonald, EM Sartison

BACKGROUND: Alberta Health and Wellness (AHW) had noted an increased number of locally-acquired mumps cases since September of 2007. Between September 1 2007 and November 30, 2007, 118 cases occurred. The increase was initially observed in post-secondary students within the 17 to 26 year age group. By November, regions implemented an enhanced mumps immunization program for students and staff in postsecondary institutions across Alberta. Within two weeks of program implementation, several suspected anaphylaxis were reported.

PURPOSE: To highlight the investigation that took place in Alberta after several severe reactions were observed following immunization with Measles Mumps Rubella (MMR) vaccine.

METHODS: During the week of November 19th 2007, three suspected anaphylaxis were reported to AHW. Over the next couple of weeks three additional reports were reported. Consultation between AHW, the Public Health Agency of Canada (PHAC) and the Biologics and Genetics Therapeutics Directorate (BGTD), resulted in suspension of three specific lot numbers of MMR on December 11, 2007, until further investigation could be completed. Detailed case histories were gathered for all cases including past immunization and allergy history; all were seen by an allergist.

RESULTS: There were six cases that met AHW's case definition for anaphylaxis, a rate of ~90/1,000,000. Case histories revealed that most had at least one previous measles containing immunization as well as various allergies. Allergy testing revealed one definite case and two probable cases of anaphylaxis according to the allergist's criteria.

CONCLUSIONS: No specific cause was determined for the high rate of severe reactions. It was hypothesized that the young adult population receiving the vaccine may have been more sensitive to the components than what has been seen in children. This case investigation demonstrated that the surveillance system used in Alberta for the detection of adverse events was effective; however Alberta's case definition may need some refining. AHW defined protocols and developed an enhanced reporting form currently in use for any severe reaction to an MMR immunization to provide further data to these investigations. PHAC is in the process of developing standard operating procedures for anaphylaxis as a result of the Alberta experience, to be used nationwide.

P05

CELLULAR IMMUNITY TO DIPHTHERIA AND TETANUS TOXOIDS AND ACELLULAR PERTUSSIS VACCINE ANTIGENS IS PROMINENT IN 4-5 YEAR OLD CHILDREN

D Scheifele, J Ochnio, SA Halperin, J Wang

BACKGROUND: Immune responses to diphtheria toxoid (DT), tetanus toxoid (TT) and acellular pertussis (aP) vaccine combinations administered in early childhood have mainly been characterized serologically, with booster doses timed to restore flagging serum antibody levels. Cell-mediated immunity (CMI) also develops following infant DTaP vaccinations but only limited data exist regarding its persistence prior to the pre-school booster and possible effects on booster responses.

PURPOSE: Measure the persistence of CMI to vaccine antigens at 4-5 years and explore its implications.

METHODS: Healthy children previously given 4 doses of DTaP.IPV/Hib (Pentacel®, sanofi pasteur, Toronto) vaccine were bled prior to booster vaccination at age 4-5 years. Peripheral blood mononuclear cells (PBMC) were separated and tested for proliferative responses to purified vaccine antigens after 6 days of incubation, assessed by incorporation of tritiated thymidine. Antigens included DT, TT, pertussis toxin (PT, heat inactivated), pertactin (PRN), filamentous hemagglutinin (FHA) and fimbriae types 2, 3 (FIM). PBMC were also stimulated with these antigens to measure cytokine release patterns, assayed using a cytometric bead array kit for Th-1/Th-2 discrimination. Proliferative responses were examined in relationship to the presence and amounts of serum antibodies in the pre-booster sample.

RESULTS: Among 162 subjects tested with all 6 antigens, proliferative responses were detected as follows: FHA 96%, PT 91%, TT 85%, PRN 67%, DT 41% and FIM 31%. Responses to 3 or more antigens were present in 88% of subjects and to 5-6 antigens in 48%. Responses to both DT and TT were present in 40% of subjects and to both PT and FHA in 90%. Only 4 subjects (2.5%) lacked a response to any pertussis antigen. Subjects without detectable pertussis antibodies often had cellular responses detectable (PT 93%, FHA 85%, PRN 56%, FIM 23%). Subjects with cellular responses had higher corresponding antibody concentrations before boosting than did proliferation-negative subjects. CMI responses were mixed Th1/Th2 type by cytokine profile, for all antigens.

CONCLUSIONS: In healthy children previously given 4 doses of DTaP.IPV/Hib vaccine, cellular immunity was prominent. Subjects with CMI were more likely to retain measurable antibody, supporting a memory function. CMI was more often present at age 4-5 years than serum antibody, especially with PT, FHA and TT. This discrepancy between cellular and humoral immunity may explain the high rate of injection site reactions seen with pre-school boosters, which have characteristics of delayed hypersensitivity reactions.

P06

AN INNOVATIVE APPROACH TO FOSTER HPV VACCINE RESEARCH AND EDUCATION IN CANADA

S Dobson, B Duval, M Fung Kee Fung, C Sauvageau, P De Wals, MH Mayrand, E Franco

BACKGROUND: The Canadian Association for Immunization Research and Evaluation (CAIRE) and the Society of Gynecologic Oncologists of Canada (GOC) created a scientific consortium to advance the Canadian implementation of preventive HPV vaccines to reduce the burden of cervical cancer.

PURPOSE: To foster collaborations between researchers and educators from the differing fields of cervical cancer screening, vaccines and public health. The objectives of the Masters Class were to 1) to develop practical research strategies to answer the leading questions necessary to maximize the use of HPV vaccines in Canada, 2) to build a pool of HPV vaccine experts in Canada through collaborative research so that education of health care providers and the public could be achieved, & 3) to identify key communication messages and gaps in knowledge in educating others about HPV vaccines.

METHODS: A series of four Masters Classes on HPV vaccines were held in 2006 and 2007 that addressed: immunology, economic modeling, impact of immunization on cervical cancer screening programs and evaluation of HPV immunization programs. Thirty Canadian experts were invited to participate in each session which began with an inventory of relevant research already being done. Experts included researchers, clinicians and decision-makers providing broad representation of the various disciplines. Each Masters Class had international experts providing the most current knowledge to the participants. This was followed by opportunities in breakout sessions to identify and discuss research project designs. Each Master Class discussed the infrastructure needed to realize the projects, existing opportunities and the steps that would be required to implement and conduct the research. Participants were expected to use the knowledge gained in the Masters Class to assist them in research project planning, teaching & education initiatives and/or decision-making.

RESULTS: A total of 29 different research issues and questions were identified during the four Masters Classes. Each of the research questions were discussed and project design was identified. Decision-makers readily participated by providing insight into information required to make programmatic decisions. As a result of the Masters Classes, CAIRE formed several research planning groups to realize the projects. Identifying mechanisms to fund these projects was an immediate priority as traditional sources of research funding rarely recognize the need to support evaluation of publicly funded vaccine programs.

CONCLUSIONS: Through an innovative approach of education and networking the series of Masters Classes has improved the HPV research infrastructure in Canada with several key HPV research projects underway in Canada.

P07

OUTCOMES ASSOCIATED WITH SPLENECTOMY(S) IN NOVA SCOTIA(NS): 1990-2002

J Langley, L Dodds, D Fell, GR Langley

BACKGROUND: S is associated with increased risk for bacteremia due to impaired clearance of bloodborne agents, and to altered phagocytosis and humoral immunity. Although an infection prevention strategy (immunization, antibiotic prophylaxis, early care for febrile illness) is considered standard of care for these patients, implementation is likely not optimal.

PURPOSE: We reviewed outcomes of a cohort of NS patients at risk for S for a 12-year period.

METHODS: Data were extracted from the NS Medical Services Insurance database for insured services rendered by a physician for 1990-2002 and the Vital Statistics Death database. Patients (pts) were selected based on diagnosis (dx) codes for hematologic and other conditions (HC) for which S might be considered. Each person was followed from the date of first dx until December 31, 2002 or death or relocation out-of province. In addition, an extraction was completed for pt files with S but without a HC, and for the 6 months post-S.

RESULTS: The cohort of pts consisted of 38,812 pts; 72% were >18 years of age (n=28,096). S occurred in 425/38,812 pts overall (1.2%) and within 6 months of the HC dx in 78% of pts. S was identified in 452 subjects without a HC dx (431 A; 21 C). S. pneumoniae immunization was recorded in 16.5% of S patients overall, and was associated with reduced risk of death (Cox proportional hazard regression ratio 0.68, 95% CI 0.47-1.00 adjusted for age at dx and gender). No S. pneumoniae immunization was recorded in patients with a HC dx but no S. Infectious illness visits were higher in pts with S v. no S (265visits/100 person-years of observation v. 119 visits/100 person-years). Results from Cox proportional hazards regression models and modelling S as a time-dependent covariate, indicated that pts with S were are significantly higher risk of death compared to pts without S in all HCs except HS.

CONCLUSIONS: NS pts with S (~73/year) have higher death rates than those without S. Delivery of pneumococcal immunization to these high-risk pts appears to be very low. Immunization is associated with decreased risk of death. Improved delivery of infection prevention programs to this population is warranted.

P08

VACCINATED CHILDREN AMONG HOSPITALIZED MENINGOCOCCAL CASES ACROSS CANADA, IMPACT 2002-2006

J Bettinger, N Le Saux, DW Scheifele, SA Halperin, W Vaudry, R Tsang

BACKGROUND: Meningococcal infections rank second in Canada among life-threatening bacterial infections in children and adolescents. Canada was among the first countries to use Meningococcal C conjugate vaccines (MenC) routinely. All provinces implemented routine infant and/or adolescent vaccination programs with MenC conjugate vaccines in 2002-2005.

PURPOSE: To determine the epidemiology of apparent group C conjugate vaccine failure among cases of invasive meningococcal disease in children.

METHODS: Active metropolitan area surveillance was conducted across Canada by the 12 centers of the Immunization Monitoring Program, Active (IMPACT) for all hospital admissions related to Neisseria meningitidis invasive infections from January 2002 – December 2006. MenC vaccine failure was defined as serogroup C disease in a completely immunized healthy child.

RESULTS: A total of 225 cases were reported in children <20 years over five years: 47 in 2002, 53 in 2003, 41 in 2004, 42 in 2005 and 42 in 2006. Serogroups B (64%), C (16%) and Y (12%) caused most infections.

Five children < 5 years of age had serogroup C disease despite vaccination with MenC conjugate. Among the five, one case appears to be a MenC conjugate failure, while three were incompletely immunized. The one apparent vaccine failure occurred in a healthy 2 year old who had received one dose of MenC at 12 months of age. Two children were immunized with 2 doses of MenC vaccine before 1 year of age and did not receive a booster dose after 12 months, and one child developed disease < 5 days after receiving MenC vaccine. For one case the vaccination date information is insufficient.

CONCLUSION: While loss of vaccine effectiveness (VE) over time remains a concern for meningococcal conjugate vaccines administered in infancy, our surveillance data indicate incomplete vaccine administration rather than loss of VE is a larger problem.

POSTER PRESENTATIONS
Public

P09

ECONOMIC IMPACT OF INFLUENZA VACCINATION OF PREGNANT WOMEN (PW) IN NOVA SCOTIA (NS): NET COST, COST-EFFECTIVENESS AND BUDGET IMPACT

S McNeil, C Skedgel, J Scott, N MacDonald, JM Langley

BACKGROUND: Pregnancy increases influenza hospitalizations and physician visits (events) in women with and without comorbidities (COM). In 2006/2007 the National Advisory Committee on Immunization expanded its influenza immunization recommendation to include all PW.

PURPOSE: We developed an economic model to estimate net cost, cost-effectiveness and budget impact of implementing a publicly-funded universal influenza immunization program for PW in NS and explored cost implications of different vaccine delivery strategies.

METHODS: A decision tree characterized the 1-year costs/consequences of vaccination/no vaccination in a hypothetical cohort of PW. Event probabilities and quality-of-life weights were derived from the literature and event costs from administrative databases. Vaccine acquisition and administration costs were provided by NS Department of Health. Three delivery strategies were considered: public health nurse (PHN), family physician (FP) incorporated into routine prenatal care visit (FP+0) and FP requiring an extra visit (FP+1).

RESULTS: The number needed to vaccinate to prevent 1 hospitalization was 376. The net cost of vaccination (vaccination cost – event costs avoided) was $0.44 (PHN), $4.70 (FP+0) and $33.43 (FP+1). Cost/QALY gained was $761, $8,195 and $58,330 with PHN, FP+0 and FP+1, respectively. Projected net program costs were $4,500, $48,450 and $345,000/year, respectively. Targeting women with COM was cost-saving with all delivery strategies except FP+1.

CONCLUSION: Universal immunization of PW by FP is very cost-effective if incorporated into routine prenatal care. Programs utilizing PHN vaccination could be extremely cost-effective, bordering on cost-saving. Targeting only PW with COM is cost-saving but risks reducing coverage rates and overall health benefit of the immunization program.

P11

NEW VACCINES PRIORITY RATING – DATA FROM A NURSES SURVEY

V Gilca, N Boulianne, E Dube, M Ouakki, C Sauvageau

BACKGROUND: A higher vaccine cost coupled with the target of new vaccines on lower incidence or less severe or visible diseases has focused health professionals' attention on the need for prioritization of new immunization programs. In Canada, nurses play a key role in vaccination. No recent study assessed nurse's support of new candidate immunization programs.

PURPOSE: 1) to assess the knowledge, attitudes and beliefs of Quebec nurses about new vaccines; 2) to estimate the Basic Priority Rating (BPR) of the implementation of new immunization programs with seven candidate vaccines by using nurses responses to five statements regarding vaccine usefulness, effectiveness, safety and acceptability by the public and by the vaccinators.

METHODS: Randomly selected nurses completed a self-administered, mail-based, anonymous questionnaire. The survey followed the general recommendations by Dillman (2000). The responses were scored: 0 for "strongly disagree", 2.5 for "somewhat disagree", 7.5 for "somewhat agree", and 10 points for "strongly agree". The "not sure" responses were scored 5.0 points. For a conservative BPR calculation, we used the formula: BPR = A((B+2C)/3)D; where A = score of immunization program usefulness; B = score of vaccine effectiveness; C = score of vaccine safety; D = score of vaccine acceptance by public multiplied by acceptance by vaccinators as perceived by respondents (Vaccine (2008), doi:10.1016/j.vaccine.2008.05.061).

RESULTS: This is a preliminary report of a survey conducted in June-July 2008. 182 out of 500 invited nurses responded to the survey by July the 3rd. Mean scores for the statements about the usefulness, safety, effectiveness and acceptability of seven new vaccines varied from 6.8 to 8.8. The highest BPR scores were observed for Twinrix (5.4), MMRV (5.3), DTaP-IPV-Hib-HBV (5.0), PCV-10 (4.8), and ACYW135 (4.4), followed by HPV (3.6) and new rotaviral vaccine (2.8). The proportions of nurses who intended to recommend new vaccines were as follow: MMRV – 97%, DTaP-IPV-Hib -HBV – 96%, ACYW135 – 95%, Twinrix – 93%, PCV-10 – 92%, followed by HPV – 86%, and new rotaviral vaccine – 81%. The four combined vaccines: DTaP-IPV-Hib-HBV, ACYW135, Twinrix and MMRV vaccines were perceived as the most acceptable.

CONCLUSIONS: The perceived usefulness, safety, effectiveness, and acceptability of new vaccines are heterogeneous. This heterogeneity is indicative of the complexity of issues related to potential new immunization programs implementation and the need of targeted educational efforts before implementing such programs.

P13

EFFECTIVENESS OF SEROGROUP C MENINGOCOCCAL CONJUGATE VACCINE: A 5-YEAR FOLLOW-UP IN QUEBEC, CANADA

P De Wals, G Deceuninck, N Boulianne, G De Serres

BACKGROUND: In 2001, a mass immunization campaign was implemented in the province of Quebec, Canada, to control an outbreak caused by a virulent clone of serogroup C meningococcus.

PURPOSE: To assess the effectiveness of meningococcal serogroup C polysaccharide-CRM169 protein conjugate vaccine (C-MCV) over a 5-year period.

METHODS: The study population includes individuals targeted in the 2001 mass immunization campaign: residents in the province of Quebec born between July 17, 1980, and November 30, 2001. Statistics provided by vaccinators and individual data from the Meningococcal Vaccination Registry were used to estimate age-specific vaccination rates. An estimated 1,542,002 persons received at least one dose of C-MCV and 333,971 persons were not vaccinated. Cases of serogroup C meningococcal disease (C-MD) confirmed by culture or by PCR and notified to public health authorities from January 1, 2002 to December 31, 2006 were obtained. This list was complemented with information provided by the Provincial Reference Laboratory. Information on immunization status came from two independent interviews.
RESULTS: 11 C-MD cases were ascertained in the C-MCV cohort and 21 in the unvaccinated group. The five-year age-adjusted vaccine effectiveness was 89% (95%CI: 74.9% to 95.3%) and there was no statistically significant decline in protection over time. There was a tendency for increased protection according to the age at vaccination: 3 C-MD cases among 56,433 individuals vaccinated before one year of age (one to 3 doses) and no case among 3,705 non-vaccinated individuals in the same age-group; 84.7% protection for individuals vaccinated during the second year (one dose) and 92.0% protection for those vaccinated at 2 year or more (one dose).
INTERPRETATION: Extended follow-up will be needed to assess the value of revaccination of individuals who received one or several doses of C-MCV at young age.

POSTER PRESENTATIONS
Immunization

P14
WHAT NURSES THINK ABOUT OTITIS MEDIA PREVENTION BY VACCINATION?

V Gilca, PH De Wals, N Boulianne, E Dube, C Sauvageau

BACKGROUND: A new 10-valent pneumococcal conjugate vaccine containing the *H. influenzae*-derived protein D as a carrier is under development. This vaccine, as its 11-valent parent, has the potential to prevent AOM caused by *Streptococcus pneumoniae* and by non-typeable *H. influenzae*, while minimizing replacement by other bacterial otopathogens. AOM is a major cause of morbidity in young children and of health services use, including antibiotic prescriptions. In Canada, nurses are playing an increasingly important role in the promotion and administration of vaccines and there is little information on their knowledge, attitudes and beliefs (KAB) regarding AOM prevention.
PURPOSE: To assess nurses KAB about pneumococcal AOM and its prevention by immunization.
METHODS: 500 nurses practicing across the province of Quebec were randomly selected to participate in this anonymous, mail-based survey.
RESULTS: 178 nurses responded to the first mailing in June 2008. From 50% to 55% of nurses correctly responded to questions regarding the frequency of AOM in young children. 39% correctly estimated the proportion of *S pneumoniae*-related AOM and 46% underestimated it by at least three-fold. Despite this, 89% of nurses agreed that the burden of AOM is sufficiently important to use a vaccine that would protect against 33% of cases. The eventual use of a vaccine with a larger spectrum of protection was seen as a possibility to reduce the antibiotic use, the number of post-AOM complications and hospitalisations by 96%, 94%, and 87% of nurses, respectively. 94% of nurses manifested willingness to recommend a new pneumococcal vaccine if it is publicly funded, but only 24% if parents have to pay for the vaccine. 97% of nurses estimated that parents will accept a new pneumococcal vaccine if it is included in vaccination program and 55% if the vaccine is recommended by a health professional but not included in a public program. 95% of nurses thought that it would be useful to have a universal immunisation program with a pneumococcal vaccine with a larger spectrum of protection against AOM. More than 20% of nurses responded "do not know" to questions regarding PCV-10 safety and effectiveness.
CONCLUSIONS: An important proportion of nurses underestimate the burden of *S pneumoniae*-related AOM. Most nurses would support an eventual publicly funded immunization program with a pneumococcal vaccine with a larger spectrum of protection against AOM. Additional information about AOM burden, vaccine safety and effectiveness should be delivered before implementing a new pneumococcal vaccine.

P15
DEVELOPING IMMUNIZATION CHAMPIONS: CAN KNOWLEDGE AND POSITIVE ATTITUDES & BEHAVIOURS BE ACHIEVED AND MAINTAINED OVER TIME

A Henteleff, L Connors, S McNeil

BACKGROUND: There is good evidence that the positive attitudes of practitioners who make recommendations for immunization have an important role in influencing patient decision making to accept immunization and have a vital role in the continued success of immunization programs. Educational methods using accepted immunization competencies may support the development of practitioners who will champion immunization and will use both peer and patient interactions as an opportunity to modify misconceptions and reaffirm the value of immunization.
PURPOSE: To identify whether the use of problem-based learning, using an immunization competency-based framework, can create an environment for transformative learning to achieve sustainable positive attitudes and behaviours.
METHODS: The 7th annual "Canadian Resident Vaccine Training Program" was delivered using a combination of interactive teaching and learning modalities set within a framework of the newly articulated immunization competencies in an intense two day educational program. The primary research strategy used was a quasi experimental non-equivalent groups pre-test/post-test design (plus late post test) in the format of an anonymous quantitative web-based self-administered questionnaire. This method allowed for the opportunity to use the Kirkpatrick framework (levels 1-3), to evaluate whether transformative learning occurred to achieve sustained positive attitudes and behaviours towards immunization.
RESULTS: Preliminary results indicate that course satisfaction results were high amongst participants (Kirkpatrick, 2004 – Level 1 – satisfaction) and that short term successes were achieved when comparing the pre course knowledge attitudes and behaviours with the post intervention results (Kirkpatrick, 2004 – Level 2 – Learning). The results for the longer term achieve sustained positive attitudes and behaviours towards immunization are pending and will be available by August 2008.
CONCLUSION: The preliminary results indicate that educational activities directed to achieve transformative learning and the methodology used for the Resident Vaccine course can have a significant impact on the knowledge, beliefs and attitudes of participants.

P16
A RESPIRATORY SYNCYTIAL AND OTHER VIRUS SURVEILLANCE SYSTEM TO IMPROVE PASSIVE IMMUNIZATION NS 2005-2008

J Langley, A Al-Azem

BACKGROUND: Respiratory Syncytial Virus (RSV) is the most common cause of severe lower respiratory tract infection in young children, and is increasingly recognized as a cause of influenza-like illness in those over 65 years of age.
PURPOSE: Through collaboration between Nova Scotia Health Promotion and Protection (NSHPP), regional laboratories (RL) and a clinician NS developed a weekly reporting system about RSV and other respiratory virus activity to inform planning for administration of anti-RSV antibody to high risk infants, as well as assist clinicians and public health and infection control practitioners in management of respiratory illness.
METHODS: Weekly (wkly) case reports of laboratory-confirmed RSV, including age and sex, are faxed from 6 labs to NSHPP. Influenza is reported from pediatric and adult labs in Halifax; parainfluenza and adenovirus are reported only from the former lab. Data include number of

specimens tested and number of positives. Data are compared to inf-like illness (ILI) diagnosed by sentinel physicians participating in FluWatch.
RESULTS: During 2005-2006, 2006-2007, and 2007-2008 seasons there were 207, 350, and 162 cases of RSV reported in NS respectively. The peak periods were from April 8 to May 5 during 2005-2006 season, January 14 to February 10 in 2006-2007, and March 30 to April 5 in 2007-2008. Most RSV cases were among children under 5 years of age. The average incidence of RSV was 25.6/100,000 population from 2005 to 2008 (3 seasons). The incidence per specific age groups ranged from 0.7 to 3321.0 cases per 100,000 population. The highest rate was among infant age group of 0-5 months and the lowest rate was among age group of 16-65 years of age. Delivery of the provincial passive immunization program in a weekly clinic each December was sufficiently in advance of the season to theoretically provide protection for almost all high-risk infants.
CONCLUSIONS: A RSV surveillance system was successfully established in NS, and now provides weekly data to the public health system, laboratorians and clinicians. The time of onset and severity of the RSV season varied and was consistently late in the winter. This data can be used to plan palivizumab prophylaxis, and when fully developed could assist in distinguish respiratory outbreaks from other viruses in the community and acute care and long term care settings.

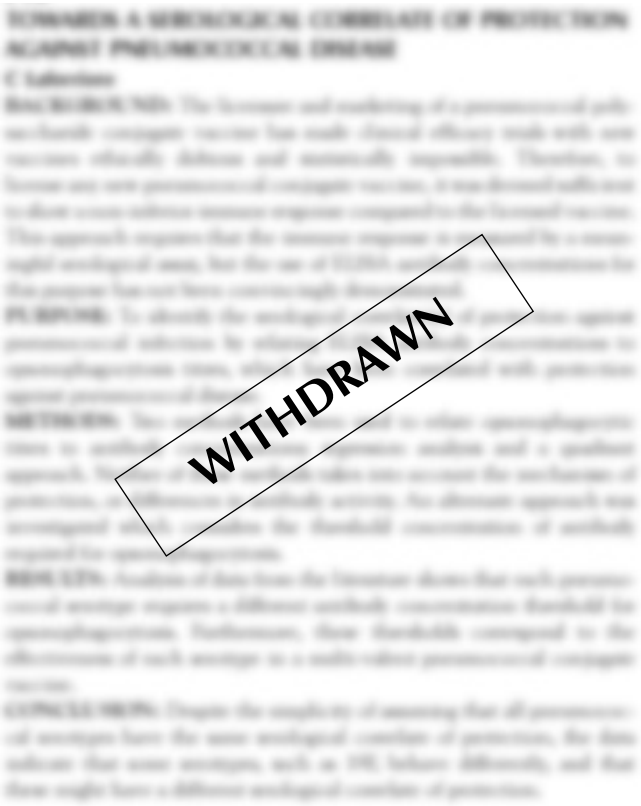
POSTER PRESENTATIONS
Laboratory

P17
NEW HPLC METHOD FOR ANALYSIS AND QUALITY CONTROL OF PANDEMIC INFLUENZA VACCINES

J Amell, J Wang, W Lim, K Anandavel, H MacDonald-Piquard, F Bouthillier, H Rode

BACKGROUND: Single Radial Immunodiffusion Assay (SRID) is the currently accepted method for the determination of influenza vaccine potency (for haemagglutinin (HA) content), and is dependent on specific reference and antiserum reagents. However, these reagents may not be readily available during an influenza pandemic. As part of the Canadian Influenza Pandemic Preparedness Plan, alternate methods for determining the potency of influenza vaccines are required. The utility of the SE-HPLC method, which is highly reproducible and independent of specific reagents, was investigated for assessing HA content as a measure of quality control of influenza vaccines.
PURPOSE: To develop a physicochemical method for the identification and quantification of haemagglutinin (HA) protein in monovalent influenza vaccines. This novel approach should be advantageous in that it can be rapidly performed and does not rely on reagents.
METHODS: A TSK-GEL G4000SWxl (Pore size, 450Å) column was coupled to a G3000SWxl (Pore size, 250Å) column, in series, on a Varian Prostar HPLC system. Several untreated monovalent bulks of influenza vaccines, including those for potential pandemic influenza strains, were injected into the column system. Optimal conditions for separating the proteins were determined using different mobile phases, pH of mobile phases, and column temperatures. The HPLC profiles of those vaccines were analysed for retention time, peak area and peak height. The identification and quantification of HA in the HPLC fractions were confirmed by SRID, BCA protein assay and SDS-PAGE, and assessed against the product's Certificate of Analysis.
RESULTS: The HPLC chromatogram demonstrated several distinct peaks, with the peak from 15-20 minutes containing HA. The HA profiles for different monovalent influenza strain vaccines, including the proposed pandemic H5N1 strains, were similar. Linearity was achieved upon varying sample concentration. Potency assessment, as determined by analysis of the HA peak area, correlated well with the quantitative HA protein values as reported on the manufacturer's Certificate of Analysis and by SRID.
CONCLUSIONS/IMPLICATIONS: This SE-HPLC method has considerable potential for widespread use as a physicochemical method for HA identification and quantification, in quality control testing for seasonal and pandemic influenza vaccines, and as a practical alternative for potency measures by the reference reagent-dependent SRID assay. Further method development will facilitate the identification of compositions of the HA peak area and standardization of this method.
Funding provided by the Canadian Treasury Board Avian & Pandemic Preparedness Strategy, Regulatory Measures (Pandemic I, 2005) and Focus on Animal and Human Health (Pandemic II, 2007).

P18



P19
POTENCY TESTING OF INACTIVATED POLIOMYELITIS AND ACELLULAR PERTUSSIS VACCINES AT HEALTH CANADA

M Reed, T Wu, M Baca-Estrada

BACKGROUND: As part of the regulatory oversight following marketing authorization, each vaccine lot is assessed by the Biologics and Genetics Therapies Directorate (BGTD) to ensure the safety and efficacy prior to its release for sale in Canada. This assessment includes independent laboratory testing. Inactivated Poliomyelitis Vaccine (IPV) and acellular pertussis (aP) vaccine are two components included in many combination vaccines administered to healthy infants and children. Both vaccines are manufactured using an inactivation process, and the conformations of these antigens have not been fully elucidated. This poses additional challenges for the potency testing of these two vaccines.
PURPOSE: Our experience with the potency testing of IPV and aP vaccines demonstrates the usefulness of the current methods and also suggests their limitations.
METHODS: An in vivo rat potency assay and an in vitro test (D-antigen ELISA) are currently recommended by the World Health Organization (WHO) and many National Control Authorities as potency tests for IPV, and both methods are performed routinely in our laboratory. However, there is no internationally accepted method for assessing the potency of aP vaccine. To evaluate the potency of the aP vaccine, an in vivo immunogenicity test in animals is used in our laboratory to assess the vaccine-induced total antibodies, by ELISA, and functional antibodies, using a cell-based assay.

RESULTS AND CONCLUSIONS: Data generated in our laboratory suggests that: 1) the D-antigen ELISA correlates well with the rat potency test. However, the rat potency test might be more sensitive in detecting changes of IPV antigens occurred after long term storage. This observation is consistent with published data showing that the rat potency test provides the most relevant information concerning the clinical performance of the IPV vaccine. 2) The aP immunogenicity test is a useful tool to assess the consistency of the vaccine lots.

P20
IMMUNIZATION OF NEONATES: GREATER PROTECTION, STRONGER AND BROADER IMMUNE RESPONSES AND A UNIQUE MEMORY T CELL PROFILE

B Reikie, K Smolen, DI Loeffler, DP Blimkie, TR Kollmann

BACKGROUND: Approximately 2.5 million neonates and infants die annually from infection marking this as the time of life most burdened by infectious disease. Prevention of neonatal mortality is hampered by a lack of safe and effective vaccines.

OBJECTIVE: The purpose of this study was to assess the ability of newborn mice to develop protective immunity in response to vaccination.

METHODS: We vaccinated newborn mice with *Listeria monocytogenes* (Lm) expressing the model vaccine ovalbumin (Lm-Ova) and assessed the primary and secondary responses, immune memory development and protection from lethal challenge. Cellular phenotype and effector responses were measured using multi-parameter flow cytometry, serum was assayed using multiplex bead array, and organ-specific protection was determined.

RESULTS: When compared to adults, neonates are better protected and mount stronger interferon gamma (IFNγ) responses to a broader array of vaccine antigens when immunized with Lm-Ova. Both primary and secondary immune responses are stronger in neonates, who exhibit superior protection from vaccination with up to 100-fold lower vaccine dose. The neonatal immune system was also found to produce several pro-inflammatory cell trafficking cytokines in greater abundance than adults, such as lymphocyte and monocyte chemotactic factors (IP-10 and MCP-1&3, respectively). Interestingly, effector memory T cells (Tem) have been demonstrated to be the protective cell type for anti-listerial immunity, and our neonatal memory T cell responses were more dominantly skewed to the Tem phenotype than adults were.

CONCLUSIONS: Greater inflammation driving a Tem dominated T cell memory response in neonates provides a potential explanation for the superior protective response observed in neonates against virulent Listeria. Furthermore, the newborn immune response to wider arrays of vaccine epitopes introduces exciting possibilities for the use of neonatal vaccination to better protect from escape mutants in pathogens such as influenza and HIV, which are prone to antigenic shift. These data support our notion that the neonatal immune system provides a unique and at times potentially superior immunological milieu for induction of protective immune responses by vaccination.

POSTER PRESENTATIONS
Immunization

P21
KNOWLEDGE, ATTITUDES AND BELIEFS OF CANADIAN PARENTS ABOUT ACUTE OTITIS MEDIA AND ITS PREVENTION BY IMMUNIZATION: RESULTS OF A TELEPHONE SURVEY

E Dubé, P De Wals, V Gilca, N Boulianne, M Ouakki

BACKGROUND: Acute otitis media (AOM) is one of the most common bacterial infectious diseases among children under six years of age and is a leading cause of children healthcare visits. It is important to understand parents' knowledge, attitudes and beliefs (KAB) toward AOM and the role of pneumococcal vaccines in its prevention.

PURPOSE: To measure parents' KAB regarding AOM management/prevention and parents' willingness to accept new vaccines with a larger spectrum of protection against pneumococcal AOM.

METHODS: In May-June 2008, a random-digit dialling telephone survey was conducted in a stratified sample of households in 10 Canadian provinces. The questionnaire was based upon the Systems Model of Clinical Preventive Care (Walsh and McPhee, 1994).

RESULTS: 502 parents/guardians of a child aged six months to <6 years participated. 80% were mothers, 55% were aged 25-34 years, and 67% had college or university degree. Mean age of the children was 3 years. Majority of respondents (94%) agreed that recommended vaccines are important for children's health. Almost one third (32%) of respondents reported at least one AOM episode for their child during the last 12 months and 92.6% of those episodes resulted in antibiotics use. Most respondents (73%) thought that antibiotics were always useful for treating AOM. If a new more effective vaccine against AOM was available, 64% of respondents would like to have their child/children vaccinated. Parental willingness to have the child/children vaccinated for increased AOM prevention was higher among those who thought that their physician and the other parent will be supportive of the vaccination (82% and 84% respectively, $p<0.0001$). Parental willingness was also associated with the perceived value of action, self-efficacy, and perceived susceptibility of the child to AOM. A higher proportion of respondents whose child has experienced an AOM agreed that a vaccine that prevents AOM would be useful to their child when compared to parents of children who have not experienced an AOM (78% versus 66%, $p=0.009$).

CONCLUSION: An important proportion of Canadian parents would by in favor of new pneumococcal vaccines with a higher degree of protection against AOM.

P22
PLANNING FOR UPTAKE OF VACCINE AMONG HEALTH CARE WORKERS DURING THE NEXT INFLUENZA PANDEMIC

T Appleyard

BACKGROUND: Health care workers in Canada are the top priority to receive vaccine during the next influenza pandemic. This can only be an effective infection control strategy if workers actually accept the vaccine. Very little is known about how health care workers will respond during a flu pandemic. Uptake of seasonal flu vaccine among health care workers is drastically below targets, despite considerable evidence of efficacy, and organizational and legal pressure to adhere to this recommendation.

PURPOSE: This study considers whether current planning for an influenza pandemic affecting Toronto's health care workers adequately considers the potential for low uptake of a vaccine.

METHODS: Flu pandemic plans of public and non-profit organizations relevant to Toronto's health care workers were reviewed for content regarding the need for active promotion of the vaccine or strategies to increase its uptake.

RESULTS: The majority of flu pandemic plans relevant to Toronto contain no references to the uptake of vaccine among health care workers. Some plans are explicit in their assumptions that more health care workers will accept the vaccine in a pandemic situation than in outbreaks of seasonal flu. Evidence for this assumption is lacking.

CONCLUSIONS: Flu pandemic planners should consider and document a range of strategies to increase uptake of the vaccine.

P23
VACCINATION COVERAGE OF HEPATITIS B AMONG RESIDENTS OF A SQUATTER SETTLEMENT IN KARACHI, PAKISTAN

A Mubashir, T Tahir, MR Ali

BACKGROUND: Vaccination coverage remains a major health related issue in developing countries. Community based data is scarce in Pakistan regarding the actual vaccination coverage of hepatitis B.

PURPOSE: To determine the proportion of vaccinated population among the residents in a squatter settlement of Karachi, Pakistan.

METHODS: This community based health survey was conducted on 28th March 2008 in Bhitayabad (one of the biggest squatter settlement in Karachi, Pakistan consisted of four villages with a total population of around 100,000). Data was collected using structured questionnaire based interview, conducted by the 25 data collectors, trained by the investigators. Four teams of data collectors were made for all four villages and a sample of 55 houses (only one participant enrolled from each house) were enrolled from each village through systematic sampling (every fourth house was selected). Information was collected about the demographics and vaccination doses of hepatitis received by the participants (confirmed by vaccination card where available). Data was entered in Epi info and analysis was done on SPSS version 15. Data was presented in mean with standard deviation (SD) for continuous and in percentages for categorical variables. T-test was applied to find out statistical significance at 95% level of confidence. P-value <0.05 was considered as significant.
RESULTS: A total of 220 participants were interviewed (response rate 88%), mean age of the participants was 34 (SD=6yrs) years and major proportion of participants was male 66%. Most of the participants belonged to low socioeconomic status (less than 1$ per day). Overall 34% of participants reported at least one dose of Hep-B vaccinations. Among them 18% received three or more doses. Mean age of ever vaccinated was 11 years (SD=3.5), which was significantly lesser as compared to the mean age of participants (38 years, SD=6yrs) who reported no vaccination (P-value <0.001).
CONCLUSION: Developing countries are still struggling to achieve appropriate vaccination coverage particularly in less developed areas. Hepatitis B vaccination coverage though increasing in younger population yet there is a need for massive provision of such vaccines for the whole population to reduce the spread and mortality as a result of Hepatitis B infections.

P24
AUTOMATED IDENTIFICATION OF VACCINE PRODUCTS (AIVP) PROGRESS REPORT: PROPOSED IMPLEMENTATION STRATEGY FOR BAR CODING VACCINE PRODUCTS

L Belzak, T Harris, L Lamarche

BACKGROUND: In Canada, several million doses of vaccine are administered every year. Each time a dose of vaccine is administered, a health care provider manually records the details in the patient's health record. Recent audits in British Colombia and Manitoba showed that 15% of immunization records were incomplete, 24% contained errors and 5% were missing information.
Since 2002, the Public Health Agency of Canada (PHAC) and the Canadian Immunization Registry Network have been working with stakeholders to incorporate 2-dimensional barcodes onto all vaccines in Canada through the AIVP project. The aim is to improve the efficiency and effectiveness of immunization delivery and the safe use of vaccines through the use of automated identification technology on vaccine products and to incorporate this technology into electronic immunization registries.
PURPOSE: To provide an update on the process to implement standardized bar codes on vaccine products in Canada.
METHODS: Key stakeholders have been engaged in the AIVP project since its inception. In March 2007, the AIVP Advisory Task Group was created and is co-chaired by PHAC and a vaccine industry representative. The mandate is to provide leadership, overall guidance and advice for the development and implementation of vaccine bar codes in Canada and to contribute to the development of global standards.
CONCLUSIONS: The Task Group finalized a 5-year strategic plan in March 2008. This year a cost benefit analysis will be completed and a comprehensive assessment of the state of readiness of all stakeholders will be implemented. The Task Group has proposed a staged-in implementation strategy. Results from the cost benefit analysis and assessment will be instrumental in refining this proposal for review by the Canadian Immunization Committee in October 2008 and presentation at the Conference.

Acknowledgements: Membership of the Automated Identification of Vaccine Products (AIVP) Advisory Task Group.

P25
PUBLIC HEALTH ON CALL

V Beynon

BACKGROUND: The need for evening and week-end access to public health services was identified within a regional health authority in northern Alberta. Staff from a variety of departments were expected to provide the public health on call (PHOC) service – Public Health Nurses, Environmental Health Officers, Occupational Health and Safety and Infection Control Practitioners.
PURPOSE: Each staff member on the roster had differing areas of expertise but had to be prepared to offer advice on a variety of topics. It was decided to develop a resource manual for the use of staff on call. The development of materials for the manual has had unexpected and positive ramifications for the delivery of certain aspects of an immunization program.
METHODS: Each department identified the topics from their area of expertise that might generate the need for immediate action outside of regular office hours. A manual was developed that included algorithms and tables, for example, that allowed staff to provide advice outside their normal work content. The form for determining the need for Tetanus / Tetanus Immune Globulin is an example of what was developed. The On call team meet quarterly to review issues and share information and determine learning needs. A powerpoint presentation was developed around wound management for PHOC staff but has been used in a variety of ways for staff education.
RESULTS: The manual has evolved over a 4 year period. The collection of On Call stats reflects the most common reasons for calls and has lead to the ongoing identification of learning needs and evolution of the manual content. Using the Tetanus / TIG information as a continuing example, a procedure has been developed for use across the region as a whole, to incorporate an audit of TD / TIG administration using a pre-existing regional risk management reporting system.
CONCLUSIONS: A comprehensive manual covering on call topics for 4 different areas of public health related practice has been developed. Learning needs of on call staff has resulted in the development of presentation materials that have been used not only by on call staff but in a variety of ways with other stakeholders. The input from on call members has led to an improved product (the manual) and improved teaching resources and risk management practices.

P26
PEACE COUNTRY HEALTH INNOVATIONS IN IMMUNIZATION (PCHIIS)

V Beynon

BACKGROUND: In 2007, Alberta Health and Wellness provided targetted funding over a 2 year period to each of the provincial health authorities to improve immunization coverage rates. Peace Country Health (PCH), a northern region with traditionally poor coverage rates has developed a number of initiatives to accomplish the task.
PURPOSE: Input was sought from across the region as to the initiatives to be developed. Baseline data for infant and preschool coverage rates were collected as well as a measurement of clinic capacity in appointment hours and clinic wait times. A number of new strategies were suggested. Some were aimed at 18 month old children, the age at which coverage rates traditionally drop. Others were more population focussed, to raise the profile for immunization services in general.
METHOD: Steering and Working committees were struck to implement the plan as it evolved. The initiatives include: an immunization van to attend community events and rural communities and provide on site immunization, tents and banners to promote immunization and attract attendees at the aforementioned events, new overdue reminders using the Health Belief model wording, an "Immunized by 2" photo display for those up to date, and introduction of a sucrose solution given orally prior to immunization for 2-6 month olds. The latter included a

marketing strategy to encourage parents to take advantage of the pain reduction possibilities for the first 3 clinic appointments and thus have their infants immunized on time.

RESULTS: There has been no improvement in coverage rates since the start of the project (one year). The van component has yet to be initiated. We spent a long time deciding what to purchase and wanted to retain remaining funds until that major expenditure was realized. Clinic wait times are being monitored and show improvement. Clinic capacity has increased.

CONCLUSION: While the rates have not improved, a number of initiatives were slow to be realized and we are hopeful that we will see improvement in future. Evaluation is ongoing.

P27

QUEBEC NURSES' OPINIONS ABOUT ROUTINELY RECOMMENDED CHILDHOOD VACCINES

N Boulianne, V Gilca, È Dubé, F Lavoie

BACKGROUND: Nurses play a key role in immunization programs. Not only do they administer the vaccines but they are the interface with the public. Several new vaccines were implemented in publicly funded immunization program since the last survey in 1998 assessed Quebec nurses' level of support of routinely recommended vaccines.

PURPOSE: To assess nurses' perceived usefulness of routinely recommended vaccines.

METHODS: This survey was conducted in June-July 2008. Randomly selected nurses completed a self-administered, mail-based, anonymous questionnaire. The survey followed the general recommendations by Dillman (2000).

RESULTS: Preliminary data from 161 questionnaires were analyzed. Among respondents 90% were females. Main place of practice for 52% of respondents was a hospital/emergency room and for 26% a local health center (CLSC). 57% of respondents had more than 15 years of experience in nursing and 54% were directly involved in vaccine administration.

67% of respondents strongly agreed (STA) and 31% somewhat agreed (SOA) with the statement "In general, vaccines recommended by public health authorities are very useful". 2% of respondents somewhat disagree with the above statement.

The proportion of respondents who agreed STA+SOA (STA) with the statement about the usefulness to vaccinate children with different vaccines was as follows: DTaP-IPV-Hib: 99% (84%), MMR – 99% (83%), meningococcal: 97% (78%), hepatitis B: 94% (75%) pneumococcal: 92% (67%), varicella: 85% (58%), and influenza: 79% (43%). The proportion of respondents who strongly disagreed with the statement about the usefulness to vaccinate children with above mentioned seven vaccines varied from 0% for DTaP-IPV-Hib to 2.5% for influenza vaccine. No important differences between responses of nurses who administer vaccines and those who do not were observed.

CONCLUSION: In general, most Quebec nurses perceived recommended childhood vaccines as a useful tool in infection prevention. The implementation during the last decade of meningococcal, pneumococcal, varicella and influenza childhood immunization did not have a negative impact on nurses' support of vaccination: 68% strongly agreed with the high usefulness of recommended vaccines in 1998 and 67% in the present study. To ensure optimal immunization coverage, additional educational efforts should be made.

P28

WITHDRAWN

P29

FEASIBILITY AND IMMUNOGENICITY OF INTRA-DERMAL VACCINATION AGAINST RABIES IN QUEBEC

Y-G Bui, F Milord, E Cambron-Goulet, AM Clouâtre, E Levac, F Lord

BACKGROUND AND PURPOSE: Pre-exposure vaccination against rabies with 3 intramuscular doses (IM) is recommended for people with occupational exposure to the virus, and for high-risk travelers. The high cost of the vaccine makes this impractical to implement. An alternative is to administer the vaccine intradermally (ID), using 1/10 of the IM dose. The ID route is as immunogenic, but technically more difficult, thus a serology is recommended after vaccination. This practice is accepted by the National Advisory Committee on Immunisation and the Protocole d'immunisation du Québec. We aim to study its feasibility and immunogenicity.

METHODS: Students and employees of a Veterinary Medicine Faculty were recruited on a volunteer basis in the fall 2006. Cell-culture vaccines were used: ImovaxRage (sanofipasteur) or RabAvert (Chiron). Participants received 3 doses of 0.1 mL ID at day 0, 7 and 21 or 28. Serology was recommended 2 to 4 weeks after the 3rd dose, and performed using the RFFIT method at the National Rabies Center (Toronto). A titer of =0.5 UI/mL was considered protective.

RESULTS: In total, 159 subjects received 3 ID doses, and 146 (92 %) had a serology done. We have results for 143, of which 141 (99 %) had titers =0.5 UI/mL. Two serologies were performed almost 1 year after vaccination, with titers below 0.5 UI/mL.

CONCLUSION: Intradermal vaccination against rabies is feasible and immunogenic. This less costly alternative can increase access to pre-exposure vaccination, especially during vaccine shortages. Titers seem higher if done between 2 to 6 weeks after vaccination. Antibody persistance will be examined in a follow up study.

P30

CAN WE NOW CHANGE OUR POLICY OF TETANUS PROPHYLAXIS THANKS TO A BEDSIDE IMMUNOCHROMATOGRAPHIC TEST FOR THE DETECTION OF ANTI-TETANUS ANTIBODIES?

JC Cavenaile, Z Vafa, J Herrero Garcia

BACKGROUND: Tetanus prophylaxis based on the clinical history is not efficient because immunized patients receive boosters and tetanus

immunoglobulin (TIG). Excessive administration of vaccines and immunoglobulin generates useless side effects and is very expensive. Tetanus Quick Stick™ (TQS)-a semi quantitative immunochromatographic test- is a good choice to evaluate the immune status of the patients and reduces the number of useless vaccinations

OBJECTIVES: Evaluate within the frame of a cost-benefit study whether the systematic use of TQS is conceivable.

METHODS: In this prospective monocentric study, 1065 patients with a sore were included; TQS was performed if the patients had not a written track-record of their immunity. Only 25 patients had a valid vaccination card; 1040 TQS were realized. Whenever TQS was positive the patient consequently received no tetanus prevention. If TQS was negative or doubtful the patients received tetanus prevention using WHO algorithm. We then compared the cost of tetanus prevention employing TQS against the cost of prevention using classical prevention.

To obtain the costs for the anti-tetanus vaccination with the help of the TQS, we've aggregated the costs of the 1040 TQS with the costs to vaccinate the patients with a negative TQS.

RESULTS: 674 patients had a positive TQS and 366 patients had a negative TQS. The prevention of the non immunized patients needed 366 boosters and 161 TIG. Without the TQS 1040 boosters and 457 TIG would have been done. Using TQS, tetanus prevention have cost 14.071 □ Using the classical method the cost to prevent tetanus would have been 22.235 □

CONCLUSION: Systematic use of TQS is cost effective and avoid unnecessary and expensive treatments with harmful consequences. The test could systematically be included in the tetanus prevention algorithm.

P31

APPORT CLINIQUE DU TETANOS QUICK STICK™ DANS LA PREVENTION DU TETANOS DANS UN SERVICE D'URGENCES

J-C Cavenaile, J Herrero Garcia

CONTEXTE: La prévention antitétanique est inadéquate quand elle est basée sur l'anamnèse. Les blessés qui ne possèdent pas de preuve écrite de leur immunité lorsqu'ils se présentent aux urgences reçoivent souvent une prévention antitétanique- vaccin et/ou immunoglobulines- alors qu'ils possèdent encore un taux suffisant d'anticorps antitétaniques.

Depuis quelques années, nous disposons du Tétanos Quick Stick™ (TQS), un test rapide immuno-chromatographique semi-quantitatif qui permet de vérifier en dix minutes l'immunité des patients. Lors des épreuves de validité, ce test a présenté une valeur prédictive positive de 97.5% et une valeur prédictive négative de 88.5%. Comme la spécificité et la sensibilité du TQS sont respectivement de 94% et 93%, nous avons décidé d'utiliser ce test systématiquement pour réaliser la prévention antitétanique des patients blessés dans notre service d'urgences.

OBJECTIF: Estimer l'apport de ce test dans la prévention antitétanique des blessés qui fréquentent notre service d'urgences.

METHODE: 1065 patients présentant une plaie ont fait l'objet de l'étude. Un TQS a été réalisé chez les patients qui ne pouvaient apporter une preuve écrite de leur immunité. 1040 patients ont été inclus. Une plaie à risque de tétanos était présente chez 457 patients. Nous avons comparé la quantité de vaccins et d'immunoglobulines que cette cohorte aurait dû recevoir sans l'apport du TQS à la quantité de vaccins et d'immunoglobulines que les patients ont reçus en utilisant le TQS.

RESULTATS: 674 patients sur les 1040 de la cohorte ont présenté un TQS positif. Parmi les 366 patients qui n'étaient plus immunisés, 161 présentaient une plaie à risque de tétanos. En utilisant le TQS 366 vaccins et 161 immunoglobulines ont donc été injectés. Sans le TQS 1040 vaccins et 457 immunoglobulines auraient été administrés. L'usage du TQS a permis une économie de 674 vaccins et de 296 immunoglobulines

CONCLUSION: L'usage du TQS dans cette cohorte de patients a permis une économie substantielle de vaccins et d'immunoglobulines et peut être envisagé de façon systématique dans la prévention du tétanos.

P32

HUMAN PAPILLOMAVIRUS VACCINE ACCEPTABILITY: A TARGETED LITERATURE REVIEW OF HEALTH CARE PROFESSIONALS, PARENTS, AND YOUNG ADULTS

V Delisle, AK Krawczyk, ZR Rosberger

BACKGROUND: The Human Papillomavirus (HPV) vaccine (Gardasil®) prevents infection from four common types of HPV: two cause 70 percent of cervical cancer cases and two cause 90 percent of anogenital warts. To implement successful HPV vaccination programs, it is important to understand the psychosocial factors affecting HPV vaccine acceptability among health care professionals (HCPs), parents, and young adults.

PURPOSE: The purpose of the study was to determine the critical psychosocial factors that affect HPV vaccine acceptability through a targeted literature review.

METHODS: Electronic databases were searched for studies examining HPV vaccine 1) knowledge, 2) attitudes, 3) beliefs, and 4) acceptability among HCPs, parents, and young adults. Thirty-two studies were reviewed from the existing literature.

RESULTS: HPV vaccine acceptability was high among HCPs and parents, but varied among young adults. Parents and young adults were more accepting of the HPV vaccine if: they believed that vaccines were beneficial; others would recommend the vaccine; they were susceptible to HPV; and they had previous experience with a sexually transmitted infection (STI). Parents were less accepting of the HPV vaccine if they were older, had higher levels of education, believed that the vaccine was not safe, and believed that the vaccine would encourage promiscuity. HCPs were more accepting of the HPV vaccine if they believed that the vaccine was effective and relevant professional organizations would recommend the vaccine. In general, female HCPs were more likely to recommend the HPV vaccine and HCPs were more likely to recommend the vaccine to girls vs. boys and to older vs. younger adolescents.

CONCLUSION: The results indicate that in order to increase HPV vaccine acceptability, education about HPV and the HPV vaccine could be beneficial to HCPs, parents, and recipients. Greater effort should be made to tailor educational interventions especially to fit the specific needs of HCPs.

P33

THE 2007/08 HPV VACCINATION PROGRAM FOR GRADE 8 FEMALES IN TORONTO: PROCESS, CHALLENGES AND PROGRAM RECOMMENDATIONS

V Dubey, A Mathur, J Cameron, J Kaashoek

BACKGROUND: On August 3, 2007, the Ministry of Health in Ontario a Human Papillomavirus (HPV) vaccine for all grade 8 females to be delivered by local public health beginning September 2007.

PURPOSE: To describe the school-based HPV vaccination program for grade 8 females in Toronto, its effectiveness in achieving the targeted coverage rate, the opportunities and challenges associated with implementation and future program modifications.

METHODS: Descriptive statistics were used to evaluate the HPV program. Focus groups were conducted of Toronto Public Health Vaccine Preventable Disease staff in January 2008 to ascertain the opportunities and challenges to program delivery. A retrospective analysis of media coverage in Toronto was also performed.

RESULTS: Approximately 14,000 Grade 8 females enrolled in 440 Toronto schools had the opportunity to receive the HPV vaccine in the 2007-08 school year. Over 8,000 girls were vaccinated, achieving a coverage rate of 60%. Delivery of the HPV program coincided with the Grade 7 Hepatitis B and Meningitis C immunizations and included an informed consent package; resources translated in 13 languages; a Grade 8 teachers' package; web-site resources; a press release and five community information forums. Challenges of this program were the short timeline to convey information to parents, limited communication resources and negative media stories. To increase coverage rates further catch-up clinics were extended into the summer, posters and post-cards were disseminated in June and a survey of parents of grade 8 females is being developed.

CONCLUSION: Most provinces have begun to implement school-based HPV immunization programs. Lessons learned from Toronto Public Health, a large urban health unit, can provide advice and consideration for others planning similar programs.

P34
PREDICTORS OF UPTAKE OF UNIVERSAL INFLUENZA IMMUNIZATION IN GRADE 1 AND 2 SCHOOLCHILDREN IN TORONTO

R Foty, SDD Dell, AG Guttmann, JK Kwong, SM Maaten, DM Manuel, DMS Stieb

BACKGROUND: In 2000, Ontario initiated a Universal Influenza Immunization Program (UIIP) to provide free vaccines for the entire population.
PURPOSE: Determine predictors of influenza immunization in grade 1 and 2 Toronto school children.
METHODS: Cross-sectional data were collected by questionnaire from parents of 5619 children attending publicly funded schools in 2006. Participant characteristics evaluated included influenza immunization in the preceding winter (2005/6), location of immunization, medical history and care (presence of asthma, hospitalizations in the past year, primary care provider type and number of visits), environmental risk factors (exposure to environmental tobacco smoke (ETS)) and sociodemographics (immigrant status, household size, parental education and income adequacy (IA)).
RESULTS: 41.3% of children were reported as having been immunized for influenza (80% in doctor's offices). In the multivariable model, immunization was more likely in children with asthma (OR 1.44, 95% CL 1.19 – 1.75) and in those who had contact with a general practitioner, or a pediatrician five or more times in year preceding the survey (OR 1.37, 95% CL 1.14 – 1.65). Immunization was less likely in those exposed to ETS (OR 0.57, 95% CL 0.47 – 0.68), those with middle high (OR 0.71, 95% CL 0.57 – 0.89) and high IA (OR 0.73, 95% CL 0.60 – 0.89), non-immigrant children (OR%0.83, 95% CL 0.70 – 0.99) and in those with an older sibling (OR 0.86, 95% CL 0.76 – 0.98). The association of immunization with low IA was stronger in those without compared to those with asthma (OR 1.48, 95% CL 1.19 – 1.84 vs. OR 0.81, 95% CL 0.50 – 1.32 respectively).
CONCLUSIONS: In spite of a UIIP influenza immunization is not universal, although differences are in part driven by medical risk (children with asthma). Consistent with the literature, higher immunization rates were found in immigrant children. Contrary to expectations higher rates are also seen in children from lower IA homes.

P35
DELAYED IMMUNIZATION MONITORING SYSTEM FOR PRESCHOOL CHILDREN IN CAPITAL HEALTH

RP Golonka

BACKGROUND: Goals and standards for the universal childhood immunization program within Capital Health are defined provincially by Alberta Health and Wellness. These standards include monitoring and reporting of immunization rates on a regular basis.
PURPOSE: To develop an immunization surveillance system which enables Capital Health to monitor immunization rates, report on the reasons children are delayed and identify geographic areas within the region where rates are below recommended target levels.
METHODS: All Capital Health immunization records are entered into a central immunization database. Information collected includes patient demographics, vaccine information as well as date and location where the vaccine was administered. Immunization rates are calculated and reported for the 4, 15 and 24-month birth cohorts monthly, quarterly and annually. For those children who are delayed, additional follow-up will identify reasons for such, recorded as either refused, lost to follow up or other.
RESULTS: Between 2004 and 2007 the overall immunization in Capital Health by 24 months of age for each childhood vaccine is as follows: DTaP-IPV-Hib – 88.2%, Men-C – 95.1%, Pneumo-C – 87.6%, MMR – 94.6% and Varicella – 91.6%. In 2007 there were slight and unexpected declines in the immunization rate at 4, 15 and 24 months. In specific geographic areas experiencing the largest declines, accompanying reasons for delayed were analyzed further. While there were minimal changes in vaccine refusals and those lost to follow up, 'other' reasons for delayed immunization had increased.
CONCLUSIONS: The surveillance system allowed Capital Health to recognize a potential decline in the immunization rate, locate specific geographic areas which were most affected and subsequently describe a potential reason for under-immunization. Early identification of such trends is essential, and was made possible by the availability of comprehensive, electronically accessible immunization information. As a result, an expanded version of the delayed immunization monitoring system is currently in development to look at more specific user-defined geographic areas, time frames and reason variables.

P36
INNOVATION IN IMMUNIZATION: ENHANCING ACCESS FOR UNDER-IMMUNIZED CHILDREN IN CAPITAL HEALTH

RP Golonka

BACKGROUND: Regional immunization statistics in Capital Health are routinely monitored and tracked by age of child or grade in school. Analysis of this data revealed that certain populations have immunization rates below Capital Health targets.
PURPOSE: To target communities with a higher risk of under-immunization with more intensive follow-up and specific interventions.
METHODS: Four general strategies were initiated: 1) enhanced community outreach, 2) facilitation of attendance at immunization clinics, 3) identification and immunization of under-immunized grade nine students in high risk schools and 4) increasing access to research based information to address immunization myths and anti-immunization information.
RESULTS: Onsite immunization clinics at daycares, the addition of extra evening clinics, and the provision of taxi voucher / bus passes helped to improve access for under-immunized children. Education of daycare providers at onsite clinics and the development of information sheets discussing controversial immunization issues for use by community health nurses and the public to increase the level of education in the community. And finally, school based immunization programs were generally well accepted and facilitated a relationship between health providers, schools and parents.
CONCLUSIONS: The Innovation in Immunization program managed to reach and immunize many children who were previously under-immunized. However certain challenges remain. Language barriers exist among many in the under-immunized population. Accessing accurate and up to date immunization records for new or mobile Albertans is difficult. While distributing accurate immunization information to physicians is an excellent way to enhance public education, additional stakeholders must be identified within the community. And finally, staffing levels may not actually permit many of these programs to be maintained.

P37
EFFECTIVENESS OF A VACCINATION REMINDER SYSTEM IN TORONTO, CANADA

E Gournis, O Kadri, M Finkelstein, L Persaud, A Mathur, V Dubey

BACKGROUND: In Ontario, parents must vaccinate their children and report the vaccination events to the local health department. Ontario law requires Toronto Public Health (TPH) to annually review all immunization records for Toronto students. Parents of students without evidence of proper vaccination are sent up to three notices requesting information before a child is suspended from school. The goal is to ensure an adequately immunized student population, while avoiding the need to suspend students.
PURPOSE: To assess TPH's system of student reminder notices as an effective means for ensuring vaccination coverage.
METHODS: A representative sample of students who received at least

one notice from the 2004/05 and 2005/06 school years was selected from the TPH Immunization Reporting Information System. Student demographics, overdue vaccine antigens, dates of vaccinations, and notice mail dates were used to assess vaccine status. Descriptive summaries and bivariate statistical tests were conducted with SAS.

RESULTS: From 6,548 randomly chosen students, 6,304 were included in the analysis. The majority (85.1%) of students provided documentation on previous vaccines (i.e. those given before the notice date), while 939 (14.9%) students received at least one vaccination on a date after TPH started to send notices.

CONCLUSION: The reminder system was effective in ensuring Toronto's student population was vaccinated. Notices either stimulated vaccination among unvaccinated students or prompted parents to provide documentation that students had been previously vaccinated. Further study is needed to determine why timely vaccination information is not being provided to TPH. A comprehensive immunization registry that collects vaccination information at the point of service could be a useful tool for keeping student vaccination records current.

P38

GET VACCINATED WITH GERRI THE GIRAFFE: PROMOTING CHILDHOOD IMMUNIZATION AND VACCINATION REPORTING

D Grakist

BACKGROUND: Ontario legislation supports the collection and assessment of school pupils' immunization information by public health staff. Medical Officers of Health can suspend children from school if their immunizations are not up-to-date. Currently, the majority of Ontario children receive their immunizations from their physicians. Without a standard means for physicians to share vaccination information, health units must rely on parents to provide these vaccination records directly.

PURPOSE: In 2004, Ottawa Public Health (OPH) adopted a proactive approach to promote childhood immunization and to remind parents to report their child's vaccination information, by "branding" immunization in Ottawa. The ultimate goal was to decrease the number of school suspensions for incomplete immunization.

METHODS: A colourful cartoon character, Gerri the Giraffe, was created to become the new, friendly face of immunization in Ottawa. Gerri appears on all program resources and promotional materials, including correspondence with parents, physicians, and schools. Recently, Gerri was brought to life as a mascot, a partnership with a local children's hospital was established to bring Gerri to community events, and a Facebook page was created.

RESULTS: Anecdotally, staff believe that parents report their children's vaccinations more often to public health without prompting. A survey, done in Fall 2007 to evaluate parental recognition of Gerri and message retention, indicated that 11% of those surveyed associated Gerri with immunization, and only 1.9% retained the message to call OPH. OPH has been approached by several provincial and national jurisdictions regarding this unique approach. One health unit has adopted Gerri as their ambassador.

CONCLUSION: More promotion of Gerri is needed in our community. School suspensions will decrease in our community when parents have their children immunized routinely and know how to report this information promptly to public health.

P39

DO SIMULTANEOUS INJECTIONS REDUCE DISTRESS AND PAIN IN INFANTS RECEIVING MULTIPLE INJECTIONS?

D Hanson, W Hall, R Bhagat, L Mills, N Slomba, M Hernandez, S Au

BACKGROUND: Injections are the most noxious medical procedures experienced by healthy infants and children. Simultaneous injection method has been reported to be a preferred vaccine administration method for multiple immunizations by vaccine providers.

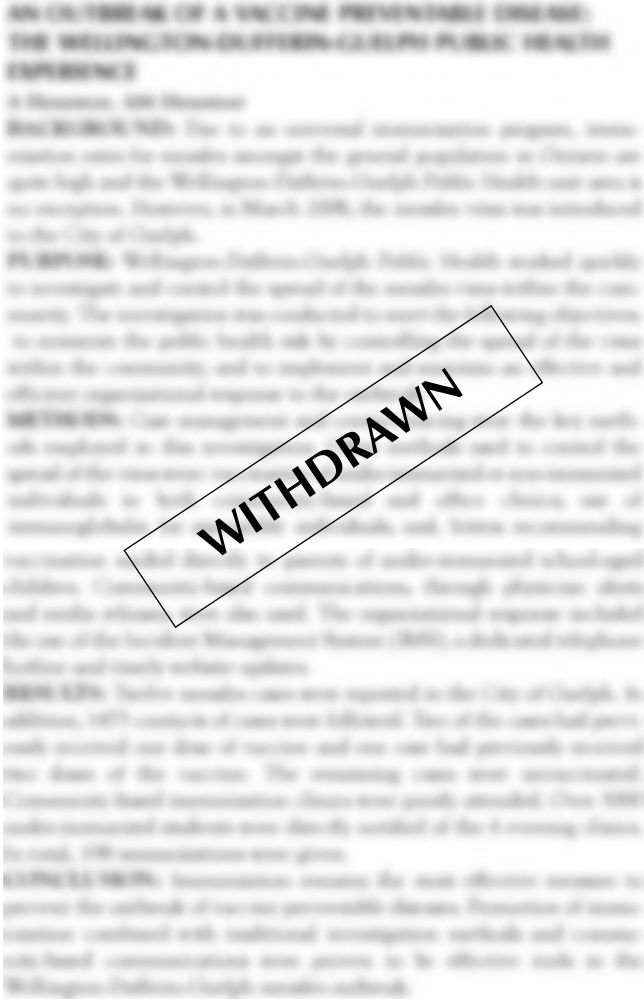
PURPOSE: The study compared the differences in infant immunization distress and pain between the control (sequential) and experimental (simultaneous) groups of infants receiving multiple injections at the 4-month routine immunizations.

METHOD: A simple randomized controlled design was used for this study. The control group of N=51 infants received 3 sequential injections (one after the other) by one vaccine provider. The experimental group of N=50 infants received simultaneous injections (two injections given at the same time) by two vaccine providers followed by the third injection. The salivary cortisol levels and the Neonatal Pain Scale (NIPS) scores were the primary and secondary outcome measures of distress and pain to compare the differences between the two groups.

RESULTS: The study enrolled 101 participants. No significant differences were found between the groups at baseline, prior to the immunization (Mann Whitney U = 1473.0, p = 0.08). There was no significant difference between groups on cortisol levels (Mann Whitney U = 932.5.0, p = 0.078); however, a significant difference was found between groups with the intervention group (simultaneous injection) demonstrating significantly less pain (Mann Whitney U = 1648.0, p = 0.003). When the groups were compared using ANCOVA to control for the NIPS at baseline, there was still a significant difference between groups (F = 45.7 (df 1), p = 0.0032), with time across groups not significant (F = 1.38 (df 1), p = 0.242).

CONCLUSION: Simultaneous injections have been shown to be effective in reducing pain behaviour responses in infants receiving their 4-month immunizations as supported in the NIPS results.

P40



P41
IMMUNIZING CHILDREN WHO FEAR NEEDLES: KEY ISSUES FOR NURSE IMMUNIZERS

M Ives

BACKGROUND: Public health nurses administer the majority of childhood immunizations in Fraser East health region, British Columbia. A significant percentage of children presenting for immunization are highly anxious and resistant to needle procedures. Estimates of needle fear within the general population are about five to ten percent and needle fear is one of children's top three fears. Immunization of children with needle fear often presents ethical, emotional and physical challenges to immunizers. Existing immunization policies focus on physiologic and mechanical elements but are silent on managing resistant behaviours associated with needle fear.

PURPOSE: To determine if and how children's resistance during immunization procedures is a significant problem for nurse immunizers.

METHODS: A survey and three focus groups were conducted with nurses from five health units within Fraser East, British Columbia.

RESULTS: Four key themes emerged from the study data: 1) Immunizing resistant children is stressful for nurses. 2) The strength of a child's resistance as well as some adult behaviour creates an ethical dilemma for nurses. 3) Parents and other adults can make the procedure more difficult and even unsafe. 4) Existing resources to support best practice are inadequate.

CONCLUSIONS: Routine childhood immunization is not a benign experience for a substantial number of people including nurse immunizers. Nurse distress is not well recognized and nurses want support and resources to improve outcomes when immunizing children who fear needles. Immunizer training and involvement in developing and testing interventions with children and their caregivers during immunization procedures is needed.

P42
ECONOMIC ANALYSIS OF A PUBLIC PROGRAM FOR PNEUMOCOCCAL VACCINE IMMUNIZATION

P Jacobs, A Chuck, T Nguyen, A Hanrahan, A Ohinmaa, J Loewen, L Mashinter, W Vaudry, J Kellner

BACKGROUND: On July 1, 2002 the Alberta government instituted a universal immunization program for pneumococcal vaccine (using a seven-valent vaccine) for young children. Although there have been economic studies of pneumococcal vaccine in Canada, all have been based on experimental study results, and none on actual experience.

PURPOSE: In this study we conducted a before / after economic analysis of the introduction of the vaccine in the Capital Region of Alberta.

METHOD: Two population cohorts (Edmonton region) were selected – one born between July and December, 1997 (pre-program) and the other born between July and December, 2002 (the post-program cohort). All children were followed between the time of discharge from hospital at birth, to their second birthday. We linked immunization records (post-cohort) with provincial utilization records for physician services, outpatient services, and inpatient services. Utilization was divided into two groups – cases identified by strep pneumococcal, and cases possibly linked by not diagnosed as such (e.g., otitis media). We tracked utilization for each child for two years, and attached costs to each service. We estimated the costs per child between the cohorts.

RESULTS: There were 5,027 children in the pre-cohort and 4,900 in the post-cohort. Utilization of hospital, physician billings and outpatient (emergency room) services were significantly less in the pre-cohort. Total costs, exclusive of the vaccine, were lower for the post-group ($118) than the pre-group ($154), exclusive of the vaccine.

CONCLUSION: The savings in utilization (about $36) was lower than the vaccine cost (about $73 for each of four doses). The implied cost-effectiveness ratio is favorable, compared with usual standards.

P43
DON'T BREAK THE CHAIN: EVALUATING COLD-CHAIN THERMOMETER RELIABILITY

R Kavanagh, J Futcher, J Cunningham, D Willliams

BACKGROUND: Vaccine supply safety is a mandatory program for Public Health in Ontario and is essential to ensuring a successful vaccine program. Maintaining the integrity of vaccine "cold chain" can ensure the highest level of vaccine potency and reduce vaccine waste.

PURPOSE: This experimental research was designed to provide evidence for the continued use of air-sensing thermometers or for their replacement with liquid-sensing thermometers in vaccine refrigerators.

METHODS: Physician's offices and clinics in the geographical area served by the Leeds, Grenville and Lanark District Health Unit were randomized for potential study inclusion. In each office a data logger and a new liquid-sensing thermometer were installed into the vaccine refrigerator along with the existing old air-sensing thermometer. Refrigerator temperatures were recorded twice daily for a period of 7-days. The data loggers automatically recorded the actual refrigerator temperature during the study. Least squares linear regression was used to determine the relationships that existed between the old and new thermometers and the data loggers.

RESULTS: The results of the regression analyses suggest that there was only a modest relationship for the refrigerator temperature recording between the old air-sensing thermometers and the data loggers. A strong relationship existed between the new liquid-sensing thermometers and the data loggers. As well, the new thermometers recorded a higher frequency of vaccine refrigerator temperature fluctuations considered to be detrimental to vaccines.

CONCLUSION: Based on the results of this study, the Leeds, Grenville and Lanark District Health Unit has decided to proceed with the purchase and introduction of the new liquid-sensing thermometers for all vaccine refrigerators in our jurisdiction. The study process also sensitized vaccine refrigerator office staff to the negative effects of temperature fluctuation on vaccine integrity.

P44
VACCINATION PRACTICES AND FACTORS INFLUENCING EXPANDED PROGRAMME OF IMMUNIZATION IN THE RURAL AND URBAN SET UP OF PESHAWAR

H Khan, A Hameed, N Jan

BACKGROUND: In Pakistan by year 2003, 82% of one-year-old children were immunized for tuberculosis, 67% for DPT3 (Diphtheria, tetanus and pneumonia), 69% for polio, 61% for measles. Data for children immunized for hepatitis B vaccine is not available.

PURPOSE: To appreciate the vaccination practices and factors influencing expanded program of immunization in the rural and urban set up of Peshawar.

METHODS: A cross sectional observational survey was conducted from December 2005 to September 2006, Khyber teaching hospital was assigned as urban setup where only respondents belonging to the city area were selected and interviewed. Women from Palusi village (rural area) were included as rural sampling in present study. Relevant information's was recorded from the respondents with the help of a predesigned proforma.

RESULTS: A total of 440 respondents including 280 (63.63%) from urban and 160 (36.37%) from rural area were selected. Of total sampling 98.57% of the urban and 86.37% of the rural women had started vaccination to their infants. Of urban sampling 67.14% and rural sampling 48.12% had fully immunized their children for polio, hepatitis B, diphtheria, pertussis, tuberculosis, measles and tetanus vaccination. Mother education level in urban and rural areas varies significantly that has its impact on the EPI services, maternal education levels were: illiterate (urban 54.64%, rural 78.75%), primary (25%, 11.87%), matriculate (11.78%, 6.25%) while only 1 (0.71%) of urban and none in rural women had postgraduate qualification. Father education was: illiterate (urban 21.78%, rural 39.37%), primary (32.85%, 24.37%), matriculate (16.85%, 16.25%), while postgraduate qualification (7.14%, 1.25%)

recorded. Maternal occupation also influence the EPI program in both set up, maternal profession recorded was: house wife (urban 55.71%, rural 70.62%), skilled woman (25.71%, 13.75%), student (11.78%, 10%) and government servant (6.78%, 1.8%).

CONCLUSION: Starting immunization of infants in urban and rural areas is satisfactory but fully immunization of infants is not as satisfactory especially in the rural setup and they are often missed in the repeated doses of vaccination. Maternal education and occupation are main factors that strongly affect the immunization on children and EPI program goals.

P45

CORRELATES OF HUMAN PAPILLOMAVIRUS ACCEPTABILITY: A PILOT STUDY OF UNIVERSITY STUDENTS IN MONTREAL

A Krawczyk, V Delisle, Z Rosberger

BACKGROUND: A Human Papillomavirus (HPV) vaccine was recently approved in Canada for women aged 9 to 26. In order to prevent the spread of HPV (which is the principal cause of cervical cancer), widespread uptake of the vaccine is essential. Therefore, it is critical to understand factors related to intentions to receive the HPV vaccine.

PURPOSE: The purpose was to assess university students' knowledge, attitudes, and beliefs about HPV and the HPV vaccine and examine the relationship between these factors and intentions to receive the HPV vaccine.

METHODS: The theoretical framework of this study was based on the Theory of Planned Behaviour and the Health Belief Model. Fifty university students aged 18-26 completed a computer task assessing implicit HPV vaccine attitudes and a questionnaire assessing demographic characteristics, sexual health and history, HPV and HPV vaccine knowledge, explicit HPV vaccine attitudes, HPV vaccine related beliefs (subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, benefits and barriers) and intentions to receive the HPV vaccine.

RESULTS: Fifty-eight percent of participants intended to receive the HPV vaccine. Knowledge about HPV and the HPV vaccine was modest (M = 9.68 out of 18, SD = 3.62). Factors related to intentions included: explicit HPV vaccine attitudes, family recommendation, and the beliefs that the HPV vaccine will prevent HPV and cervical cancer, promote comfort in sexual situations, reduce anxiety about HPV and not lead to negative health consequences.

CONCLUSION: The results suggest that HPV vaccine acceptability among university students may be more likely for those who have positive attitudes towards the HPV vaccine, receive encouragement from their family to get vaccinated and believe that the HPV vaccine has several benefits. Educational programs for young adults and their families regarding the health benefits of the vaccine may be beneficial in promoting acceptance of this vaccine.

P46

USE OF A TOPICAL ANAESTHETIC FOR PAIN REDUCTION IN ADOLESCENT HPV IMMUNIZATION

C LaJeunesse, S Fan, A Kallos, J Bettinger, K Marty

BACKGROUND: The Human Papilloma Virus HPV (Gardasil™) has been available for use as a licensed vaccine for less than 6 months in British Columbia. Clinical expertise in administration is limited. When using Gardasil™ vaccine in a clinical trial, nurses found pain experienced by subjects appeared to be considerably higher than that caused by other routine vaccines in the age groups 9-26. This observation led to an evaluation of a topical anaesthetic to determine if the use of EMLA might reduce the perception of pain thereby resulting in higher subject retention and immunization acceptance.

PURPOSE: The purpose of this evaluation was to determine whether the use of a topical anaesthetic (EMLA) can reduce injection pain during administration of HPV vaccine.

METHODS: A total of 231 adolescent and young adult girls receiving the HPV vaccine as part of a clinical trial were randomized to receive/not receive a topical anaesthetic prior to the second dose of vaccine. A baseline assessment of pain was performed (subjective and objective) at the time of dose 2. The same pain assessments were performed at the time of dose 3 administration after application or non-application of EMLA. An ANOVA comparison of the pre and post pain assessments between the EMLA and the non-EMLA groups was performed.

RESULTS: ANOVA test for NPS score and Cochran-Mantel-Haenszel test for changes in FLACC score suggest there is no difference in pain assessments, with/without EMLA.

CONCLUSIONS: In spite of the small sample size and other study limitations, we found no difference in the amount of pain between the groups using EMLA or not using EMLA when injected with HPV vaccine. The use of a topical anaesthetic to reduce pain when giving HPV vaccine is neither economically nor logistically feasible, given the lack of pain reduction in adolescent girls when HPV vaccine is administered.

P47

A NOVEL APPLICATION OF SURVEILLANCE ALGORITHMS IN CHILDHOOD IMMUNIZATION PROGRAM MONITORING

L McDonald, N Yiannakoulias, L Svenson

BACKGROUND: Immunization coverage rates are important for the monitoring of programmatic success as well as a population health indicator. In the past, sudden and ongoing decreases of measles/mumps/rubella (MMR) immunization related to perceived vaccine safety issues have led to widespread outbreaks of measles and mumps. Historically, coverage rates have been measured on a yearly basis, often months or years following year end. This delay in reporting means little can be done to improve the situation if rates drop in the short term. The value of using automated algorithms, historically used in syndromic surveillance systems, may be a solution to this problem.

PURPOSE: We investigate the use of the CUSUM and moving average algorithms on retrospective MMR and Pentacel (DTaP-IPV-Hib) registry data to determine if this type of surveillance tool is useful for measuring changes in vaccine uptake rates.

METHODS: Pentacel and MMR vaccine data were pulled for a 36-month period from the Alberta immunization registry. We used the negative, one-sided CUSUM and three-month moving average procedures to determine if the counts for MMR and Pentacel delivery had dropped below a defined minimum acceptable level.

RESULTS: At no time in the study period did the MMR immunization counts drop below the lower threshold for both algorithms investigated. The counts for Pentacel, however, did show a significant and sustained drop beginning in December of 2004. Later investigation showed this was due to a vaccine shortage during this time period.

CONCLUSIONS: Both the CUSUM and moving average algorithms performed adequately in this preliminary analysis; they alerted during the period of vaccine shortage, and did not alert at any other time. We plan to investigate the use of other commonly used alerting tools, such as the CDC's EARS algorithms, in the near future.

P48

PROJET VIP: QUALITÉ DES PRATIQUES DE VACCINATION PRÉ-POST, UNE FORMATION INTERACTIVE STANDARDISÉE

C Larue, M Letellier, M Julien, G Petit, L Gauvin, C Guimond

CONTEXTE: Des études montrent que certaines infirmières du Québec vaccinant les 0-5 ans ont des croyances erronées, des connaissances incomplètes en immunologie, des croyances mitigées quant aux bienfaits de la vaccination. Par conséquent, dans le cadre du projet VIP, une formation interactive de deux jours a été élaborée en poursuivant les objectifs suivants : 1) démontrer un positionnement éclairée sur la vaccination; 2) saisir l'ampleur du rôle de l'infirmière; 3) démontrer une capacité à mobiliser les parents vers la vaccination; 4) s'engager à diminuer les barrières à l'exercice du rôle de vaccinatrice.

OBJECTIFS: Présenter les résultats de l'évaluation qualitative pré et post formation.

MÉTHODE: Le devis de recherche est quasi-expérimental avec randomisation des CSSS/CLSC de 4 régions du Québec. Les infirmières du groupe contrôle (n : 87) ne travaillent pas avec celles du groupe expérimental (n : 84) qui seules ont participé à la formation. Les données sont compilées à l'aide d'une Situation clinique simulée (SCS) : rédaction d'arguments à partir d'un cas clinique, et d'un Journal rétrospectif (JR) : rédaction des pratiques de vaccination effectuées auprès des familles. Les analyses qualitatives des SCS et JR ont été codifiées avec NVivo-7 et soumises à la vérification inter juge.
RÉSULTATS: Le groupe ayant participé à la formation présente une augmentation qualitative de la précision des arguments scientifiques et une aisance relationnelle accrue devant la résistance du parent. Toutefois, on note le maintien de difficultés à répondre aux objections des parents notamment quand ceux-ci estiment que les méthodes alternatives remplacent la vaccination.
CONCLUSIONS: L'évaluation des effets de cette formation interactive permet de constater une progression dans l'appropriation de pratiques vaccinales optimales tout en pointant du doigt des éléments qui nécessitent davantage de soutien : qualité du langage écrit, précision des arguments.

POSTER PRESENTATIONS
Public

P49
INTERIM EVALUATION OF THE NATIONAL IMMUNIZATION STRATEGY (NIS) 2003-2007

D Taylor, S Jain, C Pinset, L Belzak, M Farhangmehr

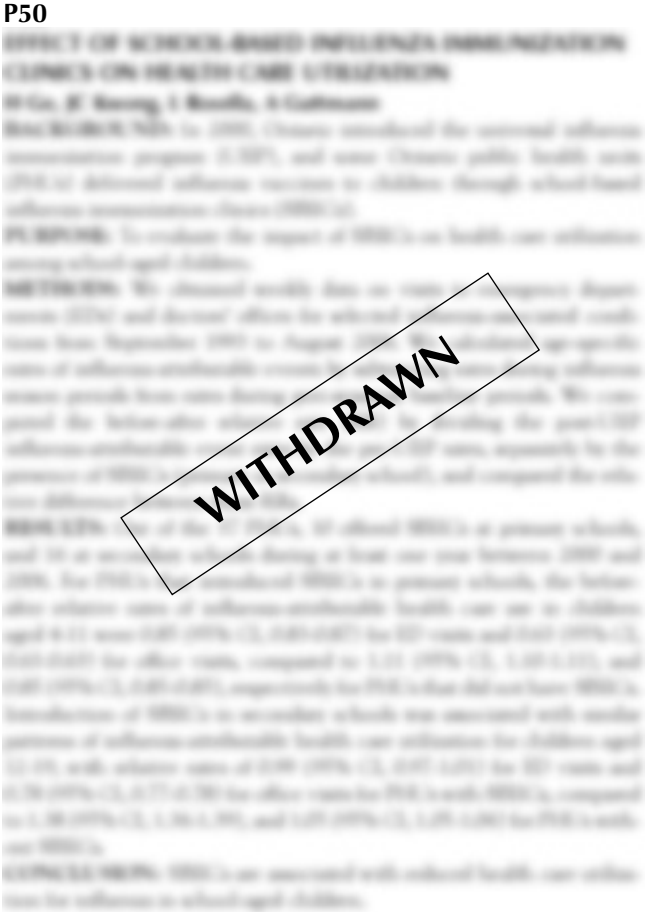
BACKGROUND: The NIS interim evaluation was implemented from May to July 2007. The objectives of the evaluation were to:

- Measure progress towards achievement of short-term outcomes between 2003 to 2007;
- Inform future decisions regarding immunization program planning, design and implementation;
- Ensure accountability; and
- Provide evidence to support and direct improvements to the NIS.

PURPOSE: To present results and recommendations from the NIS interim evaluation.
METHODS: Qualitative methods included key informant interviews with members of federal/provincial territorial working groups and an online survey of health professionals involved with immunization program delivery at the local and/or regional level; and a more quantitative assessment of programmatic documents, existing data sources and publications.
RESULTS: The NIS was found to be relevant to the priorities of both the federal and provincial/territorial governments. The design and implementation of the strategy was found to be effective, particularly in the area of increased partnerships and collaboration, improved access to programs, and enhanced affordability and security of vaccine supply. Documents reviewed revealed that from 2003 to 2007, twice as many children had access to the four new vaccines, and there was a significant increase in coverage for three of the four. The incidence rates in invasive pneumococcal disease and pertussis decreased, and vaccine supply became more secure with more provinces and territories participated in the bulk purchase program.
CONCLUSIONS: Six recommendations were made:

1. Prioritize and implement a system to monitoring and evaluation NIS activities.
2. Enhance communication between the National Advisory Committee on Immunization and the Canadian Immunization Committee.
3. Increase the interaction between NIS working groups.
4. Consider additional roles for non-government organizations on working groups.
5. Allocate specific resources to working groups.
6. Continue to develop and focus on a long term vision for immunization in Canada.

P50



P51
EXAMINING REASONS FOR INCOMPLETE IMMUNIZATION STATUS AMONG DAY CARE CHILDREN

J Fediurek, LM MacDonald, AS Stevens, JT Tober, MC Costie, JG Genua, RH Hesch, KP Paddock

BACKGROUND: In Brant County, children attending licensed day cares are suspended if they have an incomplete immunization status for diphtheria, pertussis, polio, tetanus, measles, mumps, rubella and *Haemophilus influenzae* type b. While vaccination for pneumococcal, meningococcal and varicella is also recommended, it is not enforced by suspension.
PURPOSE: To understand the reasons why day care children have an incomplete recorded immunization status and to examine if the reasons differ for vaccines that are enforced versus not enforced by suspension.
METHODS: Immunization records of day care children who had received suspension orders during November, 2007 to February, 2008 were examined. Children were categorized for each vaccine and descriptive statistics were computed. Comparisons were made between those who were missing the vaccines(s) relative to those who had not reported their immunization information to the health unit. Follow-up calls to parents occurred to obtain records for the non-enforced vaccines, as parents were not legally required to report such information.
RESULTS: One hundred and thirty-five suspension orders were issued over the four month period. No records were received from 12% of the children for at least one enforced vaccine and 41% for at least one non-enforced vaccine following the suspension order. Among children who reported vaccine records, the majority had been previously immunized ranging from 57% to 69% for the enforced vaccines and 56% to 67% for the non-enforced vaccines.
CONCLUSION: Results indicate that incomplete immunization status is often due to deficient reporting to the health unit, rather than deficient immunization. Coverage of the enforced vaccines is higher than

public health records had indicated; however coverage of the non-enforced vaccines is unclear as a fairly large proportion of children did not submit records to the health unit. Future efforts should focus on improving vaccine record collection, particularly for vaccines not enforced by suspension.

P52
MODELLING THE CLINICAL CONSEQUENCES OF INTRODUCING AN INTRADERMAL INFLUENZA VACCINE AMONG ELDERLY IN ONTARIO

S Aballéa, J Roïz, JC Kwong, P Murray, R Van Exan

BACKGROUND: Influenza vaccination via intradermal route has proven to be more immunogenic than via intramuscular route in clinical trials. This could benefit especially to elderly who have a weakened immune response to current influenza vaccines and are at increased risk for complications or death associated with influenza.

PURPOSE: To model the consequences of vaccinating elderly people in Ontario with a new intradermal vaccine.

METHODS: We developed a decision-analytic model to compare the outcomes associated with alternative vaccination policies over 5 years. Input data were obtained primarily from the published literature. A constant vaccination coverage of 80% was assumed, based on the target set by Canadian authorities for high risk groups. The incremental effectiveness of intradermal vaccination was derived from the increased immune response measured in a randomised clinical trial. The primary outcome was quality-adjusted life-years (QALY), accounting for lost quality of life during influenza episodes and complications, and the reduction in life expectancy.

RESULTS: The average incidence of influenza cases, influenza-associated hospitalisations and deaths were 1445, 158 and 68 per 100,000 persons per season among those vaccinated via intradermal route, vs. 1680, 166 and 76 via intramuscular route. The corresponding number of QALYs gained with the intradermal vaccine was 37.0 per 100,000 individuals (95% credibility interval: 21.6; 55.6). The variables with greatest influence on QALY gains were influenza-associated mortality rates and vaccine effectiveness against deaths. The introduction of the intradermal vaccine was projected to prevent 15482 (5825; 29459) influenza cases, 667 (346; 1126) hospitalisations and 746 (426; 1120) deaths over 5 years in Ontario.

CONCLUSION: The burden of influenza among elderly could be significantly reduced with the introduction of the intradermal vaccine. This model provides a framework for future cost-effectiveness analyses of the new intradermal vaccine compared to current vaccination policies.

P53
THE UTILIZATION OF AND SATISFACTION WITH PEDIATRIC PREVENTIVE HEALTH SERVICES IN SAUDI ARABIA: IMPLICATIONS FOR PUBLIC POLICY

S Alghanim, MR Alyemeni, AO Albarrak

BACKGROUND: Preventive health services, particularly immunization services are one of the main functions of the primary health care centers in Saudi Arabia. Understanding the utilization and the satisfaction with these services is important for decision makers.

PURPOSE: 1) To identify factors associated with the utilization of pediatric preventive health services provided in primary health care centers and; 2) to determine the level of satisfaction among parents about the immunization services provided in primary health care centers.

METHODS: The data were collected by a self-administered questionnaire from parents attending primary health care centers during June – August 2007. Five hundred parents were selected randomly during their attendance at five primary health care centers in Riyadh City, of which 444 (88.9%) successfully completed the questionnaire. The data were collected on a set of independent variables including predisposing, enabling and need variables which were thought influence the utilization of preventive health services. Bivariate and multivariate analyses were employed to determine which factors best explain the utilization of preventive health services.

RESULTS: The vast majority of parents (92%) were satisfied with immunization services provided to children in primary heath care centers. Enabling and need variables seemed to be the principal factors influencing the utilization of immunization services. Among the predisposing variables, distance from home to the primary health care center was the only significant variable influencing the utilization of immunization services. The study found that parents were knowledgeable about the importance of immunization services, but unaware of other preventive services provided in these centers such as sanitation and environmental services.

CONCLUSION: More efforts by health policy makers needs to be made to enhance the preventive services other than immunization services and the public should be well informed about the provision and the availability of services available in the primary health care centers.

P54
NEEDLE STICK INJURIES AMONG HEALTH CARE WORKERS IN TERTIARY CARE HOSPITALS OF KARACHI

M Aslam, T Taj, A Ali

BACKGROUND: Needle stick injury (NSI) is frequently responsible for the transmission of blood born disease and health care workers are at highest risk of such injuries. Incident is particularly higher in public hospitals and there is occupational injury reporting system in these hospitals

PURPOSE: This study was conducted to determine the frequency of needle stick injuries in one month period among health care workers in three public tertiary care hospitals.

METHODS: This cross sectional survey was conducted from November 2007 to January 2008 in three public tertiary care hospitals in Karachi. Data was collected by structured interview based questionnaires in Urdu and English language. Questionnaire was designed to obtain information regarding demography, work experience, working hours, working environment, hepatitis vaccination status, and occurrence of needle stick injuries with associated factors. Needle stick injury occurred in the preceding one month period was the defined outcome. Data was entered in Epi Data and analyzed in SPSS version 15.

RESULTS: A total of 417 health care workers participated in the study. Mean age of the participants was 24±11 years. Most of the participants had morning duties in the previous one month. Median number of injections administered per day by each participant was 20 (IQR=16). Around 70% of the participants were vaccinated for hepatitis B, nevertheless among them, 30% had incomplete vaccination status (less than 3 doses). History of at least one time needle stick injury was found in 281 (66%) participants. Around 13% (n=54) had one or more NSI in the previous one month during work at hospital and half of them were affected by non-sterile needle. None of them seek medical care or reported their injury to emergency department. Almost 90% of them were not wearing gloves or any other protective measures at the time of injury.

CONCLUSION: This study point out that incident of needle stick injury is extremely high in Pakistan and basic methods of occupational precautions are lacking. There is an immediate need for the refresher and training programs at regular intervals for hospital staff regarding the knowledge of the consequences of needle stick injuries and the methods of prevention.

P55
COST EFFECTIVENESS OF A PUBLICLY FUNDED HEPATITIS B VACCINATION PROGRAM FOR BLOOD DONORS IN BRITISH COLUMBIA

M Bigham, ST Waters

BACKGROUND: The current strategy for preventing transfusion-transmitted hepatitis B virus (TT-HBV) infection in Canada relies on donor behavioural risk and laboratory screening.

PURPOSE: The objective of this study, undertaken in British Columbia (BC) in 2007, was to assess the cost-utility and benefits to transfusion safety, of a publicly funded hepatitis B (HB) vaccination program for previously unvaccinated blood donors.

METHODS: A "health care payer" perspective, using deterministic estimates, was taken. Fixed costs and savings from prevented infections were not included. Direct and indirect program costs associated with vaccinating eligible donors through the existing regional, mixed, public health/physician vaccine delivery model, were included in the analysis, along with relevant blood donor and recipient data, obtained from Canadian Blood Services and the BC Ministry of Health.
RESULTS: Assuming 100% vaccine uptake among eligible donors, total program cost over the first year ranged between $CDN 2.55 M and $CDN 3.04 M. Program cost dropped to $CDN 0.38 M in the following year. Up to 2.46 TT-HBV infections might be averted in the first 2 program years, with a corresponding range of cost-utility based on scenarios of 30% and 10% prevalence of prior HB vaccination among donors >25 years, of $CDN 6.92-$8.09 M per Quality Adjusted Life Year (QALY) gained. About one TT-HBV related death would be averted over 40-80 years.
CONCLUSION: The cost-utility of the program in its first 2 years, approximately $7.77 M per QALY, would improve in time, as the proportion of new donors previously HB vaccinated increases as a result of existing public health HB immunization programs. Although not within the usual cost-utility range of many healthcare interventions, this is comparable to other safety measures implemented by many blood suppliers over the past decade, such as donor nucleic acid testing for HIV and hepatitis C virus. Conceptually, this program could expand the current means of enhancing blood safety, which focus on donor risk behavior screening and testing, to include primary donor prevention, that further integrates blood safety into a comprehensive public health disease-prevention strategy.

P56
IMPACT OF CHANGING THE FOUR DOSE CHILDHOOD PNEUMOCOCCAL

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BACKGROUND: A universal four-dose childhood vaccination program using a heptavalent pneumococcal conjugate vaccine (PCV7) was introduced in Saskatchewan in 2005. With emerging evidence that a three-dose schedule of pneumococcal vaccine is as effective as four doses, the National Advisory Committee on Immunization released a recommendation supporting a three-dose conjugate vaccination program.
PURPOSE: With increasing costs of administering vaccination programs, new vaccine programs and new recommendations for a three-dose conjugate IPD vaccination schedule, Saskatchewan Health, in collaboration with northern health regions, First Nations and Inuit Health (FNIH) and the Northern Inter-Tribal Health Authority (NITHA) evaluated the implications of implementing a three-dose PCV7 program in Saskatchewan.
METHODS: Data from the provincial communicable disease database, immunization registry, and First-Nations and Inuit Health infectious disease database was analyzed. A literature review was conducted and expert opinion sought.
RESULTS:

- Age-appropriate coverage according to the current four dose schedule rates (four doses of PCV7 by two years of age) was 67%. However, 84% of children received at least three doses of PCV7 by age two.
- Implementation of a three-dose program would reduce program costs by $800,000 per year
- Cases attributed to PCV7 serotype strains decreased from 86% in the pre-vaccine era to 59% in the post-vaccine era in children under two .
- 76% of children under two who had IPD had no history of vaccination.
- First Nations children under two carried a disproportionate burden of illness in both the pre-and post vaccine PCV7 era.
- Risk of IPD was greater for First Nations children living in northern Saskatchewan.

CONCLUSION: A universal three-dose PCV7 program would provide sufficient protection from IPD. With the recent increase in serotype 5 and outbreaks in high risk populations, an additional dose of PPV23 at the age of two years may provide expanded serotype protection. Children living in the three northern health regions, and some First Nations communities where there is high household density would benefit from a fourth dose of PPV23.

P57
PROVINCIAL PROGRAM FOR RSV IMMUNOPROPHYLAXIS FOR INFANTS BORN 33-35 WEEKS GESTATIONAL AGE

A Chiu, R Paulley, S Anderson

BACKGROUND: Respiratory syncytial virus (RSV) infection is a major cause of hospitalization in infants during the winter. Palivizumab (Synagis®) has been shown to decrease the risk of RSV related hospitalization in infants born at 33-35 weeks gestational age (wks GA). However, universal immunoprophylaxis in this group is impractical due to size of the cohort and the cost of treatment.
PURPOSE: To describe a provincial approach to RSV immunoprophylaxis with palivizumab in 33-35 weeks wks GA infants born in Manitoba during the 2006-07 season.
METHODS: Between May 1, 2006 and April 1, 2007, all infants 33-35 wks GA born in Manitoba and admitted to a Level II or Level III NICU were identified. Infants were divided into 2 eligibility groups. Infants whose parents reside above 50 degree North latitude were considered remote residents and automatically eligible for immunoprophylaxis with palivizumab if born before or during the RSV season (November – February). Infants not residing in remote portion of Manitoba were eligible if they were born during the RSV season and scored within the high-risk category for RSV related hospitalization using a previously developed Risk-Scoring Tool. Hospitalization for RSV related illness was recorded.
RESULTS: 367 infants born at 33-35 wks GA were identified: 122 infants were born during the RSV season; 197 infants were born before the season (184 were not eligible as residing in non-remote Manitoba); 48 infants were born after the season ended (none eligible). A total of 39 infants from remote northern communities were identified and were enrolled. Of the 102 non-remote infants born during the season with complete referral submitted, 10 were from Ontario and were not eligible. Of the 92 non-northern Manitoba patients, 56 scored in low risk category, 24 in moderate risk, and 12 in high risk. Only infants at high risk for RSV hospitalization were eligible and enrolled. However, 2 moderate infants were included as they were siblings of those scored as high risk. A total of 14 infants were enrolled based on Risk Score. For 2006-2007, only 53 infants of 33-35 wks GA were enrolled for RSV immunoprophylaxis, representing 14% of the entire 33-35 wks GA infant cohort and 19% of all infants enrolled for RSV immunoprophylaxis in Manitoba for 2006-07 (total enrolled was 277). Of the 53 infants born at 33-35 wks GA enrolled, only 2 required hospitalization for RSV disease: one before receiving immunoprophylaxis, one after receiving only a single dose.
CONCLUSION: A provincial program for RSV immunoprophylaxis for 33-35 weeks gestational age infants is feasible. Eligibility criteria based on location of residence (remote northern), and high risk for hospitalization (Risk Score) can be used to identify target groups within this cohort.

P58
MANITOBA RSV IMMUNOPROPHYLAXIS PROGRAM: INCREASE IN ENROLMENT WITH INCREASE IN ELIGIBILITY CRITERIA

A Chiu, R Paulley, S Anderson

BACKGROUND: Respiratory syncytial virus (RSV) infection is a major cause of hospitalization in infants during the winter. Immunoprophylaxis with palivizumab (Synagis ®) was initially recommended to decrease risk of RSV related hospitalization in premature infants ≤32 weeks gestation. However, more eligibility criteria have been added.

PURPOSE: To describe the changes in eligibility criteria and its effect on patient enrolment in the Manitoba RSV Immunoprophylaxis Program (MB-RSVIP).
METHODS: The MB-RSVIP has been in existence since 1999 and evolved into the provincial program in 2005. Since its inception, the MB-RSVIP has used an active notification process: it is notified of all infants meeting standard eligibility criteria of prematurity, bronchopulmonary dysplasia (BPD) and hemodynamically significant congenital heart disease (CHD). Program data from 2000 to 2008 was reviewed.
RESULTS: Original eligibility criteria were premature infants = 32 weeks gestation and infants with BPD. Additional eligibility criteria have been included: CHD (since 2003), 33-35 weeks gestation residing in remote Northern communities or at high risk of RSV related hospitalization (since 2005). Overall enrolment into the MB-RSVIP has increased from initial 158 infants in the 2000-2001 season, to peak of 277 infants in 2006-07 or 0.02% of the population of Manitoba (based on 2006 Statistics Canada census). As expected, inclusion of each additional eligibility criteria has increased enrolment. Inclusion of infants with CHD increased enrolment by average of 32 infants each year. The addition of the 33-35 weeks gestation criteria has resulted in an average increase of 57 infants per year. For 2007-08 season, infants in the 33-35 week gestation eligibility category represented 23% of the total number of infants enrolled into the MB RSVIP.
CONCLUSION: Additional eligibility criteria, especially the 33-35 gestation criteria, have significantly increased enrolment in the MB-RSVIP.

P59
MEASLES SUSCEPTIBILITY TESTING IN ONTARIO

N Crowcroft, J Maregem, T Kozlowski, L Coloquio

BACKGROUND: An outbreak of measles in Ontario in 2008 stimulated discussion about what public health action should be taken. Many cases occurred in persons born after 1970 but out of high school before the school-based second dose MMR campaign of 1996 (i.e. eligible for 1 dose of measles vaccine); however, cases occurred in both younger and older age cohorts.
PURPOSE: To estimate levels of measles susceptibility in different birth cohorts based on specimens submitted to the Ontario Public Health Laboratories (OPHL), to inform public health action.
METHODS: The OPHL information system was searched for results of the first specimen submitted for patients investigated for measles immunity between 1st September 2007 and 29th February 2008. .
RESULTS: 27,012 eligible patients were identified. 75.9% tested were female. The overall level of susceptibility to measles in this dataset was 7% - 2% above the target level of 5% set by the World Health Organization for ensuring measles elimination. Susceptibility to measles varied by birth cohort. Of those born before 1996 it was highest in those born 1990-95 at 14.6% (142/974). Amongst older birth cohorts susceptibility was similar for cohorts born 1970-79 and 1980-89 at 8.6% (557/6,510) and 8.1% (776/9,633) respectively. For those born before 1970, susceptibility was 3.6% (325/9,085).
CONCLUSIONS: The results should be interpreted with caution because of selection bias. Susceptibility may be underestimated if those tested for immunity are students applying to medical or nursing schools and healthcare workers starting in new posts, who may be more likely to be immune than the general population. In contrast, patients, especially children, may have been tested because they were suspected to be non-immune which would over-estimate susceptibility. Surveillance of immunity in Ontario using representative samples should be a priority to improve policy and decision-making and ensure better measles control in future.

P60
TWO-YEAR OLD IMMUNIZATION COVERAGE RATES IN THE REGINA QU'APPELLE HEALTH REGION BY NEIGHBORHOOD AND RURAL COMMUNITY

T Diener, Z Abbas, M Granger

BACKGROUND: Due to disparities identified in other areas such as rates of hospitalization and use of medication between neighbourhoods and communities within the Regina Qu'Appelle Health Region (RQHR), immunization coverage rates were identified as another possible area to be analyzed accordingly.
PURPOSE: To determine immunization coverage rates among children born in the RQHR in 2005 and registered in the Saskatchewan Immunization Management Program (SIMS).
METHODS: The web-based Saskatchewan Immunization Management System (SIMS) was accessed in January 2008 to determine immunization coverage rates for the 2005 birth cohort. The assessment focused on immunizations children should have received by 24 months of age – 4 doses of Diphtheria, Tetanus and acellular Pertussis (DTaP) and 2 doses of Measles, Mumps and Rubella (MMR). Antigen-specific completion rates for children 2 years of age were determined by Regina city neighbourhood and rural communities.
RESULTS: The 2005 birth cohort had a 67.7% coverage rate for DTaP (4 doses) and 66.9% for MMR (2 doses) at the age of 24 months. The immunization coverage rates differ considerably by city neighbourhoods, as well as within rural communities. The assessment of the cohort of children born in 2005 also showed that 88.2% completed 3 DTaP. However, the 4th dose of DTaP is keeping the immunization coverage rate low.
CONCLUSIONS: Low immunization coverage rates exist among children in the Regina Qu'Appelle Health Region. Targeted efforts are needed to increase immunization rates and to decrease the disparity in immunization coverage in neighbourhoods where rates are low. Different strategies to increase immunization levels in the health region in general and in neighbourhood/communities with low immunization coverage in particular are being implemented. Population and Public Health Services is working to develop web based tools to generate reminders and to provide information on childhood immunization and health care service for parents.

P61
TRAVEL IMMUNIZATION ACCEPTANCE RATES AMONG IMMIGRANTS VISITING FRIENDS OR RELATIVES IN THEIR HOME COUNTRIES AS COMPARED TO BUSINESS AND THOSE TRAVELLING FOR WORK/STUDY ABROAD

T Diener, Z Abbas, D Martin

BACKGROUND: According to the literature, although making up a minority of the population in a developed country, immigrants account for a disproportionately large number of air travellers and are less likely to seek pre-travel advice.
PURPOSE: To prospectively assess the acceptance rates of recommendations made in terms of immunization/malaria chemoprophylaxis among immigrants and their Canadian born children visiting friends and relatives (VFR) compared with people who travel for business or work/study abroad.
METHODS: Data was collected from clients attending the Travel Health Centre, Population and Public Health Services, Regina Qu'Appelle Health Region (RQHR) between September and November, 2006. Data was collected and analyzed for age, gender, country of origin, annual household income, purpose of travel, destination, duration of the trip, type of accommodation, as well as for immunizations/malaria chemoprophylaxis recommended/prescribed and accepted.
RESULTS: The overall response rate for the larger study was 95.7%. Although 993 clients took part in the survey, only the data from 66 VFRs, 43 business travellers and 27 travellers going abroad for work/study was analyzed for this part of the study. VFRs are predominately females (54.5% vs. 25.6% business travelers), have less annual household income (30% with <$40,000 compared to 71% of business

travellers earning >$70,000) and spend more time abroad (70% of VFRs away for 4 or more weeks vs. 33% of business travellers). Most VFRs visited Central Asia (28.8%). VFRs consulted their physicians for travel advice before visiting the Travel Health Clinic more often (40.9%) than business travellers (27.9%). VFRs tend to spend more time at the homes of their friends and relatives (90.9%) compared to other groups. All respondents refused rabies vaccination, despite being made aware of travel associated rabies risks. Compliance with malaria chemoprophylaxis was the same in VFRs and other travellers. Cost was a significant factor in non-compliance with prescribed immunizations among VFRs.
CONCLUSIONS: VFRs constitute a risk group for contracting and importing communicable diseases during their travels abroad. The results of this survey are being used in formulating recommendations for pre-travel assessment and counseling in terms of immunization and malaria chemoprophylaxis for VFRs.

P62
CONSEQUENCES OF ACUTE OTITIS MEDIA IN CANADA: PRELIMINARY RESULTS OF A TELEPHONE SURVEY

E Dubé, P De Wals, V Gilca, N Boulianne, M Ouakki

BACKGROUND: Between 472,000 and 590,000 cases of acute otitis media (AOM) occurred each year in Canada prior to PCV-7 use. It is important to assess the impact of existing and potential new vaccines on the burden of the disease.
PURPOSE: To estimate the incidence of AOM in young children and associated health services use, as well as the quality of life (QOL) of affected children and their parents.
METHODS: In May-June 2008, a random-digit dialling telephone survey was conducted in a stratified sample of households in 10 Canadian provinces. A QOL score based upon OM6 questionnaire (Rosenfeld, 1997) was used, results were ranging from 1 (worst QOL) to 5 (best possible QOL).
RESULTS: 502 parents/guardians of children aged six months to 5 years were reached and 32% reported a least one AOM episode during the last 12 months, with 27% of them reporting =3 episodes. 93.8% of last episodes resulted in a visit to a physician and 92.6% in antibiotics use. Mean AOM duration was 5.9 days (median=4 days). Average QOL was 3.4 for the child and 3.5 for the parent, with strong correlation between the two measures. Child QOL score was predicted by parent QOL score and by limitations in the child activities ($p<0.0001$) as well as by duration of AOM episode, by cancelation of family activities and by the number of AOM-related health problems, e.g. fever, earache, etc. ($p<0.02$).
CONCLUSION: Transitory loss in QOL is associated with AOM, both for the affected child and his/her parents. This information, along with precise estimates of direct and indirect costs to families and health system, will be useful for performing economic analyses; comparing the marginal costs and benefits of different vaccines and immunization schedules.

P63
REPONSE IMMUNE A INFLUENZA

J Eslahpazir, B Ward

INTRODUCTION: Le risque de la survenue d'une pandémie d'influenza a pour conséquence d'élargir le cercle des intervenants dans des domaines divers. Ayant pour but de faciliter leur familiarisation dans ce nouveau domaine de recherche, nous avons formulé 4 questions concernant la réponse immune à cet agent pathogène : 1) la mesure de la réponse immune ; 2) l'immunité naturelle ; 3) l'efficacité de la vaccination et 4) la réponse immune vaccinale en cas d'une pandémie.
MÉTHODES ET RÉSULTATS: Nous avons effectué une lecture approfondie des articles disponibles sur le Pubmed. Notre avons utilisé des critères sélectifs de plus en plus restreints pour arriver aux articles les plus pointus sur le sujet. Nous avons adopté au départ deux critères de sélection pour toutes les questions : la langue de la publication (français et anglais) et la période de publication (de 1960 à 2008). Nous avons ensuite utilisé des mots-clés. A titre d'exemple, pour la question de l'immunité naturelle des enfants de 2 à 5 ans, nous avons choisi les mots clés natural, immunity, age et influenza A, nous avons alors obtenu 3312 articles. En prenant en compte uniquement les humains (2993 articles) et en limitant l'âge entre 2 et 5 ans, nous avons obtenu 1064 articles. Nous avons ensuite effectué une première sélection à partir des titres des articles et sélectionné 109 articles dont la lecture des résumés a permis d'identifier seulement 3 articles clés avec une contribution importante à cette question.
CONCLUSION: Malgré des années de pratique de vaccination, des questions essentielles fondamentales restent sans réponse faute d'avoir élaboré dès le départ une stratégie cohérente. Il s'avère nécessaire, compte tenu de l'urgence actuelle, d'élaborer des études pointues et pratiques pour répondre à ces questions de sciences fondamentales en vue d'élaborer une meilleure stratégie vaccinale.

POSTER PRESENTATIONS
Clinical

P64
EVALUATION OF THE THREE-DOSE SCHEDULE OF CONJUGATE PNEUMOCOCCAL VACCINE IN BRITISH COLUMBIA

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BACKGROUND: Invasive pneumococcal disease (IPD), caused by the bacterium *Streptococcus pneumoniae*, is most common in the very young, the elderly and certain high-risk groups. In September 2003, a routine 4-dose infant immunization program of 7-valent pneumococcal conjugate vaccine (PCV7) was introduced in BC (at 2, 4, 6 and 18 months). In January 2007, BC adopted a PVC7 3-dose schedule (2, 4, 12 months of age).
PURPOSE: To describe the surveillance data related to the pneumococcal conjugate vaccine dose reduction program in BC.
METHODS: Rates of program change uptake were calculated using data from the immunization registry. IPD coverage rates following 3-dose implementation were compared with 4-dose rates for the previous period. Health authorities completed an enhanced surveillance IPD case report form for individuals aged 0 - 16 years. Report data were merged with strain-specific subtyping data from the BC Centre for Disease Control laboratory. Vaccine failure was defined as a case of vaccine-specific serotype IPD in a child who had received all recommended vaccine doses.
RESULTS: There has been good uptake of the three-dose vaccination schedule; prior to program change 66% of the birth cohort had three doses at nine months of age vs. 67% of the cohort with two doses at nine months of age following implementation of the program. One case of vaccine failure was identified. This case was in a 4-dose recipient and is in concordance with vaccine effectiveness data available from pre-licensure clinical trials.
CONCLUSION: In BC, preliminary data show that the new schedule has been well adopted, pneumococcal immunization coverage rates have not declined following program change and the reduced dose schedule has not resulted in increased vaccine failure.

P65
REPORTED CASES OF THROMBOCYTOPENIA FOLLOWING IMMUNIZATION IN CANADA JANUARY 1997 TO MAY 2008

H Anyoti

BACKGROUND: Thrombocytopenia is a rare but known adverse event following immunization (AEFI), especially with measles vaccine.
Objective: To review and characterize all thrombocytopenia AEFI reports in Canada.
METHODS: All cases with thrombocytopenia reported for vaccines administered from January 1997 to May 2008 were extracted from the

Canadian Adverse Event Following Immunization Surveillance System. Each report was reviewed individually.

RESULTS: Over the 10-year period, a total of 164 cases were reported. The age range was 8 weeks to 84 years with most reports involving children aged between 1 to 2 years old (n=93, 56.7%) and infants (n=23, 14.2%).

Medical attention was sought by 95.1% (n=156) of the cases, of whom 81.4% (n=127) were hospitalized, 4.5% (n=7) were seen in emergency department, and 11.5% (n=18) were seen as outpatients. Duration of hospitalization ranged from 1 to 12 days (median 3 days).

Outcome was specified for 83.5% (n=137) of the reported cases; of whom 68.6 % (n=94) had recovered fully and 30.7% (n=42) were recovering at the time of reporting. There was one death reported.

In all, 249 vaccines were listed in the reports with measles accounting for 43.4% (n=108). Other frequently reported vaccines include: DTP containing vaccines 15.7% (n=39), meningococcal conjugate-C 8.4% (n=21), varicella 8.0% (n=20), hepatitis A/B containing vaccines and pneumococcal 7-valent each 7.6% (n=19), and influenza 6.0% (n=15).

The Advisory Committee on Causality Assessment (ACCA) reviewed 45.1 % (n=74) of AEFI reports, and assigned causality as probable/very likely-certain to 27.1% (n=20), possible to 31.1% (n=23) and unlikely/unrelated to 18.9% (n=14).

CONCLUSION: On average, 15 AEFI reports of thrombocytopenia/year were reported to the Public Health Agency of Canada and almost two-fifth of these reports involved measles containing vaccine. While the majority of the cases had been hospitalized, most of the cases had fully recovered at the time of reporting.

P66

EMERGENCE OF OSELTAMIVIR RESISTANCE AMONG INFLUENZA A/H1N1 VIRUSES DURING THE 2007-2008 SEASON

S Aziz, S Desai, T Booth

BACKGROUND: In 2008, routine surveillance for antiviral susceptibility among influenza viruses identified emergence of oseltamivir-resistance (OsR) in influenza A/H1N1 viruses.

PURPOSE: To describe the epidemiologic features of oseltamivir-resistant influenza infection in Canada during the 2007-08 season.

METHODS: In 2006, as a part of routine influenza surveillance, the Canadian National Microbiology Laboratory (NML) began testing for antiviral resistance among isolates submitted. OsR was identified by fluorometric neuraminidase enzyme inhibition assay and polymerase chain reaction of the neuraminidase gene. Cases were defined as episodes of illness during which a specimen yielding OsR H1N1 influenza was obtained. Clinical and epidemiologic data were collected using standard questionnaires by local and provincial health departments between January 1 and March 4, 2008.

RESULTS: Of the influenza isolates tested and included in the analysis period, 57 of 370 (15.4%) influenza A/H1N1 viruses showed evidence of OsR. No OsR was identified among influenza A/H3N2 or B isolates. 55/57 (96.5%) A/H1N1 isolates with OsR were characterized as the vaccine strain (A/Solomon Islands/3/06). No oseltamivir-resistant isolates were also resistant to amantadine. Epidemiologic detail was provided for 44/57 OsR cases (77.1%). Of these, 88% were under the age of 50, 83% had illnesses that were assessed as outpatients. None required ICU admission. All but one case fully recovered with one death in a long term care facility resident. Only one case reported previous use of oseltamivir.

CONCLUSIONS: During the 2007-08 season, new resistance to oseltamivir emerged in a significant proportion of influenza A/H1N1 viruses. Based on our sample, OsR was rarely associated with prior oseltamivir use, thus, suggesting chains of transmission. Resistant virus did not appear to be associated with more severe clinical disease. The need for ongoing monitoring of antiviral resistance and the importance of primary prevention (vaccine) are emphasized. Recommendations for antiviral use will be based on continued monitoring.

P67

A UNIQUE CANADIAN MODEL OF INVESTIGATORS & INDUSTRY RESEARCH SPONSORS WORKING TOGETHER TO IMPROVE VACCINE RESEARCH CULTURE & OPPORTUNITIES

G Bjornson, D Scheifele, B Duval, SA Halperin, B Ward

BACKGROUND: The Canadian Association for Immunization Research and Evaluation (CAIRE) is a unique professional organization formed in 2000. Its 130 members are dedicated to building the scientific foundation of optimal immunization programs. Creating a 'corporate voice' for researchers permitted high-level interactions with industry to seek improvements in sponsored research.

PURPOSE: demonstrate an innovative approach to improving vaccine research culture and opportunities.

METHODS: A Research Sponsors' Advisory (RSA) Board was established in 2002, bringing together senior representatives of 5 vaccine companies and CAIRE leaders from academic and public health settings. Twice-yearly meetings are a forum to discuss generic issues. Each agenda considers new opportunities, potential collaborations and mutual concerns in the areas of research education, advocacy and practice. Any member can propose agenda items and lead a discussion.

RESULTS: Board meetings have led to numerous positive outcomes. Education advances include an annual vaccinology course for residents in training, multidisciplinary workshops and greater research emphasis in the national immunization conference. Research advocacy has focused on increasing sponsored projects in Canada including research prioritization workshops, enhanced disease surveillance and timely evaluations of newly established programs. Research practice advances include improvements in study planning, agreed means of investigator participation in data analysis and practical strategies to reduce study costs. Greater consideration is being given to integrating product and program related research and the respective academic and public health researchers. Two joint publications and a new model for multi-partner project funding have resulted.

CONCLUSIONS: CAIRE's RSA Board provides a unique, neutral venue to discuss means to improve interactions between researchers and companies that sponsor research.

P68

IDENTIFICATION OF CHRONIC HEPATITIS B AND HEPATITIS C CO-INFECTION IN BRITISH COLUMBIA FROM 1991 TO 2007

J Buxton, A Yu

BACKGROUND: Hepatitis B virus (HBV) infection is vaccine preventable. Chronic HBV and hepatitis C (HCV) co-infection is associated with poorer outcomes and accelerated progression of liver disease and is particularly relevant in British Columbia (BC) because of the substantial number of immigrants from HBV-endemic countries and injection drug users, who have a prevalence of HCV >80%.

PURPOSE: The purpose of this study was to determine the chronic HBV and HCV co-infection identification rate in BC, examine demographic characteristics and the order of virus identification, and observe trends over time.

METHODS: Newly identified cases of chronic HBV/HCV co-infection between 1991 and October 2007 were extracted from the BC integrated Public Health Information System. Nominal data and Personal Health Number (PHN) were used to link reported cases of chronic HBV and HCV.

RESULTS: Of 1815 HBV/HCV co-infected residents, 71.6% were male and the mean age at co-infection diagnosis was 40.5 years (95% CI 40.0-41.0). Among all persons identified with HCV infection (59, 080), 3.1% were identified as co-infected with HBV and 5.5% of all chronic HBV-infected (33, 250) were diagnosed with HCV. In 1996, annual co-infection identification rates peaked at 5.3 per 100,000. Females were younger when they were first diagnosed with a hepatitis virus ($p = 0.0005$) at 35.2 years (95% CI 34.0-36.5) than males at 37.9 years (95% CI 37.0-39.7). The majority of co-infections consisted of concurrent diagnoses until 2003, when the number of co-infected cases by order of hepatitis virus identification was similar.

CONCLUSION: Although HBV/HCV co-infection identification rates have declined in BC since the late 1990s with the introduction of universal adolescent and infant, and high-risk HBV immunization programs, more co-infection cases could be prevented through improved harm reduction activities for those with or at-risk for HCV and HBV immunization for high- risk populations including those with HCV.

P69

IDENTIFICATION OF ACUTE VACCINE-PREVENTABLE HEPATITIS IN INDIVIDUALS WITH CHRONIC HEPATITIS IN BRITISH COLUMBIA FROM 1991 TO 2007

J Buxton, A Yu

BACKGROUND: Both acute hepatitis A (HAV) and hepatitis B (HBV) infections are vaccine-preventable. HAV and HBV immunizations have been provincially funded for British Columbia (BC) residents with hepatitis C (HCV) since 1998 and 1997, respectively. HAV vaccine has been provincially funded for individuals with chronic HBV since 2001.

PURPOSE: The purpose of this study was to assess the effectiveness of BC immunization policy and public health follow-up of HBV and HCV.

METHODS: All newly identified cases of HAV, HBV, and HCV between 1991 and October 2007 were extracted from the BC integrated Public Health Information System. Nominal data and Personal Health Number (PHN) were used to link reported cases of acute HAV and acute HBV to previously reported cases of chronic HBV and HCV.

RESULTS: Thirty BC residents with chronic HBV and 104 with HCV were subsequently identified with HAV. Acute HBV supra-infection was identified among 162 persons with HCV. More men than women developed hepatitis supra-infection ($p < 0.0001$), but women were younger than men when they were diagnosed with HAV ($p = 0.02$) and acute HBV ($p = 0.0002$). HAV supra-infection among BC residents chronically infected with HCV peaked in 1998 at 31 cases and declined to zero cases in 2007. HBV supra-infection among individuals with chronic HCV peaked in 1996 at 26 cases and declined to two cases in 2007.

CONCLUSION: Cases of HAV and acute HBV have declined among individuals infected with HCV. However, despite the availability of publicly-available vaccines for high-risk groups and persons with HCV and chronic HBV, a substantial number of acute HBV and HAV infections post-identification of chronic hepatitis are still identified, indicating that follow-up and vaccination coverage could be improved in high-risk populations.

P70

INFLUENZA VACCINE EFFECTIVENESS IN COMMUNITY-DWELLING ELDERLY IN ONTARIO

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BACKGROUND: Past studies have found that influenza vaccination is associated with a nearly 50% reduction in all-cause mortality in the elderly during influenza seasons. These observational studies may have been susceptible to selection bias.

PURPOSE: To estimate the effectiveness of influenza vaccination in Ontario community-dwelling elderly.

METHODS: We conducted a retrospective cohort study to assess influenza vaccine effectiveness over four influenza seasons. We included individuals over 65 years of age who responded to the 1996/97 National Population Health Survey or 2000/01 Canadian Community Health Survey within one year of the start of influenza season and agreed to linkage of their responses to health administrative data. Influenza vaccination status was ascertained from Ontario Health Insurance Plan physician billing claims. Cox Proportional Hazards modelling was used to estimate the risk of all-cause mortality in vaccinated individuals compared to unvaccinated individuals during and after influenza seasons, adjusting for demographic characteristics, comorbidities, health services and drug utilization, and functional status. To estimate the extent of 'healthy' selection bias associated with vaccination status, we assessed the mortality reduction in periods where no benefit from vaccination would be expected (post-influenza season periods).

RESULTS: The cohort included 10,705 respondents and there were 96 deaths during the study influenza seasons. The hazard ratio (HR) of mortality during influenza seasons for vaccinated elderly compared to unvaccinated elderly was 0.638 (95% CI, 0.420-0.970) after adjusting for demographic characteristics and influenza season. In the fully adjusted model, a hazard ratio of 0.655 (95% CI, 0.418-1.026) was observed. A hazard ratio of 0.780 (95% CI, 0.489-1.244) was observed during the influenza post-season periods. The difference between vaccine effectiveness (VE = [1-HR] X 100) during influenza seasons (34.5%) and post-influenza seasons (22.0%) was 12.5%.

CONCLUSION: The mortality protection conferred by influenza vaccines in the elderly may not be as great as previously reported. 'Healthy' selection bias may explain some of the putative benefits.

P71

USING PASSIVE ADVERSE EVENTS SURVEILLANCE DATA TO RESPOND TO INQUIRIES ABOUT VACCINE SAFETY, BRITISH COLUMBIA

S David, M Anderson, M Naus, C McIntyre, R Wong, W Tang

BACKGROUND: British Columbia (BC) conducts population-based passive surveillance for adverse events following immunization (AEFI). Starting in May 2004, AEFI are reported through BC's integrated Public Health Information System (iPHIS). These provincial data are used to initiate investigations and answer questions about occurrences deemed unusual within a health authority.

PURPOSE: To describe BC's response to vaccine safety inquiries using passive AEFI surveillance data. Query 1: itchy rashes following influenza vaccine. Query 2: anaphylactic/allergic reactions following concurrent grade 6 meningococcal-C and hepatitis B vaccines. Query 3: local reactions past nearest joint following subcutaneous administration of pneumococcal polysaccharide vaccine (Pneumo-23).

METHODS: Adverse event reports were extracted from iPHIS. Query 1: rates of specific AEFIs were calculated per 100,000 doses of influenza vaccine distributed. Query 2: Chi-square test for significance was used to calculate the difference in AEFIs over time. Query 3: relative rates of specific AEFIs were calculated for Pneumo-23 immunizations by route of administration using estimates of the number of immunizations administered via each route from the immunization registry. 95% Confidence intervals for rates were calculated using the Poisson distribution.

RESULTS: Query 1: there were 4.4 reports of rash/hives per 100,000 doses of influenza vaccine distributed, compared to 4.2-4.7 reports/100,000 doses distributed in previous years. Query 2: there were 6 reports of allergic reaction/anaphylaxis following concurrent meningococcal-C and hepatitis B vaccines compared to 4-16 in previous years ($p=0.5$). Query 3: there were 1.37 reports of local reactions past the nearest joint following subcutaneous Pneumo-23 per 1,000 subcutaneous Pneumo-23 immunizations compared to 0.67-7.44 per 1,000 in previous years.

CONCLUSION: Based on available provincial data, there was no evidence of increased frequency of the specified events in the province or inquiring health authority. Passive AEFI surveillance data can be used to address local concerns about vaccine safety; the main limitation is unavailable/incomplete denominator data on the number of persons immunized.

P72

THE EPIDEMIOLOGY OF INVASIVE MENINGOCOCCAL DISEASE IN NOVA SCOTIA – ARE WE SUCCESSFUL IN PREVENTION AND CONTROL?

A Coombs, S Sarwal, K McGill

BACKGROUND: Following an outbreak of invasive meningococcal disease (IMD) in Nova Scotia (NS) in 1992, the rate of reported infection has been less than one case per 100,000 person years. Despite the low incidence of disease, mortality is an outcome of grave concern. Meningococcal Group C conjugate vaccine was introduced in NS in January, 2005 for children one year of age and adolescents 14 to 16 years of age as part of the NS expanded immunization program.

PURPOSE: To review the epidemiology of IMD in NS between 1993 and 2007, particularly in children and adolescents, and determine the impact of the meningococcal group C conjugate vaccine program implemented in 2005 on the incidence of the infection.
METHODS: Enhanced surveillance information for cases of IMD reported between 1993 and 2007 in NS was reviewed. Incidence rates of infection for laboratory confirmed cases of IMD were calculated for the time prior to (1993-2004) and following (2005-2007) implementation of the program. Laboratory-confirmed cases were stratified by age-group and rates of infection by serogroup were calculated.
RESULTS: The rates of IMD reported in NS from 1993 to 2004 (non-outbreak years) and 2005 to 2007 were 0.68 (95% CI 0.54-0.85) and 0.35 (95% CI 0.17-0.65) per 100,000 person years respectively. The case fatality rate for the period 1993-2007 was 8.0%. No deaths have been reported since 2002. When stratified by age-group, the incidence rate of IMD was highest in children 0-4 years of age. Serogroups B and C remain most prevalent in young children and adolescents.
CONCLUSION: IMD remains a disease of childhood and adolescence and while rates of infection have decreased post-implementation of the meningococcal group C conjugate program, time has been insufficient to evaluate the true effectiveness of the immunization program.

P73

INFLUENZA SURVEILLANCE IN CANADA: 2007-2008 SEASON

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BACKGROUND: Influenza surveillance is important in assessing the impact of influenza and planning appropriate public health interventions, including immunization programs and contingency planning for pandemic influenza. Since 1996 Canada has had a co-ordinated national influenza surveillance program, FluWatch, which monitors the occurrence and spread of influenza activity. FluWatch consists of a network of sentinel laboratories and primary-care practices, provincial and territorial health ministries, paediatric hospitals and the National Microbiology Laboratory.
PURPOSE: A description of the 2007-2008 influenza season with comparison to previous seasons will be presented.
METHODS: Descriptive analyses of the results from 2007-2008 FluWatch surveillance season (August 2007 to May 2008) was conducted. Indicators were compared to results from previous seasons.
RESULTS: Of the 12,000 influenza detections to date, 6,945 (57.9%) were influenza A and 5,055 (42.1%) were influenza B viruses. The peak in influenza detections occurred in late March at 18.7%. Of the 1,281 influenza viruses antigenically characterized, 461 (36.0%) were influenza A (H1N1), 218 (17.0%) A (H3N2) and 602 (47.0%) B viruses. Almost all (99.5%) influenza A (H3N2) isolates showed resistance to the antiviral amantadine, while 26% of influenza A (H1N1) showed resistance to oseltamivir. Weekly ILI rates have remained within or below baseline levels for the majority of the 2007-2008 season. This season, 464 outbreaks of influenza or ILI have been reported with over half (54.5%) being reported in long-term care facilities. A total of 472 influenza-associated paediatric hospitalizations have been reported with 2 deaths.
CONCLUSIONS: Influenza viruses began circulating late in Canada with activity steadily increasing across the country from mid-January. Overall influenza activity for the season remained mild to moderate and was similar to the previous two seasons. Two of the strains circulating this season were well matched to the vaccine (Influenza A (H1N1) and A (H3N2)). This season saw the global emergence of influenza A (H1N1) resistance to oseltamivir.

P74

2006 & 2006 ADULT NATIONAL IMMUNIZATION COVERAGE SURVEY

A-M Frescura, L Belzak

BACKGROUND: The Public Health Agency of Canada (PHAC) routinely sponsors the Adult National Immunization Coverage Survey (NICS) to assess coverage for select adult vaccines, to measure changes in knowledge attitudes and beliefs (KAB) and to monitor progress towards national immunization coverage targets.
PURPOSE: To compare national immunization coverage results obtained from the 2001, 2006 and 2008 Adult NICS to assess trends over time.
METHODS: The Adult NICS uses telephone interviews to sample approximately 3000 households from the non-institutionalised general population and National Advisory Committee on Immunization recommended target groups [seniors ≥ 65 yrs, health care workers (HCW) and persons 18-64 years with chronic medical conditions (CMC)]. The vaccines assessed have varied over time. In 2001, information on pneumococcal, influenza and hepatitis B was collected. In 2006 hepatitis A, tetanus, pertussis and varicella were added and in 2008, hepatitis A was removed and mumps-measles-rubella added. Coverage estimates are calculated according to the NACI recommended immunization schedule by vaccine for each of the target groups indicated above.
RESULTS: Influenza coverage remained relatively constant over time at approximately 38.3% for adults with CMC, 64.1% among HCW and 69.9% among seniors. Pneumococcal coverage also remained constant over time at 42.2% among seniors and 16.7% among adults with CMC in 2006. Results from the 2008 Adult NICS will be available for comparison at the time of the conference and will be included in the poster.
CONCLUSIONS: Although Canada has met its target coverage rate for influenza immunizations in seniors, we still fall short of national goals for adults with chronic medical conditions. Similar gaps are observed for pneumococcal coverage among at risk populations. Receiving a recommendation from a health care provider was a major motivator in getting an immunization. Health care worker cooperation and education are crucial components to improving public awareness and immunization uptake.

P75

RESULTS FROM THE 2006 NATIONAL CHILDHOOD IMMUNIZATION COVERAGE SURVEY

A-M Frescura, L Belzak

BACKGROUND: National Immunization Coverage Surveys (NICS) are implemented every two-years by the Public Health Agency of Canada to assess up-to-date and on-time immunization coverage of children 2, 7, and 17 years of age, changes in parental knowledge attitudes and beliefs (KAB) and to monitor progress towards national targets for immunization coverage.
PURPOSE: To present results from the 2006 Childhood NICS and to assess trends in childhood coverage over time.
METHODS: The Childhood NICS uses telephone interviews to speak to parents/guardians about their child's immunization history. Respondents are asked to report on the immunizations received by their child from an immunization record or based on recall. In 2006, the sampling strategy changed from a household panel to random digit dialing and included a check question to adjust for differences in coverage for antigens routinely administered in one vaccine that were observed in the past.
RESULTS: Coverage estimates from the Childhood NICS have increased significantly for the four new vaccines (meningococcal conjugate +29%, varicella +19%. Estimates have decreased significantly from 2004 to 2006 for other routinely administered vaccines; haemophilus influenzae type b (–24%), diphtheria-tetanus-acellular pertussis (–12%), measles-mumps-rubella (MMR) (–10%). Coverage assessed by 7 and 17 yrs did not change significantly between 2004 and 2006.
CONCLUSION: Coverage figures from the 2006 NICS are highly comparable to provincial rates from the same time period. This indicates that national coverage estimates in 2006 may be a more accurate reflection of national coverage. Statistically significant decreases observed in 2006 were most likely due to changes in methodology. In 2008, the NICS will employ multi-year contracts to ensure consistent contractors over time and a validation component will be added to compare telephone responses against immunization provider/public health records.

P76

IMMUNOGENICITY OF A NOVEL INTRADERMAL INFLUENZA VACCINE IN ADULTS AGED LESS THAN 60 YEARS: RANDOMISED CONTROLLED PHASE 3 TRIAL RESULTS

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BACKGROUND: Although seasonal trivalent inactivated influenza vaccines (TIV) is used for hundreds of millions of individuals worldwide, there is need to increase vaccine coverage in younger adults. An intradermal TIV containing 9 µg of haemagglutinin/strain has been developed specifically for adults aged less than 60, delivered by a unique, convenient microinjection system featuring an integral 1.5 mm long 30 gauge micro-needle that is inserted perpendicularly to the skin surface ensure correct antigen delivery into the dermis.

PURPOSE: To assess the immunogenicity and safety of ID TIV in comparison with an intramuscular (IM) control vaccine (Vaxigrip®) in adults younger than 60 years years, and to demonstrate whether 3 industrial lots of ID TIV elicited equivalent immune responses.

METHODS: A multicentre, randomized controlled phase 3 trial was conducted in 4 European countries. Strain-specific haemagglutination inhibiting, serum antibody titres were assessed on D0 and 21 using a standard assay.

RESULTS: 2249 subjects aged 18-60 yrs were enrolled and vaccinated via ID (N=1796) or IM (N=453) routes in autumn 2006 The three lots of ID TIV were found to be consistently immunogenic for each strain, allowing data to be pooled. The ID and IM vaccines were equally immunogenic: seroprotection rates (titer of at least 40) against the H1N1, H3N2 and B strains were respectively 87.2%, 93.5% and 72.9% after ID vaccination, and 86.2, 95.4 and 74.8% after IM vaccination. The post-/pre-vaccination geometric mean titer ratios ranged between 6.39 and 11.5 with ID, and 6.63 and 11.2 with IM.

CONCLUSION: Using microinjection to deliver ID TIV via the less-invasive intradermal route provides an alternative to conventional IM vaccine for adults that may encourage increased vaccine uptake.

P77

GUIDELINES FOR THE PREVENTION AND CONTROL OF MUMPS OUTBREAKS IN CANADA

M Garner, A Dalloo, T Lipskie

BACKGROUND: Since the approval of the vaccine in 1969, the number of reported mumps cases in Canada has decreased by 99% from an average of 34,000 cases reported per year in the early 1950s to fewer than 400 cases per year in the early 1990s. However, in 2007-08 an important and prolonged outbreak of mumps occurred across Canada.

PURPOSE: These guidelines have been developed to assist public health officials and clinicians about the public health management of mumps cases and their contacts during an outbreak.

METHODS: At the request of Canadian Immunization Committee and the Council of Chief Medical Officers of Health, a task group of federal, provincial, and territorial partners was assembled by the Centre for Immunization and Respiratory Infectious Diseases. Frequent teleconferences addressing a number of issues were used as the basis for the development of these guidelines.

RESULTS: The mumps guidelines provide direction for the control and response to mumps outbreaks in the realms of case and outbreak definitions, laboratory diagnosis, case and contact management (including immunization). Key recommendations include: clinical cases should be managed as confirmed cases until laboratory evidence suggests otherwise; immunization should be offered to susceptible groups as defined by the epidemiology of the outbreak, recognizing that immunization may not prevent disease; and that health-care workers who are contacts of cases and have undocumented immunization history should have their immunity established by serologic testing.

CONCLUSIONS: The mumps guidelines are based on national and international expertise and outbreak experiences, and will be a valuable tool to Canadian public health authorities in their investigation and management of mumps outbreaks. The framework provided by the guidelines will serve to improve the Canadian reporting, surveillance, and investigation of mumps.

POSTER PRESENTATIONS
Public

P78

THE PAIN BURDEN IN THE FIRST 90 DAYS AFTER THE ONSET OF HERPES ZOSTER (HZ)

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BACKGROUND: Vaccination against HZ is being considered in many countries. Master, a prospective multi-center Canadian study, was conducted to provide a thorough understanding of the burden of HZ and post-herpetic neuralgia (PHN).

PURPOSE: 1) Describe the burden of illness (BOI) due to HZ and 2) Identify patient characteristics at rash onset predictive of greater BOI.

METHODS: From 10/2005 to 08/2006, 277 incident cases of HZ aged = 50 were recruited within 14 days of rash onset and followed for 6 months. Pain severity was measured using the Zoster Brief Pain Inventory at 10 time points. Here, we defined acute HZ associated pain as pain from rash onset to 90 days, and PHN as worst pain =3 persisting after 90 days. The BOI for an individual with HZ is the area under the curve of worst pain over time until pain cessation. Thus, the BOI associated with acute HZ pain (Acute HZ BOI) can range from 0 (no pain) to 900 (pain = 10 for 90 days). BOI for acute HZ was compared for cases who subsequently developed PHN or not.

RESULTS: Acute HZ BOI was 211 and increased with age, from 170 in patients aged 50-59 yrs to 250 in 70+ year olds. Patients who subsequently developed PHN experienced substantially greater acute HZ BOI (455) than those who did not develop PHN (147). This greater BOI resulted from both longer duration and greater severity of pain during the first 90 days after rash onset. Individuals who subsequently developed PHN had greater pain at rash onset (6.9) than those who did not develop PHN (5.4) (age-adjusted p-value= 0.0007).

CONCLUSION: HZ causes a substantial burden of illness. Further analysis will describe the BOI related to PHN and identify patient characteristics at rash onset predictive of greater BOI and risk of PHN. This information should aid in optimizing treatment and prevention of HZ and PHN.

P79

ECONOMIC IMPACT OF INFLUENZA VACCINATION OF PREGNANT WOMEN (PW) IN NOVA SCOTIA (NS): NET COST, COST-EFFECTIVENESS AND BUDGET IMPACT

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BACKGROUND: Pregnancy increases influenza hospitalizations and physician visits (events) in women with and without comorbidities (COM). In 2006/2007 the National Advisory Committee on Immunization expanded its influenza immunization recommendation to include all PW. We developed an economic model to estimate net cost, cost-effectiveness and budget impact of implementing a publicly-funded universal influenza immunization program for PW in NS and explored cost implications of different vaccine delivery strategies.

METHODS: A decision tree characterized the 1-year costs/consequences of vaccination/no vaccination in a hypothetical cohort of PW. Event probabilities and quality-of-life weights were derived from the literature and event costs from administrative databases. Vaccine acquisition and administration costs were provided by NS Department of Health. Three delivery strategies were considered: public health nurse (PHN), family physician (FP) incorporated into routine prenatal care visit (FP+0) and FP requiring an extra visit (FP+1).

RESULTS: The number needed to vaccinate to prevent 1 hospitalization was 379. The net cost of vaccination (vaccination cost - event costs avoided) was $0.44 (PHN), $4.70 (FP+0) and $33.43 (FP+1).

Cost/QALY gained was $761, $8,195 and $58,330 with PHN, FP+0 and FP+1, respectively. Projected net program costs were $4,500, $48,450 and $345,000/year, respectively. Targeting women with COM was cost-saving with all delivery strategies except FP+1.

CONCLUSION: Universal immunization of PW by FP is very cost-effective if incorporated into routine prenatal care. Programs utilizing PHN vaccination could be extremely cost-effective, bordering on cost-saving. Targeting only PW with COM is cost-saving but risks reducing coverage rates and overall health benefit of the immunization program.

POSTER PRESENTATIONS
Clinical

P81
ENSURING OUR POLIO-FREE STATUS: ACTIVE ACUTE FLACCID PARALYSIS SURVEILLANCE IN CANADA

M Garner, J Macey, D Grenier

BACKGROUND: Elimination of indigenous wild poliovirus transmission was certified in Canada, and the rest of the American region, in September 1994. However, until global eradication of poliomyelitis is achieved, there remains an ongoing risk for importation of wild polioviruses. Outbreaks of polio are presently occurring in four endemic and several newly re-infected regions in Africa and, with over 1,300 cases reported worldwide in 2007.

PURPOSE: The goal of acute flaccid paralysis (AFP) surveillance is to monitor Canada's polio-free status by ensuring sensitive, active surveillance and appropriate investigation of AFP cases to rule out the possibility of poliovirus infection. As well, documentation of AFP monitoring and investigation is the means by which Canada maintains its polio-free certification status.

METHODS: Active surveillance of AFP is performed through the Canadian Paediatric Surveillance Program. A monthly collection form is sent to participants asking for the number of new cases seen in the last month, including 'nil' reports. When an AFP case is detected a detailed report form is sent to the reporter in order to collected case specific information.

RESULTS: There were 94 reports of AFP with onset in 2007, including 36 confirmed cases The 36 confirmed cases reported for 2007 represent a non-polio AFP detection rate of 0.66/100,000 children under 15 years of age, below the 1/100,000 per year expected rate. However, the number of cases captured multiple times was high, average of two reports per confirmed case, suggesting that despite the low AFP rate, the surveillance system has high sensitivity.

CONCLUSION: Twelve years of AFP surveillance data have contributed to our knowledge of AFP in Canada and serve to document Canada's polio-free status. However, the reason for lower than expected AFP rates remains unclear and may indicate under-detection of cases or be a true reflection of lower baseline levels of non-polio AFP in Canada.

P82
HEPATITIS A AND TRAVEL AMONGST NOVA SCOTIA POST-SECONDARY STUDENTS: EVIDENCE FOR A TARGETED VS. UNIVERSAL IMMUNIZATION STRATEGY

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BACKGROUND: Canadian guidelines recommend hepatitis A virus (HAV) vaccination for travelers to HAV-endemic areas. The US CDC advocates universal immunization.

OBJECTIVES: To explore whether a universal strategy for HAV immunization rather than the Canadian targeted approach for travelers is justified by measuring compliance of post-secondary students with Canadian guidelines.

METHODS: An electronic survey eliciting HAV risk factors, immunization history, disease status, and factors affecting immunization status was distributed to 4 groups of post-secondary students. Seropositivity was determined by measuring HAV antibodies in saliva from a convenience sample of survey participants within each study group. Statistical analysis used Fisher's exact test and logistic regression.

RESULTS: We received 2279 completed surveys (10.6% response) and 235 saliva samples (58.7% response). A total of 1380 (60.6%) participants had traveled to HAV-endemic regions and 1851 (81.2%) were planning to do so within the next 5 years. Less than half who traveled to HAV-endemic areas reported a history of HAV vaccination (48.0%). HAV seropositivity rates were higher amongst those who traveled to (63.6%) or were planning to travel to (47.8%) HAV endemic areas than those who had never or had no plans to traveled to such areas (8.4%). Only 8.9% of unvaccinated students were seropositive (5.3% of Canadian born students); there was a trend for higher seropositivity in those who had previously traveled to HAV-endemic areas without vaccination (14.7%) than those who had not traveled abroad (4.4%), suggesting an exposure to HAV during travel. Nearly all (93.9%) unvaccinated students indicated a willingness to receive vaccine if it were provided free of charge.

CONCLUSIONS: Current Canadian guidelines for HAV vaccination are not being followed within the post-secondary student population. Given high rates of travel, a universal approach to HAV vaccination may be warranted.

P83
PERTUSSIS IMMUNIZATION IN HEALTHCARE WORKERS: KNOWLEDGE, ATTITUDES AND BEHAVIOUR

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BACKGROUND: Pertussis continues to be a major public health problem. Pertussis rates are increasing in adults due in part to waning vaccine-induced immunity. It is now recommended that healthcare workers receive a dose of the combined tetanus, diphtheria and acellular pertussis vaccine (Tdap). However, healthcare workers are often reluctant to receive recommended vaccines.

Objectives: to assess knowledge and attitudes of pediatric healthcare workers regarding pertussis and pertussis immunization and to determine acceptability and anticipated uptake of the vaccine.

METHODS: From January to March 2008, a questionnaire was distributed to employees at a pediatric tertiary care centre through e-mail and notices posted on the hospital's intranet.

RESULTS: A total of 529 out of 3051 (17%) employees completed the survey. Knowledge of pertussis was higher than expected with two-thirds of respondents answering at least 60% of knowledge-based questions correctly. Overall, 77% of respondents indicated that they would consider receiving the pertussis vaccine. Respondents who did not have direct patient contact were as likely to consider being immunized as those who did. While 78% indicated that they would be likely to be immunized if the pertussis vaccine were offered free of charge at the health centre, only 30% were willing to be immunized if they had to pay $40 for the vaccine. Moreover, only 45% believed that the pertussis vaccine was safe and 40% agreed that it was effective. Respondents who had not received a recent influenza vaccination were less likely to consider immunization against pertussis.

CONCLUSIONS: Pediatric healthcare workers are knowledgeable about pertussis. There is widespread acceptance of pertussis immunization among both healthcare workers and nonhealthcare workers at our institution. However, more education is needed regarding the safety and efficacy of the Tdap vaccine. Public funding will be critical to the success of pertussis immunization programs.

POSTER PRESENTATIONS
Immunization

P84
TRANSMISSION DE L'INFORMATION PAR VIDÉO LORS DU CONSENTEMENT À LA VACCINATION INFLUENZA OU ZONA

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CONTEXTE: Afin d'assurer plus de fluidité lors des cliniques de vaccination à haut débit et de standardiser l'information transmise, depuis quelques années, une vidéo a été produite et utilisée en Montérégie (2e région du Québec de 1,3 million d'habitants) pour faciliter l'obtention du consentement à la vaccination antigrippale. Pour le vaccin contre le zona, des modalités semblables de diffusion de l'information pourraient être explorées.

OBJECTIFS: 1) Évaluer les effets de la vidéo sur les connaissances et le consentement à la vaccination; 2) Comparer la satisfaction et les préférences des personnes vaccinées selon l'exposition à la modalité d'information.

MÉTHODE: Devis post-test avec groupe contrôle non équivalent par enquête téléphonique auprès de 190 volontaires de 50 ans et plus recrutés après la vaccination antigrippale dans deux secteurs: exposés à la vidéo (n=97) et non exposés (information verbale transmise par l'infirmière vaccinatrice; n=92). Un questionnaire téléphonique (31 questions) a été administré en janvier 2008; des scores de connaissances et de satisfaction ont été calculés.

RÉSULTATS: Les sujets exposés à la vidéo sont plus satisfaits de la qualité de l'information reçue (score 5,59/6 vs 5,21/6; p=0,01). Une plus grande proportion de sujets exposés (73 % vs 60 %) affirment que l'information transmise lors de la vaccination ne les a pas aidés à prendre une décision plus éclairée, cette dernière étant déjà prise avant même d'aller à la clinique. Les connaissances des sujets exposés sont légèrement meilleures (score 3,76/5 vs 3,45/5; p=0,04). Pour une éventuelle vaccination contre le zona, la majorité des sujets préfèreraient garder la modalité de transmission de l'information à laquelle ils ont déjà été exposés. Près des 2/3 des sujets sont intéressés à recevoir le nouveau vaccin contre le zona.

CONCLUSION: L'utilisation d'une vidéo pour le consentement à la vaccination est bien acceptée et la plupart en sont satisfaits. Ces résultats encourageants justifient une évaluation par un devis plus robuste.

P85
VARICELLA CATCH-UP PROGRAM FOR TODDLERS AND PRESCHOOLERS, BRITISH COLUMBIA: IMPACT ON VACCINE UPTAKE

M Naus, M Chong, S David, C McIntyre

BACKGROUND: A catch-up program of varicella immunization targeting toddlers and preschoolers was conducted in British Columbia in 2006/7. Routine vaccinations had started at school entry in 2004 and age 12 months in January 2005. The catch-up included mailings to susceptible children identified through the provincial immunization registry in September 2006 and March 2007.

PURPOSE: We examined the apparent effect of the campaign on varicella immunization status of children targeted by the directed mailing and the mass campaign compared to children exposed to the mass campaign only.

METHODS: Immunization records of children born between January 1, 2003 and March 31, 2005 and those born in 2002 were extracted from iPHIS, the immunization registry used in BC by 15 of 16 Health Service Delivery Areas. 23,750 children in the younger group without a contraindication or exemption to varicella vaccine, and without a record of varicella immunization after the 1st birthday were eligible to receive a postcard inviting their parents to have the child immunized. Radio advertising of the campaign, posters, community newspaper advertisements, and a pod cast supplemented the mailing in September 2006. Radio and newspaper advertising was limited to the fall. A second postcard was sent in March 2007 to children in the younger cohort who remained susceptible. Records in iPHIS were analyzed to measure the impact of the campaign.

RESULTS: 17, 922 children who remained active in the immunization registry throughout the campaign and received 1 or more postcards. Of these, 15.7% had a record of immunization recorded after the first mailing and by January 2007, and 26.5% after the second mailing and by June 2007. In contrast, among susceptibles in the "control" group without a postcard born in 2002, only 2.9% had an immunization recorded by January 2007 and 10.4% by June 2007.

CONCLUSION: The addition of a mailing improved uptake of chickenpox vaccine among susceptible children by 16% above that from promotion alone. Using data from immunization registries to invite susceptible children for needed vaccines is more effective than promotion.

P86
MOTHERS' BELIEFS ABOUT ANALGESIA DURING CHILDHOOD IMMUNIZATION: A QUALITATIVE STUDY

A Taddio, H Boon, J Stinson, V Shah

BACKGROUND: Routine immunizations are the most common painful medical procedures performed in childhood. As vaccination deferral is positively associated with the number of vaccines administered at a visit, pain may be an important component of the immunization experience. Mothers are key stakeholders in the use of analgesics for immunization pain. However, they infrequently treat immunization pain in their children.

PURPOSE: To explore how mothers' view analgesia during immunization in their children in order to understand why pain management is suboptimal.

METHODS: A descriptive qualitative study was conducted. Fifteen multiparous women, ranging in age from 23-42 years old and with 2-4 children, participated in a semi-structured interview. Interviews were audio-recorded and transcribed verbatim. Basic qualitative content analysis was used to uncover salient themes. Data collection and analysis took place simultaneously until saturation occurred. The software package QSR NVivo Version 7.0 was used to manage data.

RESULTS: Mothers described feeling distress watching their child being immunized, but rationalized the pain by saying it was mild, short-lived, and the benefits of immunization outweighed worries over discomfort. Mothers' lack of awareness about the availability, safety and efficacy of pain-reducing strategies were evident. Mothers wanted their doctor's recommendation before using a pain medication. Mothers also tended to view medication as a last resort, and perceived pain as having no long-lasting consequences although they described fear of doctor's and needles in their children. Many mothers believed fear was more distressing than pain for their child.

CONCLUSION: Mothers believe pain is part of their child's immunization experience. They are unaware of analgesic strategies. Intervention strategies should focus on educating mothers about pain assessment and management. Knowledge translation strategies should target physicians as well because mothers heavily rely on their doctors for information.

P87
IMMUNIZATION EDUCATION AND RESOURCE DEVELOPMENT: VANCOUVER COASTAL HEALTH'S EXPERIENCE WITH FIELD-TESTING – AN IMPORTANT STEP IN THE PROCESS

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BACKGROUND: During the development of a professionally designed parent teaching book to assist immunization providers in Vancouver Coastal Health (VCH), field-testing was conducted with end-users in the fall of 2007. The book was distributed in the Spring of 2008 to physicians and public health nurses (PHNs). An evaluation is proposed for January 2009.

PURPOSE: To ensure effectiveness, comprehensiveness, usability and acceptance and to check for any significant errors in design or content so that changes could be made before implementation.
METHODS: For evaluation, a convenience sample of 43 VCH PHNs and 13 parents of young children received a self-administered questionnaire by e-mail. To ensure appropriate literacy level, a sample of 40 adult English-as-a-second-language (ESL) students received section one of the book and answered a quiz.
RESULTS: Of the 56 respondents, 95% gave an overall rating of good or excellent. All (100%) parents and 79% of PHNs agreed or strongly agreed that the book was user friendly. Amongst parents, 92% found the book very easy to read, 85% agreed or strongly agreed that the book improved their understanding of immunization and 82% strongly agreed that the book would be helpful to new parents. Amongst PHNs, 81% agreed or strongly agreed that the book would be helpful as a teaching tool. Qualitative feedback highlighted different perspectives between the PHNs and parents as well as the need to alter some of the design and content. The ESL sample evaluating for literacy found that section one was written at an appropriate language level.
CONCLUSIONS: The field-testing phase was a critical step as it highlighted areas where the book required enhancements and illustrated different perspectives and information needs of PHNs and parents. Although short timelines and limited funding are common concerns, this step should always be planned to ensure acceptance and sustainability of a resource.

POSTER PRESENTATIONS
Laboratory

P88
LABORATORY CHARACTERIZATION OF INVASIVE HAEMOPHILUS INFLUENZAE ISOLATES COLLECTED FROM IMPACT CENTRES FROM JANUARY 2007 TO JANUARY 2008

M Sill, B Tan, D Scheifele, D Law, W Vaudry, S Halperin, B Law, R Tsang

BACKGROUND: The IMPACT program for prospectively monitoring all invasive *H. influenzae* infections at participating centers in Canada began in January 2007. Isolates of invasive *H. influenzae* disease from 12 pediatric centres across Canada were collected and sent to the National Microbiology Laboratory (NML) for characterization.
PURPOSE: The *H. influenzae* isolates received at the NML were characterized using both phenotypic and genotypic methods. Here we report the characteristics of isolates collected from January 2007 to January 2008.
METHODS: The *H. influenzae* isolates were identified by standard biochemical tests, serotypes were determined by bacterial agglutination test and PCR, and genetic characterization was done by multilocus sequence typing (MLST). Susceptibility to antibiotics was determined by disk diffusion testing.
RESULTS: Twenty-three isolates from individual disease cases were received at the NML from January 2007 to January 2008, representing the majority of invasive H. influenzae isolates collected by IMPACT during that time period. Five isolates were serotype a, 1 was serotype c, 6 were serotype f and 11 were non-serotypeable. MLST results indicate the 6 serotype f strains formed a homogeneous population. A high degree of genetic similarity was also observed among the serotype a strains. In contrast, the non-serotypeable isolates were represented by several different sequence types. Antibiotic susceptibility testing found the majority of isolates were susceptible to commonly prescribed antibiotics. Resistance or intermediate resistance was observed to one or more of the following antibiotics: ampicillin, amoxicillin-clavulanic acid, and sulfamethoxazole-trimethoprim.
CONCLUSIONS: This study based on the 23 isolates collected recently by the IMPACT program indicates that invasive disease caused by *H. influenzae* is caused by non-serotype b strains. The serotypeable strains showed a high degree of similarity within their respective serotypes while the non-serotypeable strains were quite diverse. Characterization and on-going laboratory surveillance of isolates collected at IMPACT centres will help to improve our understanding of invasive *H. influenzae* disease in Canada in the post *H. influenzae* serotype b vaccination era.

P89
GENETIC ANALYSIS OF INVASIVE NEISSERIA MENINGITIDIS STRAINS IN CANADA MONITORED BY THE IMPACT PROGRAM FROM 2002 TO 2006

R Tsang, J Bettinger, S Wootton, D Scheifele, N Le Saux, S Halperin, W Vaudry, J Zhou, M Cameron, D Law, IMPACT Investigators

BACKGROUND: Very little is known about the population genetics of *Neisseria meningitidis* strains in Canada.
PURPOSE: This study examines the population genetics of *Neisseria meningitidis* strains collected from invasive meningococcal disease (IMD) cases monitored by the IMPACT program.
METHODS: *N. meningitidis* were analysed by standard methods of serogrouping, serotyping, and multi-locus sequence typing (MLST).
RESULTS: Of the 409 IMD cases identified, 33 were fatal and 376 were non-fatal. Only 22 isolates from fatal cases were available for analysis.Ten serogroup B fatal cases were caused by the following clonal complexes (cases): sequence type (ST)-41/44 (5), ST-269 (2), ST-32 (1), and ST-11 (1), and a strain identified as ST-5571. Ten serogroup C fatal cases were caused by 9 strains belonging to the ST-11 clonal complex, and 1 strain of the ST-35 clonal complex. The remaining two fatal cases were caused by a ST-23 serogroup Y strain and a non-encapsulated null mutant belonging to ST-198.
From the non-fatal cases, 150 serogroup B, 83 serogroup C, and 14 serogroup W135 isolates were analysed. One hundred and eleven serogroup B cases (74%) were due to strains classified into 4 clonal complexes (ST-41/44; ST-269; ST-32; and ST-35), and the remaining 39 cases were caused by strains belonging to many different genetic clones. Seventy seven (93%) of the 83 serogroup C cases were caused by the ST-11 clonal complex, and the remaining 6 cases were caused by 5 other clonal complexes. Eleven (79%) of the serogroup W135 cases were caused by strains belonging to the ST-22 clonal complex. There was 1 case caused by a ST-11 clone, and 2 cases by strains showing genetic relationship to clones (ST-23 and ST-167 clonal complexes) commonly identified in serogroup Y.
CONCLUSIONS: Serogroups C, Y, and W135 appear clonal while serogroup B appear panmictic.

P90
COMPARATIVE STUDY OF THE NEUTRALIZATION TEMPERATURES USED IN THE POTENCY ASSAY FOR THE MEASLES AND MUMPS COMPONENTS OF COMBINATION VACCINES

KH Yeung, D Lacombe, A Dallaire, B Moffitt, M Reed, A Bliu, A Rinfret

BACKGROUND: Canadian Food and Drug Act and Regulations require that vaccine lots be tested to assure the safety and efficacy of these biological products before release on the Canadian market. Routine testing of viral vaccines is performed in the quality control laboratories at the manufacturer level and in the laboratories Health Canada's Biologics and Genetic Therapies Directorate. The current method employed by regulatory laboratories in Canada and in other countries to assess the potency of the measles and mumps components of combination vaccines is an in vitro microtitration bioassay. This bioassay determines the infective titre of the measles or mumps virus by observing its cytopathic effects on Vero cells.
PURPOSE: The purpose of this study was to compare two methods of neutralizing the measles and mumps components of combination vaccines before titration. Health Canada procedures call for a neutralization that involves the addition of an appropriate antiserum and incubation at 37 C for two hours. Other regulatory laboratories recommend a neutralization that involves the addition of an appropriate antiserum and incubation at 4 C for one hour. The objective of this study is to determine the effect of neutralizing temperatures on the observed potency.

METHODS: The potency of each virus (measles and mumps) was determined by infecting Vero cells with decreasing dilutions of the virus material and determining the highest dilution producing cytopathic effects in 50% of inoculated cells (TCID50). The neutralization steps were carried out in parallel, one at 4 C for one hour and the other at 37 C for two hours. References for each component (calibrated against international standards) and antiserum controls were included in the testing as well as negative control on each plate. The potency was calculated and expressed as TCID50/0.5mL.
RESULTS: There was no statistical difference in the potency results obtained when the neutralization temperature was either 4 C for one hour or 37 C for two hours.
CONCLUSION: The well established method performed by Health Canada is comparable to the method employed by other regulatory laboratories. Canada's lot release program is designed to monitor the safety and efficacy of vaccines released on the Canadian market. Rigorous trend analysis of both manufacturer and BGTD data obtained is performed to ensure that manufacturers are in control of their production and testing processes.

P91
IMMUNOGENICITY AND SAFETY ANALYSIS OF AN INACTIVATED PROTOLLIN-BASED NASAL VACCINE TO MUMPS VIRUS

K Young, S Nzula, C Rodeheffer-Petrie, A Brewer, D Burt, BJ Ward

BACKGROUND: The incidence of mumps declined with the introduction of mumps vaccine in trivalent measles-mumps-rubella (MMR) in the late 1960's. The available live-attenuated vaccines have significant drawbacks, however, so alternative strategies should be explored. An inactivated mucosal vaccine would address many of these problems. Protollin (Pln)-based adjuvants are well suited for nasal administration.
PURPOSE: To develop an inactivated whole-virus nasal vaccine to mumps virus (MuV) using the Pln adjuvant/delivery vehicle and to test its immunogenicity/safety in mice.
METHODS: Eight-week old BALB/c female mice were vaccinated intranasally (IN) or intramuscularly (IM) with three doses of split Jones mumps virus antigen (2, 4, or 8 micrograms) with or without 4 micrograms Pln. Weight and behaviors were monitored to assess safety, and sera and mucosal secretions were obtained at intervals to assess MuV-specific immunity.
RESULTS: Mice exhibited no behavioural changes or significant weight loss throughout the study.
Compared with MuV antigen alone, administration of 8 micrograms of MuV-Pln induced greater MuV-specific IgG (2.1E5 ng/ml vs. 2.95E6 ng/ml, respectively. p=0.0002) and mucosal antibodies (3.64E1 ng/ml vs. 1.23E2 ng/ml, respectively. p= 0.0001). Serum antibodies were capable of neutralizing MuV in vitro. Evaluation of antigen-specific cellular responses is underway.
CONCLUSION: The intranasal MuV-Pln vaccine was safe and immunogenic. Studies are underway to combine our MuV antigen with measles and rubella antigens to create an inactivated nasal MMR vaccine.

P92
IMPACT OF KNOWLEDGE, ATTITUDES AND BARRIERS TO IMMUNIZATION ON UPTAKE OF VARICELLA VACCINE IN TODDLERS FOLLOWING TARGETED MAIL REMINDERS, BRITISH COLUMBIA

S David, M Naus, M Chong, C McIntyre

BACKGROUND: In 2006/07 British Columbia conducted a catch-up varicella immunization program that included personalized mailings to eligible children born between January 1, 2003-March 31, 2005.
PURPOSE: To compare the knowledge, attitudes and barriers to immunization among parents who did and did not have their children immunized following the mailings.
METHODS: Random samples of children immunized (Group 1, N=700) and with records indicating no immunization (Group 2, N=840) were identified using the immunization registry (iPHIS). Parents were mailed self-administered surveys. Respondents were classified as "immunized" and "susceptible" based on survey responses and iPHIS data. Analyses involved Chi Square or Fisher's exact test at alpha=0.05.
RESULTS: 254 Group 1 and 193 Group 2 parents responded; 274 children were immunized and 73 susceptible. Group 1 was significantly more likely than Group 2 to have heard that varicella vaccine was free (89.4% versus 85.5%, p=0.042) and to report varicella immunization (83.1% versus 6.8%, p<0.001); but significantly less likely to report past varicella disease (1.6% versus 25.4%, p<0.001). Parents of susceptible children were significantly less likely to indicate that varicella disease can be serious (p<0.001), varicella vaccine is good at preventing varicella (p<0.001), their doctor/public health nurse recommended varicella vaccine (p<0.001), their child received all other recommended vaccines (p<0.001), and their child has a regular immunization provider (p=0.003) than parents of immunized children. Parents of susceptible children were significantly more likely than parents of immunized children to indicated that they are concerned about vaccine side effects (p<0.001), they prefer their child get varicella naturally (p<0.001), and children get too many shots (p<0.001). The two groups' responses did not differ significantly for the questions about timeliness (p=0.145) and convenience (p=0.561) of immunization appointments.
CONCLUSION: Knowledge and attitudes of parents of immunized versus susceptible children differed significantly. Perceived access to immunization services did not affect immunization status.

P93
IMMUNIZATION COVERAGE AT TWO YEARS OF AGE, BRITISH COLUMBIA, 2004-2007

S David, M Naus, R Wong, M Anderson, C McIntyre, M Chong

BACKGROUND: Immunization coverage assessment is an integral part of the evaluation of an immunization program and serves as an indicator of population susceptibility to vaccine preventable diseases. As of 2004, British Columbia routinely assesses immunization coverage of children at two years of age using data in the provincial immunization registry (iPHIS). Ministry-defined targets for coverage were established starting 2004.
PURPOSE: To describe four years (2004-2007) of immunization coverage results for children at two years of age.
METHODS: On January 15th of each year, the immunization records of children who had their second birthday in the previous year were extracted for the 14 of 16 health areas (in 5 Health Authorities) using iPHIS. The percent of children up-to-date for age and the percent immunized with each vaccine or antigen were calculated. "Up-to-date" was defined as having received all of the infant/toddler doses in the provincial immunization schedule before the second birthday. Only doses given at or after the earliest eligible age or on or after the shortest recommended time interval between doses were considered valid.
RESULTS: The provincial percent of children up-to-date at two years of age was 50.8%, 65.1%, 71.2% and 70.0% in 2004, 2005, 2006 and 2007, respectively. From 2004 to 2006, the percent of children up-to-date in each Health Authority (HA) increased from-to as follows: 71.5-74.7%; 39.1-71.3%; 21.9-42.2%; 68.4-79.4%; 67.2-72.3%. In 2007 compared to 2006, the percent remained the same in two HAs, dropped in two (71.3-67.6%; 79.4-78.6%) and increased in one HA (42.2-50.3%). HA coverage rates for individual vaccines/antigens (range=27.0-90.6%; median=78.8%) were higher than for the "up-to-date" measure which includes all vaccines/antigens. HA coverage rates for individual vaccines/antigens also increased between 2004-2006, leveling or dropping slightly in 2007.
CONCLUSION: Immunization coverage at two years of age in British Columbia increased between 2004 and 2006, stabilizing in 2007.

P94
EXPLORING BARRIERS TO IMMUNIZATION USING A POPULATION HEALTH APPROACH

S MacDonald, CV Newburn-Cook, M Allen

BACKGROUND: Historically, we have looked primarily to personal

factors, such as knowledge, attitudes, and beliefs, to explain why some parents do not complete their children's recommended immunizations. Failure to recognize that these factors are embedded in a multifaceted systemic context has often resulted in poorly conceived and ineffective interventions. The population health framework may be a more appropriate approach for examining the multi-level etiological factors influencing immunization coverage. However, there is lack of clarity regarding the definition and application of this approach, and little mention of it in the immunization research literature.

PURPOSE: To explore the origins and definition of the population health approach and to determine its relevance for investigating the factors influencing childhood immunization coverage.

METHODS: Literature related to the development and definition of the population health framework was reviewed and synthesized. The utility of this approach for the investigation of barriers and facilitators to immunization coverage was explored.

RESULTS: The population health approach proposes that health results from the dynamic interrelationship among personal and systemic factors, and that individual knowledge, attitudes, and beliefs are rooted within a social, economic, and environmental context. This approach is thus an appropriate framework for exploring the various facilitators and barriers to immunization coverage. For instance, a parent's decision to immunize may be influenced by the interplay between such factors as concerns about vaccine safety, family input (personal factors), media campaigns, interaction with an empathetic and knowledgeable health care provider, and sufficient clinic time to address their concerns (systemic factors).

CONCLUSION: The population health approach can facilitate understanding of the factors influencing immunization coverage by promoting awareness and integration of both personal and broader systemic factors. Determining the roles and relative importance of these factors has significant implications for health policy and programs, clinical care, health care provider education, and public health education.

P95

ASSESSING BARRIERS TO IMMUNIZATION: MINIMIZING NON-RESPONSE BIAS IN A POSTAL SURVEY

S MacDonald, CV Newburn-Cook

BACKGROUND: Postal surveys are a valuable tool for collecting data from community-based populations regarding the barriers and facilitators to immunization coverage. However, the estimates provided by such surveys are only valid if they are a relatively close approximation of the true population value. A significant source of potential survey error is non-response bias. Thus, in designing a postal survey one must consider the reasons for non-response, strategies to reduce non-response through response-enhancement strategies, assessment of non-response bias, and post-survey adjustment of data.

PURPOSE: To identify appropriate measures for reducing non-response bias in a postal survey of barriers and facilitators of immunization coverage.

METHODS: Strategies for minimizing non-response bias were determined through review of the literature and consultation with experts in the field of survey design. Specific strategies were identified to reduce unit non-response and to assess and adjust for non-response bias.

RESULTS: Measures to minimize non-response bias should be incorporated into all aspects of study design, including sample selection, survey administration, and data analysis. Specific strategies include: tailoring questionnaire content and format to promote response; attaching a cover letter that highlights the salience of the subject to the target population; providing a stamped return envelope; providing a financial incentive; and distributing pre-survey notification and follow-up reminders. Assessment and adjustment of non-response bias are facilitated by a comprehensive population database for sample selection, which includes auxiliary data on all potential survey participants; and post-survey weighting adjustment to account for non-response.

CONCLUSION: Although postal surveys can be useful in assessing barriers and facilitators to immunization coverage, the potential for non-response bias must be considered in all stages of study design and implementation. Determining appropriate measures to minimize non-response involves balancing the need for reliable and valid data from a representative sample with time and resource limitations.

P96

SKILLS ONLINE: DEVELOPING A PUBLIC HEALTH WORKFORCE FOR THE 21ST CENTURY

K MacDougall, J Lowe, C Betker

BACKGROUND: Evidence based planning, communication, and program evaluation are critical components of public health. Effective public health practice depends on competent practitioners who develop and maintain relevant knowledge and skills through continuing education. Two pan Canadian environmental scans revealed that continuing professional development for public health practitioners is limited, does not reflect adult learning principles, and is not always easy to access due to time constraints and distance from educational institutions.

PURPOSE: In partnership with government, academic, and professional organizations, the Public Health Agency of Canada developed Skills Online, an Internet-based, continuing education program for public health practitioners offering a series of related, Canadian content modules in English and French.

METHODS: The Skills Online program evolved from the experience of previous projects to enhance workplace skills and is informed by documented needs, participant feedback, expert opinion, research, and reports on best practices. The modular design allows the program to be responsive to the needs of practitioners and provides easy access to high quality, interactive learning opportunities anytime, regardless of location. The relevance of existing modules is maintained through continuous expert review. New modules are developed, piloted, and launched regularly.

RESULTS: Since launching the first module in spring 2002, more than 2,200 learners from across Canada have completed one or more modules, and pilot projects have been successfully implemented in Australia and with the Pan American Health Organization in the Caribbean. Participation in Skills Online offers learners the opportunity to acquire and reinforce the Core Competencies for Public Health in Canada: Release 1.0, share knowledge and network with other public health practitioners from a range of disciplines and sectors.

CONCLUSION: Through the provision of continuing professional development in a virtual setting, Skills Online is changing the way public health practitioners learn, work, and interact with their colleagues and the environment.

P97

GEOGRAPHIC AND DEMOGRAPHIC FACTORS ASSOCIATED WITH NON-IMMUNIZATION IN ALBERTA

L McDonald, N Yianakoulias, L Svenson

BACKGROUND: Immunization has been crucial in decreasing the rates of vaccine preventable diseases in Canada. Despite this, many children in Alberta are still not immunized. In the past, surveys have been conducted to determine why some parents opt out of immunization; and while these surveys provide valuable information, the respondents are often biased towards those people with the time and interest to answer. By using administrative data in conjunction with immunization registry data, the entire province, including hard to reach populations, is better represented.

PURPOSE: This study aims to examine factors associated with non-immunization using routinely collected administrative data.

METHODS: Alberta immunization registry data was linked to the Alberta provincial health insurance plan, newborn metabolic screening and physician claim databases. Demographic indicators utilized included healthcare insurance premium subsidy level, geographic area, healthcare seeking behaviour, and parental information such as head of house and age. The relationship between the factors and immunization status were modeled using logistic regression.

RESULTS: For all vaccines the odds of children being immunized decreased linearly with parental income level. For pneumococcal vaccine, odds ratios were 0.55 (CI = 0.72-0.93) for the subsidized group and 0.82 (CI = 0.43-0.70) for parents on social assistance when compared to

non-subsidized parents. Those living in rural areas were less likely to be immunized then those living in urban areas (OR = 0.87; CI = 0.79-0.93). Finally, the odds of immunization decreased significantly when the child was from a single parent household and varied depending on whether the single parent was male or female (ORFemale = 0.55; CI = 0.49-0.63; ORMale = 0.14; CI = 0.03-0.71).
CONCLUSIONS: This study shows both geography and demographic characteristics need to be considered when developing strategies to improve immunization coverage. Increased attention is merited for lone-parent and disadvantaged families.

P98

ALBERTA IMMUNIZATION COVERAGE RATE CALCULATION: USING REGISTRY DATA FOR MORE PRECISE MEASURES

L McDonald, N Yianakoulias, L Svenson, J Svenson

BACKGROUND: The Alberta Immunization and Adverse Event Registry was developed in 2002 and continues to increase in functionality. When fully populated, this system will be a rich source of information for determining vaccine uptake and coverage rates. To date, survey data have been the standard for coverage rate calculation; however, these data have known shortcomings (such as parental recall and ambiguous denominator populations) which make the interpretation of the information challenging. With a fully populated registry, coverage rate calculation can be automated and more precise. Also, there are extensive opportunities for novel measures of vaccine delivery success and population health.
OBJECTIVES: The goal of this study was to examine the current coverage standards and determine if refinement was needed to apply them to registry data.
METHODS: A working group was established within the province to look at the current standards and identify the ideal future measures. Iterations of SAS code were developed and tested based on the group's decisions. Rates produced by the new program were compared against those reported using the traditional method to validate the results.
RESULTS: There was consensus that it was preferable to break down coverage measures into two categories: those that determine population immunity, and those that measure programmatic success. Some of the main benefits to using registry data include: 1) the ability to match denominators to numerators, 2) flexibility in selecting coverage period and age of interest and 3) the ability to report information at higher geographic resolutions than typically available from surveys.
CONCLUSIONS: Exact immunization coverage rates can be measured using registry data; however, standards taking into account the granularity of these data have yet to be published. This study is a first attempt at developing these standards.

P99

INFLUENZA VACCINATION CAMPAIGNS FOR HEALTHCARE ORGANIZATION STAFF: A SYSTEMATIC REVIEW

P-P Lam, DM Pierrynowski Gallant, LW Chambers, AE McCarthy

BACKGROUND: The Canadian National Advisory Committee on Immunization has recommended a minimum 90% influenza vaccine coverage rate for healthcare workers (HCWs). Staff immunization rates are often below targeted levels and vary across organizations in Canada. Organizations employing HCWs are recommended to use evidence-based approaches that overcome the barriers to vaccine uptake. We know of no systematic reviews on interventions aimed at increasing staff influenza vaccination coverage in health organizations.
PURPOSE: The primary objective of this review was to determine which influenza vaccination programs are significantly associated with increased staff influenza vaccination uptake in healthcare settings.
METHODS: Relevant articles published up to April 29, 2008 were identified in MEDLINE, EMBASE and CINAHL. Additionally, key experts were consulted and bibliographies were hand-searched. Eligible studies: 1) evaluated an influenza vaccine program for HCWs in a healthcare organization; 2) reported the proportion/number of HCWs who received the vaccine; and 3) were randomized controlled trials (RCTs), cluster-RCTs, controlled before-and-after (CBA) studies or an interrupted time series (ITS). Two reviewers independently abstracted data and assessed the methodological quality of included studies.
RESULTS: The search strategy retrieved 2557 citations. 81 studies evaluating an intervention to increase uptake among HCWs were identified; 6 RCTs, 3 CBAs and 2 ITSs met the eligibility criteria and were included for the analysis. All 11 studies reported multifaceted interventions, and the majority (9 / 11 studies) had an educational component and/or improved vaccine accessibility. Although all interventions reported an increase in uptake, none reached the 90% target level.
CONCLUSION: Evidence on the content and the impact of vaccine campaigns can assist health organizations to make decisions about their campaign. The preliminary findings reported here and further analyses will be used to develop an implementation guide for an influenza decision aid targeted at HCWs.

P100

PERSONAL VS. PROFESSIONAL: CHIROPRACTORS & PATIENT REFERRAL FOR IMMUNIZATION

E Medd, ML Russell

BACKGROUND: Alberta chiropractors are heterogeneous in their beliefs about immunization. Most perceive counseling about immunization to be within their scope of practice and about 1/3 of chiropractors discuss immunization in patient consultations at least monthly.
PURPOSE: Among Alberta chiropractors with children, we examined the relationship between: the chiropractors' personal immunization decisions; the vaccination status of their children; and their interest in referring patients for immunization.
METHODS: This was a secondary analysis of data collected in a 2001-02 postal survey of Alberta chiropractors (response rate 78.2%). Analysis was restricted to chiropractors with children (n=325). Chiropractors indicated their personal vaccination status and intentions (would vs. would not accept future immunization), and the vaccination status of their children (any vs. none ever immunized). Chiropractors also indicated their interest in referring patients/patients' children for immunization (interested vs. neutral/disinterested). Data analysis included frequencies and cross tabulations. Odds ratios (OR) and 95% confidence intervals (CI) were estimated. Logistic regression models (alpha=0.05) explored the association between the immunization status of the chiropractors, their own children, and their interest in referring patients for immunization.
RESULTS: 93% of the chiropractors (n=301) had ever been immunized but only 36% (n=116) would accept immunization in the future. 68% (n=219) had at least one immunized child and 22% (n=71) indicated interest in referring patients for immunization. Chiropractors who would personally accept future immunization, compared to those who would not, were more likely to indicate interest in patient referral [OR=11.2, 95%CI: 5.3-23.6, p<0.001]. Chiropractors who have at least one immunized child, compared to those with none immunized, were more likely to be interested in referring patients for immunization [OR=6.2, 95%CI: 1.4-28.1, p=0.019].
CONCLUSION: Alberta chiropractors are consistent in their personal and professional behaviours: those who accept vaccinations for themselves or their children are more likely to refer patients for immunization.

P101

FIRST NATIONS AND INUIT HEALTH – MANITOBA REGION: IMMUNIZATION ENHANCEMENT PROJECT

B Nichol, K Shafto

BACKGROUND: In Manitoba, First Nations and Inuit Health is responsible for immunization services for First Nations clients living on-reserve. All immunizations carried out by nurses in the communities are recorded in client records and reported to Manitoba Health's immunization registry, the Manitoba Immunization Monitoring System (MIMS). MIMS annual reports consistently identify immunization coverage rates among Manitoba's First Nations population approximately 10% lower than non-First Nations Manitobans. However, community reported rates

suggest that coverage rates may actually be higher than MIMS rates. In November, 2007, an initiative to support the diverse immunization related activities in select communities was implemented.
PURPOSE: The objectives were to combine resources and expertise to enhance immunization practices, increase coverage rates, and improve data collection from all immunization providers for MIMS.
METHODS: The Health Protection Directorate hired additional nurses to address immunization practice, ensure client immunizations are up-to-date, promote consistent reporting of immunizations and use MIMS to verify immunization records. The Community Wellness and Health Surveillance Directorate provides on-line privacy training, technical support and facilitates access to MIMS in the communities, via a web-based portal operated by Manitoba Health.
RESULTS: A number of communities have received resources and other communities have been identified for enhanced support and access to MIMS. Preliminary comparison of coverage rates from 2006 and 2007 are expected to indicate an increase in immunization coverage for First Nations Manitobans.
CONCLUSIONS: Delivery of health care services in rural and remote locations present challenges in recruitment, training and support. Provision of additional training and access to information tools, such as electronic immunization records, serve to improve immunization practices and reporting of immunizations. Coverage results of this project will not start to become evident until the 2008 provincial MIMS report is published (likely in late 2009). It is expected that with sustained communication and support, rates will increase in all communities.

P103
HPV IMPLEMENTATION: READY, SET, GO...
C OKeefe, MS Butler
BACKGROUND: In the spring of 2007, NACI recommended vaccination with the HPV vaccine for females between 9-13 years of age. Newfoundland and Labrador implemented a school based program for grade six girls to target this age group. Amid a national controversial media coverage Newfoundland and Labrador was able to achieve a high coverage rate.
PURPOSE: To determine what challenges the implementation of this program created and what components of the implementation led to the success of the program.
METHODS: Collaboration between the Regional Health Authorities and the province in planning the program in terms of identifying grade, timing, age, education of Public Health Nurses (PHN), development of resources material for parents and teachers took place. In-servicing of the Communicable Disease Nurses (CDN) and PHNs started early with education to the CDNs taking place first. Subject experts were involved in the education to both groups. Education included the science component as well as responding to parent's concerns. Polices were developed and distributed. Regions were provided with the vaccine and the materials for education sessions.
RESULTS: Concerns were raised that there had been no media campaign. Gaps in the education materials were identified. Some schools had distributed the MacLean's article "Are Girls Aren't Guinea Pigs". In spite of this after the first year approx 85% of girls in grade six were immunized with the vaccine.
CONCLUSIONS: Having a subject expert – obstetrician oncologist as part of the team providing the education weighed in heavenly with the CDNs and PHNs. The subject expert was able to answer all questions in a concise and clear manner. A parent /teacher on the implementation committee may have prevented the distribution of the MacLean's article at the schools in question. A formal evaluation process is needed to substantiate the reason for the success of Newfoundland and Labrador's HPV vaccine implementation program.

P104
THE STATE OF ADULT VACCINATION IN ONTARIO: A FOCUSED MULTISECTORAL CONSULTATION
B Pakes, S Wilson, A McGeer
BACKGROUND: Adult vaccination programs are increasingly recognized as an important component of preventive healthcare. However, there remain significant gaps in knowledge about the burden of vaccine-preventable disease and the vaccination status of adult Canadians, as well as the most effective program structures for delivering needed vaccines efficiently.
PURPOSE: To gather information and discuss strategies for increasing adult immunization coverage in Ontario.
METHODS: In November 2007, a one day focus group was held among representatives from local and provincial public health departments, family physician groups, infectious disease specialists, nurse practitioners, pharmacists, and vaccination advocacy groups to assess the state of adult vaccination in Ontario, and identify short and long term strategies to support adult vaccination. Later, a short survey was distributed to managers responsible for vaccination at Ontario local public health units to understand current health unit activities.
RESULTS: Four key challenges were identified:
1. Knowledge gaps,
2. Strategic approaches and alternatives (including documentation issues),
3. Program implementation (including education, communication and incentives),
4. Management of special populations, particularly new immigrants. For each key challenge, a single goal was identified, a series of questions were raised, and solutions were discussed. The group made short- and long-term recommendations to included: a survey of current local public health unit activities in adult vaccination, advocacy for provincial funding for under-vaccinated adults, the development of algorithms to assess vaccination needs for adult immigrants, and strategies to disseminate available tools to current vaccinators. The recommended survey was carried out and revealed heterogeneous practices at Ontario Health Units - including many innovative approaches.
CONCLUSIONS: Coordinated action will be needed to understand how to identify best practices and effectively deliver adult vaccination programs in Ontario. Advocacy for this coordinated action, information sharing about current initiatives in different sectors, and continuing support for local projects will all assist in improving adult vaccination programs in Ontario.

P105
INTEGRATING CORE COMPETENCIES FOR IMMUNIZATION PROVIDERS INTO NURSING CURRICULA: AN ATLANTIC REGION PERSPECTIVE
D Pierrynowski Gallantm, SA McNeil, SL Bowman, L Pelly
BACKGROUND: Lack of knowledge about vaccine indications and contraindications contribute to lower than desired vaccine coverage rates. Many Health Care Professionals feel ill equipped to make recommendations to their patients about the merits and risks of vaccines. The Nova Scotia Vax-Ed Project needs assessment conducted in 2006 confirmed these findings with a survey of students in Medicine, Pharmacy and Nursing. In a cross country survey of curriculum content most nursing programs reported the inclusion of some content regarding vaccine preventable diseases, immunization principles and practices, and clinical skills while other disciplines covered fewer topics, yet nursing programs had less time than other disciplines devoted to vaccine related content. The survey findings also revealed lower mean knowledge scores among nurses compared to the other disciplines. Many students reported feeling that they had not received adequate education about immunization. There are initiatives taking place to respond to the issues identified in the needs assessment.
METHOD: Semi-structured group interviews were initiated with a convenience sample of nursing faculty in the Atlantic Region to seek feedback about the need for the core competencies for vaccine providers,

how the competencies could be successfully integrated into their curriculum, and to identify potential barriers and supports that may impact integration. More focus groups are planned to elicit educators' opinions regarding the importance of increasing vaccine education in their programs, their commitment to doing so, and how this can be accomplished.
RESULTS: There was support for the need for core competencies for vaccine providers to improve consistency in the level of preparation of vaccine providers and improve vaccine coverage. Time and opportunities for practice were identified as barriers. Coordination and review of current curriculum were activities that could support the integration of the core competencies.
CONCLUSION: Collaboration with undergraduate professional education providers to integrate core competencies into university curricula is timely and desirable.

P106
HEPATITIS B CONTROL FOR CHINESE IMMIGRANTS IN CANADA: A SYSTEMATIC REVIEW OF OVERCOMING BARRIERS INVOLVED IN HEPATITIS B TESTING AND VACCINATION

S Rouhani, C O'leary, Z Hong, J Wu, H-X Wu

BACKGROUND: Chinese Canadian immigrants constitute over 3 % of the Canadian population and have one of the highest incidence rates of Hepatitis B Virus (HBV). Around 5%-15% of Canadian Chinese immigrants are chronic carriers compared to less than 1% of the general Canadian population, suggesting lower levels of HBV vaccination. There is limited data addressing HBV risk factors and knowledge among Chinese Canadian immigrants.
PURPOSE: Our analysis summarized data from previous studies on HBV knowledge, HBV testing and immunization in Chinese immigrants and identified barriers towards HBV testing along with suggested vaccination strategy for this vulnerable population.
METHODS: We performed a systematic review of epidemiological studies and surveys on risk factors and socio-cultural barriers associated with HBV testing and immunization in Chinese Canadians. Databases searched from May 6, 1994 to August 31, 2007 included MEDLINE (Ovid), using the key words "Hepatitis B, vaccine delivery, Asian health, immigration".
RESULTS: A total of 15 epidemiological studies were included in our systematic review. Due to limited studies, our quantitative analysis was restricted to only 2 studies. Between 26%-33% of individuals reported being both tested and vaccinated for HBV. Education level, fluency in English and lack of HBV testing recommended by a physician were main barriers among Chinese Canadian immigrants in comparison with general Canadian population (OR 4.4, 95%CI 2.2-8.6, $p<0.0001$). Furthermore, very few respondents had knowledge of infection sources, transmission routes and severity of the disease (OR 1.6, 95%CI 1.0-2.4, $p<0.05$).
CONCLUSION: There is a need to strengthen health education among Chinese immigrants and increase vaccination coverage rates for close contacts of infected persons with chronic HBV. Culturally sensitive intervention programs should also utilize physician and social networks in the Chinese community to increase HBV testing rates and promote vaccination among those not immunized. With the high influx of Chinese immigrants to Canada, it is a public health priority to control HBV transmission and reduce the high burden of HBV among Chinese Canadian immigrants.

P107
INFLUENZA VACCINE DELIVERY PROGRAMS: A SYSTEMATIC REVIEW

B Sander, M Mir, MD Krahn

BACKGROUND: Annual epidemics of influenza continue to cause worldwide morbidity, mortality, and societal disruption. Jurisdictions utilize a mix of influenza delivery strategies to reach vaccine coverage targets with varying success.
PURPOSE: This systematic review examines influenza vaccine immunization delivery programs and settings around the world to identify and describe successful programs.
METHODS: We searched MEDLINE and EMBASE databases to identify records describing the methods of delivering influenza vaccine to the population at large. A total of 1844 records were initially screened and 98 citations were selected as potentially relevant and obtained in full-text. Detailed information was abstracted using a pre-specified 20-item data extraction form.
RESULTS: Most influenza immunization programs are targeted to vaccinate those at high risk of complications from influenza infection, as well as their contacts in traditional settings such as physician offices. However, an increasing number of people are receiving the influenza vaccine in non-traditional settings such as pharmacies, schools and in the workplace. Immunization programs in non-traditional settings are often more accessible and convenient, especially for the economically disadvantaged, inner city, and minority populations.
CONCLUSION: Health-care provider's offices, hospitals and public health units continue to effectively deliver influenza vaccines to the general population.

P108
INTEGRATED APPROACH TO INFLUENZA IMMUNIZATION

M Sanderson

BACKGROUND: The Assiniboine Regional Health Authority (ARHA) is spread over 32,134 square kilometers in southwest rural Manitoba. Over twenty facilities provide either community, acute or long term health care services to a population of 69,371 residents. In 2005, the public health nursing team identified the need to develop an integrated approach for the planning and delivery of the annual influenza immunization program.
PURPOSE: The purpose of the initiative was to develop a regional approach to influenza immunization delivery based on current literature and best practices in the community, acute and long term care facilities.
METHODS: Public health nursing staff invited infection control personnel, key members of acute and long term care services and other regional stakeholders to form an Influenza Strategy Team. Team members met regularly and developed terms of references. Yearly goals and specific strategies to minimize the impact of influenza in facility and community settings were developed.
Immunization resource binders were developed by the team and distributed regionally. Binders included information about best practices related to informed consent, vaccine storage, vaccine administration, adverse event reporting, and documentation requirements. Management attended team meetings and endorsed funding for nurses to immunize eligible ARHA employees.
RESULTS: Since the development of the Influenza Strategy Team, the community and facility influenza programs are jointly planned and delivered across the region's health care system. The team meets four times a year to plan, evaluate and revise the program.
CONCLUSION: The integrated approach provided a venue to coordinate efforts to mitigate the impact of the annual influenza season across the regional health care system. The collaboration has not only enhanced capacity for other immunization programs but has also contributed to inter-facility communication during the inter-pandemic period.

P109
"YOUR CHOICE ...THEIR FUTURE"

M Schepers, L Stanford, MA Holmes

BACKGROUND: The continued success of vaccines in preventing disease depends on parent awareness of disease risk, confidence in vaccine safety, and on them choosing to immunize their children.
PURPOSE: To support parents of young children to make informed choices related to their child's immunization by providing educational resources and points of access to get answers to their questions and concerns.
METHODS: The project "Your Child…Their Future" was designed to provide parents with children under the age of five the opportunity to learn about childhood immunizations. Components included:

- Display Board – key messages about disease and impact of immunization

- Parent guide – profiles seriousness of disease, immunization benefits (for young children and as they grow, attend school and explore the world); importance of protecting a child from harm or disease; guidance for credible web resources; immunization schedule and stickers to calendar track immunizations.
- Teaching flipchart – profiles the seriousness of childhood diseases, disease trends, vaccine safety and the immunization schedule.
- Presentations – importance of immunization, disease trends and addressing parent questions and concerns.

RESULTS: Presentations at: Ontario Early Years Centres reaching new mothers (various ages, income/education levels); pre/postnatal classes; multidisciplinary workshops. Distribution of the guides: 5000 copies (via presentations, health professionals). The primary theme that emerged was the importance of addressing parents questions and concerns on immunization. This proved to be critical in supporting parents making informed decisions about childhood immunization.
Expansion: a power point presentation accessible at bedside computers in Combined Care Unit and Special Care Nursery at Royal Victoria Hospital in Barrie as a pilot project.
CONCLUSION: Health care providers were keen to access parent-friendly resources to support their teaching and parent decision making. In an out-of-sight, out-of-mind environment, collaborative, comprehensive and ongoing efforts are needed to support parents in decisions about childhood immunization.

P110
IMMUNIZATION E-DOCUMENTATION: LESSONS FROM THE FIELD

D Shaw

BACKGROUND: Disparities in Albertan childhood immunization rates persist, and concern is rising that more parents are delaying or abstaining from immunization rates driving the population level of immunity below protective levels.
Over a decade or more, we have been attempting to create an electronic record of immunization (e-immunization record). Following the 1996 Health reform a Public Health Information System was implemented in south western Alberta with the intent to form the basis of an electronic health record that was accessible region wide.
PURPOSE: In 2004 in the Framework for A Healthy Alberta, the Government set objectives to promoting health and preventing disease and by 2012, more children will be immunized against vaccine preventable diseases.
How will we know if we are achieving this goal? By measuring the results of the immunization programs at the point of care into a single electronic record.
METHODS: Immunization rates were measured by the same methodology in each of the 3 time periods; 2005, 2006 and 2007. A denominator of children was obtained by identifying all age appropriate patients from a master patient index maintained by a regional electronic admissions process (covering 95% to 98% of registered regional children) with 2 to 5% lost to follow up. All electronic records were reviewed to determine immunization rates.
RESULTS:

- 12% of children residing in Chinook are under-immunized and are at risk for disease
- Reminder/recall system has decreased the individuals who are delayed in getting their immunizations by 9%.

CONCLUSION: E-immunization documentation is still in its infancy, and so is our understanding of the trends of refusals and non immunizing patterns. This information is best collected at the point of care where the clinician has a relationship with the client.
What we feel we: 1.identify populations at high risk for vaccine-preventable diseases and target interventions and resources efficiently. 2.combine immunization information from different sources into a single record, provide official immunization records and improve office efficiency by reducing the time needed to gather and review immunization records. A report from the RSHIP Public Health project indicated (10.3%) of children under 18 years of age duplicate immunization history. 3.100% of adverse event reports following immunization are accessible to all health care providers. 5.help providers when immunizations are due and help ensure that children get only the vaccinations they need. 7.the aggregate information is useful in examining how well the system is performing in meeting the health-care needs of people, specifically that by 2012 we can measure that more Albertans are immunized against vaccine preventable diseases.

P111
USING UNIT CHAMPIONS TO PROMOTE VACCINE UPTAKE

J Slaunwhite, SM Smith, MT Fleming, R Strang, C Lockhart

BACKGROUND: At the Capital District Health Authority (CDHA), there has been a concerted effort to increase influenza vaccine uptake among staff. Although the centre has set a target vaccination rate of 70% of employees, the vaccination rates were between 38% and 42% between 2000-2004.
PURPOSE: In an attempt to increase vaccination uptake in 2005 at CDHA, an intervention was designed which provided key members (a.k.a. "champions") within specific work units with a brief training session designed to increase awareness of the benefits associated with influenza vaccination.
METHODS: Unit champions were responsible for encouraging members of their work units to accept an influenza vaccination and in some cases had the requisite training to administer the vaccination on site. Work units were randomly assigned to one of two conditions (champion present vs. control) in order to assess the impact the intervention had on acceptance rates for influenza vaccine among staff at CDHA.
RESULTS: Results suggest increased inoculation compliance for groups where a champion was present (N = 23). An independent sample t-test revealed a significant difference between the two groups $t = 2.304$, $p < .05$ (= .026) which resulted in a percentage change from 41% in the unchampioned group to 52% in the championed group. Analyses which included only those units that had a trained champion (N=13) did not produce a significant statistical test ($p = .08$); however a percentage increase from 41% to 54% was observed.
CONCLUSION: Overall the presence of a unit champion did produce a clinically relevant increase in vaccine uptake in championed work units. It is clear that having an assigned champion in a work unit can positively influence vaccination rates. Limitations and future research are discussed.

P112
ATTITUDES AND BELIEFS OF ACUTE HEALTH CARE WORKERS TOWARDS INFLUENZA VACCINATION

V Sunil, E Cheuk, AM Holt, L McCarey, D Dingman, AL Noseworthy

BACKGROUND: Influenza A is one of the most important pathogens affecting 10-25% Canadians every year. Contrary to their role as caregivers, health care workers are often implicated as the vector of nosocomial influenza transmission. Despite repeated campaigns and other methods to increase the influenza vaccination coverage rates among health care workers in acute care facilities, the coverage rates have been consistently lower than that in long-term care homes within the Haliburton Kawartha Pine Ridge District Health Unit jurisdiction.
PURPOSE: The main objective of this cross-sectional study was to assess knowledge, attitudes and beliefs of hospital staff toward influenza vaccination and to determine what factors affected their decision as to whether or not to be vaccinated for the 2005/2006 influenza season.
METHODS: A self-administered survey was distributed to all the staff in four hospitals within the Health Unit jurisdiction. Hospital authorities determined the method of dissemination.
RESULTS: Personal attitudes, beliefs and deficits in knowledge regarding influenza vaccination were identified as a major barrier for not getting vaccinated. Statistical analysis revealed significant differences between the immunized and non-immunized groups with regards to knowledge and attitudes toward vaccination (probability value<0.01). It was also observed that having regular patient contact

significantly influenced vaccine acceptance (Odds ratio 1.56). The vaccination rate increased with increase in age. Stratification on type of patient contact revealed a statistically significant difference in knowledge and attitudes among those who have regular patient contact and those who have little patient contact.

CONCLUSION: This study highlights the need for continuing education programs and campaigns for health care workers addressing concerns regarding adverse side effects of influenza vaccination. It is necessary to address unfounded fears, preconceptions and misconceptions about influenza and the influenza vaccine as identified in this study.

P113

LOVE THEM, PROTECT THEM, IMMUNIZE THEM: IMMUNIZATION AWARENESS CAMPAIGN

K Sweiger, J Haase, K Whitehouse, L White, ML Barron, C Marshall, C Coburn

BACKGROUND: In September 2006, 79% of day nursery children in Grey and Bruce counties were complete for routine immunization. Only 18% of children registered on the Immunization Record Information System (IRIS) were fully protected against Invasive Pneumococcal Disease at 18 months of age.

PURPOSE:

1. Increase uptake of pneumococcal conjugate vaccine in children in Grey and Bruce counties.
2. Increase on-time routine vaccination of children in Grey and Bruce counties.

METHODS: Educational events considered large geographic area, time of day, issue relevance and venue attractiveness. Two dinner events offered to healthcare professionals and one evening event to the general public. All events were free and offered presentations by keynote speakers, display boards and door prizes. Events were promoted to health care providers via individual invitations and reminder flyers. Flyers, posters, website, radio and TV ads and interviews promoted the evening event to the general public. Twenty-nine books by Dr. Gold, ("Your Child's Best Shot"), were presented to Ontario Early Years Centres, and libraries with local media coverage.

Promotional items created included billboards in high-traffic locations, fridge magnets with information cards, a display board panel, radio, TV and newspaper ads. All visual ads displayed a consistent message and recognizable colour theme and logo. The campaign ran for three months April -June 2007.

RESULTS:

– 105 out of the 107 invited healthcare professionals attended the educational sessions
– 39 members of the general public attended the evening educational event
– statistics from IRIS indicate a 22% increased uptake of pneumococcal conjugate
– statistics from IRIS indicate a 3% decrease in the number of day nursery children complete for immunization

CONCLUSION: Much effort went into the development and execution of the Love Them, Protect Them, Immunize Them campaign. Positive outcomes have resulted from all of this effort as measured by a dramatic increase of 22% in their fourth dose pneumococcal immunization rates in the region. However, the campaign failed to increase the rate of on-time routine vaccinations for children in Grey and Bruce counties

P114

ESTIMATES OF CHRONIC HEPATITIS B INFECTION IN CANADA

H-X Wu, A Dudani, Q Li, A Andonov, J Wu

BACKGROUND: Chronic hepatitis B infection is a major health problem in Canada and worldwide. Limited data are available regarding hepatitis B virus (HBV)-related morbidity and mortality and potential reduction in disease burden from hepatitis B vaccination.

OBJECTIVES: To estimate the prevalence of chronic HBV infection in Canada and the attributable proportions associated with demographic groups at higher risk of infection.

METHODS: The populations by the country of birth for the period 1981-2006 were derived from Canadian census data. Estimates of immigration-related chronic HBV cases were determined by applying chronic HBV infection prevalence estimated from individual countries to immigration estimates. Chronic HBV prevalence was based on a Medline search of population-based studies conducted in the countries of origin over the period 1990-2007. Estimates for selected high-risk groups (injection drug users, homosexual men) and low-risk groups (first-time blood donors) in Canada, were combined proportionally to their representation in the population.

RESULTS: The estimated prevalence of HBV surface antigen (HBsAg) was increased from 0.0% for 0-9 year olds to 1.1-1.8% for 50-50 year age group. A Canadian HBsAg prevalence of 240,000 (0.8%) was estimated. Approximately 76% of individuals with chronic HBV infection were estimated to be non-Canadian-born people came from countries with relatively high prevalence of HBsAg (South-East Asia: 43%, Africa:10%, other countries: 23%).

CONCLUSION: Given a relatively long latency period between HBV infection and clinical manifestation of the disease, Hepatitis B-related chronic liver disease rates may therefore remain elevated for decades in Canada despite the declining acute HBV incidence. Screening for hepatitis B should be offered to people born in areas of high endeminicity, which may benefit from early detection and early treatment of active disease.

P115

SAFETY SYRINGES: HAVE PUBLIC HEALTH NURSES BEEN OVERLOOKED?

M Yetman, G Butler, D Moralejo, C O'Keefe, H Dyson, T Bussey

BACKGROUND: Nurses account for a majority of percutaneous injuries in healthcare facilities. However, there is limited data on the number of percutaneous injuries experienced by public health nurses (PHNs) working in community health practices.

PURPOSE: The purpose of this study was to evaluate if: i) percutaneous injuries associated with the administration of vaccines are a concern for PHNs and ii) do PHNs have any concerns with the use of safety engineered devices.

METHOD: The evaluation has taken place in two phases. In phase one a questionnaire was administered to all public health nurses in the province of Newfoundland Labrador to assess their concerns regarding safety practices associated with the administration of vaccines. In phase two the use of a safety device was pilot-tested in one clinic. The vaccine manufacturer first provided education sessions on the use of the syringe. The seven PHNs then used the safety device in an immunization clinic for the administration of the human papilloma virus (HPV) vaccine to 32 recipients. They then provided feedback on the safety device. Further pilot testing is ongoing.

RESULTS: In phase one 58.9% of the questionnaires were returned. In a preliminary review of the data 1.7% of the PHNs did not have hepatitis B vaccine and 5.6% of the PHNs reported a needlestick injury in the past 12 months. In response to the statement "I would like to use a safety engineered syringe for providing immunizations": 4.8% indicated no interest in using a safety device; 33.6% were ambivalent about using the device; and 61.6% indicated interest in using a safety device for the administration of immunizations. In the pilot study (phase two) five of PHNs indicated that the use of the safety device requires special training, however all would recommend safety syringes for all vaccine delivery.

CONCLUSION: PHNs are a risk of sustaining percutaneous injuries and must be given an opportunity to evaluate and use safety devices. A single education session on safety syringes may not be enough to engage PHNs in the use of safety syringes.

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P116
PEDIATRIC ESTIMATES OF RSV- AND INFLUENZA-ATTRIBUTABLE HOSPITALIZATION VARY BY STATISTICAL METHOD AND REQUIRE VALIDATION

R Gilca, G De Serres, DL Buckeridge, DM Skowronski, G Boivin

BACKGROUND: RSV and influenza are significant winter causes of pediatric hospitalization. Public health experts require measures of disease burden in proposing, prioritizing and evaluating prevention programs. Estimates are usually derived from readily-accessible administrative databases that typically include clinical coding without laboratory-confirmation. Various non-validated statistical methods are used to adjust for seasonal variation in virus contribution.

PURPOSE: We compare estimates of RSV/influenza-attributable pediatric hospitalization using six commonly-applied statistical methods versus prospective evaluation that included individual virus diagnosis.

METHODS: The proportion of RSV-/influenza-attributable hospitalizations for pneumonia and influenza (P&I) and bronchiolitis in children age 6-23 months was assessed during 7 Quebec winters (1998-99 to 2004-05) using: 1)Serfling regression; 2/3)peri-seasonal differences; 4)Poisson regression with log link and autoregression; 5)negative binomial regression with identity link; and 6)Box-Jenkins transfer function. Results were compared across statistical methods and seasons and to observations from prospective evaluation during two winters (2001-02; 2002-03).

RESULTS: We report wide variation in estimates of disease burden by statistical method. No single method consistently reflected estimates found by prospective evaluation. With the exception of the peri-season method for influenza during 2002-03 all statistical point estimates underrepresented the influenza-attributable proportion measured prospectively. Estimates were more consistent and highest for RSV for both P&I and bronchiolitis hospitalization. There was more between-season fluctuation in influenza-attributable hospitalizations compared to RSV, but this variation was matched by an equivalent or greater degree of change within-season but between-methods. Overall, P&I estimated through peri-season methods appeared to be a better serious outcome indicator for influenza whereas bronchiolitis estimated by negative binomial regression and Box-Jenkins methods appeared to give better indication of RSV contribution.

CONCLUSIONS: Statistical methods retrospectively applied to administrative databases do not reliably capture virus-specific disease burden and require validation through large epidemiologic studies. Until then, methodologic differences/caveats should be made explicit and proxy estimates used cautiously in guiding public policy.

P117
IMMUNIZATION COVERAGE AND SCHOOL SUSPENSIONS BY NEIGHBOURHOOD IN TORONTO

E Gournis, E Kefalas, V Duvey, J Cameron, L Persaud, B Yaffe

BACKGROUND: Assuring vaccination coverage in all areas of the city is a public health mandate and priority. Given physicians administer most vaccines in the city of Toronto, Toronto Public Health (TPH) relies on their school immunization assessment program, under the Ontario Immunization of School Pupils Act, to ensure students are adequately immunized for measles, mumps, rubella, diphtheria, tetanus and polio. In this program, TPH contacts parents/guardians of a student several times over a 9-week period to provide: 1) documentation of a previous vaccination, or 2) proof they got their child vaccinated, or 3) a notarized exemption from vaccination. Otherwise, their child is suspended from school.

PURPOSE: To determine if immunization coverage and school suspension rates for inadequate proof of coverage vary across neighbourhoods in Toronto.

METHODS: The number of children who were current for immunization at each school was aggregated at the neighbourhood level and coverage rates were calculated. Spatial distribution of rates was then mapped using MapInfo 7.5. Numbers of suspensions, resuspensions and exemptions were also aggregated at the neighbourhood level and mapped as point ranges.

RESULTS: The overall vaccination rate for the city was 81.1% before and 97.4% after suspension notices were sent out. All 140 neighbourhoods had rates >95% after suspension orders. Over 5,000 suspensions (1.38% of the school population) were ordered across the city. Eighty-five resuspensions (0.02% of the school population) were necessary in 32 of 140 neighbourhoods.

CONCLUSION: Mandatory vaccinations through an immunization school suspension program assure that high immunization coverage rates are achieved across Toronto. In Toronto, 13 priority areas have been identified across the city where there are not enough social services to address the growing needs of the community. The high number of resuspensions issued in 7 of these areas illustate the continued effort needed to achieve and maintain high rates of immunization in some settings.

P118
THE ECONOMIC BURDEN OF THE NOVA SCOTIA MUMPS OUTBREAK

A Janes

BACKGROUND: This economic burden-of-illness study of the recent Nova Scotia (NS) mumps outbreak estimated the incremental costs to the health care system. There have been three recent mumps outbreaks in NS, with the most recent being the largest. This outbreak predominantly presided in individuals born between 1970 and 1991 who only received one dose of Measles-Mumps-Rubella vaccine, where immunity may be insufficient.

PURPOSE: The purpose of this study is to provide an understanding of the economic impact of a large mumps outbreak to the health care system.

METHODS: A variety of sources were utilized to quantify the unit costs for the identified resources used from February 22 – October 31, 2007. An economic incremental costing approach was used to capture all resources used by the health care system and included the response to the outbreak and the immunization programs. Costs were organized by personnel time, supplies and equipment.

RESULTS: We estimated the total burden of the mumps outbreak in NS to be more than $2.4 million. The cost per case (709 cases at the end of study period) was estimated to be $3,495. Excluding the cost of an immunization program, the cost per case decreased to $3,074. The personnel cost, not including the immunization program, was 55% of the total outbreak cost, while the immunization program was 9% of the total outbreak cost.

CONCLUSIONS: Nova Scotia's mumps outbreak created significant costs to the health care system. The main drivers of costs are the amount of personnel involved to control the outbreak and implement measures to prevent further spread. This study has created a framework for examining the costs to a health system associated with communicable disease outbreaks.

P119
THE COST-EFFECTIVENESS OF HUMAN PAPILLOMAVIRUS DNA TESTING FOR CERVICAL CANCER: A SYSTEMATIC REVIEW OF THE LITERATURE

J Kingston-Riechers

BACKGROUND: The human papillomavirus (HPV) is the most common sexually transmitted infection. About 75% of sexually active women and men will have at least one HPV infection in their lifetime. Infection with the high risk (HR) strains of HPV appears to be a necessary, but not sufficient, cause of cervical cancer, being found in up to 99.7% of invasive cervical cancers.

Unaided, the immune system can usually purge any HPV infection within 24 months. However, about five to ten percent of women infected with HR-HPV develop persistent infections, increasing their risk of developing invasive cervical cancer over a period of up to ten years. This relatively slow progression makes the early detection possible through

regular screening: causing cervical cancer to be an almost completely preventable disease

PURPOSE: This study assesses the current literature on the cost-effectiveness of HPV DNA testing as an alternative, either as a stand alone or an adjunct test, to the current strategy of conventional cytology alone.

METHODS: Studies are included if they provide cost-effectiveness figures for HPV DNA testing in relation to no screening or conventional cytology, are in English, based on a sample drawn from a developed market economy, and were published after 2002.

RESULTS: Twenty-five articles matching the search criterion were found. Though time horizons and costs that are included vary, HPV DNA testing is generally found to be cost-effective (i.e. less than the country's GDP per capita per life year saved), the screening interval is between two to ten years and the target group is roughly between the ages of 20 to 65 years. Based on a five year screening interval, using HPV DNA testing to triage atypical squamous cells of undetermined significance, is estimated to cost between $1500 and $7000 per year saved.

CONCLUSION: HPV DNA testing may be a cost-effective screening tool for cervical cancer.

P120

THE EFFECT OF SCHOOL-BASED INFLUENZA IMMUNIZATION CLINICS ON VACCINATION RATES

J Kwong, LC Rosella, H Johansen, MK Moran, S Maaten, A Guttmann, D Northrup

BACKGROUND: When Ontario introduced its Universal Influenza Immunization Program (UIIP) in 2000, some public health units (PHUs) offered school-based influenza immunization clinics (SBIICs).

PURPOSE: To examine the effect of SBIICs on influenza vaccination rates in school-aged children.

METHODS: We surveyed Ontario PHUs to identify those that provided SBIICs in elementary and/or secondary schools. We obtained vaccination rate data from two sources. For children aged 12-19, we assessed vaccination rate using the 1996/97 National Population Health Survey and the 2000/01, 2003, and 2005 Canadian Community Health Survey. For children aged 4-11, we assessed vaccination rates using a telephone-based survey conducted in 2007 to measure influenza vaccine uptake amongst children younger than 12 during the 2006-07 influenza season.

RESULTS: From 2000 to 2006, out of 37 PHUs, 10 offered SBIICs in elementary schools and 17 offered them in secondary schools for at least one year. Among children aged 12-19, vaccination rates increased 25 percentage points for PHUs with SBIICs (from 13% pre-2000 to 38% post-2000) compared to 12 percentage points for those without (from 17% pre-2000 to 29% post-2000) ($p < 0.001$). For children aged 4-11, the vaccination rate during the 2006-07 season was 41% (95% CI, 37%-45%) in areas with SBIICs and 29% (95% CI, 27%-32%) in areas without SBIICs ($p < 0.001$).

CONCLUSION: Children living in areas where PHUs offer SBIICs are more likely to receive influenza vaccination than those who live in other areas. Public health authorities might consider delivering influenza vaccines through school-based clinics to increase influenza vaccination rates in school-aged children.

P121

THE EFFECT OF UNIVERSAL INFLUENZA IMMUNIZATION ON ANTIBIOTIC PRESCRIPTIONS

J Kwong, S Maaten, REG Upshur, D Patrick, F Marra

BACKGROUND: Influenza infections may be a marker of influenza activity in the population. One approach to responding to the challenge of antibiotic use in patients with influenza infections is to prevent influenza infections through vaccination. In October 2000, Ontario initiated a universal influenza immunization program (UIIP) to provide free influenza vaccinations for the entire population 6 months of age or older.

PURPOSE: To evaluate the effect of Ontario's UIIP on influenza-associated antibiotic prescriptions.

METHODS: Antibiotic prescription data from 1997 to 2007 for all ten Canadian provinces were obtained from IMS Health Canada's CompuScript dataset, a sample of all prescriptions filled at retail pharmacies across Canada. Monthly rates of influenza-associated antibiotic prescriptions were estimated using Poisson regression models, controlling for province, influenza activity, and temporal trends. Influenza-associated prescriptions were computed as the difference during influenza seasons between observed prescriptions and the model-predicted baseline in the hypothetical absence of influenza. Changes in influenza-associated antibiotic prescription rates before and after UIIP introduction in Ontario were compared to changes in other provinces.

RESULTS: After UIIP introduction, rates of influenza-associated antibiotic prescriptions decreased from 17.9 to 6.4 per 1000 people in Ontario (relative=0.36, 95% CI, 0.26-0.49), compared to a decrease from 8.3 to 8.2 per 1000 people in other provinces (RR=0.99, 95% CI, 0.86-1.13) (ratio of RRs=0.36, $p<0.001$). Influenza-associated antibiotic prescriptions represented 2.7% of total respiratory antibiotic prescriptions in Ontario prior to 2000 but only 1.1% after 2000, compared to an unchanged proportion in other provinces combined (1.4% pre-2000 and 1.5% post-2000). In sensitivity analyses, consistent results were seen when the influenza season periods were broadened and narrowed; when we started with the 1994-95 season; when Ontario was compared to each province individually; and when we restricted the analysis to A(H3N2)-predominant seasons. We observed an amplified effect when seasons with poor vaccine match were excluded. As tests of specificity, we demonstrated no effect on prescriptions of respiratory antibiotics in July or on prescriptions of non-respiratory antibiotics in February.

CONCLUSION: Compared to targeted programs in other provinces, UIIP introduction in Ontario in 2000 was associated with reduced influenza-associated respiratory antibiotic prescriptions. While influenza-associated antibiotic prescriptions represent a small fraction of annual antibiotic use, jurisdictions wishing to decrease antibiotic use might wish to consider programs to increase influenza vaccination.

P122

STRENGTHENING PUBLIC HEALTH PRACTICE – CORE COMPETENCIES FOR PUBLIC HEALTH IN CANADA: RELEASE 1.0

K MacDougall, C Betker, J Lowe

BACKGROUND: A competent public health workforce is essential to a strong public health system. In October 2005, the pan-Canadian Framework for Public Health Human Resources Planning identified core public health competencies as a foundational building block to strengthen public health.

PURPOSE: The Federal/Provincial/Territorial Joint Task Group on Public Health Human Resources recommended that the Public Health Agency of Canada lead a national process to review, modify, and validate a draft set of core competencies for public health.

METHODS: An extensive, iterative pan-Canadian consultation sought input from the public health community to help define the core competencies, and provide input for tools and strategies to support their use. Components of the consultation included surveys, interviews, implementation pilots, work with specific public health discipline groups, and regional consultations.

RESULTS: Over 3000 public health practitioners including nurses, physicians, and epidemiologists as well as representatives from academic institutions, human resource planning, and all levels of government participated in the research. Nine regional consultations and nine implementation pilots were completed. All provinces and territories were represented. Individual and summary reports for each research activity were produced.

CONCLUSION: In September 2007, the Core Competencies for Public Health in Canada: Release 1.0 was launched. The Core Competencies define the essential knowledge, skills, and attitudes necessary for effective public health practice, and are key elements of public health human resource planning. They have been ratified by national and provincial/territorial groups, and are being used in curriculum development and orientation packages, to assess continuing education needs of practitioners and organizations, and provide consistency for job

descriptions. They also provide a foundation for the development of discipline specific and other related competency sets (e.g., immunization programs). An evaluation framework to explore the impact of the consultation process and implementation of the Core Competencies for Public Health is under development.

P123
VACCINATION STRATEGIES FOR HEPATITIS B: IS THERE STILL CONTROVERSY?

C Mackie, DM Patrick, JA Buxton, S Tadwalkar

BACKGROUND: Approximately 350 million people are chronically infected with hepatitis B virus (HBV) worldwide, causing an estimated 600 000 deaths annually. Chronic cases are the most problematic because of the high risk of cirrhosis and hepatocellular cancer. A significant proportion of chronic cases are acquired in infancy, while high-risk activities in adolescence account for another major burden of HBV-related illness. Research trials proving efficacy were initially short-term, leaving some uncertainty about the duration of protection and the ideal timing for universal vaccination programs.

PURPOSE: This study aims to describe at what age(s) should universal HBV vaccination be provided. We also examine the issue of what capacities are required to adequately implement and evaluate a universal HBV program.

METHODS: We conducted a policy analysis to appraise the evidence that HBV vaccination provides long-term protection against chronic HBV infection. Key types of evidence were population level data of effectiveness and data from controlled studies. We also considered the cost-benefit ratio of various HBV vaccination schedules.

RESULTS: The results of serological surveys are now bolstered by long-term controlled studies of both observational and experimental design showing that both infant and adolescent immunization schedules offer lasting protection against HBV. In countries where national immunization registries exist, innovative research on HBV shows that protection conferred by infant vaccination lasts well into adolescence. There is strong consensus in the public health community globally that infancy is the preferred age for vaccination, and that this protects against chronic carriage well into adolescence without the need for a booster dose. Preliminary economic modeling suggests that routine booster doses in adolescence would be expensive and prevent few cases of chronic HBV infection.

CONCLUSION: The authors recommend that all remaining jurisdictions, including provinces in Canada that offer universal immunization in adolescence, should join the 164 World Health Organization member countries that have chosen to offer universal infant immunization programs. Countries that lack of a national immunization registry are at a significant disadvantage in assessing the long-term effectiveness of vaccination policy and implementation.

P124
LABORATORY DIAGNOSIS AND SURVEILLANCE OF PERTUSSIS IN CANADA

I Martin, M Sill, F Jamieson, S Richardson, S Halperin, R Tsang

BACKGROUND: A National Consensus Conference on Pertussis was held in 2002 with a number of recommendations made for laboratory diagnosis and surveillance. To discuss implementation of the recommendations, a follow-up workshop was held at the National Microbiology Laboratory on March 7, 2006.

PURPOSE: To gather Canadian experts to examine the recommendations made in 2002 and to discuss current issues related to laboratory diagnosis and strain characterization for surveillance.

METHODS: Meeting participants included 21 representatives from academia, federal and provincial laboratories, hospital laboratories and industry from Canada and the USA. Surveys were sent to 216 provincial, hospital and private laboratories to find out the current diagnostic methods used across the country for pertussis. Recommendations were summarized based on consensus from the discussions held at the NML workshop.

RESULTS: The workshop recommended the following:

1) a diagnostic laboratory system for pertussis

2) a laboratory surveillance system for pertussis

Results of the survey identified18 laboratories are using PCR for pertussis diagnosis. Of the 18 laboratories that use PCR, both real-time PCR and conventional PCR are used with the majority of the labs targeting the IS481 gene for detection and identification of pertussis. Only 7 of these labs also carry out culture for the B. pertussis organism.

CONCLUSION: 1) A national forum is required to standardize and update methods for the laboratory diagnosis of pertussis and surveillance.

2) A proficiency program on PCR detection of B. pertussis DNA is required to ensure accuracy of the PCR diagnosis.

3) An update is required on the case definition to include laboratory detection of B. pertussis DNA or a positive B. pertussis culture in the presence of compatible clinical diagnosis.

P125
METHODOLOGICAL ISSUES IN SURVEILLANCE OF INFLUENZA VACCINATION AMONG YOUNG CHILDREN

E Medd, ML Russell

BACKGROUND: A primary series of immunizations against influenza in children <10 years old comprises 2 doses of vaccine delivered after 6 months of age and at least 28 days apart. In any influenza season, children who have ever received only one dose of vaccine (partially vaccinated) are less likely to be protected against influenza than those who have received two doses: the current vaccine plus one prior dose (adequately vaccinated for season). Without knowledge of prior vaccinations, misclassification of children as being adequately vaccinated may occur.

PURPOSE: We examined methods of collecting child immunization data for surveillance and epidemiological research, evaluated them for the potential for misclassification bias and identified strategies to minimize its impact.

METHODS: After speaking with local and provincial immunization surveillance experts, we searched PubMed using the terms 'vaccin$ or immun$', 'dose', and 'coverage', then used the PubMed 'related articles' feature and examined reference lists of relevant articles to identify data sources and methodological issues in measuring child vaccination status. We evaluated the methods of data collection using a framework for misclassification bias informed by the epidemiological literature, and proposed strategies to avoid this bias.

RESULTS: Commonly used data sources included parental recall, medical records, immunization cards and registries. Parental recall alone underestimates vaccine coverage especially for vaccines requiring multiple doses. Health charts, immunization cards and registries may not contain a complete immunization record. Strategies to avoid misclassification for influenza vaccination include: using a clear definition for adequate vaccination against influenza; capturing date of birth and dates of all vaccinations for assessment of adequate vaccination; and using multiple information sources to capture immunizations from multiple providers.

CONCLUSION: All information sources for child immunization data, used alone, could lead to misclassifying a child as being 'adequately' vaccinated against influenza. The proposed strategies will prevent this type of bias.

P126
A COMPARISON OF CHILDHOOD IMMUNIZATION COVERAGE IN CANADA AND THE UNITED STATES

S Romain, MA Schillaci

BACKGROUND: Canada's Universal Health Care system provides free access to primary care for all residents. In contrast, the United States privately funded Health Care system leaves more than 35 million of its citizens lacking health insurance. Childhood immunizations, typically given during well-child visits, serve as a sentinel for the level of childhood primary health care.

PURPOSE: To compare immunization rates for Canada and the U.S..

To investigate the relationship between access to primary care physicians and compliance with childhood immunization schedules in Canada.
METHODS: National-level childhood immunization coverage estimates were compared between the United States and Canada, for two-year old children. Coverage estimates were published by the National Immunization Survey and Public Health Agency of Canada. Data for several recommended antigens were compared for 2002 and 2004. Data on the number of family medical practitioners registered in Ontario was provided by the Ontario Physician Human Resources Data Centre. Population data were provided by Statistics Canada. Relative access to a family medical practitioner was expressed as the number of family medical practitioners relative to the population.
RESULTS: Contrary to initial expectations, our comparison of childhood immunization rates in Canada and the United States revealed that immunization rates for most antigens were higher in the United States than in Canada. For the immunization series including four doses of diphtheria and tetanus toxoids, and acellular pertussis vaccines, 2002 rates in the U.S. were 5.4% higher than in Canada (80.8% vs. 75.4%). In the most populous province, Ontario, immunization rates for 7-year-olds were strongly correlated (r=0.80) with the number of doctors per thousand residents.
CONCLUSIONS: Childhood immunization rates for the majority of antigens were higher in the United States than in Canada. Our findings suggest that access to primary health care is an important factor in maintaining immunization coverage.

P128
THE COST-EFFECTIVENESS OF ONTARIO'S UNIVERSAL INFLUENZA IMMUNIZATION PROGRAM
B Sander, JC Kwong, CT Bauch, A Maetzel, AJ McGeer, JM Raboud, MD Krahn
BACKGROUND: In July 2000, Ontario initiated a universal influenza immunization program (UIIP) to provide free influenza vaccines for the entire population (> 6 months) that replaced targeted influenza immunization programs (TIIP) used in other Canadian provinces. This is the first large-scale program of its kind worldwide.
PURPOSE: To evaluate the cost-effectiveness of Ontario's UIIP.
METHODS: The economic evaluation is an extension of an ecological study using administrative data from 1997 to 2005, estimating visits to doctors' offices, ED visits, hospitalizations and mortality per season pre- and post-UIIP implementation as observed in Ontario and in 9 other Canadian provinces. To calculate the expected numbers of events had Ontario continued to offer TIIP we apply the relative change estimates pre 2000 to post 2000 as observed in other provinces to pre-UIIP Ontario event rates.
Unit costs are based on Ontario administrative data on health care resource utilization. Immunization program costs were obtained from the Ministry of Health and include all costs related to the program. Utility weights are obtained from the literature.
We calculate the incremental cost-effectiveness (cost per QALY gained) of the program from the health care payer perspective. QALYs due to mortality are discounted at 3%.
We perform a series of deterministic sensitivity analyses as well as a probabilistic sensitivity analysis.
RESULTS: Ontario's UIIP costs approximately C$20 million more than a targeted program, but reduces health care services cost by C$8 million. Most cost savings can be attributed to hospitalizations avoided. The program saves 955 QALYs by reducing mortality and additional 552 QALYs by reducing morbidity. The ICER is C$7,971/QALY gained. Results are sensitive to deaths averted, hospitalization cost and utility weights. The probability of UIIP being cost-effective at a willingness to pay threshold of C$50,000/QALY is greater than 0.95.
CONCLUSIONS: UIIP appears to be an economically attractive intervention.

P129
THE CANADIAN HIV VACCINE INITIATIVE
V Sarazin
BACKGROUND: Through a variety of initiatives and meetings, the Canadian HIV stakeholders in community, research, government and private sector organizations expressed an interest in accelerating a Canadian contribution to the global effort in HIV vaccine research and development.
PURPOSE: How the development of a uniquely Canadian HIV vaccine program will enhance HIV vaccine research and development and help to address gaps identified by the Scientific Strategic Plan of the Global HIV Vaccine Enterprise.
METHODS: A number of areas of Canadian expertise coincide with gaps identified in the Global HIV Vaccine Enterprise's Scientific Strategic Plan. Planning and establishing the Canadian HIV Vaccine Initiative involved negotiating contributions and priorities among five Government of Canada Departments (the Canadian International Development Agency, the Public Health Agency of Canada, the Canadian Institutes of Health Research, Industry Canada and Health Canada) and the Bill & Melinda Gates Foundation. In August 2006, the Bill & Melinda Gates Foundation and the Government of Canada signed a five-year Memorandum of Understanding to collaborate on a uniquely Canadian program to focus on the following key areas:
- Discovery and social research
- Clinical trial capacity building and networks
- Pilot scale manufacturing capacity for clinical trial lots
- Policy and regulatory issues
- Community and social dimensions
- Planning, coordination and evaluation

RESULTS: Developing a national program with multiple partners in and outside the country as well as linkages to global efforts is possible with careful negotiation to ensure priorities of all are taken into consideration in the program design. Resources must be dedicated to manage the ongoing coordination of such a multi-faceted collaboration and the engagement of stakeholders.
CONCLUSION: The Canadian HIV Vaccine Initiative will contribute to the global search for an HIV vaccine by establishing four major funding areas with assistance from stakeholders in Canada and around the world.

POSTER PRESENTATIONS
Clinical

P130
DIX ANS DE SUIVI DE REVACCINATION SUITE A DES MANIFESTATIONS POST-VACCINALES
J-L Grenier, E Toth, S Giroux, S Ménard, R Roussel, G De Serres, M Landry, M Tremblay
CONTEXTE: Lorsque des manifestations cliniques indésirables (MCI) post-vaccinales sont signalées, des recommandations quant à la poursuite ou non de la vaccination avec des doses ultérieures du même vaccin sont habituellement émises. Au Québec depuis 1998 un suivi systématique a été rendu possible afin de vérifier la récidive ou non des MCI lors de l'administration de doses ultérieures. Un guide sur les conduites à tenir suite aux MCI a été revisé au Québec en 2005.
OBJECTIFS: Déterminer la proportion des MCI qui récidivent lorsqu'une recommandation de poursuivre la vaccination a été émise et évaluer la gravité de ces récidives.
METHODE: On a révisé les déclarations enregistrées dans la banque de donnée Québécoise ESPRI (Effets secondaires possiblement reliés à l'immunisation) depuis 1998 et faisant suite à une dose de vaccin dont le calendrier vaccinal prévoit une dose subséquente. Les variables suivantes ont été relevées : vaccin reçu et son numéro de dose, la MCI éprouvée, recommandation de poursuivre la vaccination, revaccination ou non, récidive ou non et nature de celle-ci, sévérité de la récidive. Les proportions de

récidive parmi les revaccinés, de même que la sévérité de celles-ci sont les mesures de résultats attendues.
RÉSULTATS: Un total de 2349 incidents étaient éligibles pour une recommandation de revaccination. Parmi ceux-ci, 1062 (45,2%) ont fait l'objet de cette recommandation et d'un marquage pour suivi. Une information de suivi a été inscrite pour 609 de ces cas (57,3%). Les proportions de récidive et leur sévérité seront extraite des dossiers au cours de l'été 2008.
CONCLUSION: L'ajout d'une variable de suivi de la recommandation de poursuivre l'immunisation a permis de documenter la survenue de récidives ou non suite à une revaccination. Le nouveau formulaire canadien de signalement des MCI intégrera cette variable. Cette information sera précieuse pour conforter ces recommandations car la littérature scientifique aborde peu ce sujet.

P131
PREDICTING THE IMPACT OF HUMAN PAPILLOMAVIRUS VACCINATION ON JUVENILE ONSET RECURRENT RESPIRATORY PAPILLOMATOSIS USING MATHEMATICAL MODELING

M Hawkes, P Campisi

BACKGROUND: With the recent licensure of a quadrivalent human papillomavirus (HPV) vaccine, many manifestations of HPV infection are now potentially preventable, including the devastating childhood disease juvenile onset recurrent respiratory papillomatosis (JORRP). Mathematical models have been used to predict the impact of vaccination on genital complications of HPV infection, but have not previously been applied to JORRP.
PURPOSE: To predict the impact of HPV vaccination on the incidence of JORRP using mathematical modeling.
METHODS: We used both deterministic and stochastic population dynamic mathematical models to estimate the impact of vaccination with the quadrivalent HPV vaccine on the incidence of JORRP. The models have the flexibility to account for a variety of vaccination strategies including variable uptake among young females as well as vaccination of young males.
RESULTS: Mathematical models predicted a declining incidence of RRP following implementation of HPV vaccination programs. The rate of decline depended on the immunization strategy, increasing with greater vaccination coverage and highest when both males and females were vaccinated. At a realistic immunization coverage of 50% of females (no males vaccinated), RRP incidence decreased by approximately 1.4% per year. The model predicted an important herd immunity effect. In the long term, models predicted that HPV types 6 and 11 and RRP could eventually be eliminated from a population by sustained vaccination of at least 36% of girls, although this would require over 100 years at a realistic vaccine coverage rate. At lower immunization rates, the JORRP incidence declined with vaccination to a new stable endemic equilibrium, but was not completely eliminated. In this scenario, vaccination of males provided incremental benefit and could tip the balance toward disease elimination.
CONCLUSION: The quadrivalent HPV vaccine is predicted to significantly decrease the incidence of JORRP, although gains will be slow at the current vaccination rates.

P132
A NATIONWIDE SURVEY OF PAST HEPATITIS A INFECTIONS AMONG CANADIAN ADULTS

C LaJeunesse, J Ochnio, D Scheifele, B Duval, G De Serres, V Gilca, M Ho, R Milner

BACKGROUND: HAV infection rates in Canada are low and declining. Our recent survey confirmed that HAV infection is uncommon in children but the burden in adults remains unclear. The true incidence might be substantially underestimated and the observed decline may also reflect changing patterns in reporting. More accurate, population-based sero-epidemiological estimates would better guide use of hepatitis A vaccines in Canada.
PURPOSE: To assess the burden of hepatitis A virus (HAV) past infections among Canadian adults.
METHODS: A country-wide survey of prior exposure to HAV and of selected risk factors was conducted among 18–70 year-olds identified by random digit dialing. Volunteers were sent study materials and returned oral fluid and completed questionnaires by mail. An ultra-sensitive assay was used to detect HAV antibody in oral fluid. Multiple logistic regression was used for risk factor assessment.
RESULTS: Of 2104 potential study participants, 1552 (74%) returned an adequate oral fluid specimen and questionnaire. Anti-HAV was detected in 509 individuals (33%) and was associated with birth in HAV endemic areas, self-reported prior hepatitis A vaccination, prior travel to developing countries, and increasing age. Among Canadian-born, non-vaccinated participants anti-HAV was present in 30% individuals from Quebec, 22% from Maritimes, 18% from Western Canada and 14% from Ontario. Age-specific positivity rates were: 18-29 years 2.6% , 95% CI 0.5, 7.4(3/115); 30-39 years 6.1% ,95% CI 2.8,11.2 (9/148); 40-49 years 11.4%,95% CI 6.9,15.9 (22/193); 50-59 years 26.4% ,95% CI 19.9,32.9 (47/178) and 60-70 years 46.5%, 95% CI 39.0,53.4 (85/184).
CONCLUSIONS: Past HAV infection rates among Canadian-born non-vaccinated individuals are low in young adults and increase by two fold per age decade. Travel to developing countries is a significant risk factor for Canadians. Interregional differences in anti-HAV prevalence are also present reflecting population differences.

P133
HEPATITS A VACCINE USE BY CANADIAN TRAVELERS IS INADEQUATE: RESULTS OF A NATIONWIDE SURVEY

C LaJeunesse, J Ochnio, D Scheifele, B Duval, G De Serres, V Gilca, M Ho, R Milner

BACKGROUND: HAV infection rates in Canada have been low for decades leading to an increasing number of susceptible adults. The observed explosion of international travel is recognized as an important risk factor for infection. To provide protection to travelers to endemic areas hepatitis A vaccine has been offered through travel clinics and physician offices for more than a decade. Effectiveness of this strategy is unclear as vaccine coverage in the general population and in travelers in particular is simply unknown.
PURPOSE: To estimate the proportion of Canadians who travel to endemic areas and the frequency of vaccination of travelers with current strategy of vaccine distribution.
METHODS: A country-wide survey of prior exposure to HAV antigens was conducted among 18-70 year-olds identified by random digit dialing. A questionnaire was used to collect information regarding history of travel to endemic areas and vaccination while oral fluid was used to detect HAV-specific antibody.
RESULTS: 53.3% of 1594 participants reported past travel to developing countries and 55.7% planned such travel within the next five years. Travel was most frequently reported by subjects residing in Ontario (65%) and Western Canada (60%). Only 24.1% of travelers and 29.4% of travelers below the age of 30 were actually vaccinated. Most travelers (72.5%) who were not vaccinated lacked protective antibody. A similar proportion of travelers in each age group was vaccinated. Subjects with higher educational level and higher income were more likely to have been vaccinated.
CONCLUSIONS: Majority of Canadian adults travel to hepatitis A endemic areas. Although less than a quarter of travelers received vaccine it is unclear what proportion of reported travels took place before vaccine was available. The low frequency of vaccination among young travelers who most likely traveled when vaccine was available and the high level of susceptibility among non-vaccinated individuals suggests that the current vaccination strategy is inadequate to curb disease importation.

P134

IMPROVED REAL-TIME PCR DETECTION SCHEME WHICH TARGETS THE BEXA CAPSULE GENE OF HAEMOPHILUS INFLUENZAE FOR ALL TYPEABLE STRAINS.

D Law, J Zhou, R Tsang

BACKGROUND: Conventional PCR schemes that target the *Haemophilus influenzae* bexA gene fail to detect clonal division II strains, including some of the serotype a, and many of the serotype e and f. Sequence data show that there are significance sequence variations that exist within the bexA gene of the two clonal types. Improvement in the PCR detection of capsular *H. influenzae* strains is required.

PURPOSE: To redesign PCR primers and probes with degenerations based on our sequence data in order to enhance detection of all capsular types of *H. influenzae* within both clonal divisions I and II.

METHODS: A SmartCycler II system (Cepheid) was used as the real-time PCR platform of detection. Specific PCR product was detected by measuring fluorescence in real time when a Carboxyfluorescein fluorescent dye (FAM) labelled probe was hybridized to the PCR product. Data collected were analysed with the SmartCycler software.

RESULTS: Forty seven *H. influenzae* strains from our culture collection were selected from this study and they included 12 serotype a strains (9 belong to clonal division I and 3 belong to clonal division II), 9 serotype b strains, 1 serotype c, 4 serotype d, 8 serotype e, and 13 serotype f strains (all clonal division II). All 47 strains were detected by our new PCR scheme compared to only 23 clonal division I strains were detected while the 16 clonal division II strains and 8 serotype e strains were missed by the conventional real-time PCR.

CONCLUSION: All typeable *H. influenzae* strains from our collection can now be detected by this new scheme to show that they all have the capsule gene bexA. The new scheme incorporates degenerate primer and probe designs to improve the detection efficiency to 100%. This improvement is important in any laboratory surveillance program that aims at precise characterization of strains.

P136

SAFETY AND IMMUNOGENICITY OF ADULT FORMULATION TDAP VACCINE FOLLOWING BLOOD AND MARROW TRANSPLANTATION (BMT) IN ADULTS

M MacFarlane Conrad, S Couban, S Halperin, J Edwards, SA McNeil

BACKGROUND: BMT is standard therapy for many disorders; however, it causes recipients to become susceptible to vaccine-preventable infection. Protection is reestablished by re-immunizing with a primary vaccine series. While booster immunization against pertussis is now recommended for all adults, evaluation of the safety and immunogenicity of Tdap is needed to establish the optimal dosing schedule required to ensure protection post-BMT.

METHODS: In this pilot study, patients aged 11-64 years 12 months post-BMT at our centre and who had not yet been vaccinated were enrolled. Patients received Tdap at 12, 14, and 20 months post-BMT. Serum IgG titres to pertussis antigens (FHA, FIM, PT, PRN) were determined by ELISA at baseline, as well as before and 8 weeks after each dose. Titres of IgG to the tetanus and diphtheria components of the vaccine were also analyzed.

RESULTS: Twelve patients were enrolled. Arm tenderness was the most commonly reported (54%) adverse event. At baseline, no patient had detectable IgG to pertussis antigens. After 3 doses, there was 33% seroconversion to FHA, PT and PRN, with 75% seroconversion to FIM. These levels were far below those achieved by healthy adults after one booster dose. Over 91% of patients developed protective titres of IgG to tetanus and diphtheria antigens.

DISCUSSION: Tdap has been recommended for all adults; however, the safety and immunogenicity of this vaccine in BMT recipients is not known. In this study, no clinically significant adverse events related to vaccination were observed. Subjects had no immunological memory for pertussis 1 year post-BMT; only low levels of seroconversion to all 4 antigens were achieved with 3 doses of Tdap, suggesting the need for multiple doses of Tdap post-BMT. This pilot study indicates that larger clinical trials to establish the optimal number and timing of doses of Tdap required to ensure protection in BMT patients are warranted.

P137

EAST MEETS WEST: THE MUMPS EXPERIENCE IN BRITISH COLUMBIA

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BACKGROUND: Recently in Canada large mumps outbreaks have occurred in Nova Scotia and Alberta. In 2008, in British Columbia, an outbreak of mumps occurred, initially affecting a small faith-based community in Fraser Health Authority. Sporadic cases of mumps have occurred across the province.

PURPOSE: We will describe the evolving mumps outbreak situation in BC, exploring similarities with and differences from outbreaks in other jurisdictions.

METHODS: An enhanced surveillance database of mumps cases began February 22, 2008 onward. Sporadic case data were obtained from iPHIS (reportable disease database used in BC). Laboratory test results were obtained from the public health laboratory to supplement epidemiologic data.

RESULTS: As of June 30, 49 laboratory confirmed cases, 18 epidemiologically linked cases and 42 clinical/suspect cases have been identified. All but five cases have occurred in Fraser Health Authority. Dates of onset for laboratory confirmed cases range from February 16 to June 16. The majority of cases (59%) are in a faith-based community. Confirmed cases (lab and epi-linked) range in age from 2-59 years old. Most cases have been in children and young adults, with 40% of cases 0-19 years old and 36% 20-26 years old. The ratio of male:female cases is 1:1. Vaccine history among confirmed cases is: two with 2 previous doses of MMR, 19 with 1 dose (31%), 13 with unknown histories and 27 cases (44%) unvaccinated. Health care workers, in general, have not been affected.

CONCLUSION: Thus far, BC's mumps outbreak has shown limited spread despite its epicenter in an unvaccinated community. Potential reasons may include limited mingling between the general population and the primarily affected community, vaccination of students in high schools near the faith-based community, lack of involvement of post-secondary institutions, and a long-standing policy of two dose of measles vaccination for students of colleges and universities.

P138

HEPATITIS B VACCINATION AMONG LIVER TRANSPLANT PATIENTS: A SYSTEMATIC REVIEW

C O'Leary, S Rouhani, Z Hong, J Wu

BACKGROUND: The preferred treatment for patients transplanted for hepatitis B virus (HBV) related liver disease is hepatitis B immunoglobulin (HBIG) combined with an antiviral such as lamivudine to reduce the risk of HBV recurrence. It has been found that HBV DNA can remain in most patients for more than 10 years following liver transplant (LT) and therefore treatment must be administered indefinitely. The use of long term HBIG treatment has its drawbacks such as the emergence of HBV escape mutants, various side effects, inconvenience and high cost. An assortment of studies have tested various active immunization strategies as an alternative to HBIG treatment with conflicting results.

PURPOSE: Our meta-analysis will summarize and compare the effectiveness of several active immunization schedules and analyse the various patient factors which predict successful anti-HBs antibody seroconversion.

METHODS: MEDLINE (Ovid) and PubMed databases since 1999 were searched for relevant articles using the key words: "HBV vaccine AND liver transplant" A systematic review was performed on epidemiological and clinical trials that met the prespecified criteria.

RESULTS: The results of various studies had widely conflicting response rates. The included 19 studies had an average response rate of 34%. Predictive factors for good response rates included multiple administrations of vaccinations, the use of a powerful adjuvant, a low dose of immunosuppression agent, acute HBV infection, a long interval between LT and vaccination as well as negative pretransplant HBV DNA.

CONCLUSION: Active hepatitis B vaccination is an alternative strategy to replace long term prophylaxis in LT patients which could reduce cost, and improve quality of life. Because of the fairly low rates of seroconversion, a careful patient selection is necessary if we want to achieve a successful hepatitis B immunization.

P139

HEPATITIS B IMMUNE GLOBULIN AND VACCINATION TO PREVENT TRANSMISSION OF HEPATITIS B VIRUS FROM MOTHER TO INFANT: A SYSTEMATIC REVIEW

C O'Leary, Z Hong, J Wu

BACKGROUND: The risk of an infant acquiring the infection though vertical transmission without the use of immunoprophylaxis ranges from 10% to 90% depending upon the mother's HBeAg-carrier status. The combination of Hepatitis B immune globulin (HBIG) and hepatitis B vaccine is considered to be the most effective strategy in controlling hepatitis B among infants.

PURPOSE: Our meta-analysis will summarize the effectiveness of different passive and active immunization schedules. We will also provide some suggestions of operational strategies for giving a subsequent dose of HBIG or a booster HBV vaccine.

METHODS: We performed a systematic review of epidemiological studies and clinical trials that met the prespecified criteria and provided data for estimating the protective rates of HBIG and hepatitis B vaccine. Databases searched from January 1, 1998 to May 31, 2008 included MEDLINE (Ovid) and PubMed, using the key words "Immunization, HBIG, HBsAg positive mother".

RESULTS: We included 21 epidemiological studies and clinical trials in our meta-analysis. For mothers with HBsAg (+) and HBeAg(–) markers, the protection rate of the 3-doses of hepatitis B vaccine for newborns was 90% whereas the combination of HBIG and hepatitis B vaccine gave newborns a protection rate of 96% (χ^2 =1523.38, P value <0.0001). For mothers with HBsAg(+) and HBeAg(+) markers, the protection rates of hepatitis B vaccine and the combination of HBIG and hepatitis B vaccine for newborns were 86.4% and 94.2% respectively (χ^2 =570.55, P value <0.001). The hepatitis B vaccine schedule of 0, 1, 6 months seemed superior to other schedules.

CONCLUSION: The combination of HBIG and hepatitis B vaccine provides the best protection rates for infants born to HBsAg-positive mothers. There is a need to verify the best schedule to deliver hepatitis B vaccine in Canada as well as around world.

P140

OPTIMIZATION OF HEPATITIS B VACCINE RESPONSES IN PATIENTS WITH CHRONIC KIDNEY DISEASE.

D Salloum, S McNeil, S Soroka

BACKGROUND: Patients undergoing hemodialysis (HD) are at increased risk for infection with HBV, and therefore Hepatitis B vaccination (HBV) is recommended for all patients starting HD. Increased infection risk is due, in part, to impaired cell mediated immunity which also leads to sub-optimal response (seroconversion) to currently available HBV vaccines.

PURPOSE: We reviewed the results of studies examining alternative immunization strategies in this population in an effort to enhance immunogenicity. Strategies studied include timing of vaccination (including pre-dialysis), route of vaccine administration (intramuscularly versus intradermal) and the use of various immune adjuvants.

METHODS: Using standard systematic review methods, the English language literature was searched for primary articles. Studies were reviewed to determine the population studied (pre-dialysis, hemodialysis or peritoneal dialysis), the type of vaccination regimen used (dose, schedule, route of administration), whether an adjuvant was used to increase immunogenicity, and the seroconversion rates.

RESULTS: The literature provides some evidence for improved rates of seroconversion when HBV is provided to patients with CRF before the need for dialysis. Improved rates of seroconversion, duration of protection, and economic advantages have also been documented for intradermal use of HBV compared to the intramuscular route. Lastly, evidence suggests benefits for the use of adjuvants including levamisole, AM3 (Inmunoferon®), erythropoetin, and granulocyte-macrophage colony-stimulating (GMCSF) with variable improvement in primary seroconversion rates and seroconversion rates among patients who failed to respond to routine HBV immunization.

CONCLUSIONS: Unfortunately, the studies reviewed herein were of variable size and differences in design and too heterogeneous to allow pooling of data for meta-analysis. The use of intradermal vaccination protocols in patients prior to starting dialysis appears to be the most efficacious, but may not have been widely adopted in Renal Programs in Canada. Further RCTs to determine the optimum dose and timing of vaccination prior to dialysis start are needed.

P141

REACTOGENICITY OF REPEATED SEASONAL INFLUENZA VACCINE DELIVERED BY INTRADERMAL MICROINJECTION: RESULTS FROM A RANDOMISED CONTROLLED OPEN LABEL TRIAL IN ADULTS

M Saville, I Leroux-Roels, G Leroux-Roels, M De Decker, I Meyer, M Seiberling, L Barreto

BACKGROUND: As an alternative to intramuscular (IM) vaccination against seasonal influenza, an intradermal trivalent inactivated influenza vaccine (ID TIV) was developed with a unique, convenient, and robust microinjection system. Two dosage presentations were developed specifically for elderly and younger adults: respectively 15µg or 9µg hemagglutinin/strain/dose.

PURPOSE: As a part of a phase 2 trial in younger adults, the reactogenicity of 3 annual vaccinations of ID TIV or an IM control (Vaxigrip®) was documented.

METHODS: Subjects were randomized each year for three years to receive ID or IM vaccination. After each vaccination, solicited injection site and systemic reactions were recorded daily to Day7, unsolicited adverse events (AE) were documented to Day21.

RESULTS: Of the 978 subjects aged 18-57 enrolled and vaccinated (ID=588, IM=390) in 2005; 864 were re-randomised in 2006 (ID=521, IM=343), and 818 in 2007 (ID=493, IM=325). Reactogenicity was not influenced by the administration route used in previous years: incidences of injection site and systemic reactions in the subgroup who received three ID vaccinations (ID-ID-ID subgroup) were comparable after each vaccination, and also comparable to observations after the ID vaccination in the IM-IM-ID subgroup. The proportion of subjects in each subgroup and year reporting at least one solicited injection site reaction after ID vaccination ranged from 92-95% (most commonly erythema), and 50-71% after IM vaccination. A higher incidence of visible injection site reactions is expected with a vaccine injected into the skin. The proportions reporting at least one solicited systemic reaction were 32-48% after ID and 34-50% after IM vaccination. Reactions were mainly grade 1-2, and transient (spontaneously disappeared within 3 days).

CONCLUSION: Three successive annual vaccinations of adults <60 with a new ID influenza vaccine or an IM control show that the ID vaccine can be used repeatedly and interchangeably with conventional IM vaccine, with no increase in reactogenicity.

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INTRADERMAL INFLUENZA VACCINE ELICITS SUPERIOR IMMUNE RESPONSES IN ADULTS AGED ≥60 YEARS: A RANDOMIZED CONTROLLED PHASE 3 TRIAL

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BACKGROUND: Annual trivalent inactivated vaccines (TIV) provide protection against influenza and its complications for hundreds of millions of individuals. Yet among elderly (aged 60 or more) adults, vaccine efficacy is lower than in younger adults. Elderly adults are also the most at risk, with the highest influenza morbidity and mortality. An influenza vaccine, injected using a novel intradermal microinjection system, has been developed to potentially offer improved protection for this vulnerable population.

PURPOSE: To assess whether TIV given via ID microinjection induces a superior immune response in adults aged 60 years or more, compared with an intramuscular (IM) control vaccine (Vaxigrip®).
METHODS: A multicenter, randomized controlled phase 3 trial was conducted in 4 European countries. Each vaccine dose contained 15µg hemagglutinin/strain. Strain-specific hemagglutination inhibition titers were assessed on D0 and 21 using a standard assay.
RESULTS: 3701 subjects aged 60-94 years (mean: 70.8±6.8) were enrolled and vaccinated ID (n=2612) or IM (n=1089) in autumn 2006. 54.4% were female. Seroprotection rates were significantly higher in the ID group (p=0.0003 for H1N1 and B, p<0.0001 for H3N2) with a difference of 5.5-6.6 percentage for each strain. Mean titer increases after ID vaccination were: H1N1 3.97, H3N2 8.19 and B 3.61, which were 24.5%, 53.1% and 18.8% higher (p<0.0001) than the corresponding values in the IM group. Seroconversion rates among those with a prevaccination titer <10 were significantly higher with ID: H1N1 64.3% vs 55.6% p=0.0127, H3N2 80.9% vs 69.3% p=0.0003 and B 41.3% vs 35.5% p=0.0282.
CONCLUSION: In a large phase 3 population of adults aged 60-94, the immunogenicity of a new ID influenza vaccine was superior to that of a conventional IM control vaccine. Increased serum antibody responses should provide improved protection against influenza for this vulnerable population.

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HIGH RISK OF ANAL CANCER IN INDIVIDUAL TREATED FOR ANAL CONDYLOMAS IN QUÉBEC PROVINCE (1990-1999)

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BACKGROUND: Anal cancer incidence is rising in many areas. For the period 1984-2001, in Montréal region the increase of anal cancer was 353% in men while for areas outside Montréal the increase was 244% for women. Human papillomaviruses (HPV) cause condylomas and are also found in more than 80 percent of anal cancer cases.
PURPOSE: To estimate the burden of anal HPV infection based on the standardized incidence ratio (SIR) of anal cancer among individuals who received treatment for anal condyloma in the province of Quebec (Canada).
METHODS: Data from Régie d'assurance maladie du Québec and the Tumor registry were coupled.
RESULTS: From 1990 to 1999 there were over 30,000 treatments for anal condylomas performed in 7074 patients of all ages. Overall 47% of these were men; in Metropolitan Montreal, an area with 44% of all cases, most (53%) were males. Over 3/4 of all individuals were aged 15-44 and 13% were 45-54. During the above period there were 15 anal cancers among the study population, resulting in an SIR of 424.
CONCLUSION: Persons receiving treatment for anal condylomas present a significantly higher risk of anal cancer than the general population. Whether this implies a causality link between HPV 6 and 11 and anal cancer, or shared risk factors like sexual behaviour remains to be explored. The newly approved quadrivalent HPV vaccine prevent both the types of HPV that cause warts (HPV types 6 and 11) as well as the most commonly associated with anal cancer (HPV types 16 and 18)and could thus significantly curtail the burden of HPV related disease.

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A TRAVEL-RELATED POSSIBLE CASE OF VACCINE-ASSOCIATED PARALYTIC POLIOMYELITIS (VAPP)

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BACKGROUND: A previously healthy 6 month old Canadian-born Chinese boy developed fever and acute flaccid paralysis (AFP) two weeks after receiving oral polio vaccine (OPV) in China. In Canada, prior to travel, he had received 2 routine doses of inactivated polio vaccine (IPV) at 2 and 4 months.
PURPOSE: To determine the etiology of the AFP.
METHODS: Investigations were conducted during two time periods – during his acute illness in China (immune work-up, stool culture, cerebrospinal fluid (CSF) cell count and chemistry and magnetic resonance imaging (MRI)) and in November-December 2007 upon return to Canada (serology, cultures, electromyogram (EMG) and MRI).
RESULTS: In China, the baseline immune work-up, was normal. Stool culture was only positive for poliovirus 3; the isolated strain showed 99.7% homology with the Sabin 3 OPV strain used in China. The CSF white cell count was 12×10^6/L, protein was 1.43 g/L, and glucose level was normal. CSF viral culture and polymerase chain reaction were not conducted. The MRI in China showed enhancement of the cauda equina, whereupon a diagnosis of Guillain Barre Syndrome (GBS) was made. He was appropriately treated. Canadian investigations revealed polio antibody titers of <1:8 for poliovirus 1, 1:32 for poliovirus 2 and 1:128 for poliovirus 3. The EMG demonstrated denervation to muscles of the left leg, and repeat MRI revealed enhancement (inflammation) of left-sided anterior horn cells of the spinal cord at two levels. Repeat cultures were negative. By May 2008, the child still has only motor paralysis of the left leg.
CONCLUSION: While initial Chinese investigations were consistent with a diagnosis of GBS, the above clinical, laboratory and imaging findings makes this a possible case of vaccine-associated paralytic poliomyelitis (VAPP). Although the seroconversion to polio 1 and polio 2 were reported in the literature to be >90% after two doses of IPV, the response to polio 3 was significantly less in one study, i.e. 74%. It is therefore possible that a poor response to polio 3 contributed to this patient developing VAPP.