hypertension studies, 2) help the VDW development efforts by clarifying data element creation rules and interpretations, and 3) document any new columns or tables in a Hypertension Registry data dictionary. All three sites had equal responsibility for registry development, documentation, and writing distributed code for quality checks rather than a lead site being designated for these efforts. **Results:** An algorithm for defining hypertension was used to create a "superset" of hypertensive patients. Using the protocol as a guide, the data team examined existing VDW tables to determine if all aims could be met with current data elements and developed solutions for additional variables or tables necessary to support planned papers. Challenges to harmonization of data elements were encountered in relation to data quality, data availability, and differing business models. Data team members gained a better understanding of the strengths and benefits of having a VDW in place, but also learned of areas where differing interpretations of the VDW data dictionary necessitated rework in the VDW or the need for better documentation. This presentation or poster will share how the team attempted to resolve these challenges in order to aid similar studies in the future. **Conclusions:** The Hypertension Registry is currently supporting at least 12 different hypertension papers and has been fully documented so that Hypertension Registries could potentially be built at additional sites. Continued discussion of VDW supported research efforts within the HMORN community is needed to learn how to best identify and create efficiencies.

Keywords: Hypertension Registry, Virtual Data Warehouse, Algorithm for defining hypertension

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C-C1-02:

Creating a GIS Infrastructure to Evaluate Air Quality's Effect on Health Outcomes

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Background and Aims: Air pollution exposure is a complex and heterogeneous condition. The association of air pollution with disease is consistently established in many epidemiological studies. This creates a need for an infrastructure to measure both air pollution levels and health outcomes geospatially. **Methods:** As part of the North American Public Health Institute, we developed a multidisciplinary, international research team encompassing Windsor, Ontario, Canada and Detroit, Michigan, USA. While this geographic region consists of a single air-shed it exhibits different socioeconomic conditions and health delivery systems. We deployed 100 active and/or passive pollution samplers across this common air-shed based on U.S. Environmental Protection Agency guidelines for ambient air monitoring to determine levels of gaseous (i.e., NO2, SO2), volatile and particulate pollutants at a resolution greater than what is currently available. We are collecting asthma-related health outcomes for the populations residing within this region using emergency room, clinic, and hospital encounters from American and Canadian health care providers. Utilizing global positioning satellite for pollution sampler allocation and geocoding technique for patient address location, we created a complex mappable system to relate air pollution components and levels to health outcomes. **Results:** Air pollution levels can be linked to asthma events by several mechanisms. The first step is to use direct measurement value of the closest sensor by creating Voronoi polygons and mapping the asthma events to that geographic area. Associations between pollution level and asthma exacerbation can be examined between these data set. Models of the pollution levels using land use regression can increase the resolution beyond the point values. Longitude/latitude coordinates can be mapped to a pollution level in the surface generated by the model. **Conclusion:** Establishing a geospatial information system (GIS) integrated database with both pollution measurements and health outcomes creates a comprehensive resource. This infrastructure is flexible enough to investigate the effects of air pollution on many diseases, such as respiratory and cardiovascular disease, by physical and mathematic modeling. We can also compare health outcomes by health delivery system.

Keywords: Air pollution exposure, Geospatial Information System, Asthma-related Health outcomes

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C-C1-03:

Using the Electronic Health Record to Create Population Denominators: Optimization Using Insurance Enrollment

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Background and Aims: The HMORN includes research centers that are part of integrated delivery systems where the practice and insurance entities are independent (e.g., Geisinger, Marshfield). Rules for defining population denominators at these centers require acknowledging that patients in the practice population may not be members of the insurance entity. Methods for defining a population denominator for primary care patients from the electronic health record (EHR) can be validated in the subset of patients who are in the primary care system and members of the insurance entity. The aim of this study was to validate and optimize a method for calculating population denominators from the EHR. **Methods:** We proposed a method for defining population denominators from the EHR data at HMORN 2009. This method was based on describing utilization patterns of primary care patients' overtime. For this study, the cohort was limited to the subset of Geisinger primary care patients who were enrolled in the Geisinger Health Plan. Survival analysis was used to minimize bias in person-time estimates and incidence estimates. The aims were to identify optimal times from insurance enrollment to first utilization and time from final utilization to insurance disenrollment. Since the results are likely dependent upon gender and age (i.e. a typical gap in utilization will tend to be longer for young males as compared to older males), the analyses were compared across patient demographics. **Results:** To define cohort entry, the time between initial encounter and insurance enrollment was estimated using survival analysis. EHR enrollment was considered active until the patient failed to have any encounters with a primary care clinic for an age/gender specific cutoff of time. If the patient became inactive, the end date was imputed forward in time based on optimization from survival analysis using the insurance enrollment. These estimates were used to create an age/gender specific algorithm for calculating population denominators from the EHR. **Conclusions:** EHR utilization can be used to define population denominators. Validation of the proposed method was conducted by comparing results to insurance enrollment spans. This application is limited to clinical areas where there is evidence of relatively complete capture.

Keywords: Electronic Health Record, Defining population denominators, Data utilization

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C-C1-04:

How to Win Friends and Influence People with the SAS Output Delivery System

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Background and Aims: Long-time SAS users remember the days when SAS output was embarrassingly ugly. Version 7 saw the introduction of the Output Delivery System (ODS). ODS has matured into a very capable subsystem that gives users powerful reporting options. This presentation will highlight useful features and outline a macro-based system for handling multiple ODS destinations simultaneously. Nowadays there is no excuse for ugly SAS output! When building reports, SAS users should think about the needs of those using the reports. Some people just want to review frequency tables, and are happy to do so on a monitor. Others want to be able to print data for review in a meeting. And, there are always those that want to work with the data in a spreadsheet. Consider the ideal formats for each of the users

outlined above. For the casual data browser, HTML output is ideal. For printing, PDF is preferred. And for the additional analysis, Excel is a popular option. With ODS, we can meet all of these needs. **Methods:** Because ODS permits opening multiple output destinations simultaneously, a single procedure can be used to generate data in HTML, PDF, and Excel at once. The presentation will demonstrate the following: o- basic ODS syntax for HTML, PDF, and Excel output o- custom HTML table of contents o- using the ExcelXP tagset for multi-tab spreadsheets o- a custom macro for managing multiple ODS destinations simultaneously o- simple PROC Template code for easy customization o- techniques for consistent output from multiple platforms. **Results:** The techniques outlined here have been well-received in a variety of business reporting environments. **Conclusions:** The SAS ODS provides a wide array of reporting options. Don't limit yourself to just one type of output.

Keywords: SAS Output Delivery System, Reporting options, Output Delivery System destinations

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PS3-04:

Cultivating an Environment and Attitudes Where Data Quality Improvement of the Virtual Data Warehouse Can Occur

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Background and Aims: The Virtual Data Warehouse (VDW) at the Institute for Health Research (IHR) at Kaiser Permanente Colorado (KPCO) is the data source of choice for the IHR analytic team. This research ready data source is important for efficient use of analytic team resources. Our aims are to 1) describe the attitudes, methods and processes that lead to high data quality in the VDW at KPCO, and 2) provide examples of improvement successes. **Methods:** The methods used to pursue VDW improvement include the following: 1) we gathered support from all local interested parties and provided avenues for all interested parties to participate in setting VDW file improvement priorities along with the allocation of available resources to support the process; 2) we worked to develop relationships with experts in data content areas throughout KPCO's clinical delivery system and those overseeing legacy source data systems; 3) we stayed informed of issues concerning the VDW by participating at the national level in committees concerned with VDW development; 4) we encouraged programmer networking at both the local and national levels; 5) we created an environment that encouraged detailed file documentation; 6) we encouraged two way communications between those using data files and those creating data files. **Results:** We found that nurturing a collaborative team spirit encouraged 1) the identification of key individuals best suited to improve specific files, 2) realistic estimates of time necessary to complete the improvement tasks, and 3) the freeing of time for those key individuals to perform these tasks. Engaging content experts outside of the IHR allowed for better understanding of legacy data files and allowed for lead time to respond to data system changes. Engaging programmer networks allowed for the development and sharing of best practices. Enhanced VDW file documentation lessened the chance of misinterpretation or misuse of data. Enhanced communication between those creating the VDW files and those using the files assure continued improvement. **Conclusions:** Good communication among many different parties and a supportive team spirit from local interested parties are necessary to facilitate the building and maintenance of a high quality research data structure.

Keywords: Virtual Data Warehouse, High quality research data, Quality data best practices

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Genetics

PS1-08:

Genetic Service Providers Identify Barriers Related to Referral, Counseling and Testing for Familial Cancer

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Background and Aims: Little of what we know about the use of family history and genetic risk assessment services has been gathered from those engaged in counseling. To fill this gap, we conducted a survey to understand the processes of identifying and referring high-risk patients for genetic counseling and testing for familial cancer from the perspective of genetic service providers. **Methods:** Genetics professionals (genetic counselors and physician geneticists) from eight CRN sites were surveyed. The survey, administered via Survey Monkey, included questions regarding sources of referrals, steps to get an appointment, use of electronic medical records, perceived barriers to referral, strategies employed to improve identification and referral of high-risk patients, and ways to increase awareness among providers of the value of obtaining family history of cancer. Analyses involved computing frequencies of categorical responses and means of continuous responses (performed in SAS v9.1). **Results:** Of the 40 invited, twenty-eight individuals responded to the survey (70%). Referrals were predominantly from providers (89% on average) versus self-referrals (10% on average). Barriers that may prevent patients who are referred for counseling services from being seen included the following: genetic risk evaluation was not a priority for patients (72%, 18 of 25 responding to this item), concerns about insurance (52%, 13 of 25), distance to appointments (48%, 12 of 25), lack of patient and/or provider knowledge (36%, 9 of 25), discouragement by family members (28%, 7 of 25), and fear (20%, 5 of 25). Attending meetings was the most frequently (57%, 16 of 28) reported strategy to increase awareness among and referrals from providers. Provider education was mentioned most frequently (70%, 14 of 20 responding to this item) to improve understanding of the value of family history documentation and increasing referrals. **Conclusions:** Our survey identified several areas in the identification and referral process for cancer genetic services where opportunities for improvement exist including increasing awareness of the importance of genetic risk assessment among general practitioners, creating a simple standard for collecting genetic information and referring patients, and promoting the value of family history and the importance of determining genetic susceptibility, when appropriate, among patients and providers.

Keywords: Genetic risk assessments, Genetic counseling, Testing for familial cancer

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PS1-09:

Public Opinion of Family History and Genetic Testing for Common Diseases: Results from Focus Groups with Kaiser Permanente Colorado Members

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Background and Aims: With the advent of personalized medicine, consumers are routinely exposed to information about new gene discoveries, family history, and direct-to-consumer (DTC) advertising of genetic tests. Since 2008, the BRACAnalysis® test for breast cancer risk has been steadily advertised directly to consumers in different markets across the US, and at least 3 companies now offer DTC genetic screening for $300 - $1000, with more companies entering this burgeoning market. The specific aims of this project are to: 1) determine how individuals understand the issue of family history and DTC genetic tests, and 2) to determine how individual perspectives about issue salience and issue frames differ by population group.