Human Factor
ANALYTICS

# Executive Summary of Population Health Management Report

Time Period:

Medical Utilization Data: January 1, 2013 to December 31, 2014

Pharmacy Utilization Data: January 1, 2013 to December 31, 2014

Prepared for:

## State of Arkansas
## Bureau of Legislative Research

# Executive Summary

## Introduction

The following report is the result of an analysis of archival medical and pharmacy utilization data for Arkansas State Employee (i.e., labeled as "ASE") and Public School Employee (i.e., labeled as "PSE") health plans that service employees, spouses, dependents, and retirees of the State of Arkansas. The intent of this analysis is to yield a better understanding of the epidemiology currently influencing this population and to suggest population health management opportunities that can address the specific risk impacting this population. In order to accomplish this task, archival data was processed through proprietary algorithms in order to properly risk-stratify the population. The risk of a population has a direct relationship to current and future spending patterns. Variables that are the building blocks of risk and/or disease include, but are not limited to:

- Age, Gender, Lifestyle, Genetics, Ethnicity, Acute Illness, Chronic Illness, Co-Morbidities, Multi-Morbidities, Medication Compliance/Non-Compliance, Compliance/Non-Compliance to Evidence-Based Guidelines, Gaps in Care, etc.

The majority of the aforementioned variables were utilized to investigate risk stratifications within the population. A sample size of this magnitude can yield unique insights into future population health management strategies. The overall health of a population is determined by multiple factors; however, an individual's lifestyle is a powerful predictor of leading causes of morbidity and disability.

This report has some limitations in that lifestyle factors such as physical activity status, nutrition, tobacco use, and weight/BMI could not be included in the stratifications of risk associated with this population. However, if the Arkansas State & Public School Life & Health Insurance Program Legislative Task Force and the Bureau of Legislative Research decide to move forward with recommended population health management strategies, this data can be collected and included in future analyses.

This analysis explored multiple areas of interest within the data, including the following research questions:

1. What is the cost burden of lifestyle modifiable risk factors within the employee population?
2. What is the relationship of age and gender to various disease states?
3. What are the gaps in care associated with suggested preventive measures for this population?
4. What is the relationship between drug compliance and non-compliance, as related to disease severity?
5. What is the financial burden associated with chronic disease within this population?
6. What is the distribution of acute disease versus chronic disease within this population?
7. What is the level of HEDIS compliance (i.e., evidence-based & preventive medicine) within this population?
8. What is the expense related to specific co-morbidities (i.e., hypertension, hyperlipidemia, depression, etc.) within this population?
9. What variables best predict and explain future high spenders within this population?
10. What are actionable solutions that can be implemented to mitigate existing and future health risks?

This report has attempted to explain the causality of risk and precursors to risk within the State of Arkansas ASE and PSE data. As was validated through this analysis, there is a wide variety of risk that was identified through the archival healthcare utilization and pharmacy data. It should be noted that each risk group offers an opportunity for population health management strategies. Some of these strategies will include therapeutic lifestyle change (e.g., exercise, proper nutrition, weight management, tobacco cessation, etc.) and some of the strategies will include specific evidence-based clinical tasks. Successful population health management interventions are well communicated, sensitive to human behavior patterns, and are implemented into a supportive work environment.

Population health management has been implemented in the United States for more than 30 years. Scientific documentation has proven that well-designed programs can yield reductions of risk within the participating population and potential reductions in medical expenditures. Through the use of analytics, pre and post results from a population health management program can be measured and strategies can be amended to ensure program success. By having access to additional data, many more questions can be explored with regard to this population. Our hope is that this report will stimulate the need for further questioning of the data and the start to a successful risk management strategy.

## *Key Findings and Solutions for Consideration*

The following key findings resulted from the analysis of archival health care data (i.e., medical utilization data and pharmacy utilization data) conducted by Human Factor Analytics.

***Key Finding 1: Reductions in Spending from 2013 to 2014***
*Pages 14-15, 24-27, 32-35, 53-62, and 65-69 of Population Health Management Report*

- **Key Finding:** When looking at overall spending for the ASE and PSE populations combined, there was a $19,778,382 reduction in medical spending from 2013 to 2014; this dollar figure was based on total amount paid. Both populations also had a slight reduction in mean (average) expenditures from 2013 to 2014; the PSE population had a mean expenditure of $2,542 in 2013 and a mean expenditure of $2,261 in 2014. The ASE population had mean expenditures of $2,786 in 2013 and $2,586 in 2014. Savings was also realized in pharmacy expenditures; this savings combined for PSE and ASE was $28,707,079.

  This savings was primarily due to the inclusion of reference-based pricing for several drug categories and other consumer-based strategies (i.e., a large portion of the population was taking generic and therapeutic equivalent medications rather than brand name medications). An analysis was conducted to investigate the causality of the reduction in medical spend **(Refer to Attachment 3)**. The analysis first looked at the overall state of health of the population to see if the population was healthier from 2013 to 2014 or if there had been some type of universal risk reduction. Several methodologies were used to quantify risk within the ASE and PSE populations from 2013 to 2014.

  Patterns of risk generally occur within any given population. In order to better understand these patterns, the population was risk stratified into the following five distinct groups:

| Group | Description |
|---|---|
| 1 | No chronic disease and less than $1,500 utilization expenditures per 12 months |
| 2 | No chronic disease and $1,500 or more utilization expenditures per 12 months |
| 3 | Chronic disease* with no co-morbidities and no complications |
| 4 | Chronic disease with co-morbidities, but no complications |
| 5 | Chronic disease with co-morbidities and disease-specific complications**, or chronic disease with disease-specific complications but no co-morbidities |

*This calculation includes the following chronic diseases: Asthma, Cancer, Heart Disease, Hypertension, COPD, Diabetes, Obesity, Hyperlipidemia, and Depression.
**This calculation includes complications to the following diseases: Asthma, Diabetes, COPD, and Heart Disease.

Mean amount paid within the ASE population was as follows in 2014:

- Group 1: N = 29,582 Mean = $372
- Group 2: N = 5,751 Mean = $5,603
- Group 3: N = 16,086 Mean = $2,783
- Group 4: N = 13,920 Mean = $4,123
- Group 5: N = 3,325 Mean = $9,375

Mean amount paid within the PSE population was as follows in 2014:

- Group 1: N = 44,849 Mean = $299
- Group 2: N = 6,643 Mean = $6,323
- Group 3: N = 20,482 Mean = $2,622
- Group 4: N = 14,120 Mean = $4,180
- Group 5: N = 2,868 Mean = $10,937

An analysis was completed to investigate the economic differences between each group. The analysis revealed that for both ASE and PSE populations, mean expenditures increased as an individual incrementally progressed from Group 3 to 4 to 5.

It should be noted that in chronic Disease Groups 3, 4, and 5, spending was $7,551,838 less for the ASE population in 2014 when compared to 2013 spending. The total number of chronic diagnoses slightly increased for Group 3 and Group 4. Even though the numbers increased, overall spending decreased for these groups. When looking at the PSE population, spending also reduced in Groups 3 and 4 and was slightly higher for Group 5. Even after subtracting the added costs that Group 5 had in 2014, there was still an $8,315,974 dollar reduction in spending.

When both the reduction in spending for the ASE and the PSE populations are added together, that equates to a reduction in spending related to the population with chronic disease (i.e., Groups 3, 4, and 5) of $15,867,812. Therefore, it is plausible to suggest that this reduced spending was due to the increased preventive visits that took place between 2013 and (primarily) in 2014. Past research studies have demonstrated that various preventive visits can lead to cost reductions of 8 to 9 percent (cited research is available upon request). In order to better validate this observation, 2012 data should be analyzed as a baseline year and other statistical experimentation should be completed.

In 2013 and 2014 combined, there were a total of 25,011 individuals from the ASE population who had preventive health codes (i.e., codes that were included in the wellness program, as listed in Appendix V) and 45,535 individuals from the PSE population who had preventive visits. In order to test if participants were of equal risk status to non-participants, an analysis was conducted that counted the number of unique diagnoses for each group to ascertain the equality of risk **(Refer to Attachment 2)**. The greater the number of ICD-9 codes, the greater the risk.

In addition to the analysis of risk equality, an analysis was performed to isolate outcomes derived from individuals undergoing a colonoscopy as a preventive visit **(Refer to Attachment 6)**. The results identified 1,152 unique individuals from PSE population who had a colon cancer screening and had a tumor or polyp biopsied or removed; the analysis further identified 42 unique individuals with a diagnosis of colon cancer. For the ASE population, 967 unique individuals had a tumor or polyp biopsied or removed, and 31 unique individuals had a diagnosis of colon cancer. The early diagnosis of colon cancer can greatly reduce cost of treatment, improve clinical outcomes, and contribute to an individual's quality of life.

The strategy to increase preventive visits seems to have yielded some good outcomes for both the ASE and PSE populations.

Based on the chronic diseases included in the aforementioned Disease Group Risk Stratification, more than 45 percent of the ASE population and more than 40 percent of the PSE population (i.e., of the portion of each population that had medical claims in 2014) had a chronic disease. It would be estimated that an additional 10 to 15 percent of the population have chronic illness and have not yet been diagnosed, due to gaps in care.

The top three most expensive chronic diseases for both the ASE and PSE populations in 2014 were: (1) Cancer, (2) Heart Disease, and (3) Diabetes. The top three most frequently diagnosed chronic diseases for the ASE population in 2014 were: (1) Hypertension, (2) Hyperlipidemia, and (3) Cancer. The top three most frequently diagnosed chronic diseases for the PSE population in 2014 were: (1) Hypertension, (2) Cancer, and (3) Hyperlipidemia.

For both the ASE and PSE populations, Diabetes was number three (3) for overall costs and number four (4) for frequency. It should be noted that Diabetes is often a precursor for Heart Disease, Renal Disease, and Cancer.

An analysis was performed to look at the prevalence of catastrophic expenditures for 2013 and 2014 **(Refer to Attachment 4).** Catastrophic spend was defined as individuals claims exceeding $100,000. The ASE population had 52 claims in 2013 and 59 claims in 2014. The PSE population had 85 claims in 2013 and 98 claims in 2014. Thus, both groups had increased catastrophic claims from 2013 to 2014.

Recommended Solution: The impact of chronic disease, co-morbidities, and disease-specific complications magnifies the impact of an individual's mean and overall expenditures. This type of stratification (i.e., the aforementioned Disease Group Risk Stratification) clearly shows that a relatively similar group of individuals drives a large percentage of overall expenditures. A population health management strategy that targeted individuals in Groups 1, 2, & 3 would have the largest return on investment. Groups 1, 2, and 3 would be considered emerging risk or low risk populations.

The challenge is to prevent individuals with chronic disease from developing co-morbidities and disease-specific complications. Special attention should be given to evidence-based medicine compliance for individuals with chronic disease in order to prevent migration to higher risk status. This, in combination with lifestyle modification, should be a primary focus for future population health management strategies.

Consider the implementation of a health risk appraisal and biometric screenings (i.e., height, weight, Blood Pressure, Total Cholesterol, LDL Cholesterol, HDL Cholesterol, Triglycerides, Glucose, HbA1c) for the insured lives within the health plan. A screening of this type will yield invaluable data, increase health risk awareness, and identify individuals that are currently undiagnosed with chronic illness.

Implement a Cultural Audit to determine the population's receptivity to a population health management program. The Cultural Audit will identify critical viewpoints from management-level personnel versus non-management personnel. This type of audit can yield valuable information to the planning stage of any population health management initiative.

Introduce a participation-based wellness program in Year 1. A participation-based wellness program allows an employer to connect wellness participation (e.g., complete a Health Risk Appraisal and participate in a Biometric Screening) with an employer-sponsored health plan. Connecting the wellness program with incentives through the health benefits plan will help ensure high participation rates among plan participants. The data captured through the wellness program will help with the early identification of individuals with various chronic diseases (e.g., hypertension, diabetes, hyperlipidemia, obesity, metabolic syndrome, etc.) and help connect these individuals with physicians for clinical attention to their various risk factors. It would be expected that a program of this type would identify an additional 10 to 15 percent of the population with chronic illness. The biometric screening should include Height, Weight, Blood Pressure, Total Cholesterol, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol, Triglycerides, Glucose, HbA1c, and Girth Measurement.

Consider the use of a Health Risk Appraisal (HRA) that has actuarial validity with regard to predicting high-spend individuals. Through the use of advanced analytics a correlation can be made between an individual's overall HRA score and their overall and mean health care expenditures. In the future, this relationship could aid State of Arkansas in negotiating insurance rates (i.e., re-insurance, disability, and life insurance) and better project future expenditures.

In Year 2 of the intervention, consider evolving the participation-based wellness program into a strategy that utilizes evidence-based clinical rules to guide participants to choose from a menu of clinical "to dos" that are relevant to the participant's age, gender, health status (i.e., chronic versus non-chronic) and gaps in care. For example, if the participant has chronic disease, give incentive for the participant to take their medications and get their disease-specific preventive visits.

An analysis was conducted to demonstrate the value of individuals with diabetes complying with their medications; the analysis revealed that compliance to evidence-based medications for diabetes reduced the chance of developing diabetes-specific complications **(Refer to Attachment 7)**. Based on an additional analysis, there were a large number of individuals with a diagnosis of diabetes within the ASE and PSE populations who are non-compliant to evidence-based medications related to diabetes management **(Refer to Attachment 1)**. Systems are available that can mail specific clinical "to dos" to each member's home and monitor on-going compliance to these directions; this strategy also impacts the spouse and dependent children.

The majority of wellness program strategies often do not implement programs that are sensitive to the clinical side of population health management and just concentrate on lifestyle modification (e.g., exercise, nutrition, stress management, etc.). However, in order to be effective with the chronic population, clinical strategies must be a part of the overall population health management strategy. Further analyses were conducted to identify the importance of chronic disease as a predictor of future spending **(Refer to Attachments 8 and 9)**.

***Key Finding 2: Diabetes Complications and Co-Morbidities***
*Pages 28-29 of Population Health Management Report*

- **Key Finding:** The top three Diabetes-specific complications for both the ASE and PSE populations in 2014 were: (1) Cardiovascular, (2) Neuropathy, and (3) Retinopathy. Diabetes-specific complications are associated with uncontrolled diabetes and sometimes with undiagnosed diabetes. For example, a diagnosis of Idiopathic Neuropathy means "of no known cause"; however, it is often associated with an undiagnosed case of diabetes. Wellness programming that includes biometric screenings would identify individuals with undiagnosed diabetes.

  Individuals with diabetes were identified and a risk stratification analysis was performed. The results of this stratification discovered that for the ASE population in 2014 there were 2,122 individuals with diabetes that had only 0 to 1 co-morbidities attached to their primary diagnosis of diabetes. For the PSE population in 2014, there were 2,344 individuals with diabetes that had only 0 to 1 co-morbidities attached to their primary diagnosis of diabetes. Disease management in combination with compliance to HEDIS guidelines for diabetes would offer a high return on investment with this group of emerging and low-risk individuals with diabetes.

- **Recommended Solution:** Establish evidence-based medicine guidelines (i.e., HEDIS goals, as described in the Recommended Solution for Key Finding 3) for the population that relate to diabetes management:

- Hemoglobin A1c (HbA1c) testing
- Hemoglobin A1c control (<7.0%)
- Retinal eye exam performed
- LDL-C screening
- LDL-C control (<100mg/dl)
- Screening for neuropathy
- Blood Pressure control (<130/80 mm/Hg)
- Medical attention for nephropathy

***Key Finding 3: Preventive Screenings***
*Pages 41-42 of Population Health Management Report*

- **Key Finding:** Preventive screenings for breast cancer, cervical cancer, and colorectal cancer were well below HEDIS National Guidelines. The suggested standards for HEDIS National Guidelines are as follows:

  - Breast Cancer Screening: 80% in the 95th percentile and 69% in the 25th percentile
  - Cervical Cancer Screening: 82% in the 95th percentile and 73% in the 25th percentile
  - Colorectal Cancer Screening: 68% in the 95th percentile and 50% in the 25th percentile

  Actual screening rates for the ASE population were as follows in 2014:

  - Breast Cancer Screening 44.2%
  - Cervical Cancer Screening 33.9%
  - Colorectal Cancer Screening 15.8%

  Actual screening rates for the PSE population were as follows in 2014:

  - Breast Cancer Screening 46.1%
  - Cervical Cancer Screening 36.6%
  - Colorectal Cancer Screening 14.5%

- **Recommended Solution:** Increase the awareness of age/gender-specific preventive screenings within the population. Education in combination with various incentives would increase the population's compliance with preventive screenings. Increased compliance to preventive screenings would identify diseases in the early stage, thus improving treatment outcomes and decreasing future expenditures.

  Establish at least five HEDIS (Healthcare Effectiveness and Information Set) goals for the population. HEDIS is one of the most widely recognized healthcare performance measures in the United States. Suggested goals are as follows:

  - Goal 1: Increase the number of individuals between the ages of 18 to 75 who have a diagnosis of diabetes and are compliant with the following evidence-based medicine guidelines:
    - Hemoglobin A1c (HbA1c) testing
    - HbA1c poor control (>9.0%)
    - HbA1c control (<8.0%)
    - HbA1c control (<7.0%) for a selected population
    - Eye exam (retinal) performed
    - LDL-C screening
    - LDL-C control (<100 mg/dl)
    - Medical attention for nephropathy
    - BP control (<130/80 mm Hg)

- Goal 2: Increase the number of individuals between the ages of 18 to 74 who had an outpatient visit and had their body mass index (BMI) documented
- Goal 3: Increase the percentage of women between the ages of 40 to 69 who had a mammogram to screen for breast cancer
- Goal 4: Increase the percentage of women between the ages of 21 to 64 who received one or more Pap tests to screen for cervical cancer
- Goal 5: Increase the percentage of individuals between the ages of 50 to 75 who had an appropriate screening for colorectal cancer

***Key Finding 4: Musculoskeletal Diagnoses***
*Pages 22-23 and 43-44 of Population Health Management Report*

- **Key Finding:** Expenditures for musculoskeletal-related diagnoses were the second most expensive diagnostic category for both the ASE and PSE populations in 2014 (i.e., approximately $19.1 million for ASE and approximately $22.6 million for PSE).

  An analysis was completed to investigate which Musculoskeletal & Connective Tissue claims could potentially be work-related. Work-related musculoskeletal claims are usually associated with jobs or crafts that require manual material handling, frequent bending and twisting, static work posture, or whole body vibration. The results of this analysis were as follows for the ASE population in 2014:

  - Back $491,575
  - Upper Extremity $175,948
  - Hand & Wrist $79,805

  The results of this analysis were as follows for the PSE population in 2014:

  - Back $585,844
  - Upper Extremity $229,826
  - Hand & Wrist $112,791

- **Recommended Solution:** Based on the high frequency and costs associated with musculoskeletal medical claims, consider the implementation of pre-employment physical ability testing that simulates the essential functions of a particular job or craft. Conduct a job task analysis identify the essential functions of high-risk jobs. EEOC has specific guidelines for the design and implementation of physical ability tests. A well-designed physical ability test can help prevent worksite injury.

***Key Finding 5: Medication Compliance***
*Pages 25, 27, and 51-52 of Population Health Management Report*

- **Key Finding:** Calculation of a Medication Possession Ratio revealed that within the ASE population in 2014, 19,605 individuals were prescribed hypertension medication (97.5% MPR) and 6,463 were prescribed statin medication (i.e., lipid management drugs) (98.1% MPR). Within the ASE population, there were 17,308 unique individuals in 2014 who had a diagnosis of hypertension and 9,637 who had a diagnosis of hyperlipidemia.

  For the PSE population in 2014, 13,543 individuals were prescribed hypertension medication (96.6% MPR) and 4,060 were prescribed statin drugs (98.5% MPR). Within the PSE population, there were 18,575 unique individuals in 2014 who had a diagnosis of hypertension and 10,164 who had a diagnosis of hyperlipidemia.

The Medication Possession Ratio determines an individual's compliance to medications. However, it only takes into account individuals who have been prescribed medication and have refilled the prescription at least once. It does not take into account the other people who may have a diagnosis, but no prescription has been tracked. For example, a person may have a diagnosis for hypertension, but they may not appear in the pharmacy data due to the fact that they either have no prescription or they have failed to fill a prescription they were prescribed.

- **Recommended Solution:** Implement a solution that identifies all individuals who are non-compliant with medications and implement a mail-out reminder to the member's home address. Combine this strategy with an incentive connected to the member's benefit plan design.

***Key Finding 6: Patient/Physician Communication***
*Pages 22-23 of Population Health Management Report*

- **Key Finding:** It should be noted that high frequencies of Symptoms, Signs, and Ill-Defined Conditions (i.e,. the fourth most expensive diagnostic category for both the ASE and PSE populations in 2014) could be a strong predictor of poor patient/physician communication. Within this category, no specific diagnosis is rendered, yet treatment cost is experienced. For example, with a diagnosis of Symptoms, Signs, and Ill-Defined Conditions involving the abdomen, in reality the diagnosis could be more specific as Gastro Esophageal Reflux Disease (GERD).

- **Recommended Solution:** Personal electronic health records can help improve the accuracy of an individual's diagnosis, and writing down all symptoms prior to a physician visit can also improve the accuracy of diagnosis.

***Key Finding 7: Avoidable Emergency Room Visits***
*Pages 63-64 of Population Health Management Report*

- **Key Finding:** Avoidable Emergency Room visits for the ASE and PSE populations combined amounted to greater than $1.5 million in excess spending **(Refer to Attachment 5)**. Avoidable ER visits are defined are as those visits which could have been appropriately treated in another setting at the time the visit occurred. The State of Washington, through sampling of 53 hospitals and 2.2 million patients, established the definition of avoidable ER visits. Avoidable ER visits have the following statistics:

    - 1 out of 9 visits is avoidable.
    - Avoidable visits account for approximately 11 percent of the overall ER spend.
    - Children that are less than 18 years of age comprise 1/3 of all avoidable visits.
    - The majority of avoidable visits are comprised of females.
    - The uninsured have approximately the same rate of avoidable visits as compared to the insured.
    - The majority of avoidable ER visits occur between 12 p.m. and 8 p.m.

- **Recommended Solution**: In order to effectively reduce avoidable ER visits, frequent flyers need to be identified and connected with a primary care physician. The State of Washington research indicated that if these individuals are assigned a primary care physician, avoidable ER visits will be reduced by approximately 58 percent. It would also be suggested to distribute medical self-care guides to help people differentiate between an emergency and a situation that can be resolved at an alternative setting. One other leading cause for avoidable ER visits is related to drug seeking behavior; this can be limited by urging hospitals to limit the amount of pain management drugs that are prescribed, especially opioid-based medications.

### *Key Finding 8: Warehouse Data in Relational Database*

- **Key Finding:** It is recommended that State of Arkansas consider warehousing all relevant healthcare data within a relational database that has the ability to query the data. By having the ability to query and explore archival and current healthcare data, empirical evidence can be gained that will support strategic risk management decision-making. Additionally, such data analysis can serve as a vital tool to measure the pre/post effectiveness of various population health strategies and interventions.

## *Summary*

The overall goal of this population health analysis is to bring meaningful use to the 2013-2014 medical and pharmacy data for the ASE and PSE populations. Meaningful use is defined as gaining insight into future population health management strategies that will promote the health and well-being of the ASE and PSE populations of the State of Arkansas. This analysis will provide a baseline to measure future success of population health management strategies (e.g., wellness, pharmacy management, disease management, and adherence to evidence-based medicine guidelines).