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Clinical Decision Support

# Medication Therapy Management and Intervention Priority Score (IPS)

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# Agenda

- Background
- Development of IPS – Methodology
- Results and analysis
- Conclusion

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# BACKGROUND

- Medicare has set requirements that any Part D sponsor entity must have Medication Therapy Management (MTM) program
- Based on the latest programs analysis, typically around 15% of the membership are targeted for interventions
- MTM target population is selected based on all of the following Medicare criteria:
  - Expected next year total cost > $3000 (PMPM > $250)
  - Having 2-3 or more of Core Chronic Diseases
  - Being on 2-8 or more Part D medications
- What does these three criteria mean?

  They "assume" that members with higher cost, more diseases and medications will have more problems and therefore are more appropriate for being managed

In order to facilitate MTM clients in selecting members with highest priority for intervention MEDai scientists and clinical team have developed Intervention Priority Score (IPS)

# Development of IPS - Methodology

- MTM clients will provide demographics and Rx data only and IPS is designed to utilize them to score the entire membership
- IPS is a percentile score from 0 -100 where higher score means higher priority for intervention
- IPS = 0 for all Non-Users (members with no Rx claims) and the lowest value of the Users' IPS is the Non-Users' percentage

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# Development of IPS - Methodology

- Model training was done on 6 months dataset from Medicare MTM population
- The date range was from Jan. 1st 2009 to Jun 30th 2009
- There were 748,346 members in the training dataset
- All were users

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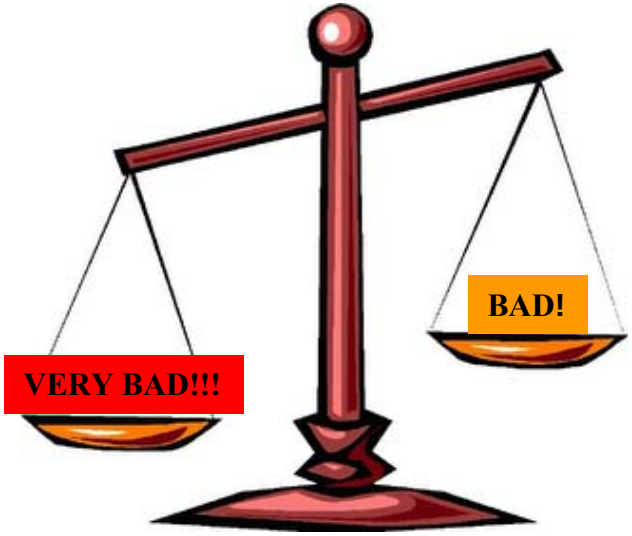
# Development of IPS - Methodology

- Intervention potential was the leading idea during the development of the score.
- If possible “bad” event prompts for immediate action, that will result in higher score and vice versa “bad” events that require longer time to develop complications will be scored lower



# Development of IPS - Methodology

- The creation of IPS is a non-trivial, non-traditional mathematical problem, because there is no real dependent variable (we had to create a surrogate one)
- The “goodness” of the score depends on the behavior of many criteria/measures each one with different contribution
- Members with IPS score between 85 and 100 (top 15%) should be primary target for interventions.

# Development of IPS - Methodology

Surrogate dependent variable was defined by combining various contributions of the following five components:

1. Cost (per member per month: PMPM)
2. Drug-Drug Interactions (various levels of severity)
3. High Risk Medications in Elderly, Duplication in Therapy and Dosing Guideline Gaps
4. Medication Compliance and Gaps in Therapy for selected Cardiovascular, Diabetic and Hyperlipidemia medications
5. Overall Rx Compliance for all maintenance drugs

How to define the contribution of the different components/factors – that's the main problem

# Development of IPS - Methodology

Example 1

Drug-Drug Interactions (DDI) of severity 1 or contraindicated drugs will have the highest priority for intervention. Reasons?

- Unacceptably high risk for adverse reactions with potential to severely impact patients
- In almost all cases combination should not have been prescribed
- Instant savings potential

Intervention to mitigate the risks should be immediate!

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# Development of IPS - Methodology

Example 2

On the other hand gap in compliance with Statin therapy will have lower priority score for the following reasons:

- It requires months or years to manifest with complications
- Allows more time for intervention
- Potential to even spend more. Why? To become compliant members should be dispensed more Statins

# Development of IPS - Methodology

In order to get the best perspective on members Rx profile, we had 249 variables from the following 6 categories available:

1. Cost – 100 variables
2. Demographic – 4 variables
3. Guidelines – 28 variables
4. Severity – 4 variables
5. Utilization – 108 variables
6. Motivation – 5 variables

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# Development of IPS - Methodology

The weights were calculated by heuristic optimization procedure. The goal (criterion) is min violations of the following rule:

**Avg IPS (X, *i*)** ≥ **Avg IPS (X, *j*)**

(*i*-th percentile of risk factor X) (*j*-th percentile of risk factor X) for $i > j$ for any X

We also assumed the risk factors are not independent and reduced the individual contribution of each non-major risk factor in the presence of multiple factors. The weights were calculated after thousands of runs of the heuristic optimization procedure on the training set.

# Results and analysis

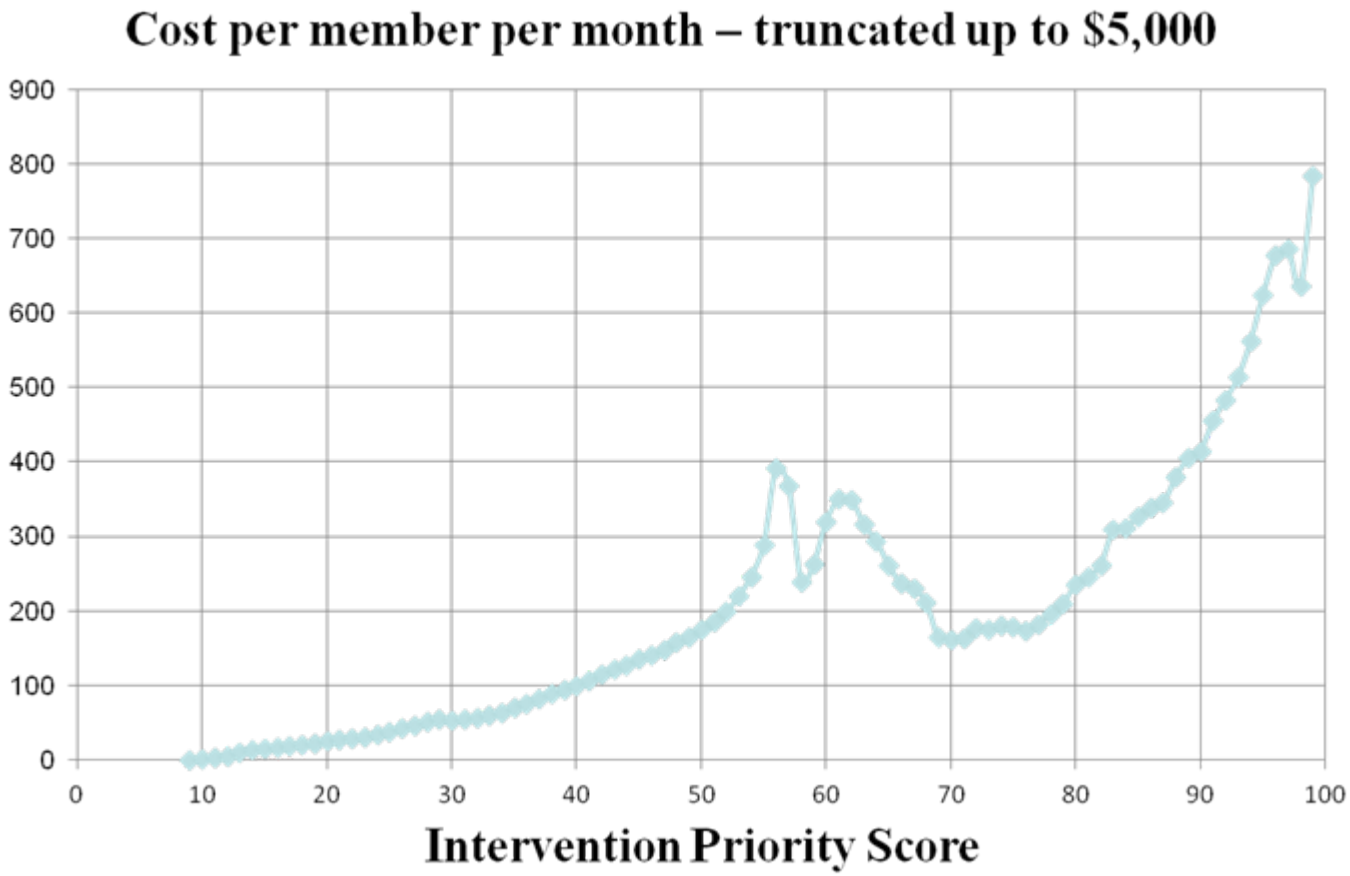
- Model validation with the final version of the IPS score was done on 12 months dataset from Medicare MTM population
- The date range was from Jan. 1st 2009 to Dec. 30th 2009
- There were 1,028,495 members in the validation dataset
- Approximately 91% were users

# Results and analysis

- Components of the score were analyzed individually and the results are shown in graphs below
- The observed values for each component are averages in respect to the whole population of the corresponding percentile with the only exception of Overall Rx Compliance where we have selected only members that have the measure calculated within each percentile and then calculated the average

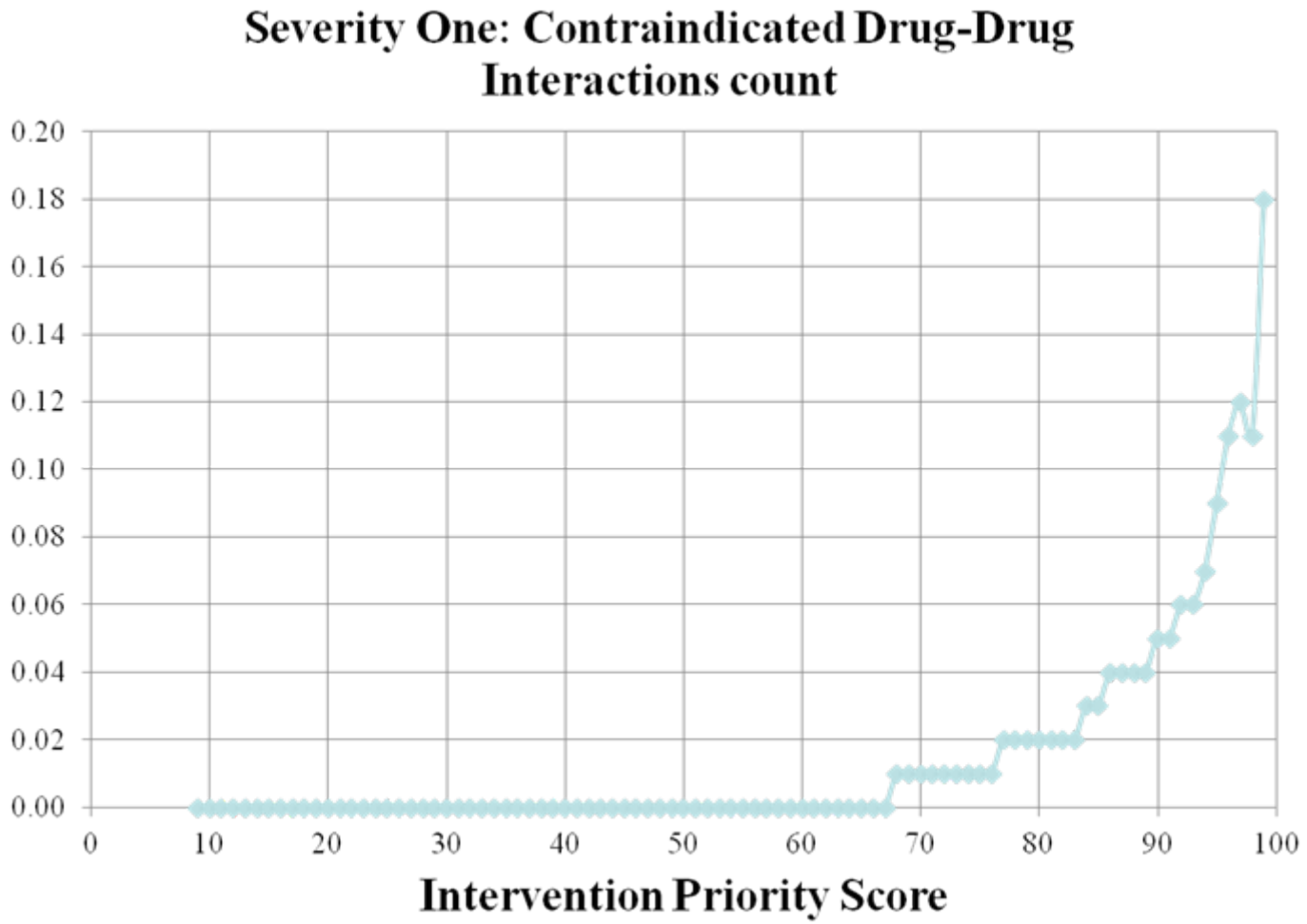
# Results and analysis

Cost component analysis:



# Results and analysis

Drug-Drug Interactions component analysis:

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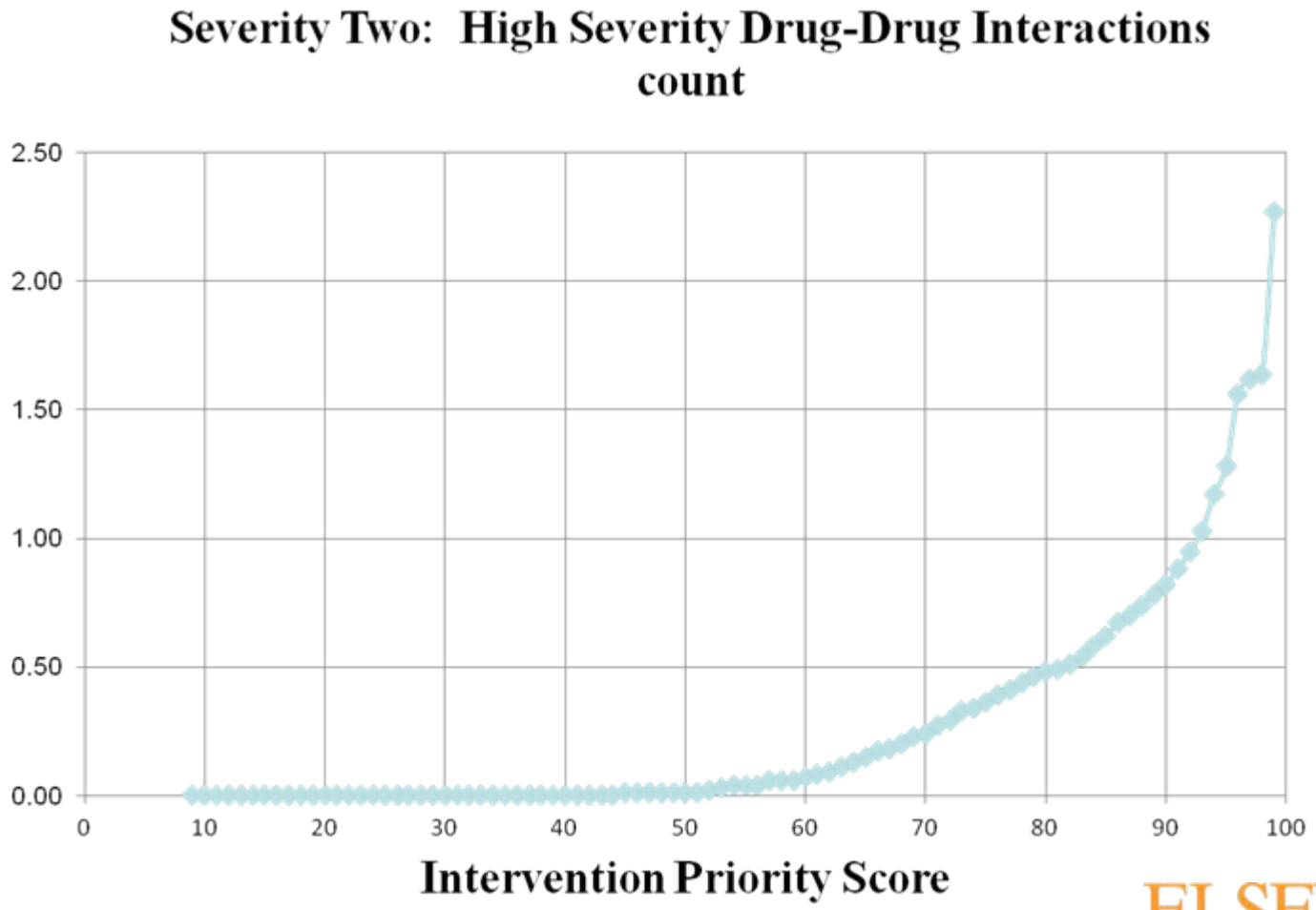
# Results and analysis

## Drug-Drug Interactions component analysis:

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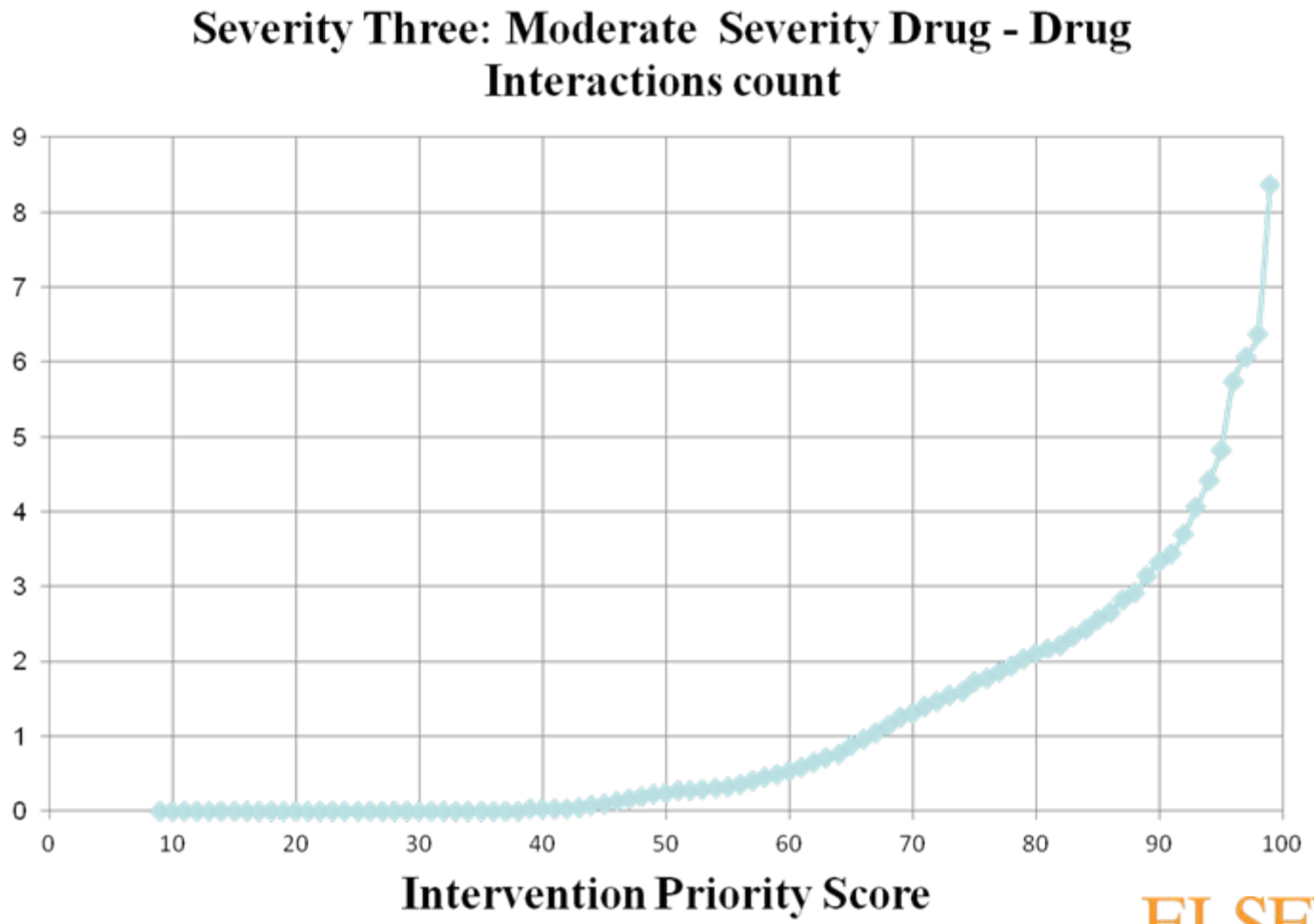
# Results and analysis

Drug-Drug Interactions component analysis:

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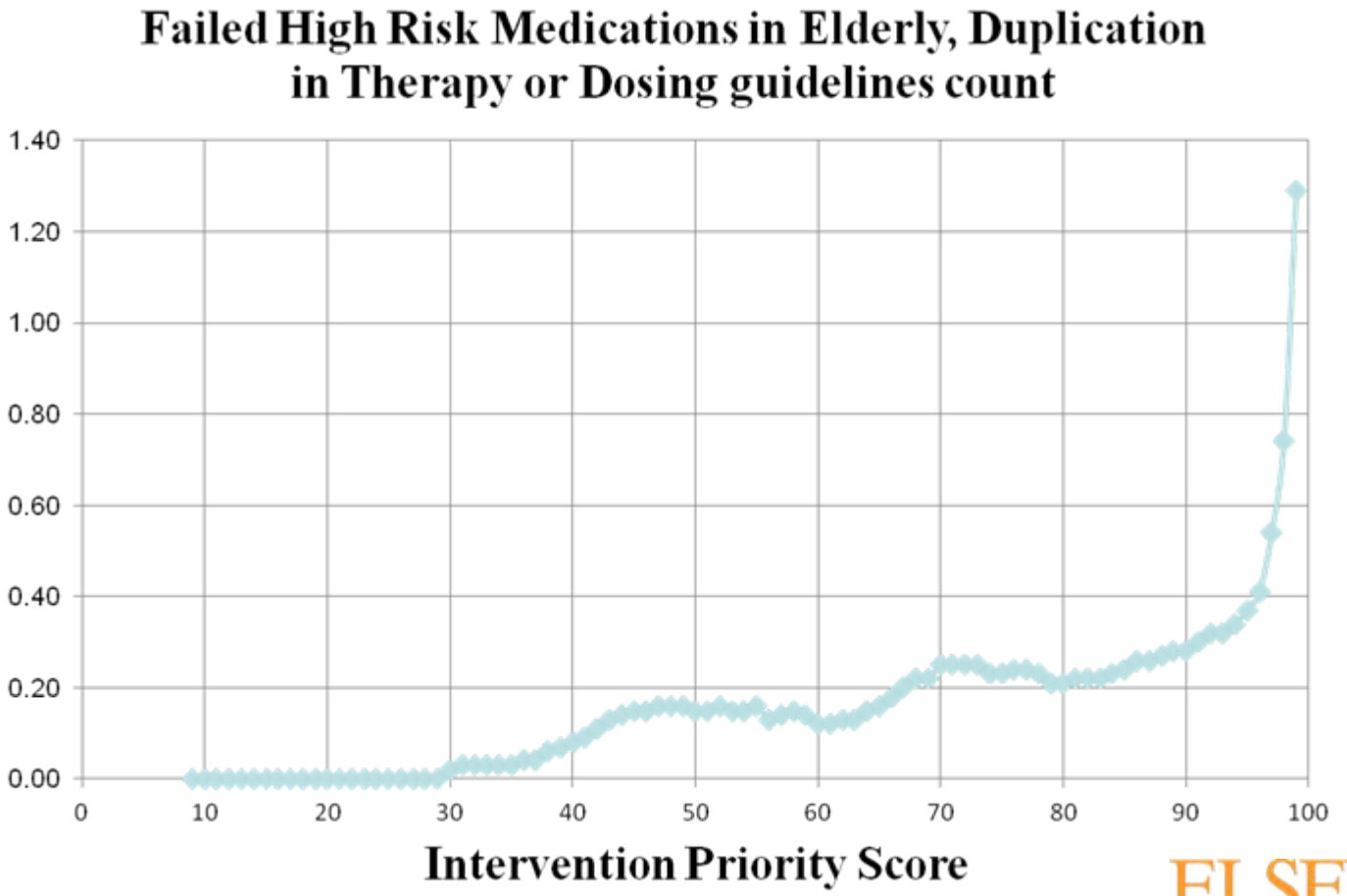
# Results and analysis

High Risk Medications in Elderly,
Duplication in Therapy and Dosing component analysis

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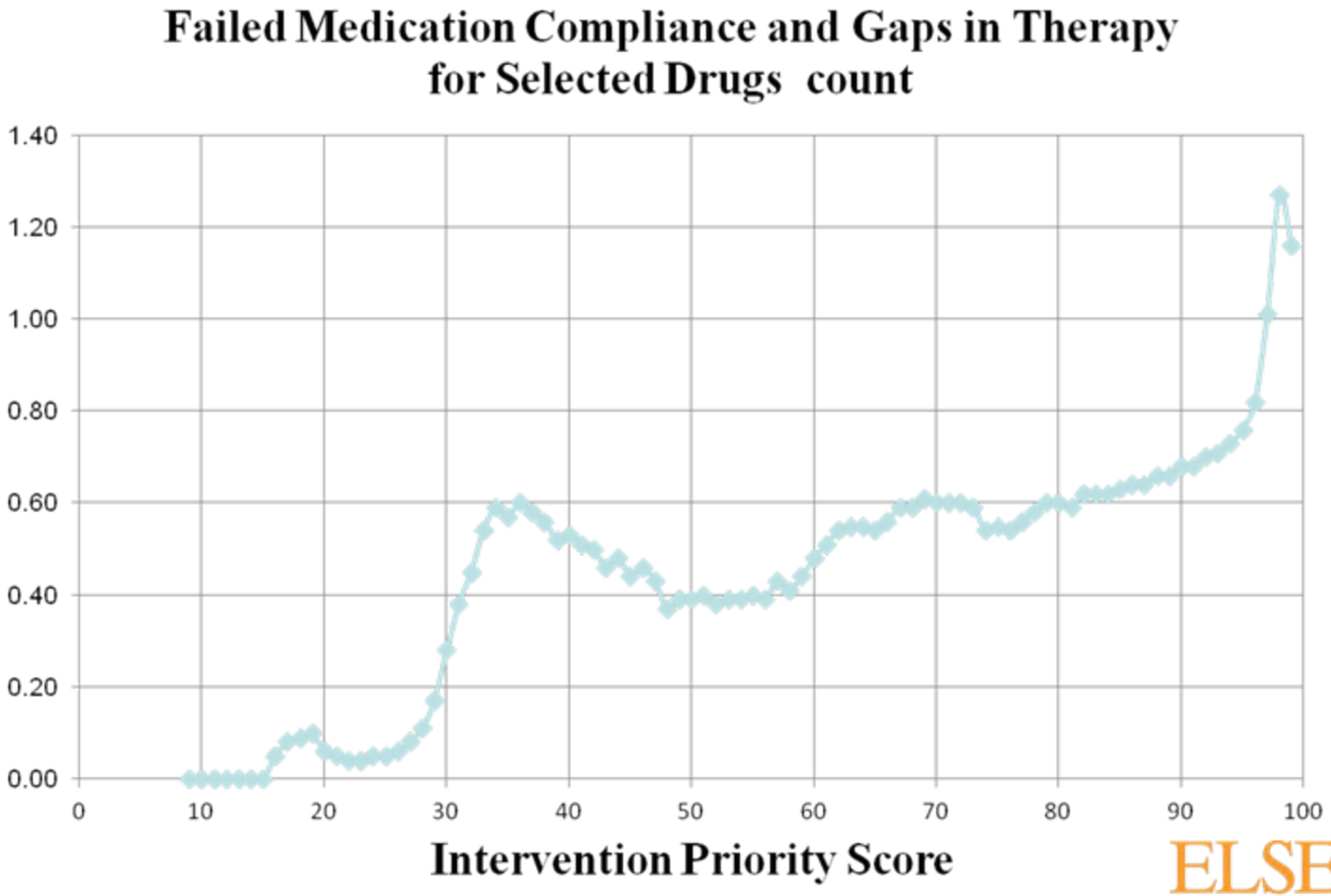
# Results and analysis

Medication Compliance and Gaps in Therapy for Selected Drugs component analysis

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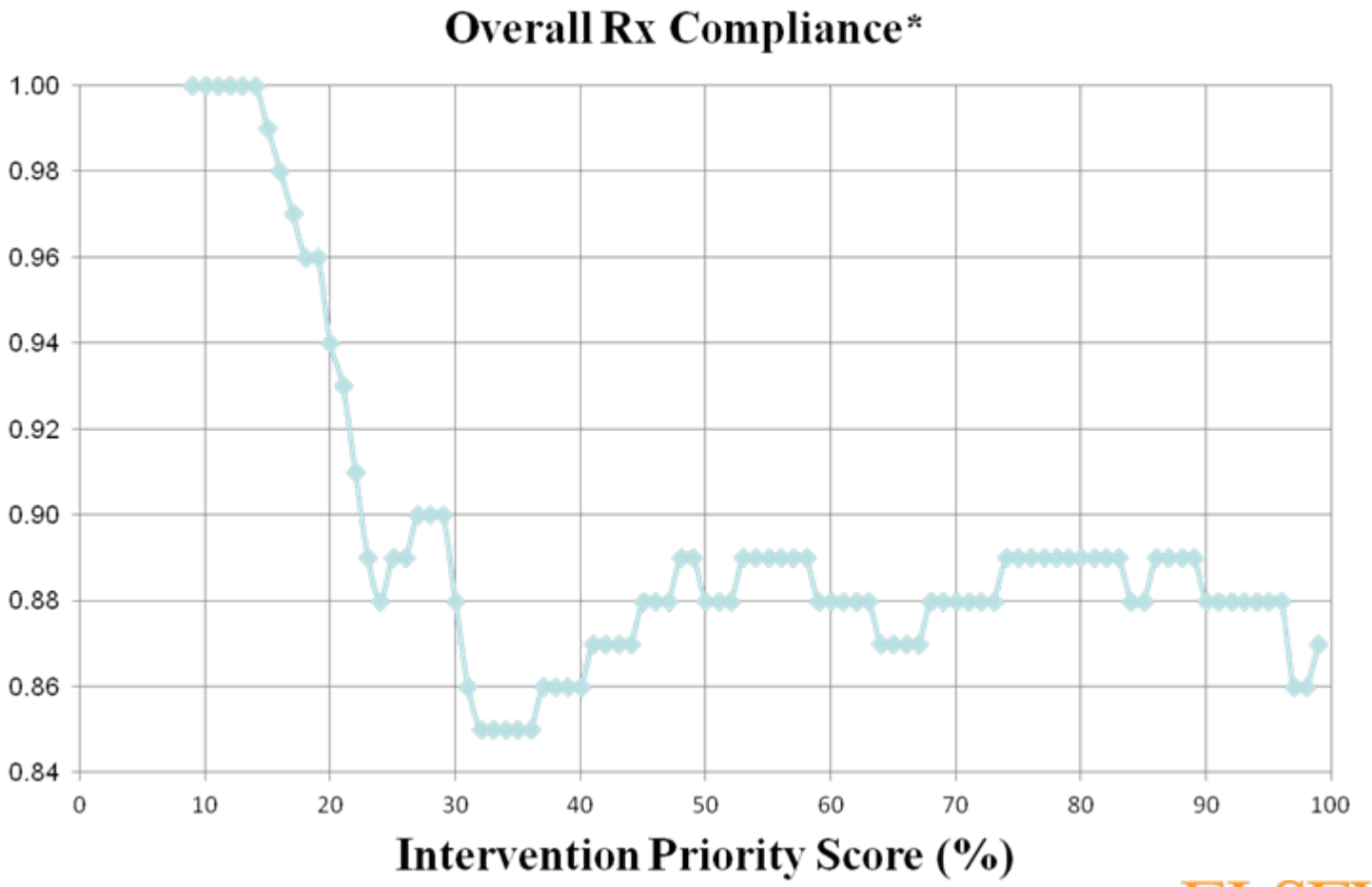
# Results and analysis

## Overall Rx Compliance component analysis




* Expressed as index relative to 1,
with 1 as the best and 0.5 as the worst compliance

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# Results and analysis

Analysis of outliers revealed acceptable scores as per design of IPS

- For example, member with the highest total cost ($596,681) and relatively low score (IPS = 57%; below intervention threshold about 85%) in the validation dataset has hemophilia with 12 prescriptions of ANTIHEMOPHILIC FACTOR each one around $50,000 in cost (Note: it is only one drug and one disease involved - below Medicare criteria for MTM target population)

# Results and analysis

On the other end, member with the lowest total cost ($193.08) and the score (IPS = 89%) above intervention threshold has hit every component of the IPS besides the cost. Member has all of the following:

- *3 Drug-drug interactions of severity 2*
- *3 Drug-drug interactions of severity 3*
- *Maximum Number of Scripts per Month = 7*
- *5 failed gaps: 1 Duplication in Therapy and 4 Low Compliance or Gaps in Therapy*
- *Total Number of Distinct Maintenance Drugs = 11*
- *Overall Rx Compliance = 0.77*
- *3 Chronic Diseases*

# Results and analysis

**Sanity check**: we run some indicators that we expected to be closely related to the IPS score:

- Count of Distinct Therapeutic Classes
- Count of Maximum Scripts per Any One Month
- Count of Chronic Diseases

# Results and analysis

## Sanity check


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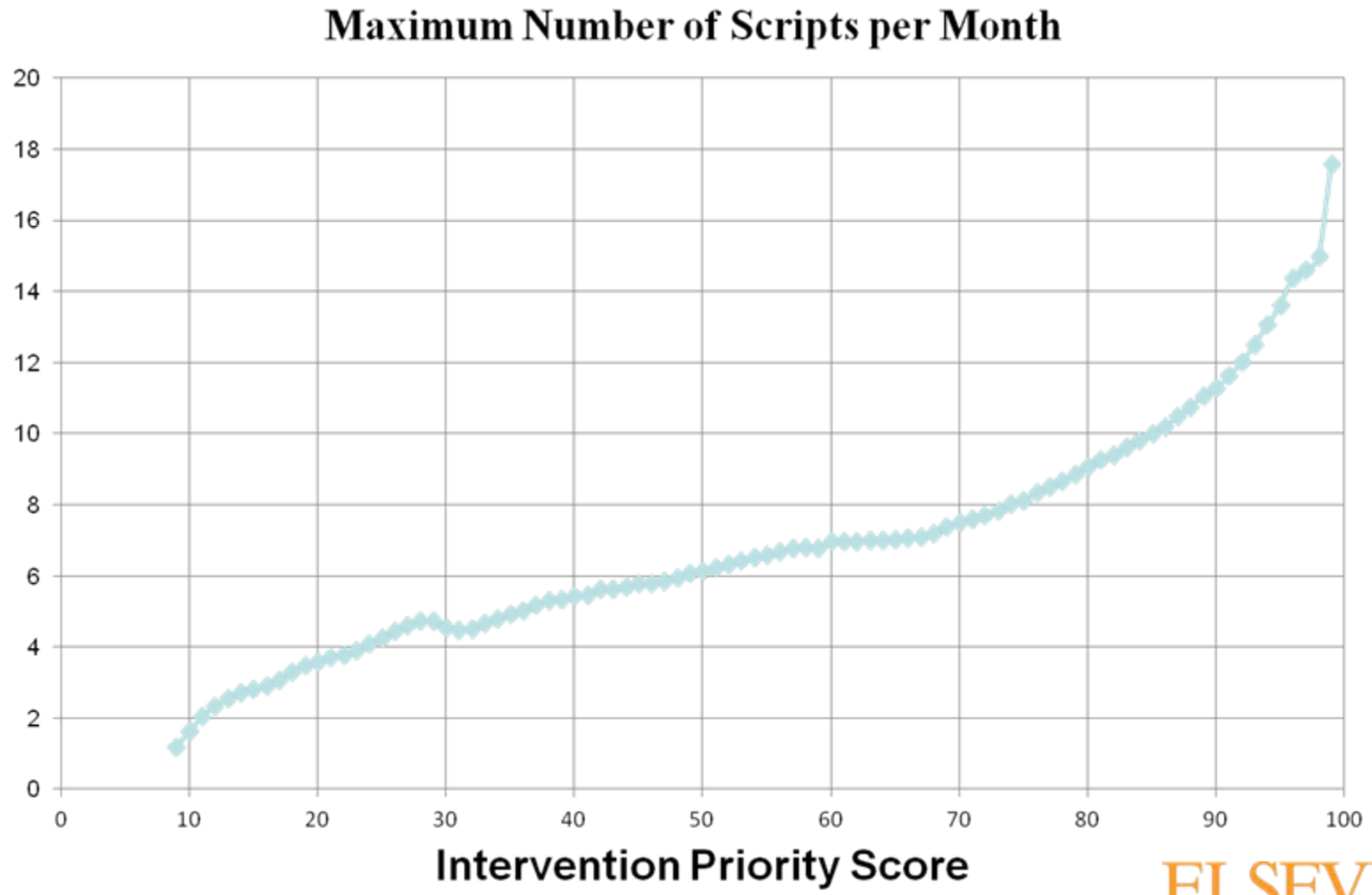
# Results and analysis

## Sanity check

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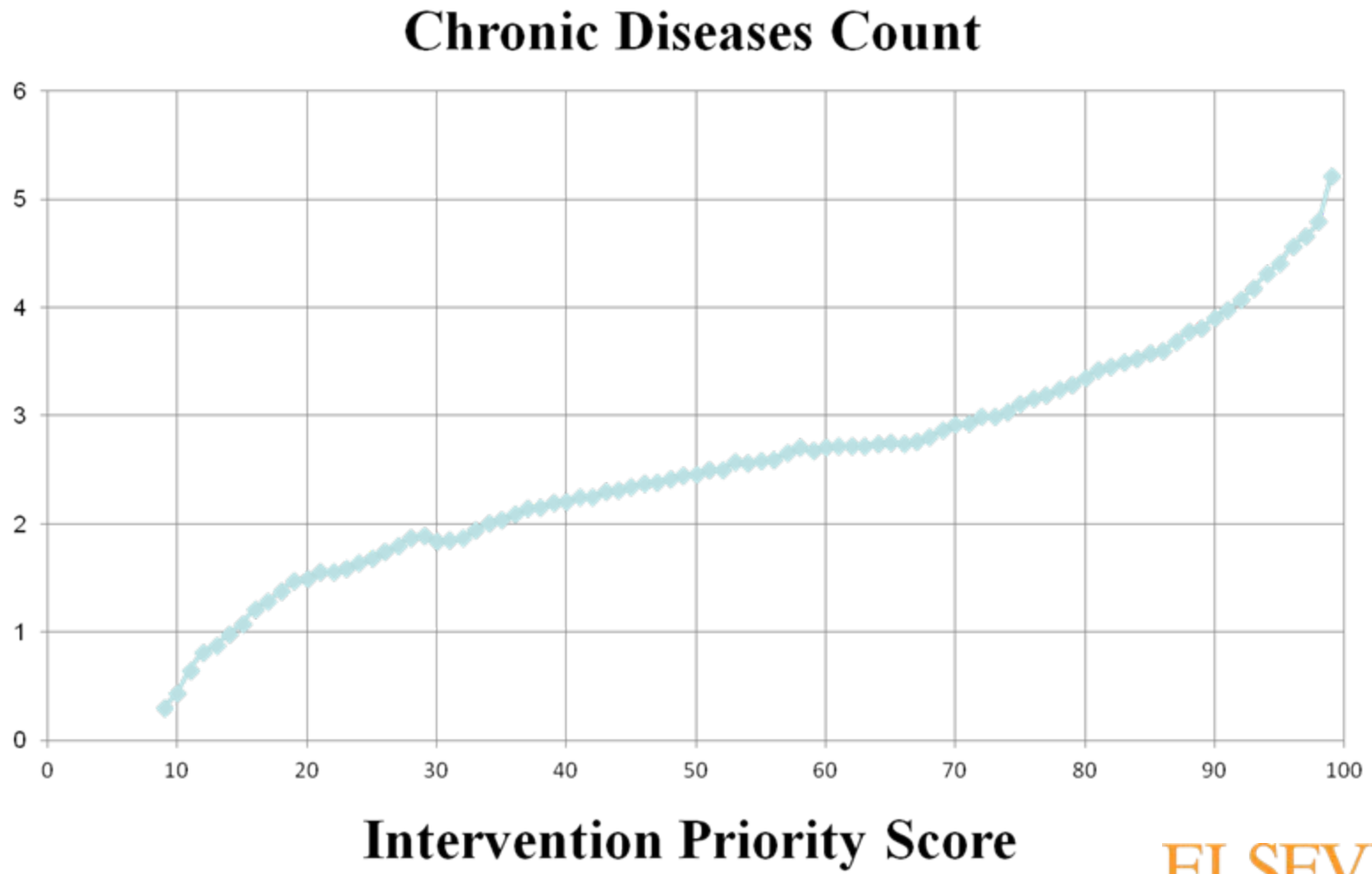
# Results and analysis

## Sanity check

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# Comparative Study - design

- Conventional Methodology: MTM target population is selected based on all of the following Medicare criteria:
  - *Current* year total cost > $3000 (PMPM > $250)
  - 2 or more of Core Chronic Diseases
  - 2 or more Part D medications

- We compare IPS Methodology with the Conventional Methodology on 945K new Medicare members

# Comparative Study - design

Table 1: MTM high risk population selection criteria

| Selection Method | Selection criteria |
|---|---|
| **Medicare** 95,658 members top 10% | •Total Annual Drug Cost ≥ $3000<br>•Chronic Diseases count ≥ 2<br>•Part D drugs count ≥ 2 |
| **Intervention Priority Score (IPS)** 95,658 members IPS top 10% | •Cost (per member per month: PMPM)<br>•Drug-Drug Interactions (3 levels of severity)<br>•High Risk Rx in Elderly; Duplication in Therapy and Dosing Guideline Gaps;<br>•Compliance with Cardiovascular, Diabetic and Hyperlipidemia medications;<br>•Overall compliance to chronic medications |

# Comparative Study - results

Table 2: Impactable events for the top 10% highest risk population selected independently by Medicare's mandated criteria vs. Intervention Priority Score (IPS) methodology

| Component (average) \ Selection Method | Medicare | Intervention Priority Score (IPS) | % Improvement by IPS |
|---|---|---|---|
| Contraindicated Drug-Drug Interactions | **0.082** | **0.156** | **90.24%** |
| Drug-Drug Interactions of High Severity | **0.655** | **1.160** | **77.10%** |
| Drug-Drug Interactions of Moderate Severity | **3.200** | **5.220** | **63.13%** |
| Failed High Risk Rx in Elderly, Duplication in Therapy or Dosing recommendations | **0.219** | **0.480** | **119.18%** |
| Failed Overall Drug Compliance | **0.374** | **0.709** | **89.57%** |

# Conclusions

- Using IPS methodology we were able to identify anywhere from 60 – 120% more individuals within each group of impactable MTM events in top 10% of highest risk members.
- In other words top 10% of highest risk individuals selected by IPS had approximately twice more options for cost savings interventions
- Compared to conventional method, the IPS score is significantly better tool for population selection and placement into Medication Therapy Management programs with significant cost savings potential!

# Conclusions

- Even though within individual components of IPS we have small irregularities in distribution, their interaction results in very smooth combination (IPS itself) for almost all indicators tested

- This is the first iteration of the model and the idea is to give clients the option FOR PRIORITIZATION (selecting the components' weights according to the client's specifics) to have a broad and flexible IPS score. Based on the feedback we can build in certain rules as needed

# Conclusions

- We have purposely not set any cost or other thresholds in order to force the values of IPS (for example including all members with total cost above $10,000 or with more than certain number of gaps into IPS > 90)

- Front user interface should give clients the ability to easily filter for cost and many other parameters. This allows IPS to be exactly as the name suggests: Intervention Priority Score