The Office of the National Coordinator for Health Information Technology

Why Patient Patient Matching for PDMPs?

Carmen Smiley, IT Specialist, ONC

Why is patient matching important?

Without consistently and correctly matching individuals to their data to enable a complete record of a one's health history, patients will continue to suffer consequences due to preventable medical errors and patient misidentification.

- Other reasons?

The Benefits of Accurate Patient Matching

- Accurately matching individuals or patients to their health information has a number of benefits:
  - improved patient outcomes
  - improved patient safety
  - greater efficiency
  - improved fraud detection
  - promoting data integrity
  - reduced inappropriate data exposure

(Some) Challenges to Patient Matching

- It is not possible to achieve perfection in patient matching
- Inaccuracy is not just a technology problem – there is a significant human component
- Poor data quality (both accuracy and completeness) significantly inhibits the ability to accurately match patients
- Limited published research, reported metrics, or best practices
- There is no one-size-fits-all solution
- Challenges increase as data gets further removed from the source, and when more sources of data are involved
- Universal identifiers for patients/individuals may be helpful, but are not a panacea

Lack of understanding and concurrence

- Makes communication, reporting, and cross-system or cross-organizational comparisons difficult or impossible
- Impedes a full and accurate assessment of the extent of the problem
- And therefore, the ability to devise sufficient solutions
- Prohibits evidence-based decision making
- Including decisions on which MPI or other technical solution to employ
- Limits research on complementary matching methods
- Inhibits progress and innovation

Performance Indicators, HIMSS 2011

HIMSS developed a set of key performance indicators (KPIs) that allow an organization to evaluate its patient matching processes and technology and make continuous improvements.

- EMPI Database Activity Rate (EDAR)
- EMPI Database Duplicate Rate (EDDI)
- Duplicate Creation Rate (DCR)
- True Match Rate (TMR)
- False Positive Match Rate (FPMR)
- False Negative (Non-Match) Rate (FNR)
- Indeterminate Match Rate (IMR)
- Matching Accuracy Rate (MAR)
- Matching Error Rate (MER)

Precision and Recall

$$\text{PPV} = \text{Precision} = \frac{TP}{TP + FP}$$

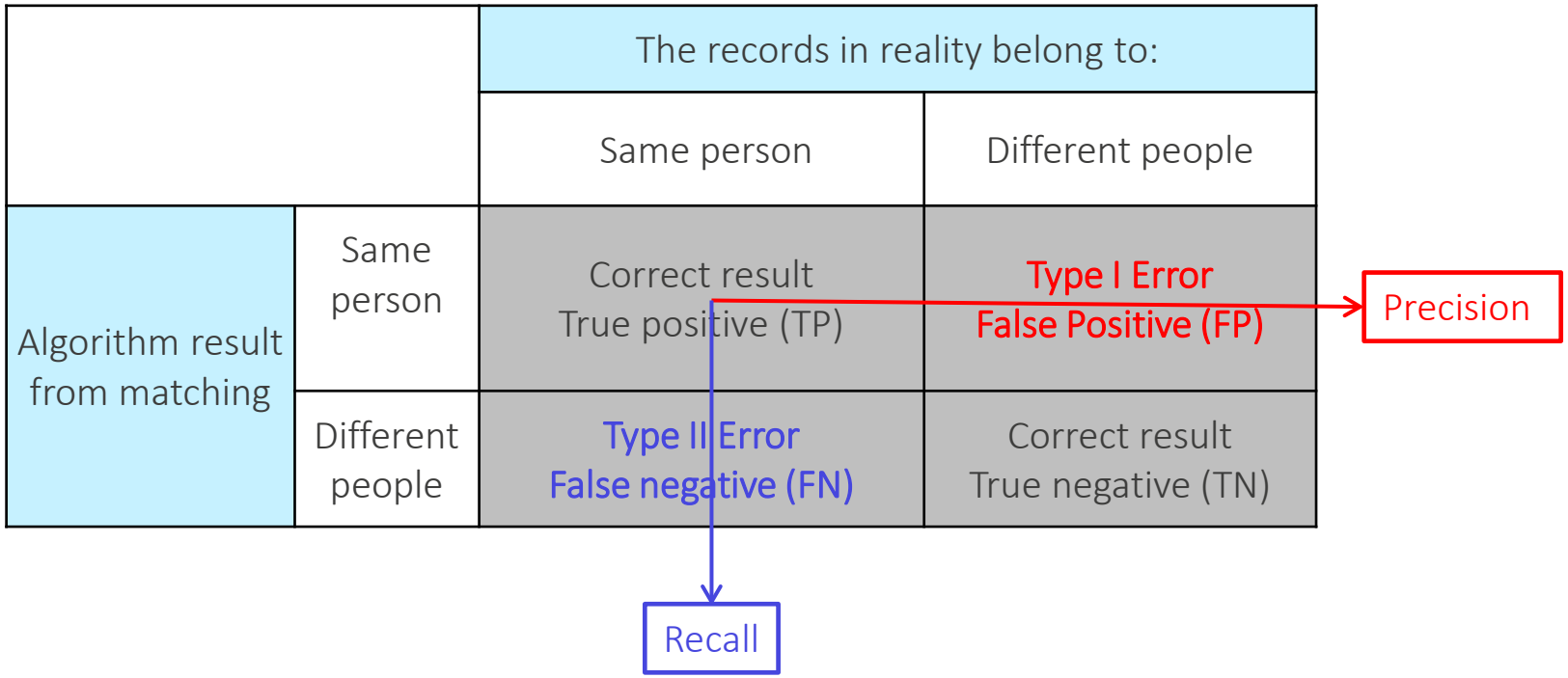
The proportion of true matches that were found out of the total matches found. Precision is the number of correct results divided by the number of all returned results.

$$\text{Recall} = \frac{TP}{TP + FN}$$

How many from the matches found are real matches or he percent of all relevant documents that is returned by the search.

The two measures are sometimes used together in the F-Score (or F1-score or f-measure) to provide a single measurement for a system.

Precision and Recall



F-Score

- a.k.a., F-1 score or F measure
- The harmonic mean between precision and recall

$$F = 2 * \frac{\text{Precision} * \text{Recall}}{\text{Precision} + \text{Recall}}$$

Type I and Type II Errors

		The records in reality belong to:	
		Same person	Different people
Algorithm result from matching	Same person	Correct result True positive (TP)	**Type I Error** **False Positive (FP)**
	Different people	**Type II Error** **False negative (FN)**	Correct result True negative (TN)

Clinical information assigned to the wrong patient by creating an overlay if match meets or exceeds low threshold

Clinical information not linked, patient has duplicate records

Sensitivity, Specificity, PPV & NPV

		The records in reality belong to:		
		Same person	Different people	
Algorithm result from matching	Same person	Correct result True positive (TP)	Type I Error False Positive (FP)	$PPV = \frac{TP}{TP + FP}$ Precision
	Different people	Type II Error False negative (FN)	Correct result True negative (TN)	$NPV = \frac{TN}{TN + FN}$
		$Sensitivity = \frac{TP}{TP + FN}$ Recall	$Specificity = \frac{TN}{TN + FP}$	