Queensland Health

Introduction to the Master Linkage File

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Presentation outline

- Overview the Master Linkage File (MLF)
- Data source integration
- Routine data linkage cycle
- Yearly quality assessment
- Future developments

What is the MLF?

- A map of an individual's journey through the Queensland health system and related services
- Maintained by routinely bringing together information from multiple data collections and registries
- A simple "mapping" table
- Contains enduring linkages between an individual's event-level records

Maps records to “persons”

Distinct key = distinct “person”

Identifies a record in source data. Facilitates joins to the source.

Linkage Key	Source	Source Key/s
12345678AAA	ADMIT	References an Admitted Patient record
12345678AAA	ADMIT	References an Admitted Patient record
98765432BBB	PERIB	References a Perinatal Baby record
98765432BBB	ADMIT	References an Admitted Patient record
98765432BBB	BIRTH	References a Birth Registration record
34567890GGG	QAS	References a QLD Ambulance record
34567890GGG	EDC	References an Emergency Dept. record

What the MLF is not

The Master Linkage File is not

- A repository of identifiable data.
  - Identifiable data are not available from the mapping table/s
- A repository of content data.
  - Content data are available only from the source data collections

Data Collections - linked

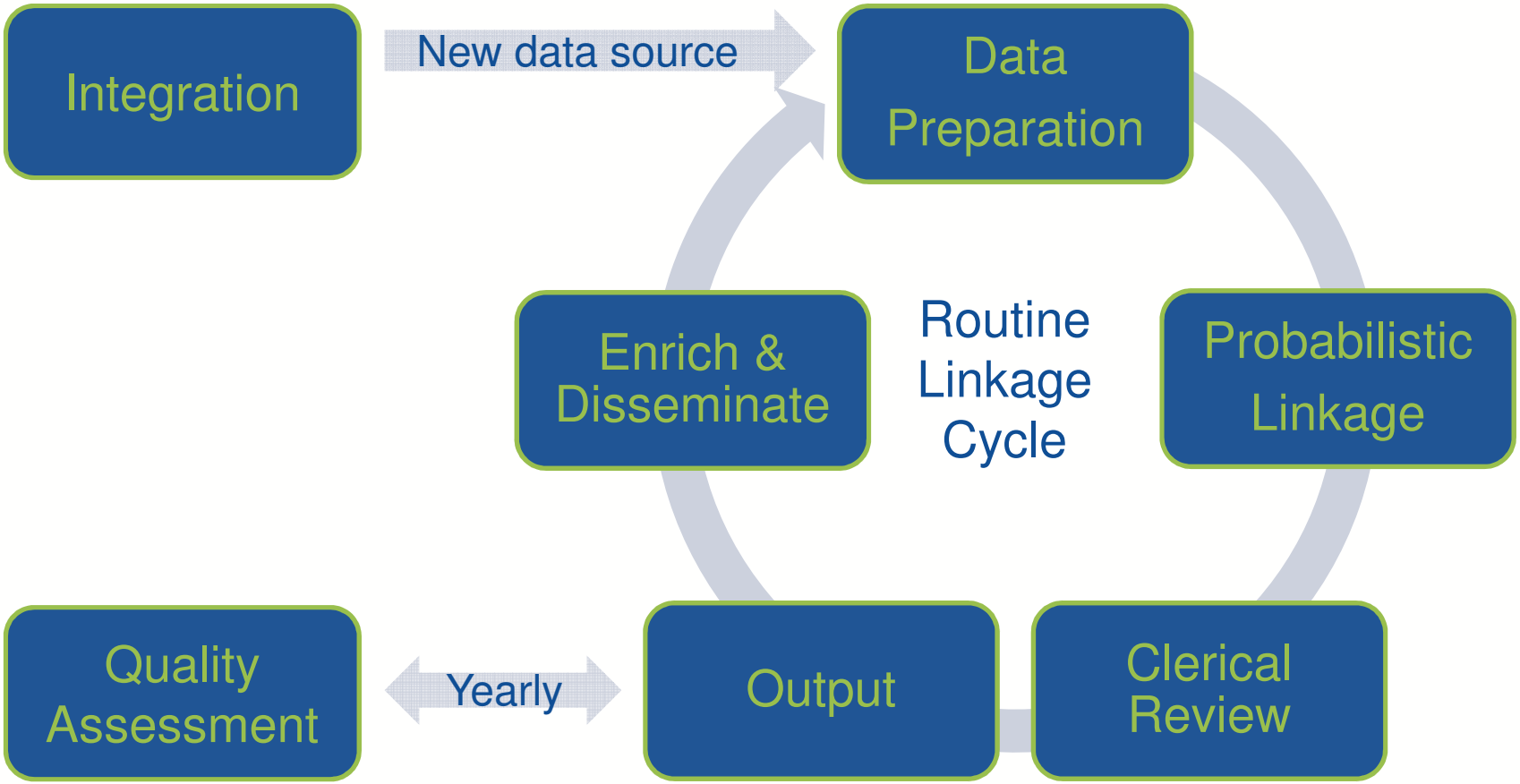
Data Collections	Coverage
Queensland Hospital Admitted Patient	Public: Jan-2004 to current Private: Jul-2007 to current
Emergency Department	Jan-2012 to current
Perinatal (Mothers & Babies)	Jul-2007 to current
Birth Registration	Jul-2007 to current
Death Registration	Jan-2004 to current
Elective Surgery Waiting List	Jul-2014 to current
Outpatient Waiting List	Jul-2015 to current

The MLF contains approx. 32 million records, with current growth at approx. 800,000 records per month.

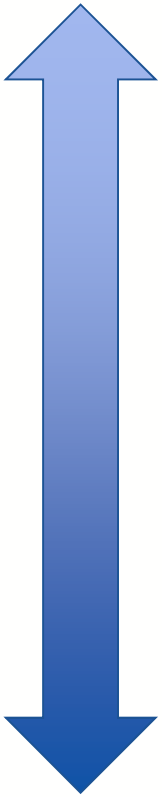
Data collections - pending

Data Collections	Status
QLD Ambulance Service	Integration commenced
Surgery Connect	Integration commenced
Notifiable Conditions System	Approved
Vaccination Information	Approved
Non-Admitted Patient (Specialist Outpatient)	Approved
Air Retrievals	Approved
Education (AEDC, NAPLAN)	Approved/Negotiating access

High-level routine linkage process



Integration



Stakeholder engagement

- Custodians: Data content, quality, timeliness, dynamic?..
- Users: Linkage quality

Data exchange

- Implement systems for data receipt and dissemination

Data quality assessment

- Data profiling and issue management

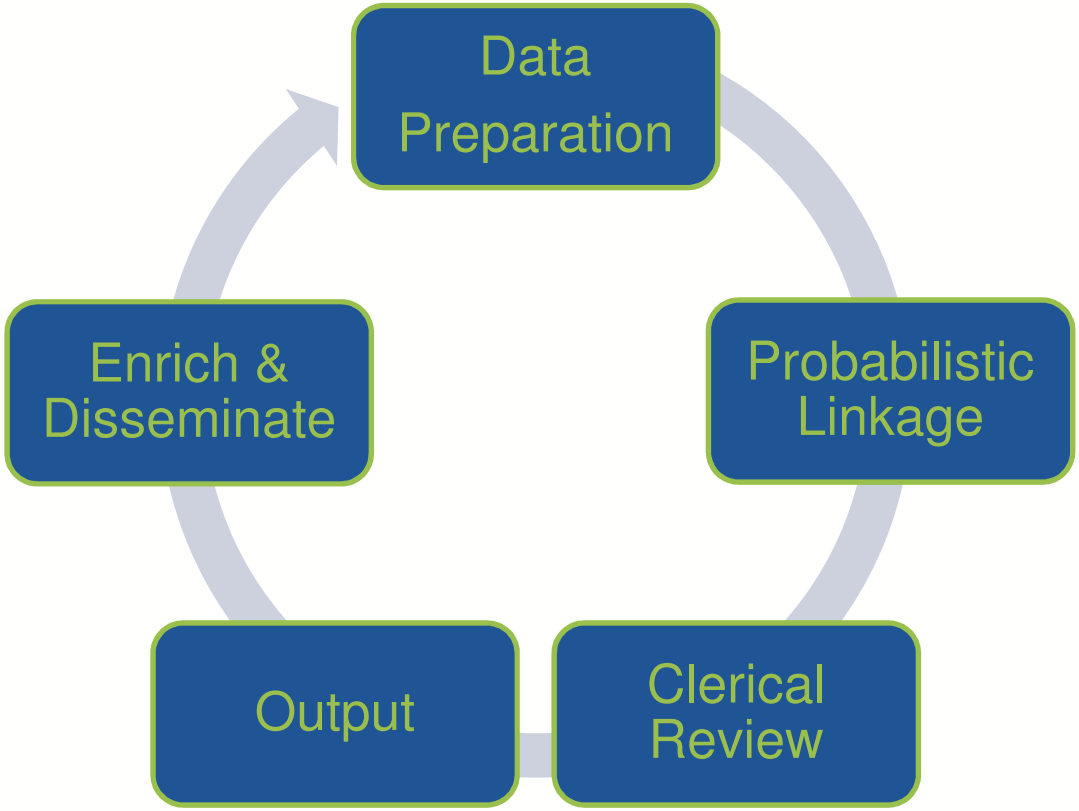
Database & script development

- Data preparation processes and linkage infrastructure

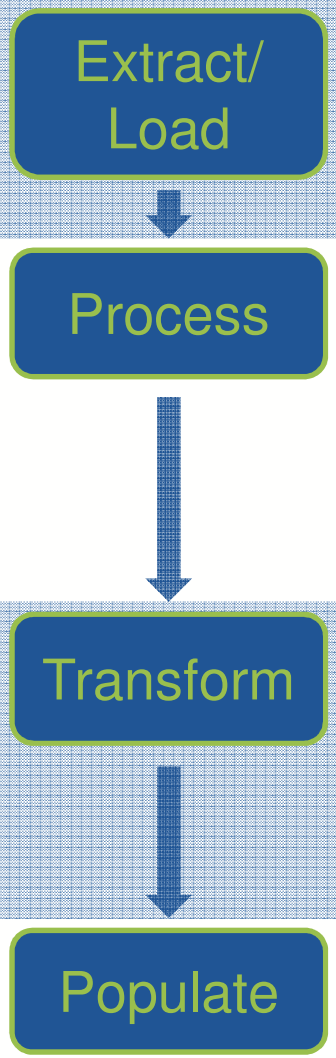
Linkage model development

- Ensure linkage quality meets stakeholder expectations

Regular linkage cycle



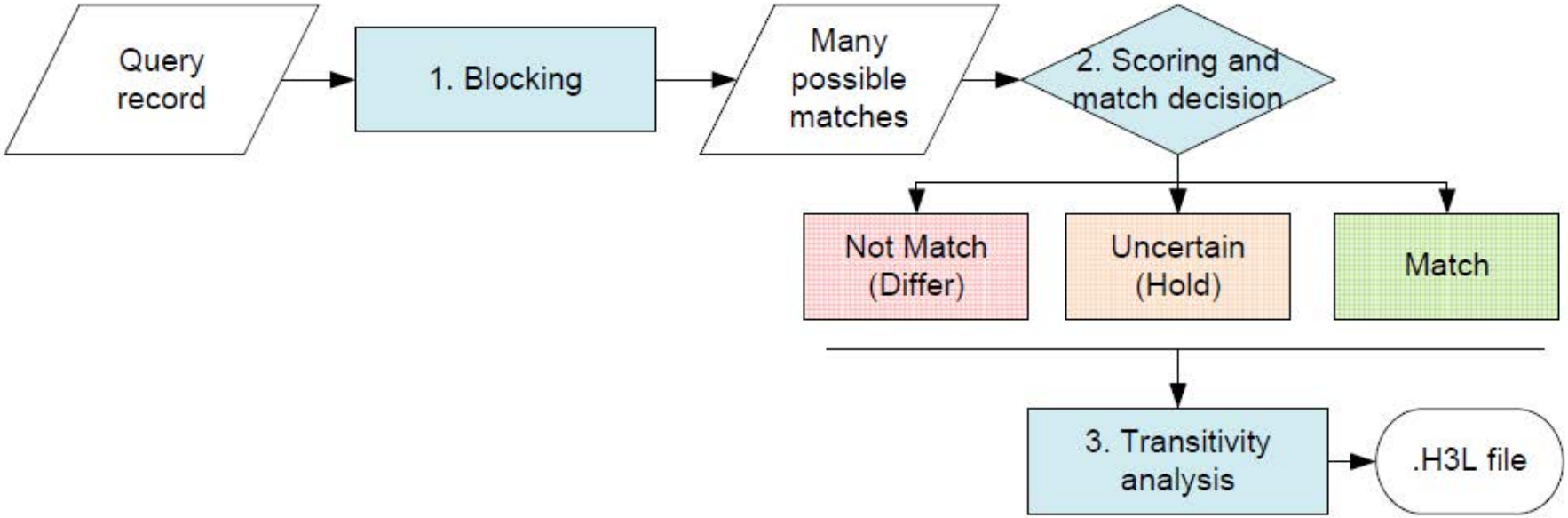
Data preparation



- 2+ extractions per month
- Extract after data due at SSB
- Process dynamic data
  - Allows use of current “in-work” data
  - Ensures MLF consistent with source
  - Meets emerging needs
- Standardise phone numbers
- Comprehensively parse names
- Map to QHDD formats and values
- Make data available to engine

Probabilistic linkage

- Minimise human review while maintaining quality
- 3-Stage process performed by the ChoiceMaker linkage engine



Probabilistic linkage

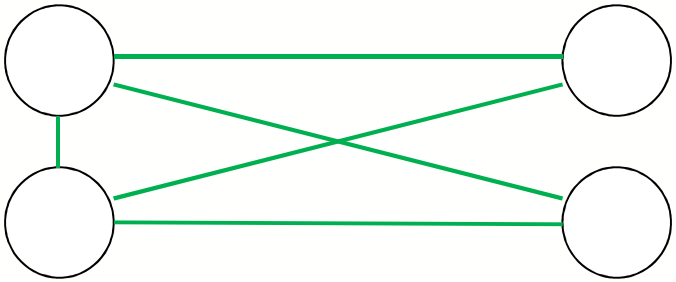
1. **Blocking**
   - Creates “blocks” of records that possibly match to each other to minimise unnecessary comparisons
   - ChoiceMaker algorithm and 17 blocking fields to efficiently minimise false negative errors
2. **Scoring and match decision**
   - Custom model determines whether records match, differ or undecided (hold)
   - 150 weighted tests used to calculate probability
   - Tuned thresholds assign the decision
   - 14 deterministic rules can over-ride decisions

Probabilistic linkage

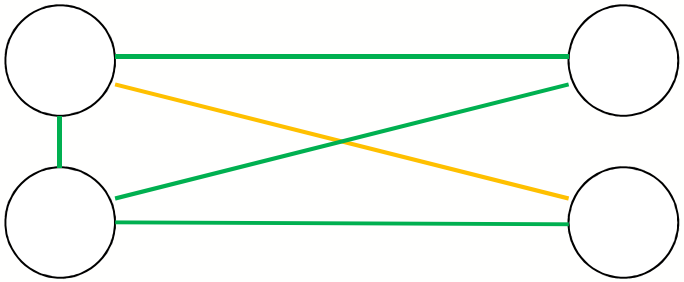
3. Transitivity analysis

- Creates two types of linkage groups: merge and hold
- Bi-connected transitive closure of records creates merge groups: records will be assigned same key
- Incomplete transitive closure of related records creates a hold group for clerical review (grey area)

Merge group



Hold group



Regular linkage cycle

Clerical review of uncertain links

Human review of hold groups (grey area)

- In-house developed tool for review
- 1,000 to 20,000 hold groups per linkage
- Requires sustained focus and quick decision-making
- Some decisions are not clear-cut
- Interrogation of source data often required
- Maintaining consistency is paramount
- A tough job, but we have a very capable team!

Regular linkage cycle

Output the linkage results

- Results written to MLF draft tables
- Routine quality checks performed
- Errors corrected
- Archived for reference

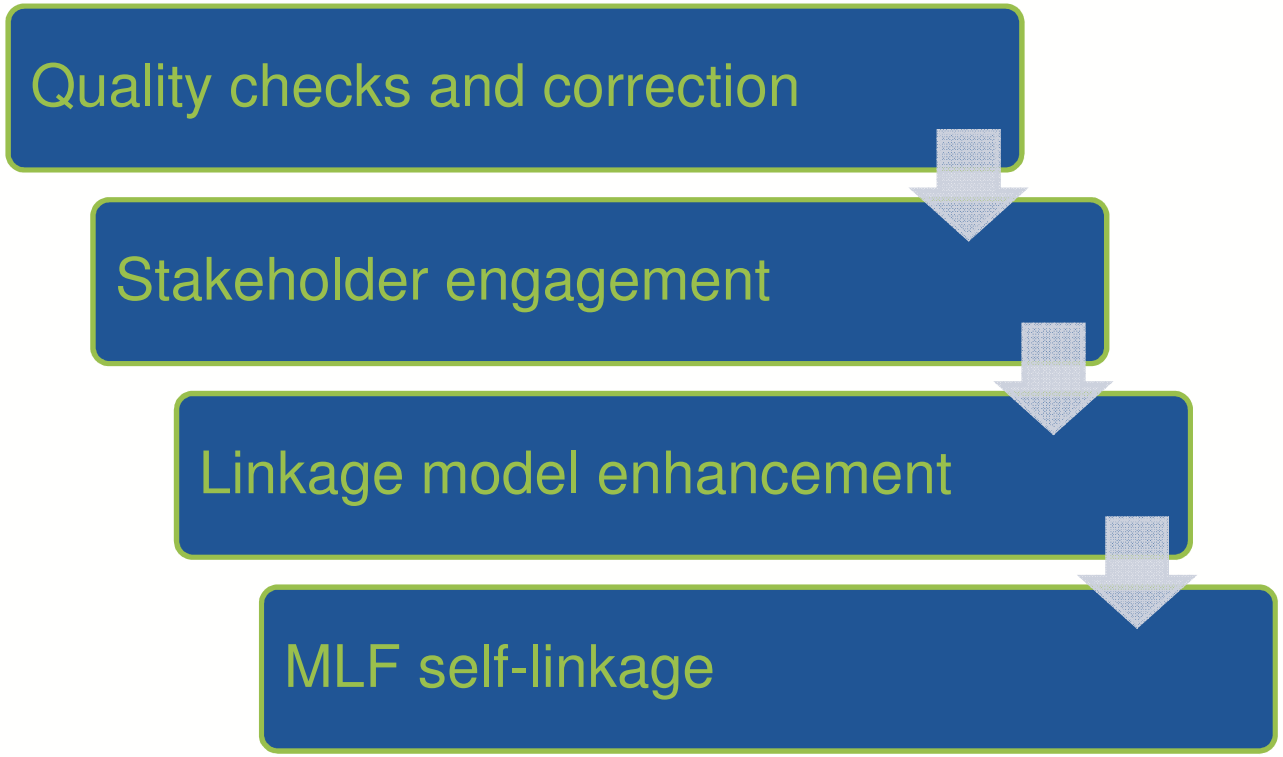
Regular linkage cycle

Enrich and disseminate linked data

- Refresh data for QH users – direct access to MLF
- Routine data enrichment and dissemination
  - Collection reconciliation (PDC:QHAPDC)
  - Secondary linkages & data provision (QCOR)
  - Linked files (CALF, deceased list…)

Yearly quality assessment

Quantify and improve MLF quality



Yearly quality assessment

Quality checks and correction

- Quantify and correct subsets of linkages known or suspected to be problematic
  - Approx. 25 subsets checked
  - E.g. Twins falsely linked
- Accuracy
  - 10/1000 errors per subset (ideally 5/1000)
  - 5/1000 errors per MLF

Yearly quality assessment

Stakeholder engagement

- Gain consensus regarding linkage quality
- Often relates to linkage error bias: “how conservative?”

Enhance the linkage model

- Modelling to remove root-causes of significant errors and implement stakeholder feedback
- Improves the quality of subsequent linkages

Yearly quality assessment

Self-link the MLF

- Applies model enhancements to previously linked data
- Corrects false-negative errors by merging disparate linkage groups

Future developments

- Continued integration of new data sources
  - Queensland Ambulance Service
  - Surgery Connect
- Implement enduring linkage keys
- Operational continuity and efficiency
  - Migrate to the current version of the ChoiceMaker linkage engine
  - Infrastructure enhancement
- Continued quality and process improvement – the never ending quest

Contacts and information

https://www.health.qld.gov.au/hsu/link/datalink.asp