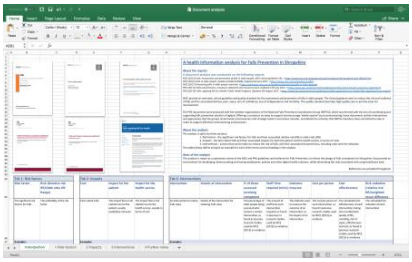
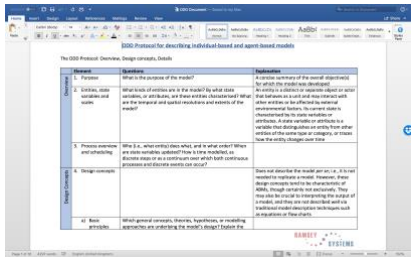
Simulations for Health
Products

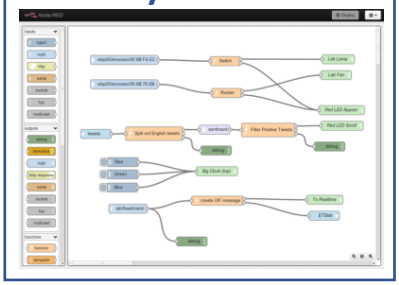
Document analysis



Information Architecture



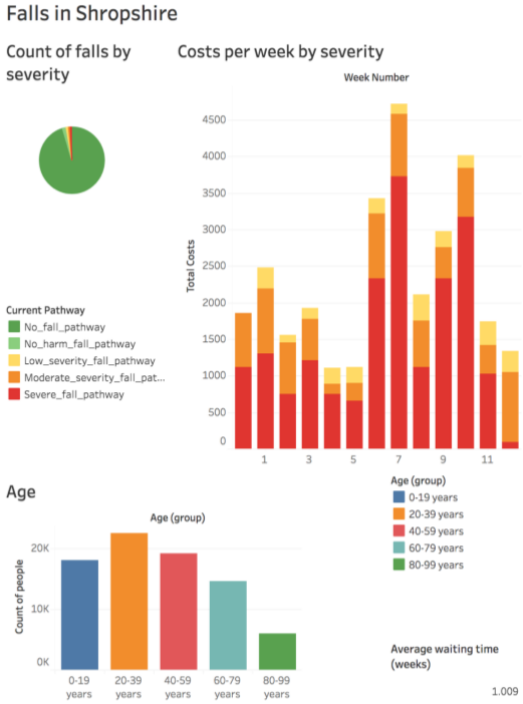
Pathway editor



Population builder

	A	B	C	D	E	F	G	H	I	J	K
1		Age	DOB	Family_Num	FirstName	Gender	Married-to	Next_of_kin	PersonID	PersonType	Surname
2	209	47	18/03/1969	1	Georgina	Female	253	253	295	Coupled	Rees
3	167	44	29/02/1972	1	Katie	Female	295	295	253	Coupled	Morris
4	478	26	26/10/1990	2	Daniel	Male	315	315	407	Coupled	Knowles
5	229	24	03/01/1992	2	Daisy	Female	407	407	315	Coupled	Murphy
6	492	29	22/08/1987	3	Ethan	Male	318	318	421	Coupled	Stevenson
7	232	27	30/11/1989	3	Cerys	Female	421	421	318	Coupled	Austin
8	136	60	22/09/1956	4	Leah	Female	263	263	222	Coupled	Moore
9	177	63	24/11/1953	4	Keira	Female	222	222	263	Coupled	Warner
10	533	41	19/04/1975	5	Billy	Male	423	423	462	Coupled	Steele
11	494	44	15/02/1972	5	Joel	Male	462	462	423	Coupled	Parry
12	293	38	27/02/1978	6	Jasmine	Female	440	440	379	Coupled	Riley
13	511	37	31/07/1979	6	Ewan	Male	379	379	440	Coupled	Godfrey
14	453	18	23/04/1998	7	William	Male	512	512	163	Coupled	Matthews
15	583	22	08/06/1994	7	Taylor	Male	163	163	512	Coupled	Lewis
16	615	63	05/07/1953	8	Mohammed	Male	355	355	544	Coupled	Pratt
17	269	64	11/11/1952	8	Sofia	Female	544	544	355	Coupled	Gough
18	173	35	23/05/1981	9	Abigail	Female	399	399	259	Coupled	Wallace
19	470	30	01/10/1986	9	Harrison	Male	259	259	399	Coupled	Slater

Visualisation



Pathway execution engine

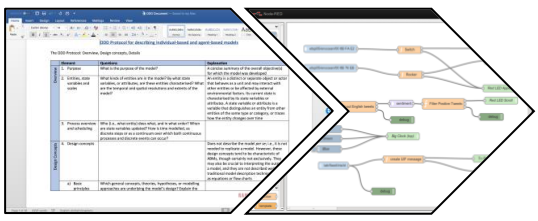
B	C	D	E	F
person_id	unique_id_number	current_week_number	current_pathway	current_pathway_state
322	1403	0	Falls_risk_assessment_pathway	Initial
322	1410	0	Falls_risk_assessment_pathway	Falls_risk_assessment
322	2744	0	Falls_risk_assessment_pathway	At_risk
322	3097	0	Falls_risk_assessment_pathway	Moderate_severity_fall
322	3610	0	Moderate_severity_fall_pathway	Initial
322	3762	0	Moderate_severity_fall_pathway	Moderate_severity_fall
322	4044	0	Moderate_severity_fall_pathway	Attending_MIU

Digital exhaust generator

```
MSH|^~\&|unknown||||20171127123313.1+0000||ADT^A01^ADT_A01|9001|P|
PID|||7||McCay^Ann
MSH|^~\&|unknown||||20171127123313.191+0000||ADT^A01^ADT_A01|9101|
PID|||7||McCay^Ann
MSH|^~\&|unknown||||20171127123313.203+0000||ADT^A01^ADT_A01|9201|
PID|||7||McCay^Ann
```

Pathway mining

Pathway validator



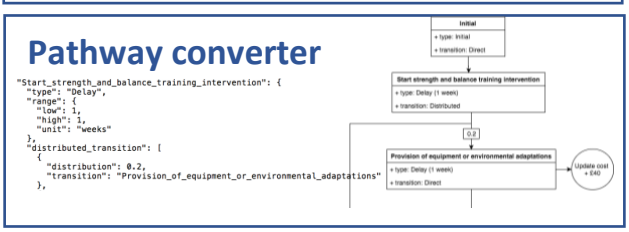
Population validator

Population aged 16-64 (2016)

	Wolverhampton (Numbers)	Wolverhampton (%)	West Midlands (%)	Great Britain (%)
All People Aged 16-64	160,600	62.6	62.2	63.1
Males Aged 16-64	80,500	63.4	62.9	63.8

A	B	C	D	E	F	G	H	I	J	K
Fema										
Source: C	1	Age	DOB	Family_Num	FirstName	Gender	Married-to	Next_of_kin	PersonID	PersonType	Surname
Notes:	2	209	47 18/03/1969	1	Georgina	Female	253	253	295	Coupled	Rees
	3	167	44 29/02/1972	1	Katie	Female	295	295	253	Coupled	Morris

Pathway converter



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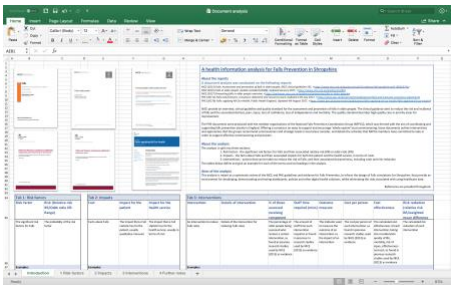
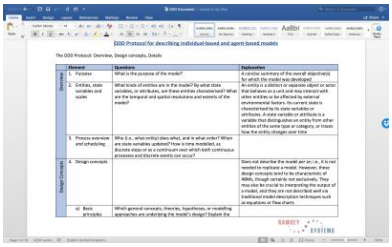
Document analysis

Identifying relevant information from policy documents, reports or clinical guidelines. This provides an evidence base for the pathway design.



The analysis includes:

- Risk factors
- Impacts
- Interventions

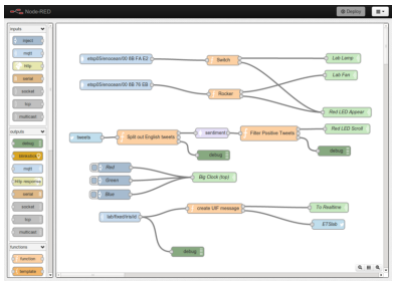


Information Architecture

A standards-based information architecture defining the information items relevant to the domain and how they relate to each other and to generic health information standard components. This links concepts familiar to the communicating community with terminologies and structures that are consistent across healthcare.

Pathway editor

Editing tool used to build pathways for a specific condition. Pathways created in this editor can be directly converted into the standard machine-readable format.



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Population builder

We generate our population by inputting Census data and any other relevant statistics in a standard format.

Pathway execution engine

Generate event log by running the population through the pathways from the start date week by week. This allows interactions between individuals, health and care services, and any other agents that impact health.

B	C	D	E	F
person_id	unique_id_number	current_week_number	current_pathway	current_pathway_state
322	1403	0	Falls_risk_assessment_pathway	Initial
322	1410	0	Falls_risk_assessment_pathway	Falls_risk_assessment
322	2744	0	Falls_risk_assessment_pathway	At_risk
322	3097	0	Falls_risk_assessment_pathway	Moderate_severity_fall
322	3610	0	Moderate_severity_fall_pathway	Initial
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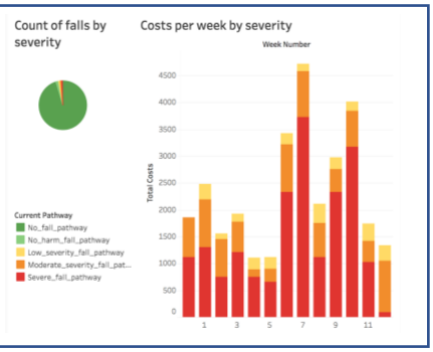
```
MSH|^~\&|unknown||||20171127123313.1+0000||ADT^A01^ADT_A01|9001|P|
PID|||7||McCay^Ann
MSH|^~\&|unknown||||20171127123313.191+0000||ADT^A01^ADT_A01|9101|
PID|||7||McCay^Ann
MSH|^~\&|unknown||||20171127123313.203+0000||ADT^A01^ADT_A01|9201|
PID|||7||McCay^Ann
```

Digital exhaust generator

When individuals interact with health and care services a digital exhaust is produced that replicates those seen in real systems.

Visualisation

Analysis of data outputted in event log. This can be used to visually compare outcomes where pathways have been modified e.g. a new intervention pathway added.

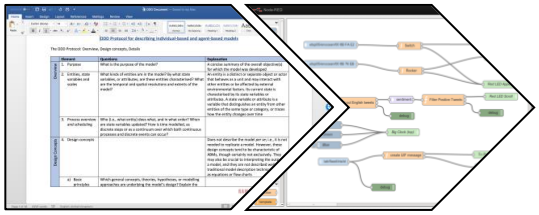


Pathway mining

Use consented patient data to discover pathways or validate and improve existing pathways.

Pathway validator

Compare set of pathways with the information items defined in the Object Design Document to ensure completeness.



Population validator

Compare Census and public health statistics for the real population with the synthetic population to establish how realistic the synthetic population is.

Population aged 16-64 (2016)

	Wolverhampton (Numbers)	Wolverhampton (%)	West Midlands (%)	Great Britain (%)
All People Aged 16-64	160,600	62.6	62.2	63.1
Males Aged 16-64	80,500	63.4	62.9	63.8
Females Aged 16-64	80,100	61.8	61.4	62.4

Source: ONS Population estimates - local authority based by five year age band
Notes: % is a proportion of total population

Pathway converter

Connectors used to convert machine-readable pathways into a standard pathway format that can be validated, compared and run by our systems.

```
"Start_strength_and_balance_training_intervention": {
  "type": "Delay",
  "range": {
    "low": 1,
    "high": 1,
    "unit": "weeks"
  },
  "distributed_transition": [
    {
      "distribution": 0.2,
      "transition": "Provision_of_equipment_or_environmental_adaptations"
    },
```

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