



Breast Screening: “A Blue Print for Success”

A report of how Leeds & Wakefield Breast Screening Services are planning to achieve & sustain 36-month Round Length.

Finding a Solution:

Brent Wherry, the Technical Director of Focused_On Ltd explains:

"Three forces complicate Breast Screening:

1. Geographic - Women want local Screening
2. Historic - Agglomeration of Screening to fix past slippages
3. Contemporary - Each Round Length must not exceed 36 Months

And, this 3-dimensional Clustering has yet three further complexities:

1. Introduction of Age Extensions
2. Migration to Digital Screening
3. Staffing of various Static or Mobile facilities.

This is a very large challenge for optimisation and has been addressed using a mixture of Set Covering, Simulation and bespoke Clustering and Time Scheduling algorithms."

Client Comments:

Kate Jacobs, Screening Programme Lead, NHS Leeds reports:

"Leeds & Wakefield have saved buying at least 2 new Screening machines & now have a blue-print for success. Focused have got the tools & understanding to help other Breast Screening Services quickly."

Jayne Reeves, Commissioner, NHS Leeds found:

"The culture of Focused_On Limited was to listen and be collaborative, innovative, and inclusive."

Our client now has:

"a Breast Screening tool that ... can be easily replicated for other PCT's and provider trusts."

Jayne concludes "NHS Leeds were extremely satisfied with the outcome in helping resolve such a highly complex problem."

Breast Screening Project @ Leeds & Wakefield

Original Commission:

The Leeds & Wakefield Breast Screening Service & Primary Care Trusts asked Focused_On Limited to build a Demand & Capacity simulation model focused on the number of Mobile and Static Screening facilities and the Screening Staff needed to cope with background population increases and the Age Extension Strategy.

The Age Extension Strategy means reducing the lower age for automatic invitation from 50 to 47 & increasing the upper age for automatic invitation from 70 to 73. Its introduction may need to be phased: Younger / Older over two or more years.

The Client also wanted the ability to modify when & how often individual staff worked on Screening Duties within a Rostering structure.

It was crucial that the simulation model calculated and recorded the Round Length between Screenings so that compliance with the 36-Month Standard could be evidenced.

This work was begun in Spring 2008 & largely completed Autumn 2008 with a significant period of compassionate leave during the Summer.

Additional Development:

During initial discussions and analysis of the problem, Focused realised that this was not a simple Demand & Capacity planning problem and that the true nature of the problem was only being aggravated by the +50% extra Demand being introduced over a 10-year period to 2017.

The Client was actually facing another two important decisions over and above any Capacity considerations:

1. Mobile 'v' Static Screening Facilities
2. Convenience & Attractiveness of Machine Locations

However, there was actually an even more challenging issue to resolve if Round Length was to be achieved & sustained efficiently:

Fixes to old Round Length Failures had caused an Agglomeration of Screening Dates. In essence, fixes & catch-ups had resulted in periods of extreme activity with intervals of under utilisation.

Matured questions now became:

1. Where are the optimum Screening locations for the Women registered at our GP practices?
2. What Screening Capacity should be in those Locations?
3. How to produce Optimised Screening Schedules for each Location to mitigate the consequences of Agglomeration (Stress Periods & Redundant Capacity)?
4. Can we modify Staffing Rosters to match the new Machine Strategy?

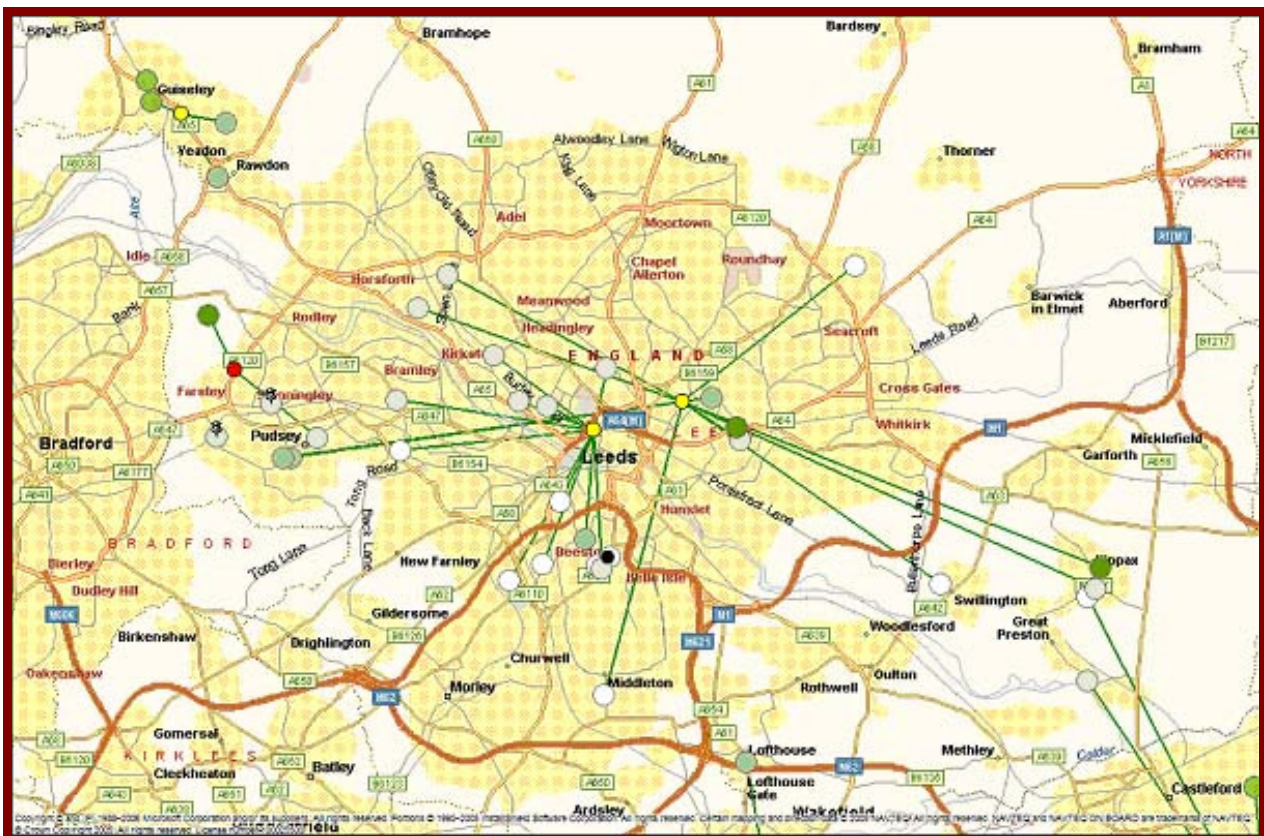
A major piece of work would be needed to produce new Screening Invitation Schedules for each year through to 2017 & ensure that Round Length Standards could be achieved & sustained with Take-up rates at each Location at their current rates.

These new questions have been answered by applying two new service solutions that have been designed, developed & funded by Focused_On Limited. This decision to re-invest in our Client and our service Solutions means Leeds & Wakefield Breast Screening Service can confidently answer all of their key questions and means that Focused_On Ltd is uniquely placed to work with other Breast Screening Services across England.

LocationFocus:

Since it was clear that for a number of reasons Static Screening Facilities would be preferable to a challenging program of Mobile locations, we first looked to see where these static facilities should be located.

The demand for the last three years were examined separately for the localities Otley and Surrounds, Leeds, and Wakefield/Pontefract and by mapping the demands we produced a paper titled "End Point Scenarios". An example of one option for Leeds is below:



The “End Point Scenarios” paper enabled the BSS Group to consider alternatives and decide on their preferred approach.

This was:

1. To maintain the existing two machines screening at St James’
2. To try to make best use of the spare capacity at Wharfedale
3. From the start of 2010 to introduce a new static screening facility in Wakefield.
4. From the start of 2011 to introduce new static screening facilities in Leeds Centre and in Pontefract.

With these decisions made we then had a very much stronger foundation to progress with the rest of the work.

ScheduleOptimisation:

We now have the situation where we are aware of the overall growth in demand (the SHA growth factors), we have decided the times at which we will introduce the age extensions and we know the static facilities with which we can work.

The problem is then to take the annual demand for the years up to 2017 and allocate these screenings to either static or mobile facilities. While this is being done we have two major objectives:

1. To be bound by the maximum intervals between screenings of three years.
2. To attempt to “smooth” the annual workload so that we are not forced to equip and staff for some unnecessary workload peaks.

Substantial programming resulted in scheduling algorithms which, for each year up to 2017, produced:

1. Schedules of which Practices needed to be screened by which Facilities and on what Dates.
2. Maps of the allocations of Practices to Facilities.

In addition a “Checks and Balances” sheet was produced to demonstrate that the suggested schedules did, indeed, honour the three year target.

A final Scheduling report was produced which detailed the activity required from each screening Facility.

This report shows periods within a year when the Facilities are underused and indeed, for Mobiles, identifies some complete years when the Mobiles are not required.

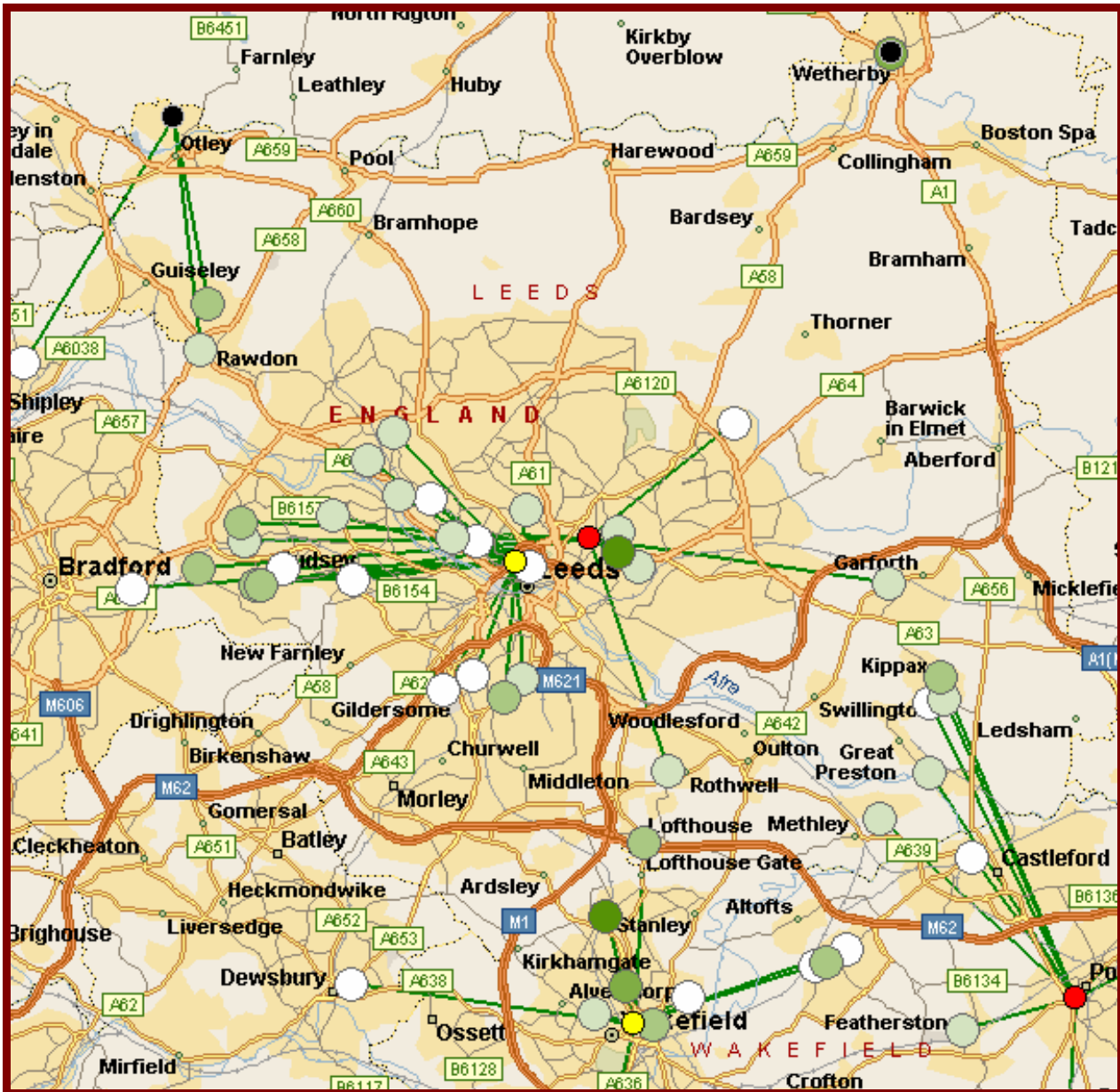
This presents the opportunity for re-deployment of these mobile units to neighbouring services.

In summary, by smoothing the annual workload we achieved a growth in screening capability from 122,000 women in 2008 to 188,000 women in 2017 while only increasing screening facilities from 6 machines (plus Wharfedale) in 2008 to 7 machines (plus Wharfedale) in 2017.

The plan is very robust since out of the 7 machines, 2 are on mobiles which are necessary for flexibility but are generally loaded to less than 50% capacity.

The schedules of assignments of Practices to Facilities are also the blueprint for service delivery to 2017 and, in effect, mean that all “Rounds Planning” is unnecessary until this date.

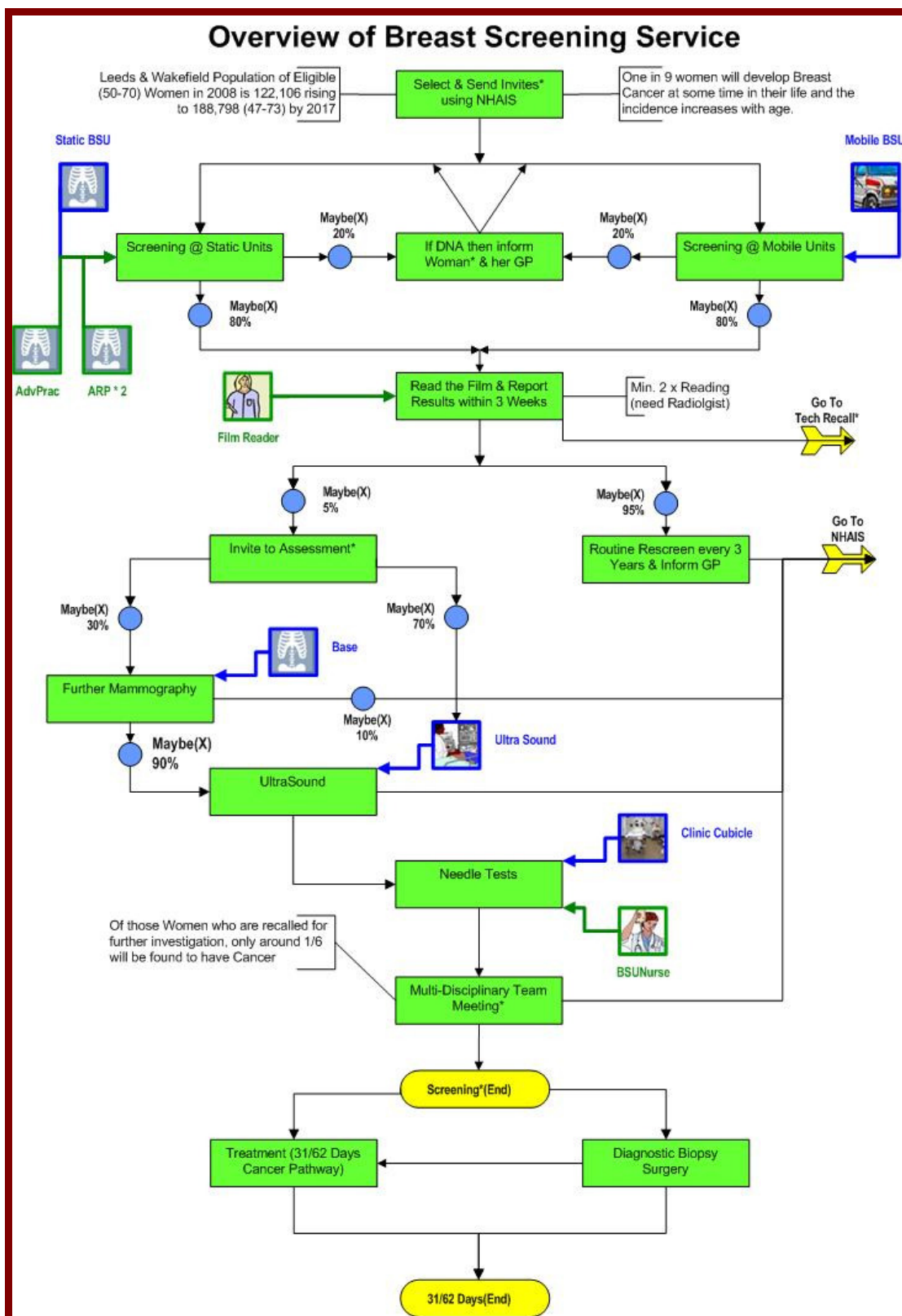
An example of the level of detail provided by these Optimised Schedules can be seen in Appendix1, which defines the screening to be done in 2011 and is supported by the following Map of Allocations.



Note that via the use of Microsoft MapPoint, this map is actually active and floating the cursor above the objects will show information like names, demand volumes, dates etc.

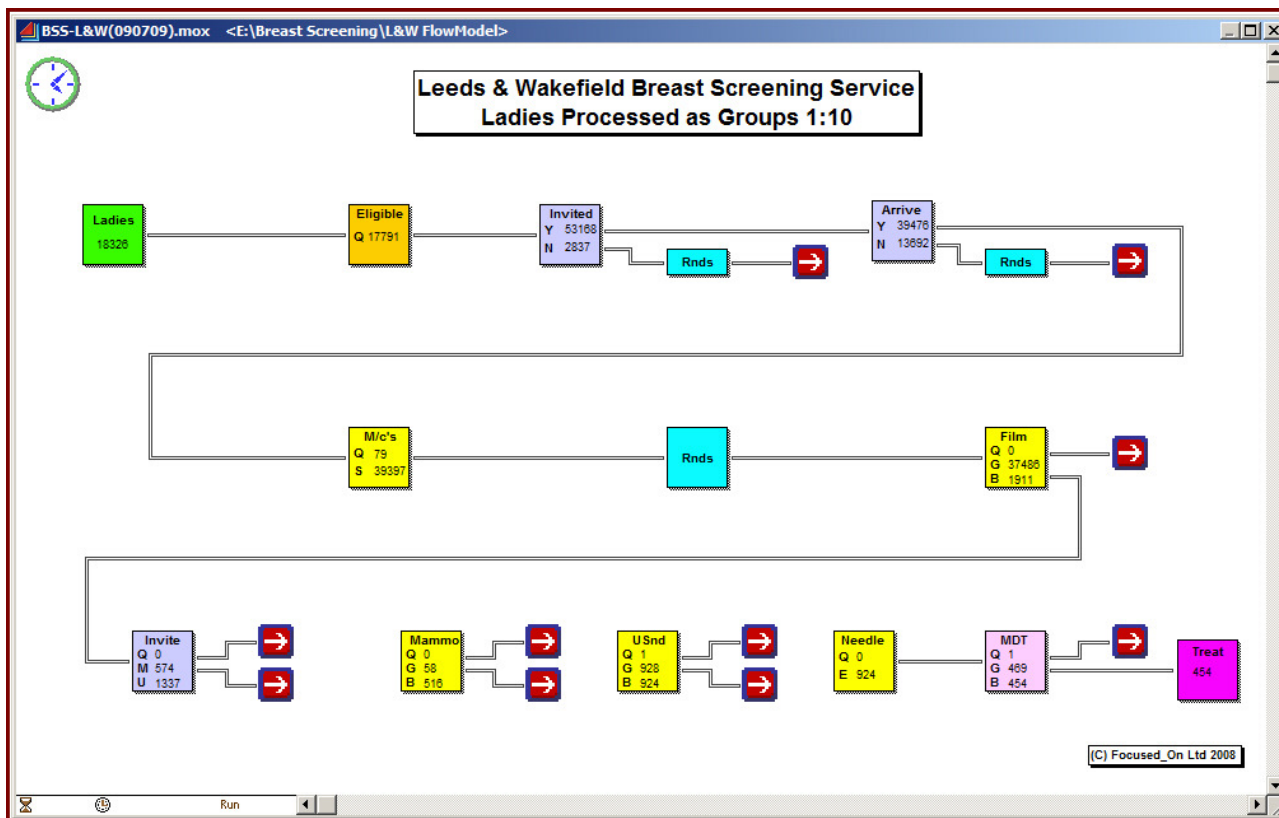
Demand & Capacity Simulation:

The initial Flow of Women through the Screening process was documented using (PFP) PatientFlow Planning software and both Leeds & Wakefield PCTs have been granted Licences for use of this tool beyond this project.



Informs design & scope of Demand & Capacity simulation model

Annual rates of Screening Demand are taken from Regional QA data. The break down of these data by GP Practice & Staff Shift rotas (Activity Schedules) were provided by the Leeds & Wakefield Breast Screening Service.



The simulation model is focused on Demand & Capacity Planning and can be calibrated with the new Machine Strategy.

Given the limitations of discrete event simulation modelling, we are not concerned with issues of Location or Agglomeration. These are treated in-depth by *LocationFocus* and *ScheduleOptimisation*.

MS Excel is used as the source & destination for automatic Import & Export of Control Data. It is also used to allocate Practice Based Demand to Machine Capacity. It does this for each of the 10 years as it rotates through the list of Practices, switching from one Machine to the next as cumulative assignments approach an allocation threshold.

Summary of Demand Allocations:	Mc	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	1	6747	7263	6346	7025	6837	7080	8241	7285	7517	7493
	2	6897	7341	8421	7769	9022	6846	7776	7087	7269	8612
	3	8663	7864	7623	6987	5774	7953	8481	8680	8445	8831
	4	7424	7399	7342	8133	9767	8896	8069	9844	9445	8301
	5	7179	7261	7362	6331	7991	7446	7573	8344	7906	7701
	6	3527	4549	5336	8752	7981	8074	8986	8550	8573	8067
	7	0	0	0	4300	8481	7704	7555	8649	8180	8064
	8	0	0	0	0	1411	4321	1145	2584	4588	5453
	9	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0
		40436	41677	42430	49296	57263	58322	57825	61024	61923	62522
	Avg	6739	6946	6061	6162	7158	7290	7228	7628	7740	7815

Screening Rosters are consolidated from each individual's Shift Rota to take account of their Skills & Availability over 672 Hour (4-week) period - some staff patterns vary from week to week. These are done for the Advanced Practitioners, the Radiographers and

the Assistant Radiographer Practitioners (ARP's). New Staff can be added and individual Activity Schedules may be modified in any of 10 years.

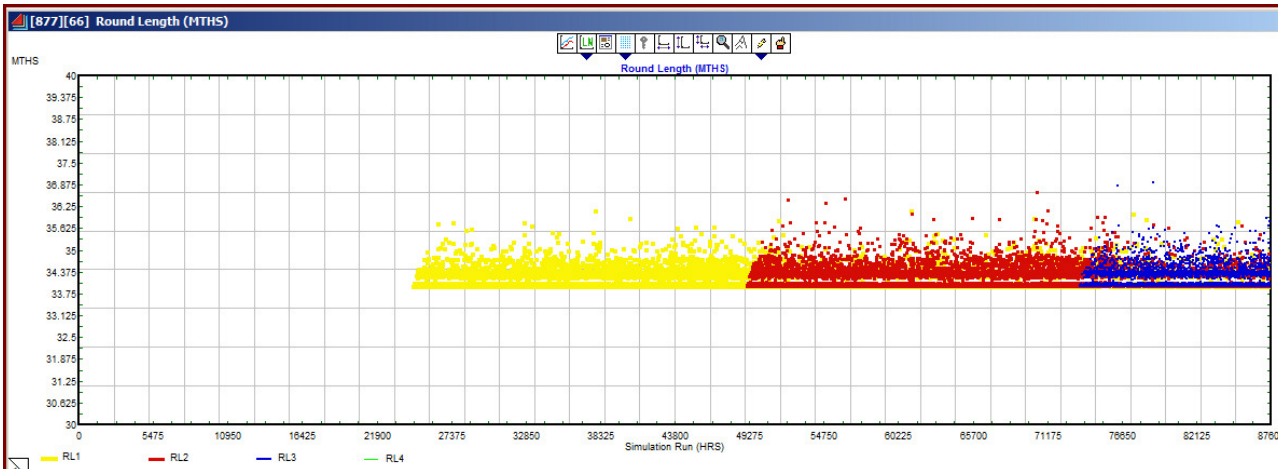
Breast Screening Activities					7	RAD	RAD	RAD	RAD	RAD	RAD	RAD	RAD1	RAD2	RAD3	RAD4	RAD5
Rota Name	RAD2				Time	1	1	1	1	1	1	1	0	0	0	0	0
Repeat Every	672	Hours				Mille	Elaine	Jo	Veronica	Phillipa	Mary	Moira	RAD1	RAD2	RAD3	RAD4	RAD5
Starting	8760					0	0	0	0	0	0	0	17520	26280	35040	35040	87600
Ending						87600	87600	87600	87600	87600	87600	87600	87600	87600	87600	87600	87600
	Week	Day	Hour	0													
MONDAY	AM	1	2	9	33	ASSESS	SCREEN	SCREEN	SCREEN	SCREEN	na	na					
lunch		1	2	12.5	36.5	0	0	0	0	0	0	0					
	PM	1	2	13.5	37.5	ASSESS	SCREEN	SCREEN	SCREEN	SCREEN	na	na					
tea		1	2	17	41	0	0	0	0	0	0	0					
	EV	1	2	17.5	41.5	na	na	na	na	na	na	na					
home		1	2	20.5	44.5	0	0	0	0	0	0	0					
TUE SDAY	AM	1	3	9	57	ASSESS	FILM	SCREEN	SCREEN	SCREEN	SCREEN	SCREEN					
lunch		1	3	12.5	60.5	0	0	0	0	0	0	0					
	PM	1	3	13.5	61.5	ASSESS	ASSESS	SCREEN	SCREEN	ASSESS	SCREEN	SCREEN					
tea		1	3	17	65	0	0	0	0	0	0	0					
	EV	1	3	17.5	65.5	na	na	na	na	na	na	na					
home		1	3	20.5	68.5	0	0	0	0	0	0	0					
WEDNE SDAY	AM	1	4	9	81	SCREEN	SCREEN	ASSESS	na	na	ASSESS	na					
lunch		1	4	12.5	84.5	0	0	0	0	0	0	0					
	PM	1	4	13.5	85.5	SCREEN	SCREEN	ASSESS	na	na	ASSESS	na					
tea		1	4	17	89	0	0	0	0	0	0	0					
	EV	1	4	17.5	89.5	na	na	na	na	na	na	na					
home		1	4	20.5	92.5	0	0	0	0	0	0	0					

In addition to re-calibrating the Staff Activity Schedules via MS Excel, the User may also adjust Practice Based Demand & Take-up rates.

Expected Screening Time is calibrated in Minutes and defined as a Triangular Distribution with Minimum Expected = 5, Maximum Expected = 9, and Most Likely = 7 and these can be quickly & easily changed directly in the model.

The simulation is normally Run for 87600 Hours (10 years) and takes just a few minutes to complete. For computing efficiency, Women are simulated in small batches of 10.

During the first 3 years the Women are all Screened and their Initial Screening date is recorded or a Notional date is assigned if they Do Not Attend. As their 3-year Anniversary approaches, they are once again Invited to Attend. In the model, the minimum Interval between Invites is currently calibrated to 1020 Days (34 Months). The Women then Wait for their 2nd Screening & their Round Length is calculated and recorded and presented in the following Chart:



The actual data is also exported to Excel at Simulation end.

Summary & Benefits:

Breast Screening Staff can contribute to future Service improvements and Round Length achievement & ongoing sustainability by simulating & testing the likely consequences of changes to their own Activity Schedules.

As a result of this work we believe it fair to say that the Breast Screening Service for Leeds and Wakefield will be delivered in an extremely cost effective fashion. Beyond that, we have succeeded in reducing the very high activity “panic” years and we have provided schedules and maps which lay out in detail how the screening should be done for the next eight years. Evidence is provided that these schedules will meet the three year targets. Our Client is now in the position of having a practical, robust work plan. The certainty engendered by this will enable our Client to concentrate on other ways of lifting the quality of service, because they can now be confident that the major issues have been addressed and resolved.

These results have been achieved while increasing the convenience and attractiveness of the screening locations and significantly reducing the cost of the service (as measured by screenings per machine).

In the course of this project, Focused_On used some quite specialised software including: Set Coverage Location software for LocationFocus, Internally designed software for the geographic and timing issues of Schedule Optimisation, and Simulation for the Demand and Capacity Analysis.

It is now quite possible to use these tools for other Clients. If we start from a list of Practices, each Practice being identified by some unique number and each Practice being located via its Post Code and having an agreed 10 year Demand, then other Breast Screening Services and their PCT's could now benefit from our *LocationFocus* and *ScheduleOptimisation* services.

We'd expect individual projects to be completed within just a matter of weeks after Practice Based Demand had been validated. Similarly for Simulation after Staff Activity Schedules were agreed.

Pricing can be flexed to account for Local, Regional, or National interest and in any event these important benefits may be obtained at costs that will benefit from the Research & Development funded by Leeds & Wakefield Primary Care Trusts and Focused_On Ltd.

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To Whom it May Concern

Re: Focused_On Limited Testimonial

NHS Leeds were asked to provide a testimonial for Focused_On Limited based on our experience and level of satisfaction with their services.

Following a formal tendering process Focused_On Limited was commissioned by NHS Leeds during 2008 and 2009 to build a breast screening demand and capacity simulation model. The model focused on the number of mobile and static screening facilities and the screening staff needed to cope with population increases and changes in the age criteria for screening.

NHS Leeds also wanted the ability to modify when, and how often, individual staff worked on screening duties. As the Breast Screening Commissioning Leads for NHS Leeds my colleague can express our satisfaction and pleasure with service received as Focused_On Limited delivered the end product over and beyond the original brief. For example, they produced new screening invitation schedules for each year through to 2017. They also ensured that round length standards could be achieved and sustained at each location at existing rates.

Brent and Steve of Focused_On Limited were able to comprehend, document and articulate succinctly, highly complex ideas and situations. This was achieved through close personal and partnership working across the numerous organisations involved. They also contributed to the development of NHS Leeds staff by sharing knowledge and feedback on the use and analysis of the tools they developed. Identified risks were managed such as ensuring that a process to validate data was incorporated into the model. The ethos of the company resulted in developing and implementing a robust end product.

The culture of Focused_On Limited was to listen and be collaborative, innovative and inclusive. We believe these qualities helped develop a Breast Screening tool for NHS Leeds that was 'user friendly' and can be easily replicated for other PCTs and provider trusts.

Focused_On Limited shared planned timescales for the completion of work, behaved professionally and proved to be dependable and hardworking throughout the working relationship. NHS Leeds were extremely satisfied with the outcome in helping resolve such a highly complex problem.

Yours Sincerely,



Jayne Reeves & Kate Jacobs
Commissioning Managers NHS Leeds

Appendix1:

An extract from one of the Schedules:

Cluster Name	Total Demand at this Node	Allocated Name	Demand	Start Date	End Date
LEGACIES STATICS					
St James Leeds	7105.8			21/02/2011	17/06/2011
		B86011	769.1	21/02/2011	07/03/2011
		B86016	1490	07/03/2011	31/03/2011
		B86050-1	1067.6	31/03/2011	15/04/2011
		B86081	556.4	15/04/2011	23/04/2011
		B86018	941	23/04/2011	07/05/2011
		B86058-1	448.2	07/05/2011	14/05/2011
		B86670	129.1	14/05/2011	15/05/2011
		B86054	464.5	15/05/2011	28/05/2011
		B86658	555.8	28/05/2011	08/06/2011
		B86077	684.1	08/06/2011	17/06/2011
King St Wakefield	7434			07/02/2011	06/10/2011
		B87039	1055.7	07/02/2011	13/03/2011
		B87041	253.3	13/03/2011	20/03/2011
		B87600	319	20/03/2011	31/03/2011
		B87604	253.7	31/03/2011	07/04/2011
		B87004	816.9	07/04/2011	30/04/2011
		B87013	1642.5	30/04/2011	25/06/2011
		B87027	1328.7	25/06/2011	04/08/2011
		B86020	1066.9	04/08/2011	07/09/2011
		P00001	26.1	07/09/2011	08/09/2011
		Q99999	307.3	08/09/2011	22/09/2011
		B87044	363.9	22/09/2011	06/10/2011
And so on....					
OTHER TEMPO ASSIGNED					
Tempo1	1267			04/12/2011	14/01/2012
		B86033	1266.9	04/12/2011	14/01/2012

NHS Leeds now has “a Breast Screening tool that ... can be easily replicated for other PCT’s and provider trusts.”

For more information, please email
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