Research and Analysis Report - from CARA Research Ltd (1st December 2003)

Mortality, MRSA - High-Level Performance Indicators and Controls Assurance

Index

Research and Analysis Report

1. Introduction

This report is based on an analysis of:

- raw data provided by the National Audit Office (NAO) to CARA Research Ltd on 14th November 2003.
- controls assurance data for 2003 obtained from the Department of Health Controls Assurance Team; and
- CHI high-level performance indictors posted on the CHI web-site in 2003.

The objectives of the study were to identify if there were significant relationships between levels of mortality, MRSA and any other potentially interesting variables.

2. Methodology

The process of identifying key variables and quantifying their significant relationships across the database was complex and subject to the time-constraints of the project. A range of high-level analyses methodologies was used throughout the project and, where possible, the outcomes of one process were tested by another.

The report makes repeated use of valid statistical findings but does not throw out any relationships that are close to being statistically valid if the findings are supported by other identified relationships across the database. Where any non-statistical inference has been made this is be noted in the report.

The aim was to try to identify real-world effects that are significant or interesting from within the combined set of databases. Thus care has been taken to identify sets of variables whose combined effect is illustrative of strong underlying links with real-world effects.

3. Findings[1]

Mortality Rates and Relationships with other Data

i) MRSA

It may be a natural assumption that there is a relationship between mortality rates and the MRSA data. It is surprising therefore that no statistical relationship can be found within the data available at the normal levels of statistical validity. However significant relationships between MRSA rates and other variables do exist and will be examined in this report. There are links between MRSA rates and data for individual controls

[1] All of the key findings in the report are mapped and presented at Appendix 1

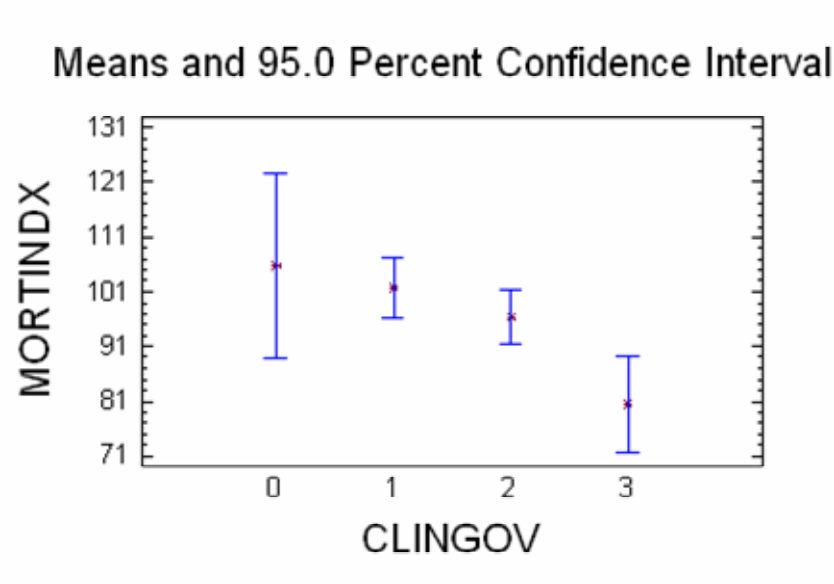
assurance standards of the data and these will be dealt with in a separate section devoted to these links.

The analysis also found many valid relationships between the mortality index and other variables and these will be identified and discussed throughout the report.

ii) Clinical Governance

'Clinical Governance grade' is one of many high-level performance indicators available from CHI.

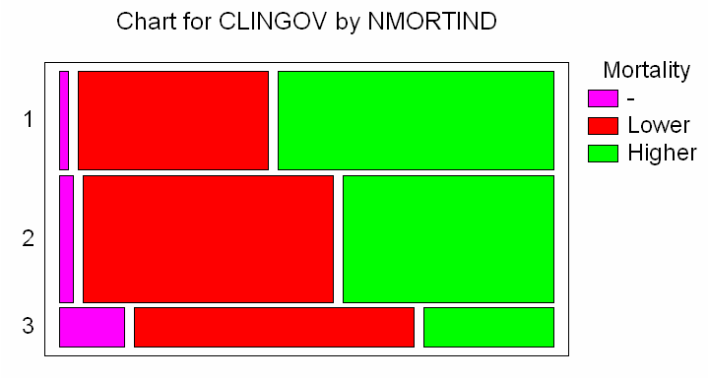
- as the clinical governance grade improves there are lower rates of mortality associated with each increasing grade[2]. An examination of the mean values of mortality at the different grades of clinical governance is shown below,



- if a trust has a high mortality rate then it is far less likely to have a '3' grading for clinical governance than a 1 or 2 grade.

Graphically the position is as shown below where 'NMORTIND' is the mortality index figures categorised into two groups of higher and lower scores with a zero score represented by a '-'. It is clear that as the clinical governance grade increases then there are more 'lower' rates of mortality.

[2] It is important to note at this stage (and throughout the rest of the report) that a statistically valid relationship does not imply causation. It would be incorrect to assume that a higher clinical governance grade caused a lowering of the mortality rate. What can be said is that there is a demonstrable relationship between the two variables which might mean (x) - where 'x' can be any statement not implying causation but which could be reasonably determined from the links between the data. This report will contain many statistical relationships and it is the consistency and direction of the findings that allow for meaningful and compelling relationships to be determined.

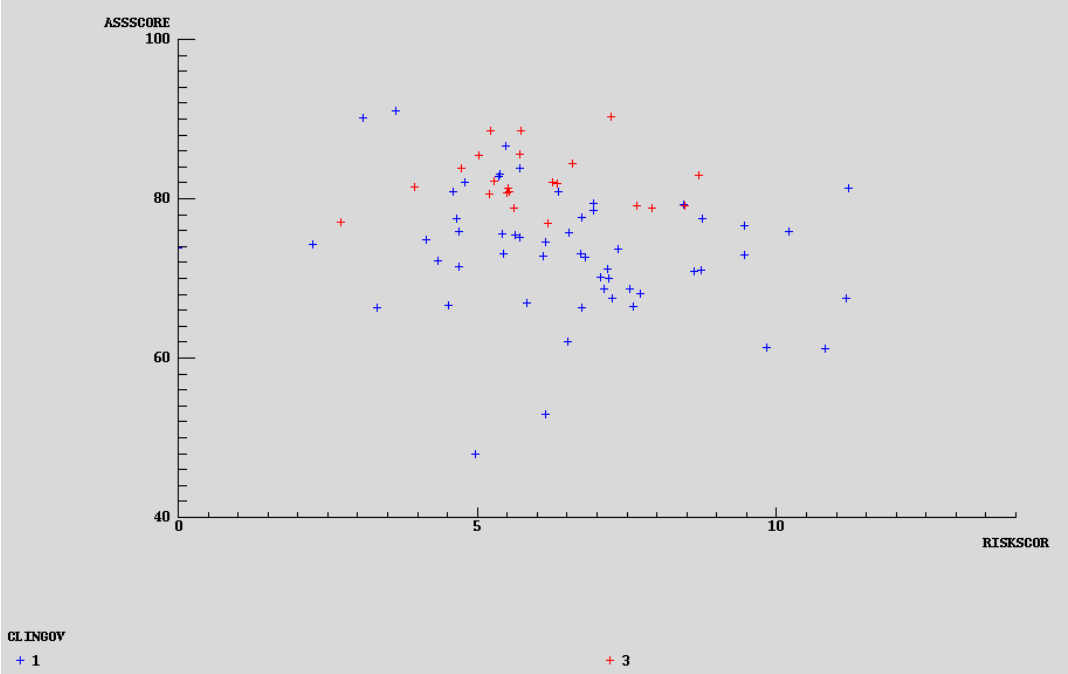


Clinical governance grade turns out to be a particularly useful variable in terms of linking with other key variables. The full extent of these links is beyond the scope of this report but a number of the key findings are given below.

ii) (a) Clinical governance and Risk-Assurance

The diagram below appears to suggest that trusts with a higher grade of clinical governance tend to have both higher overall levels of controls assurance and somewhat lower overall levels of risk-score[3] This suggests that, generally speaking, trusts that are rated higher by CHI in the clinical governance rating also tend to have scored themselves higher in their controls assurance self-assessments. This shows some degree of consistency between the two systems.

[3]The risk-score for a trust is an average of the risk-score placed on every action point raised by that trust within the controls assurance 2003 year. The risk-score is calculated as the impact multiplied by the likelihood (both on a 1-5 scale) where an increasing score indicates a higher level of risk.
It is probable that individual sets of standards are the main influence here but their determination is beyond the scope of this report



Clinical Governance, Risk Assurance and the Mortality index

This approach has been extended to examine the relationship between the mortality index, the overall level of trust risk through the controls assurance data, and related levels of clinical governance. The graphic shown in appendix 3 indicates:

- higher levels of clinical governance are associated with trusts that have a mortality index of below 107 and a risk-score of below 8. A score of 8 is well within the overall average risk-score scored by two-thirds of the trusts in the database.

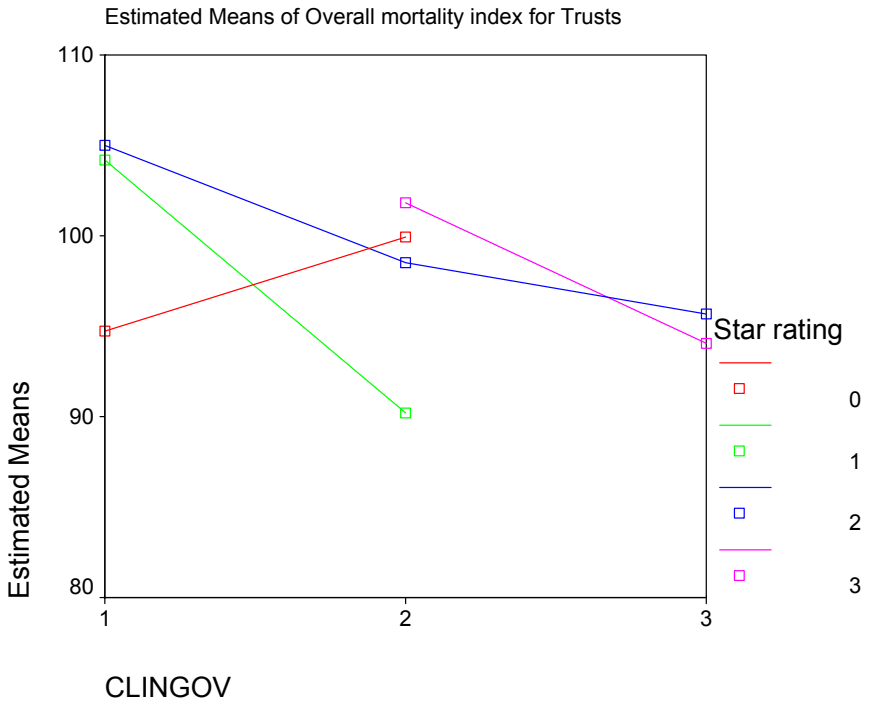
The final graphic at appendix 4 indicates:

- The highest clinical governance grade is associated with levels of mortality below 107 and risk-assurance levels above the 12-14 range. (The average risk-assurance score is 17).

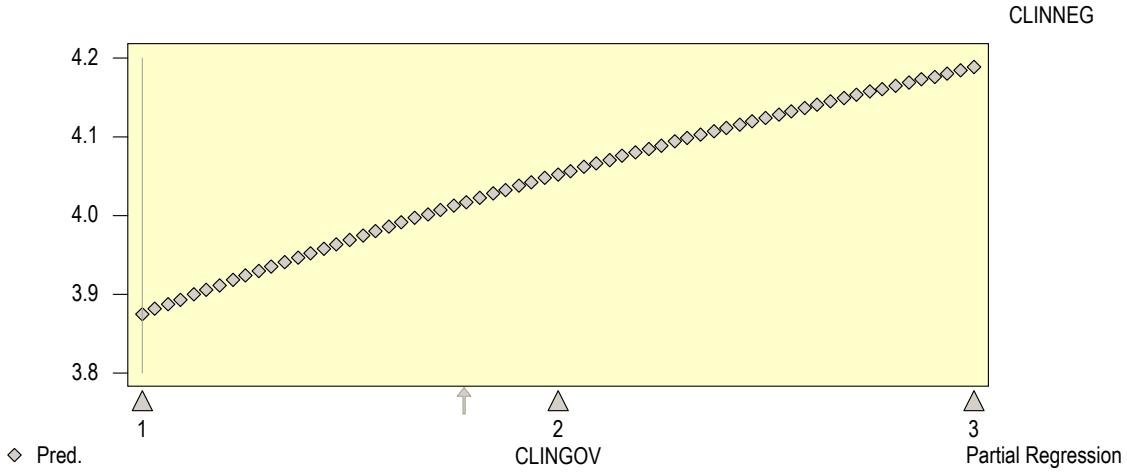
The above points tend to indicate that complying with controls assurance and being relatively good at CHI Clinical Governance ratings may well manifest itself in better survival rates.

There is a statistically sound relationship between the clinical governance grade and the star rating of a trust as shown in the diagram below

- For all grades of clinical governance (apart from the '0' grade) the level of the mortality index is always lower for increasing levels of star rating.



It is not surprising but worth noting that there is a relationship between the levels of clinical governance and the performance indicator for clinical negligence. The effect is shown below. It can be said that if a trust has a clinical governance score of 3 as opposed to the average grade of 2 then it is around 3 times more likely to have a clinical negligence grade of 5 rather than a 2.



Clinical governance and the PEAT score have a positive relationship - as the level of the clinical governance grade increases so does the related PEAT score. This can be expressed as follows:

- a trust with a clinical governance rating of 3 as opposed to a 2 is around 5 times more likely to have a high PEAT score than a low one.

- There is also a positive link between the level of overall risk-score a trust has and its grade for clinical negligence - one tends to increase with the other.

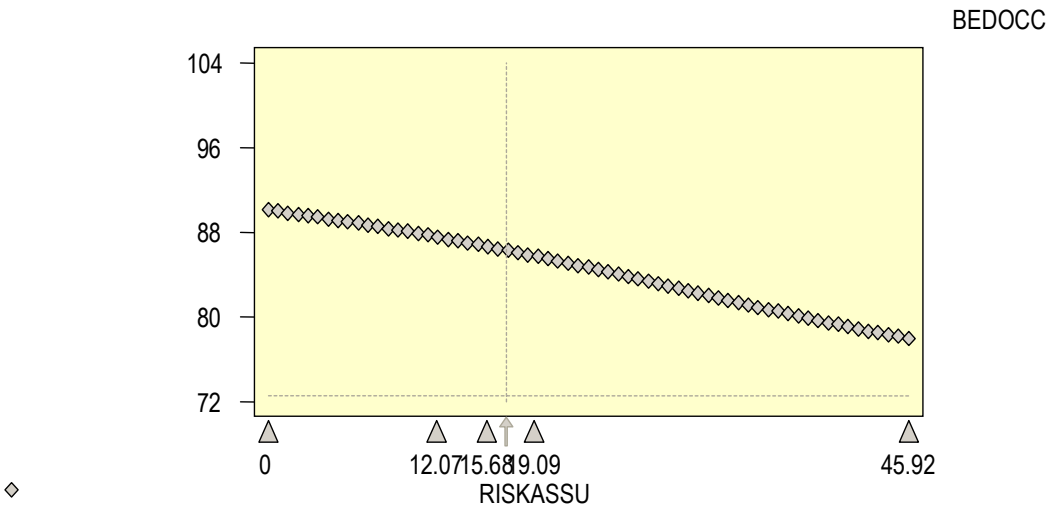
iii) Bed Occupancy

If the NAO raw data is used then there is no significant relationship between bed occupancy and either the Mortality index or PEAT score. Neither does the bed occupancy rate significantly relate to the MRSA rate.

It can be the case that the nature of the data contains so much inherent variability, especially when some of the trusts have zero scores in the variables that a better picture of the underlying relationship can be tested by grouping the data into representative groups - for the data in question this is often 'higher' or 'lower' groups. Where this approach has been taken it is possible to test the resulting relationships statistically and all of the relationships mentioned throughout the report will have valid statistical relationships. In some cases although there is no direct relationship between two variables they can have a 3rd variable in common which can throw light upon the nature of the overall relationship. This aspect of analysis will be examined later in the report.

It is noted however that there is some evidence of a relationship between the bed occupancy rate and the mortality index for fractured necks. Although the rate of significance is outside of statistical bounds it would be correct to say 7 times out of 8 that the higher the rate of the '**Mortality index for patients with fractured neck of** femur' the higher the respective rate of bed occupancy. This can be restated as - a trust with a high rate of mortality (neck) around 190 as opposed to the average of 100 is around 15 times more likely to have a high rate of bed occupancy than a low rate.

The rate of bed occupancy was compared to the controls assurance standard. This statistically valid finding is shown graphically below,



As the level of risk-assurance increases it is linked to reducing levels of bed-occupancy. The inference would be that increasing high levels of bed occupancy exist in trusts recording high levels of risk and lower levels of assurance.

iv) Star-Ratings

This section of the report examines links between the NAO data and the star ratings. The key findings are now briefly examined.

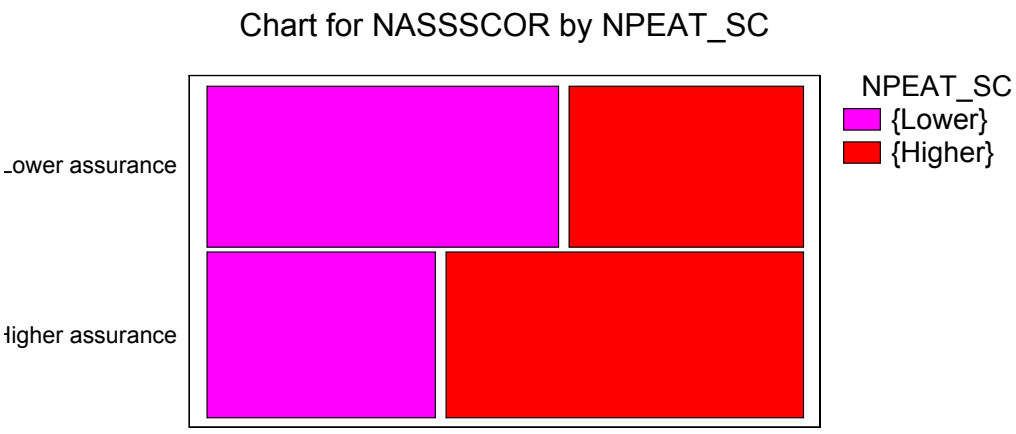
- Clinical governance - clinical governance grades and star rating grades have a tendency to move together. Improvements in one are often echoed as improvements in the other.

- Infection Control - infection control assurance levels tend to rise in line with levels of the star rating (infection control is of course one element within the star rating assessment profile - but only one of many).

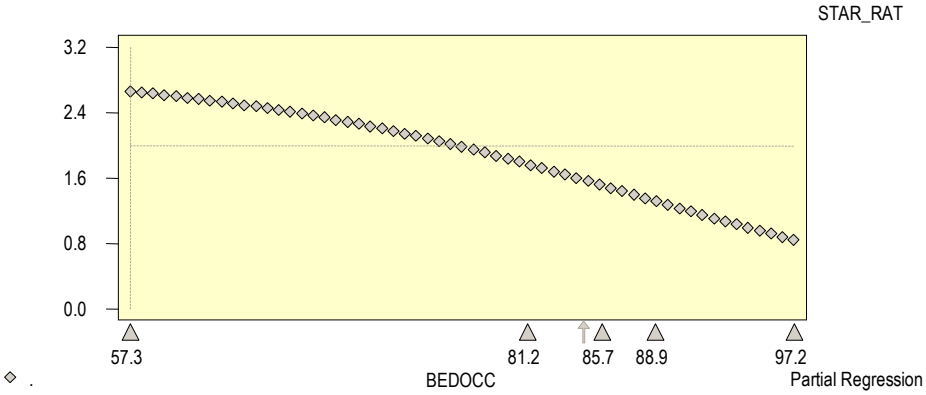
- MRSA - there is a tendency for the higher star-rated trusts to have lower rates of MRSA

- Overall levels of Controls Assurance

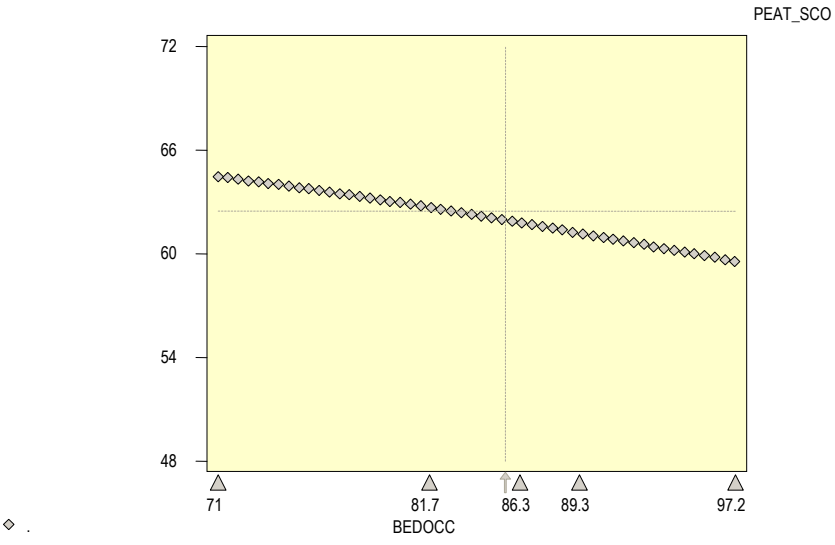
  At higher levels of controls assurance scores there is a tendency for trusts to have a higher PEAT score. The chart below clearly shows this relationship.



- Bed Occupancy - higher star ratings are associated with lower levels of bed occupancy



- There is also a relationship between higher rates of bed occupancy and lower scores for PEAT.

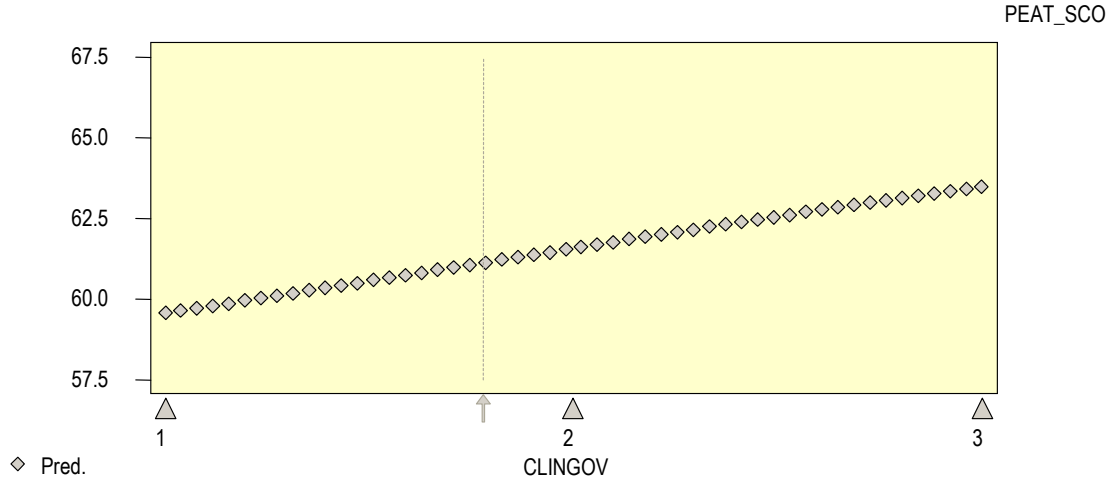


- PEAT - higher star ratings are also associated with higher scores for PEAT. This is especially noticeable at the highest level of star rating versus levels 0 and 1. There is therefore more evidence of a set of underlying relationships across the databases rather than one all pervasive relationship that would explain the key underlying factors. It is far more likely to be a combining set of underlying key factors that leads to situations that cause organsiations some difficulties.

v) PEAT and MRSA

There is a valid statistical relationship between the **MRSA bacteraemia improvement score**, and the PEAT score. The relationship is that as the **MRSA bacteraemia improvement** score improves then the PEAT score tends to be lower. The implication is that trusts with higher rates of the PEAT score have not improved their **MRSA bacteraemia improvement score** as much as trusts that started with a much lower rate of PEAT score. This is intuitively sound. Lower scoring trusts have a greater capacity to improve than the higher scoring trusts. There is good evidence across the controls assurance database that this is a common trend. Trusts (for example) with higher rates of assurance tend to make smaller levels of improvements in subsequent years than those trusts with lower assurance scores.

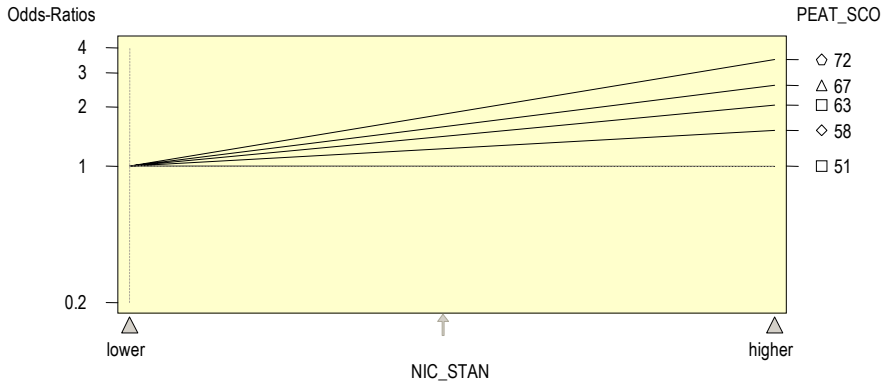
In relation to the above finding there is a relationship between increasing levels of PEAT and increasing levels of clinical governance.



The diagram can be interpreted as stating that if a trust had a clinical governance grade of 3 instead of a 2 grade or lower it would be 6 times more likely to have a high PEAT score (close to 70) as opposed to one nearer 50.

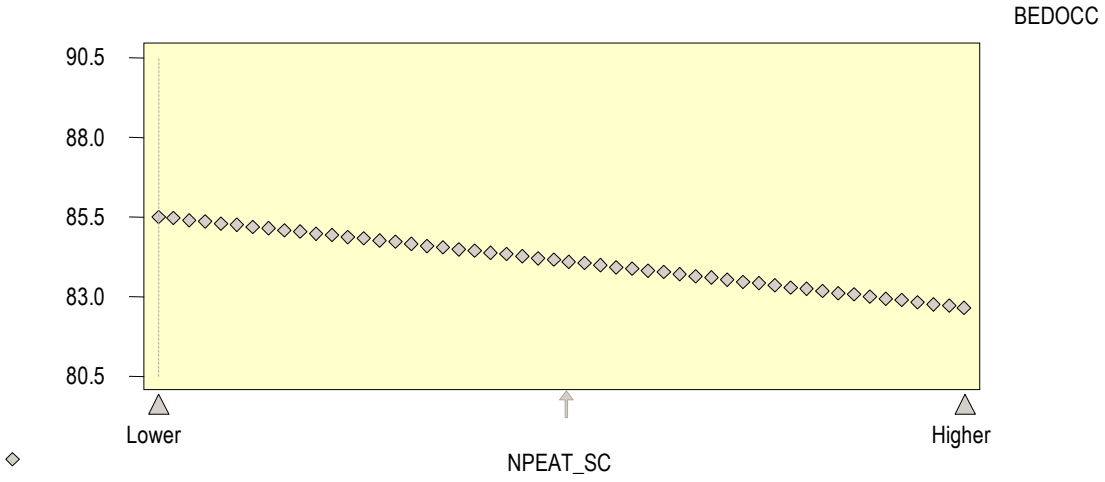
vi) Infection Control, MRSA, Controls Assurance and the PEAT score

Although there is no direct evidence of a relationship between PEAT and MRSA they do have a common influential factor in the level of infection control score. The relationships are as follows where the scores for infection control have been categorised into higher and lower groups,

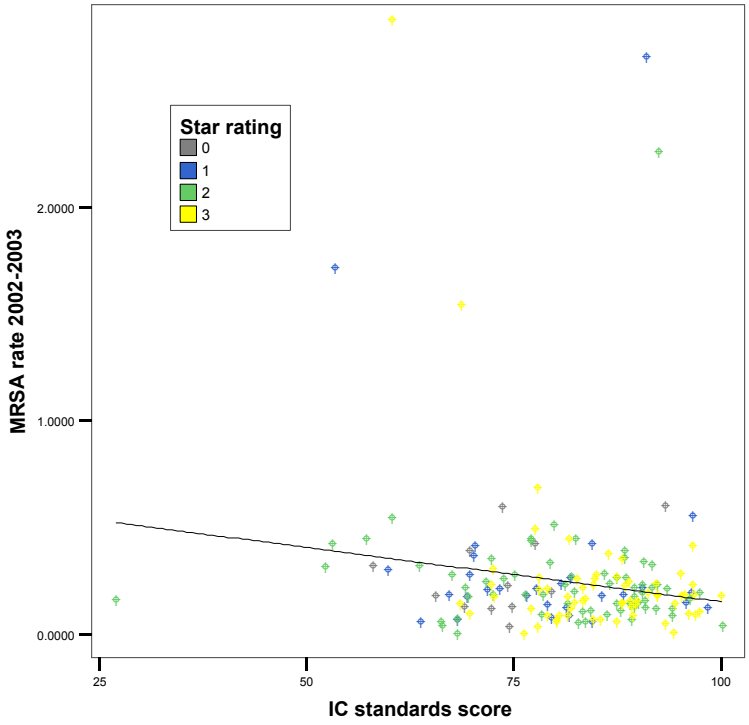


It can be said that if a trust has a higher infection control score as opposed to a lower score then it is around four times more likely to have a PEAT score of 72 than one of 51

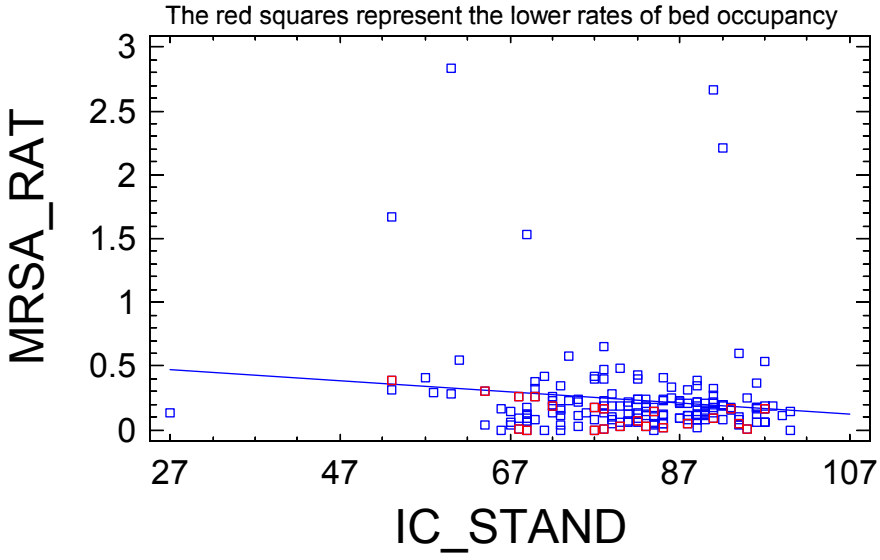
There is also a valid relationship between the higher and lower groups of the PEAT score and the level of bed occupancy. It can be said that if a trust is in the higher group of PEAT scores then it is approximately 15 times ***less*** likely to have a higher bed occupancy rate than a lower one.



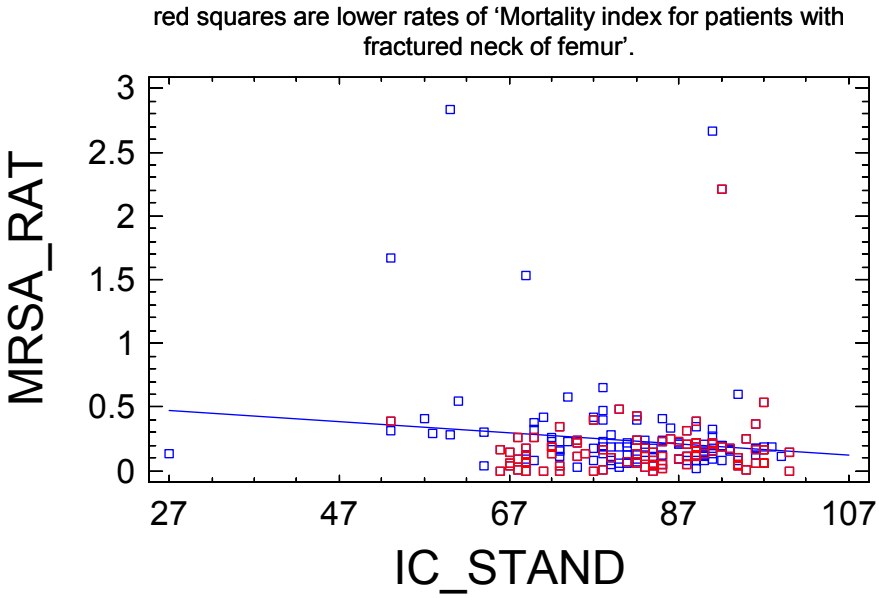
There is an interesting relationship between the MRSA rate, the IC standards score and the star-rating. The chart below makes it clear that higher scores in the IC standard do relate to lower MRSA rates and that the highest star-rating (3) has a strong tendency to be associated with both high IC scores and low rates of MRSA



It is worthy of note that when the IC assurance is plotted against the MRSA rate and the lower rates of bed occupancy it is clear that lower rates of bed occupancy tend to be associated with lower rates of MRSA.



The relationship between the mortality index (fractured neck of femur)and the rate of MRSA becomes striking when plotted as in the chart below.



Finally in this section there exists a strong link between the level of PEAT score and the Environmental Management Assurance Score. The relationship is positive in that higher levels of the PEAT score are associated with higher assurance scores for environmental management.
Although it is not the main aim of this report, as a matter of course, to drill down into the underlying level of criteria scores, appendix 9 shows the average scores for each of the ten criteria that make up the environmental management standard. Two of the lowest scores have been highlighted and these refer to criterion 9 - systems in place to monitor and review environmental risk-management, and criterion 7 which concerns the training relevant to the achievement of environmental policies, objectives and targets.

vii) Mortality and Capacity & Capability focus indicators

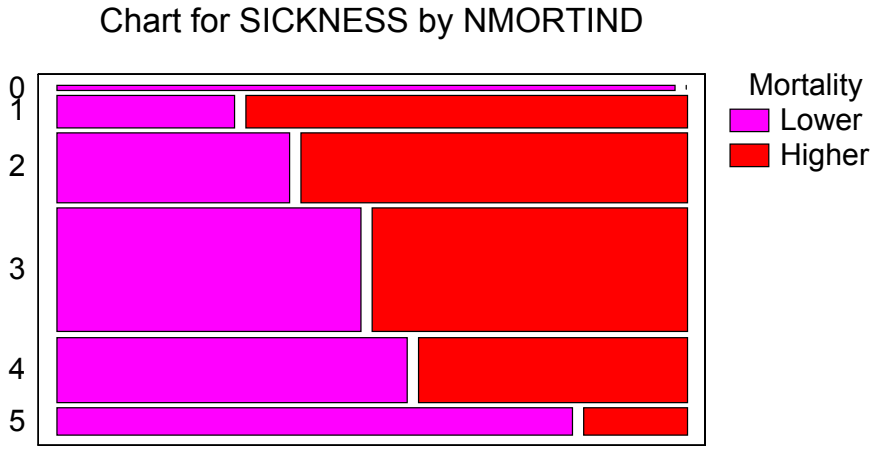
There were a number of links between the mortality index and other clinical performance indicators and these are discussed below,

The technique used, attempts to find the key relationships between complex sets of data. In this case there is evidence that rates of the mortality index are affected by the grade of the 'Staff opinion survey' indicator and also the grade of the 'Sickness absence rate'. The evidence is statistical and indicates that the lowest rates of mortality (88.2) relate to a staff opinion survey grade of 5. A higher mortality figure of 101 relates to a staff opinion survey of below 5 (4,3,2, and1). Further where the level of the sickness indicator is 1 1-3 then the mortality index is higher (102.7) than for those trusts with a sickness grade of 5 or 4 (97.0). The output of the network is as shown below.

```
STAFF_OP [4 3 2 1] [Ave: 101.101, Effect: +0.789 ] (138)
    SICKNESS [3 2 1] [Ave: 102.707, Effect: +1.606 ] (99)
    SICKNESS [5 4] [Ave: 97.026, Effect: -4.076 ] (39)
STAFF_OP [5] [Ave: 88.222, Effect: -12.091 ] (9, 1.0) -> 88.222
```

The relationships between the mortality index and the staff opinion survey and the sickness grade are shown in some detail in appendix 6 and 7.

By categorising the data for the mortality index into higher and lower groups it is possible to chart the nature of the relationship with the 'sickness' grade as follows,



There are clear indications that mortality levels are lower as the sickness grading improves.[4]

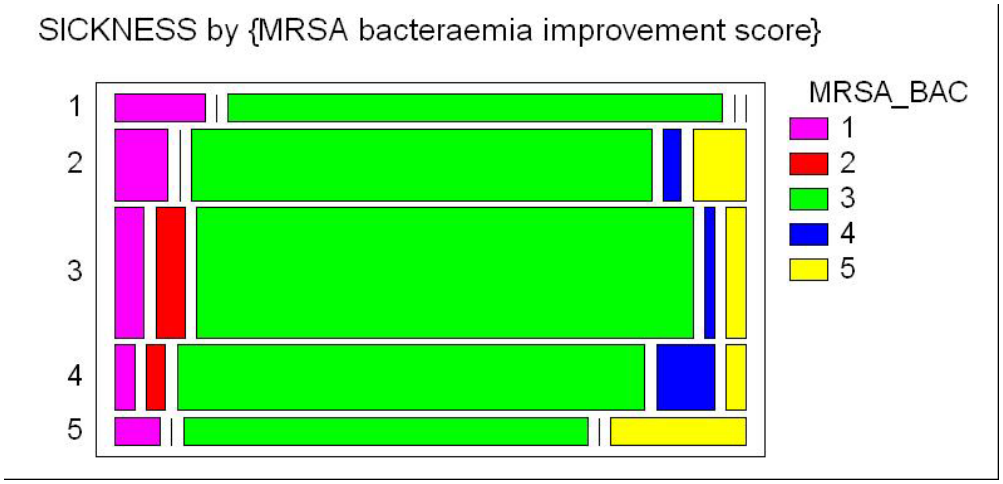
It is possible to generate a formula which shows the approximate nature of the relationship between mortality and sickness and staff opinion. The main idea here is that because the sickness and staff opinion grading both have the same scale it can be inferred that it is the sickness measure that carries the greater 'weight' - approximately 2.5 to 3 times the effect of the opinion survey.

Equation: MORTINDX = 111 + (-2.8 * SICKNESS) + (-1.1 * STAFF_OP)

There is also a general relationship between the **MRSA bacteraemia improvement score** and the sickness grading. It appears to be the case that as the level of sickness grade improves then so does the level of the **MRSA bacteraemia improvement score**.

[4] This relationship is also validated statistically

The above chart indicates a smooth progression - this is not in fact the case - the chart below makes the position clearer,

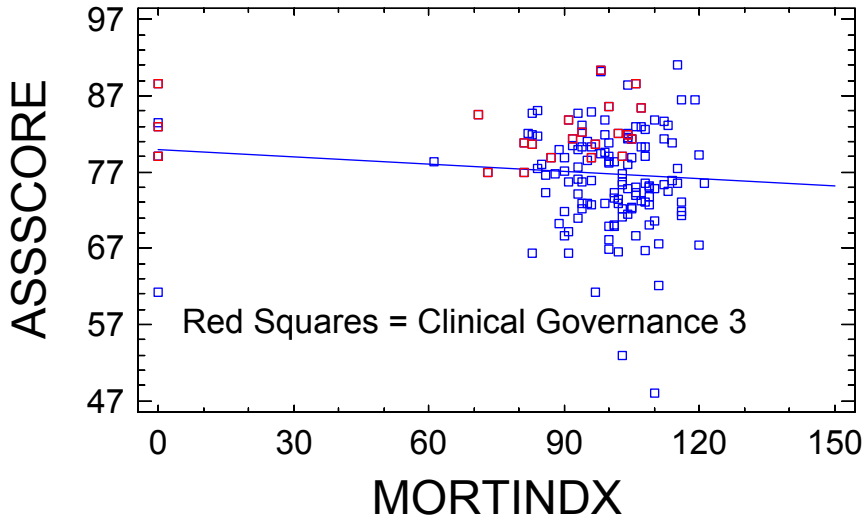


It is best said that there are indications that the higher rates of the **MRSA bacteraemia improvement score tend to be associated with the higher grades of the sickness indicator. The findings are therefore far from robust and would need further clarification 'on the ground' However taken in conjunction with the other findings for 'sickness' there is a body of evidence that the level of sickness grading is a factor in affecting other measures of performance.**

viii) Mortality and Risk-Assurance

When the mortality data was compared to the controls assurance database a number of important relationships was discovered. The chart below, for example, indicates that there is a three-way connection between the mortality index, the overall assurance score for a trust and the level of clinical governance. It appears to be the case that trusts with a level

3 for clinical governance have higher assurance scores and lower rates of mortality than those who do not.



There is a clear pattern of relationships between the overall scores for a trust's assurance and risk levels and the level of the mortality index. The contour plot shown in appendix 5 clearly indicates that higher levels of mortality are associated with lower levels of assurance and higher levels of risk-score[5].

ix) Relationship between MRSA rates and other variables

Although the MRSA rate does not link directly to the mortality index it does link with a number of key assurance standards. These links are now explored below.

ix) (a) Human Resources

There are a number of interesting relationships exposed when the levels of the human resources risk-assurance are plotted against the levels of human resources actions. The results are shown in appendix 8. It is apparent that higher rates of MRSA occur at lower levels of risk-assurance and increasing levels of action in the trusts. It is also clear that 3 star trusts are not raising high numbers of action points when compared to the lower grades of star rating. Research across the whole of the NHS controls assurance database clearly shows that trusts with lower levels of assurance consistently raise more action points (exactly what the controls assurance process would predict).[6]

[5] It is possible to overlay the plot with the positions of individual trusts but this report has been written with the intention of not identifying individual trusts' data at this stage

[6] it can be argued that action points are not homogeneous. This is undoubtedly true of individual action points. It can be argued however that sets of action points for individual standards across the whole range of trusts will exhibit a degree of homogeneity because i) the individual criteria that comprise each standard are common across all trusts and ii) at some level of action points (and there are many tens of thousands of them for Trusts) the numbers will have a strong tendency to create a valid statistical pattern that can be used in interpretations of relationships between low assurance-higher risks and more actions. This relationship has been found and has been shown to be consistent across all standards.

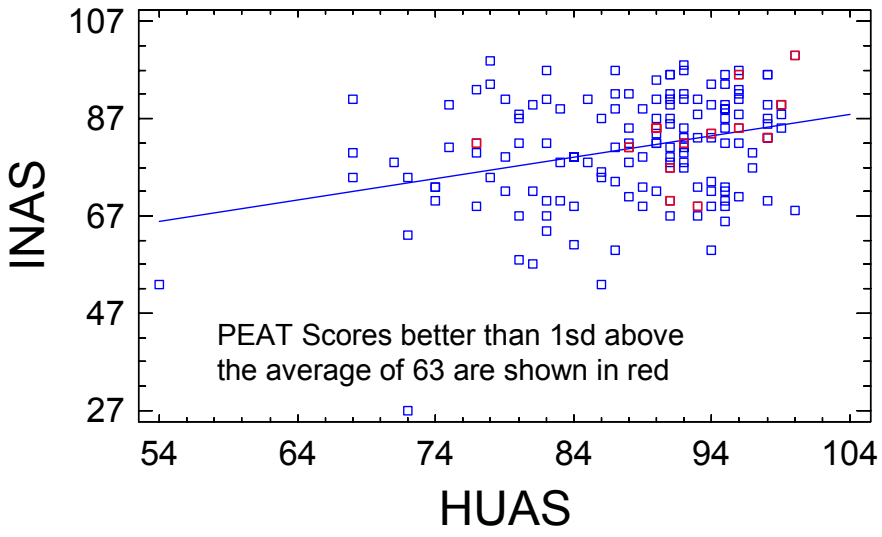
There is a striking relationship between the level of MRSA and Human Resources risk-assurance. The formula which attempts to mirror the relationship is,

MRSA_RAT = 0.25 - 0.006*HURISKAS + 0.012*HUACT

While the formula is a linear approximation only it does show that the average level of MRSA (which is 0.26) tends to reduce with the level of the Human Resources Risk-assurance level but to increase depending on the numbers of action points being raised in the human resources standard.

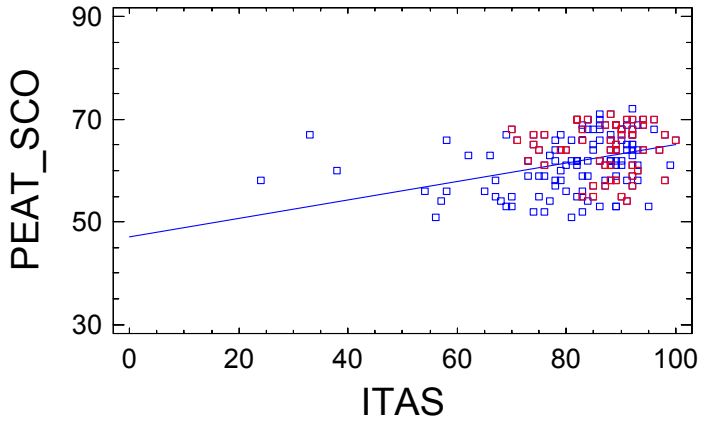
(as one rises so does the tendency of the other to rise).

Key standards that relate to the PEAT score often act jointly to promote a discernable effect. For example the assurance scores for infection control and human resources when plotted against the higher levels of the PEAT score show a definite pattern. The pattern



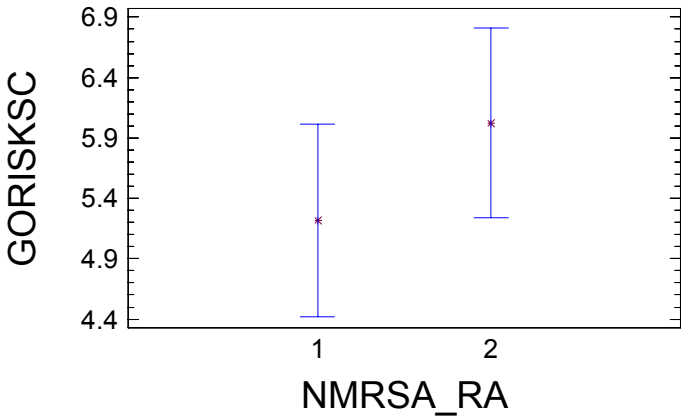
ix) (b) PEAT and Information Technology

A similar three-way effect can be shown with the PEAT score , the information technology score and the highest ranking 3 star trusts. The diagram below shows a positive relationship between PEAT scores and the IT standard level of assurance. The 3 star trusts appear to cluster at high levels of scores in PEAT and IT assurance. This is not to say that there is a direct link with IT performance against the standard and the PEAT score. High assurance scores in the IT standard have previously be found to link positively with a number of high-level performance indictors. It is probably the case that trusts that have placed a good deal of emphasis in the IT areas covered by the standard have also experienced follow-on benefits elsewhere.



ix) © MRSA and the Governance Standard

It is noted that there is a significant difference between the mean scores for the governance assurance level and levels of MRSA. If the levels of MRSA are grouped into higher (2) and lower (1) groups the differences are clear.



As there is also a demonstrable relationship between the star grading and levels of both clinical governance and levels of controls assurance a picture is emerging of a cohesive set of relationships that can be used to distinguish 'better' organsiations from others.

x) The MRSA Question

One of the main objectives of the analysis was to try to identify factors that might influence the overall level of MRSA. To try to produce a summary of the overall effects a neural process was used to identify and calculate levels of the key variables that would appear to influence levels of MRSA. Given the time constraints of the report it was not possible to carry out an exhaustive analysis of the question. At some time the final results would need validating against alternative sets of generated models to identify that the results were the 'best' model obtainable. This aim in itself would be time consuming so it has been decided to rely upon the level of consistency that is evident within the model as an early validation of its appropriateness.

The output from the model has been rephrased into a straightforward table of two columns. The statistical process is robust and has identified a consistent set of patterns that does account for part of the differences in the MRSA rating.

The process creates (in this case) two distinctive groups, each represented by a set of trusts. As the process requires a 'clean;' or near complete set of data only 31 and 32 trusts were used to form the two groups.

x) (a) A Brief Interpretation

The main test is a test of a key difference between the scores for MRSA. The values are 0.411 for group 1 and 0.158 for group 2. In terms of their real-world effects these figures are highly discriminating. Once the MRSA figures have been shown to be of interest then all of the rest of the data lines up behind these figures as shown in the two columns. The process itself adds no qualitative assessment to either group 1 or 2 but 'only' shows the likely areas of difference which essentially can be used as a profile of a better as opposed to a poorer performer. No attempt has been made to carry out individual significance tests on each of the 36 variables in the lists but it is their consistency that is compelling. Where categorical variables have been created for the purpose of previous analysis then these have also been tested against their originating data to ensure consistency. There is in fact total consistency down through the sets of variables.

It has been noted earlier in this report that there is very little evidence of a direct relationship between the MRSA rate and the mortality index. The results of the clustering exercise show that higher mortality rates attach to the set of variables in group 2 which has the lower rates of MRSA. The difference is close (2.43) and this is far less than the difference for mortality following the fractured neck of femur - where the group 2 trusts have a lower figure by 7.8.

A number of the variables have the same or similar results regardless of group but it is noted that the group 2 trusts with lower rates of MRSA have the following attributes in common;

- **Lower rates of MRSA**[7]
- Slightly higher key target, clinical focus and patient focus scores
- Higher levels of controls assurance across the standards
- Generally lower levels of risk-score derived from the controls assurance database and following from the above two items
- A much higher level of risk-assurance ratio
- Slightly higher PEAT scores
- A higher level of assurance in the infection control standard

[7] This distinguishing list might well have been different if the mortality index had been chosen to be the over-riding key variable

- Bed occupancy rates slightly higher but not significantly so
- Had a positive not negative change in the mortality index
- Had a much lower mortality index for the fractured neck of femur indicator
- A higher staff consultation grade
- Were creating lower numbers of action points - this is consistent with higher rates of assurance and lower risk-scores

It is a major finding of the analysis and mapping shown in appendix 1 that whilst the mortality index is affected in the main by clinical variables, the MRSA rate has a stronger tendency to be affected by Controls Assurance variables. This finding suggest that in order to deal with the major issues arising from the MRSA problems a considered approach embracing both clinical and corporate governance ideas would prove to be particularly effective.

4. Conclusion

There is good evidence to support the idea that levels of mortality and MRSA relate to a number of key clinical indicators and also to several aspects of the controls assurance database. It is the consistency of the direction of the findings that are compelling although further work should be considered on the detail of the findings as and when further ideas are generated from the findings.

The analyses has demonstrated that a number of the better trusts have reached levels of assurance and associated risk-scores that make it difficult for them to improve the overall position without significant amounts of additional effort. The statistics support this view in that the relationship between assurance and risk is frequently non-linear in nature. This has the real-world effect of making it increasingly difficult to achieve reductions in risk via further increases in assurance levels.

It is suggested that the above may indeed be the central paradox of the controls assurance model. The original and stated intention of the controls assurance methodology was to control levels of risk and assurance and prioritise actions. The eventual positive outcome would be a means of balancing the risk against perceived benefits and maximising the eventual effect on patients. If however organisations believe that it is the 100% overall assurance level that is the holy grail of the assurance methodology then they will eventually see diminishing returns for their efforts.

The findings in this report show quite clearly that both clinical and corporate governance measures both have an effect on levels of high-impact performance indicators. It is suggested that more work should be carried out on examining the complex but powerful sets of relationships that exist between key sets of variables in the clinical and corporate areas. It is further suggested that organisations would do well to consider the 'mix' of their performance against the key sets of relationships that exist across the clinical and corporate 'boundaries'.

5. Summary

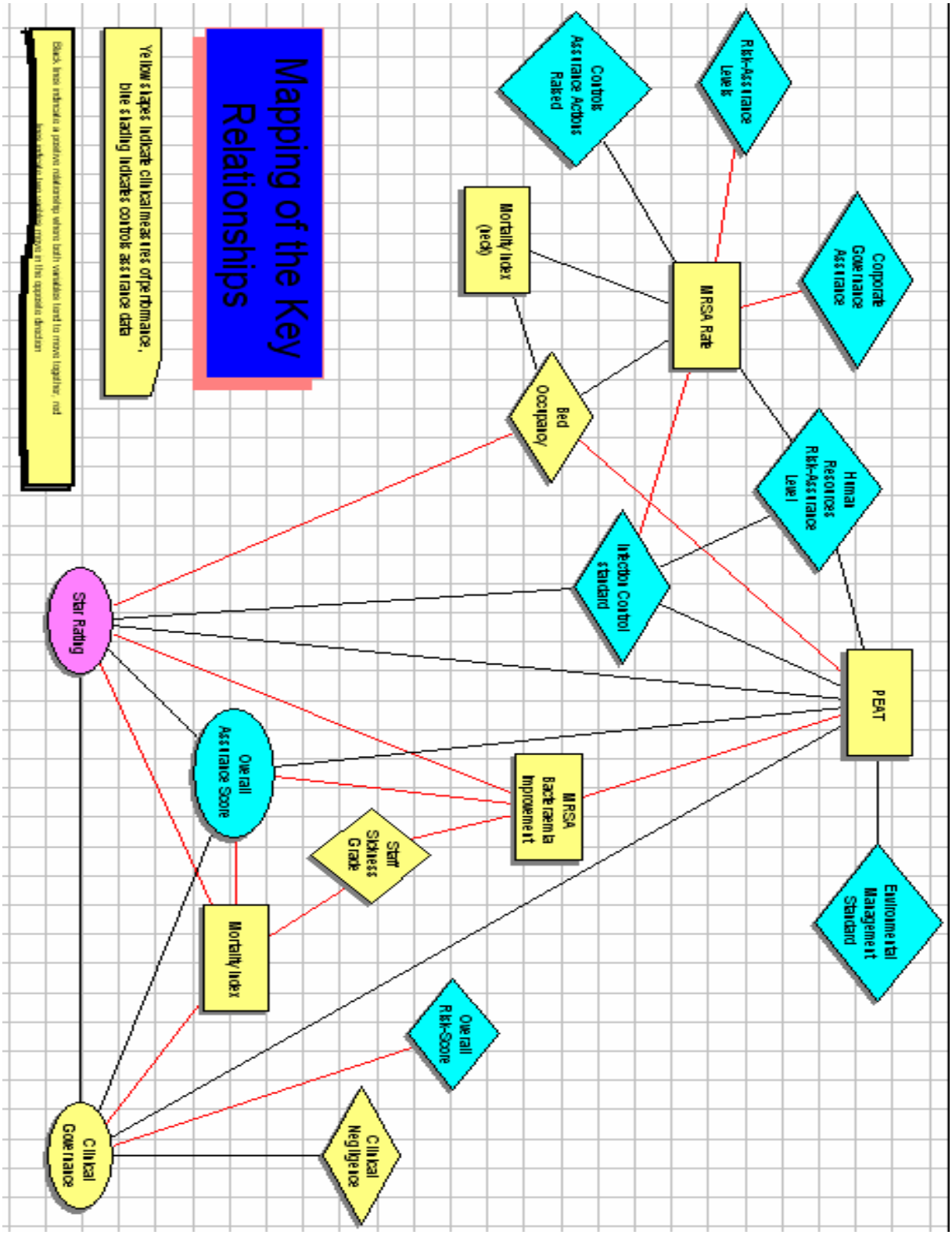
This report has brought together three databases with a combined set of over 150 variables. The report has had of necessity to limit the amount of analysis to the main effects discernable across the combined database. A number of key patterns and relationships have been revealed and briefly discussed in the context of the report as a whole.

A repeated finding has been that it is more often the case that combined sets of variables exert a more discernable influence than aspects of individual variables. It would appear to be the case that 'good' organsiations tend to be good across a number of key areas in both the clinical and corporate governance arenas and that this leads to positive outcomes in a number of high-level performance indictors which signal a real-world effect.

R.N.Hopkins

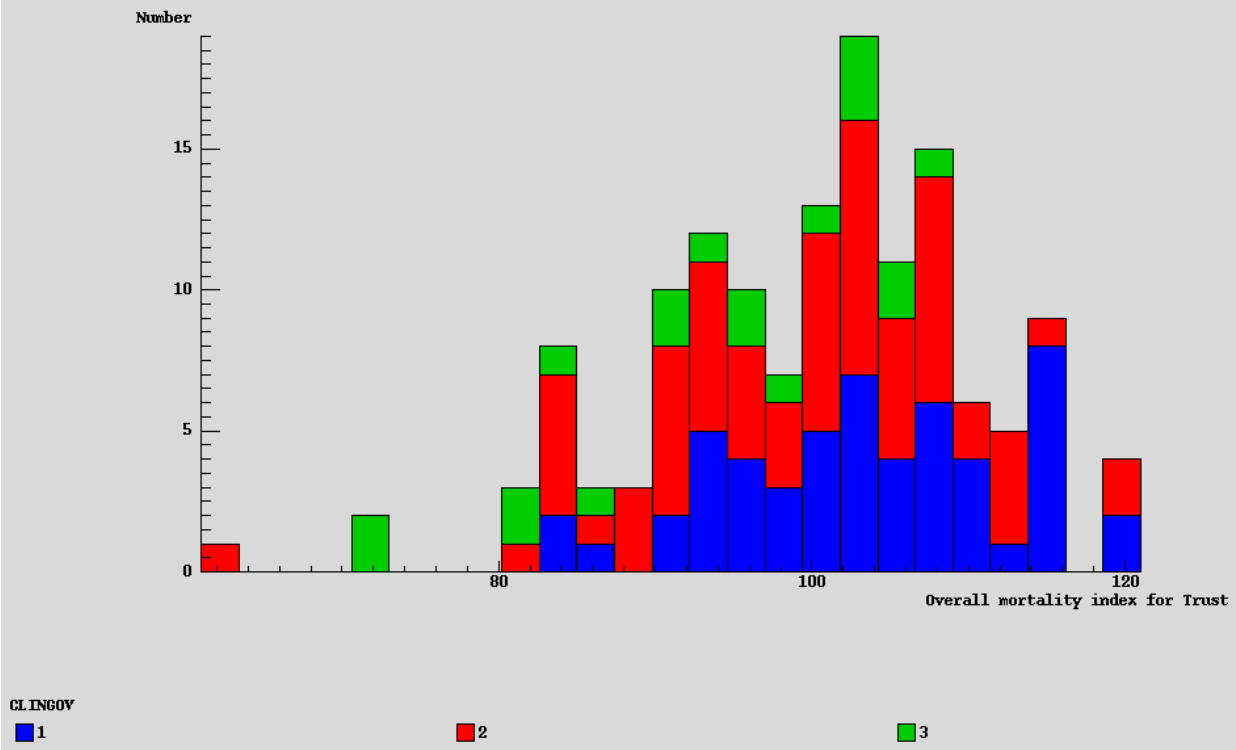
Director of CARA Research Ltd

Appendix 1 - Mapping of the Key Relationships across the Report



Appendix 2

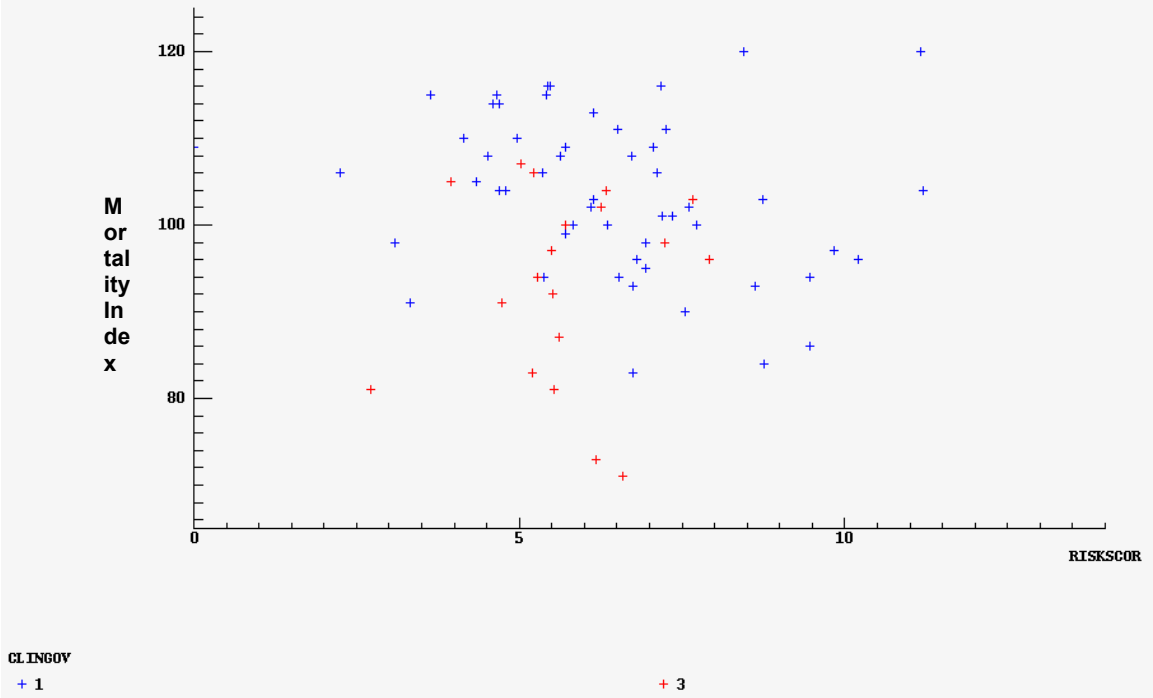
Mortality Index and Clinical Governance Levels



It can be seen that trusts with the highest grade of clinical governance do not appear at the highest levels of the mortality index. Similarly there are few trusts with a clinical governance grade of 1 that have a low mortality index.

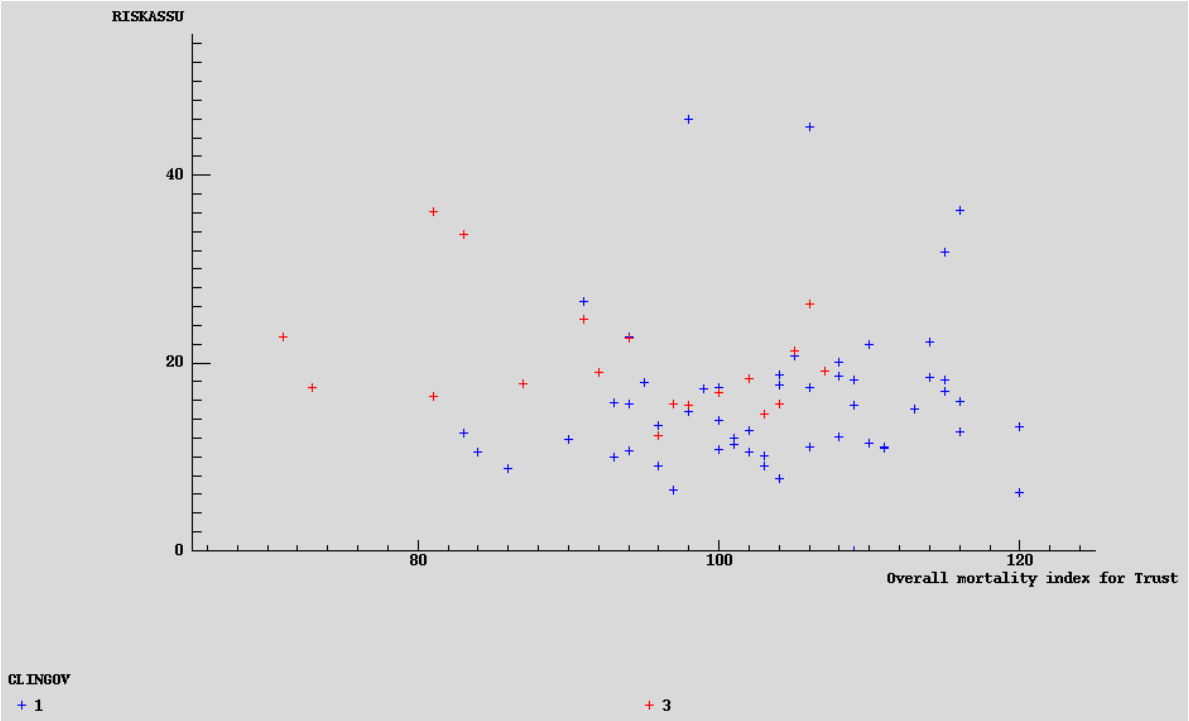
Appendix 3

Mortality Index and Risk-Score with associated levels of Clinical Governance.



Appendix 4

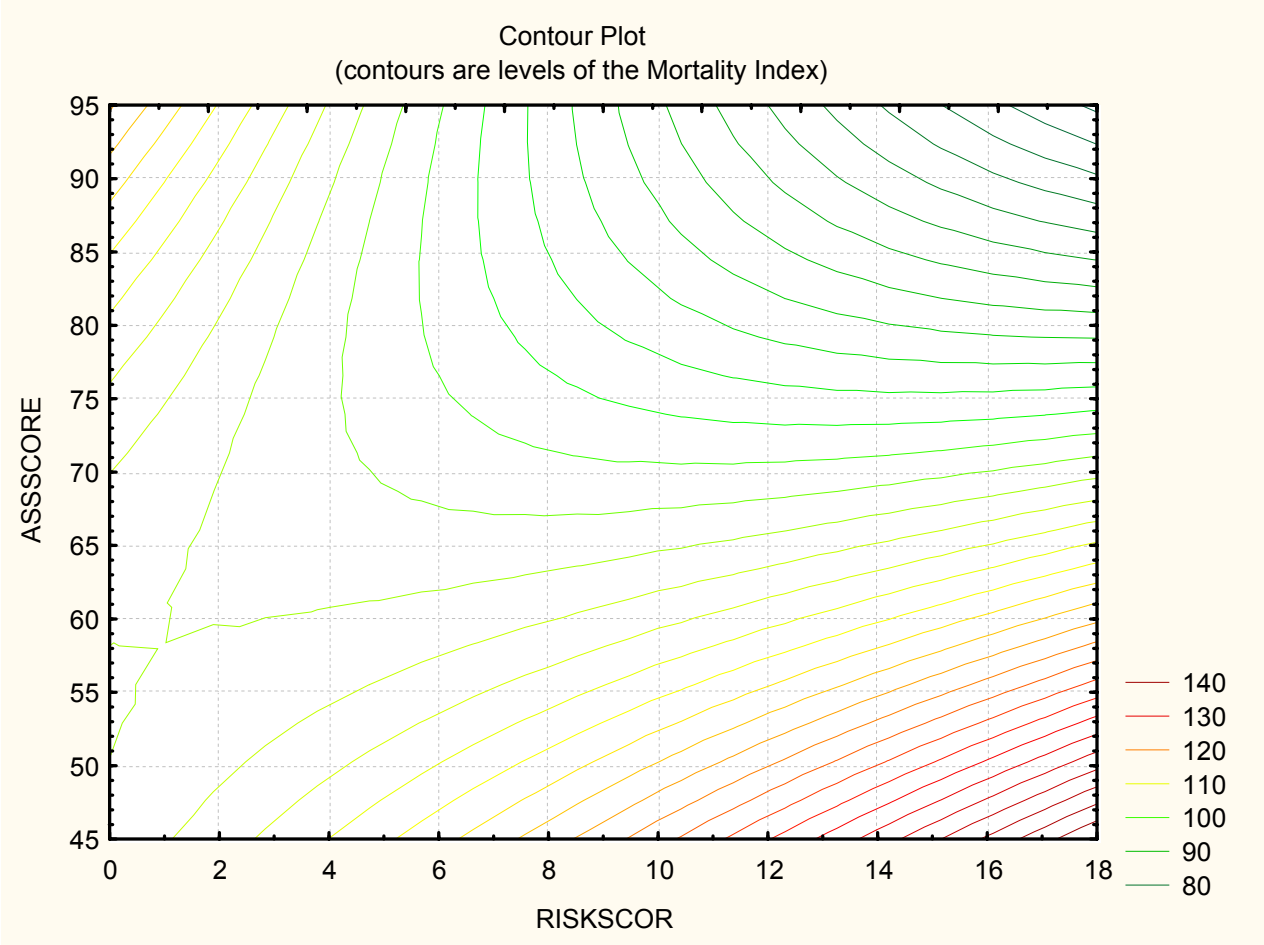
Mortality Index compared to the overall level of Risk-Assurance and levels of Clinical Governance



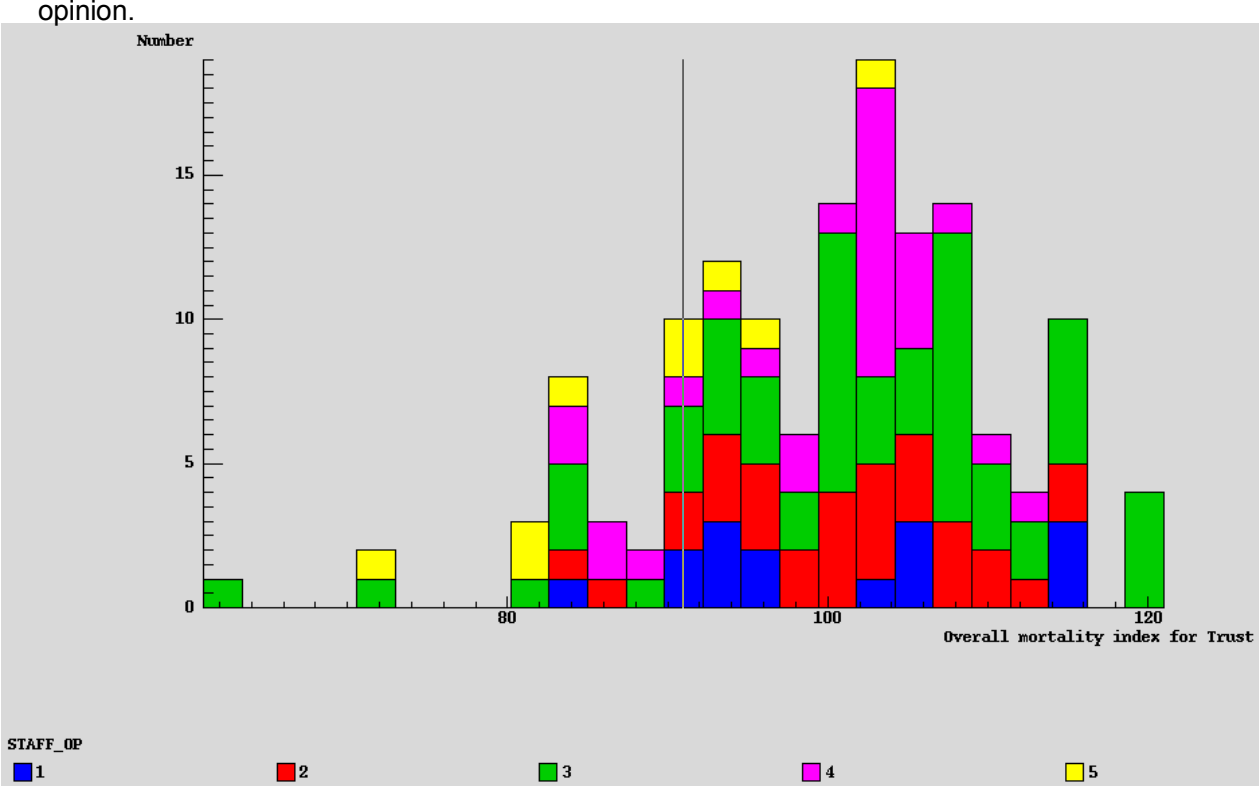
The highest clinical governance grade is associated with levels of mortality below 107 and risk-assurance levels above the 12-14 range. The average risk-assurance score is 17.

Appendix 5

The contour plot extrapolates from all available data the most likely pattern between all variables



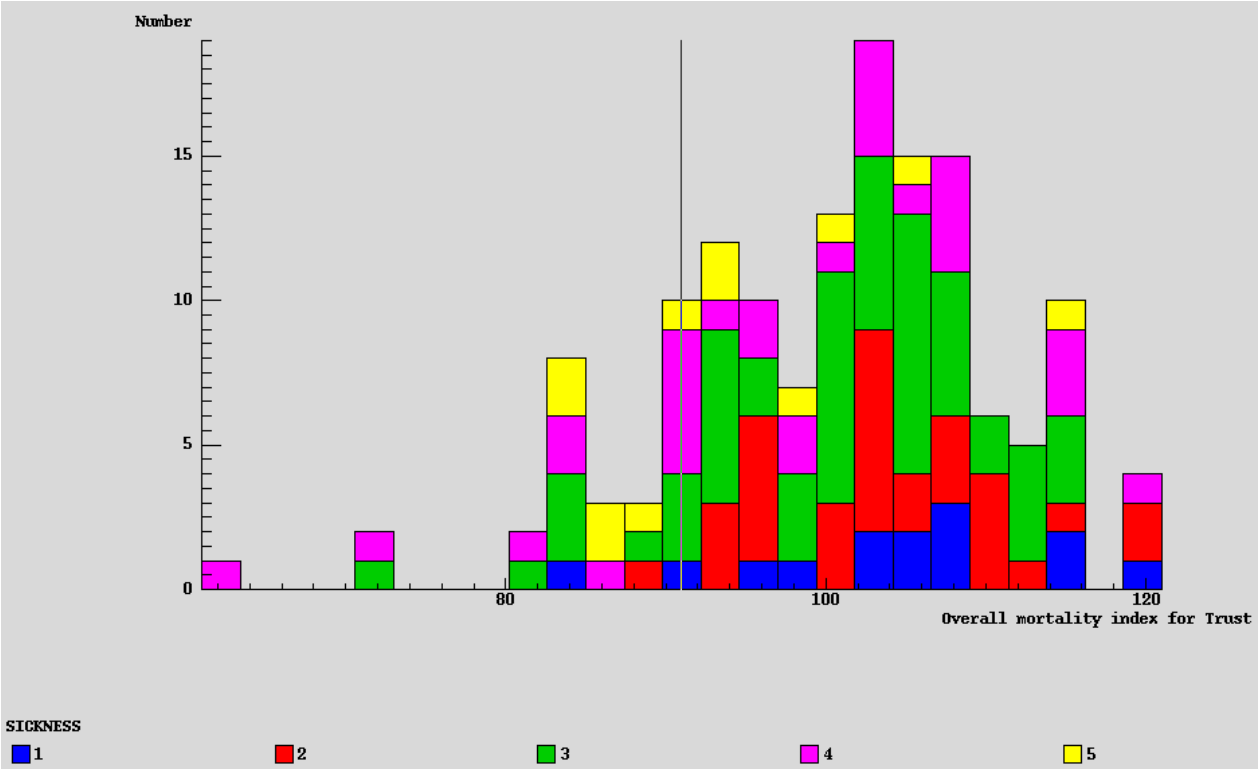
note that the lower half of the mortality index scale has very few 1 or 2 staff opinion survey grades. The majority of the blue and yellow (high staff opinion survey) go no further than around an MI score of 100 (average). The highest MI's are the lowest three scores of staff opinion.



Appendix 7

Mortality and the Sickness Indicator

the majority of the lower grades (1 & 2) fall into the higher bands of the MI range

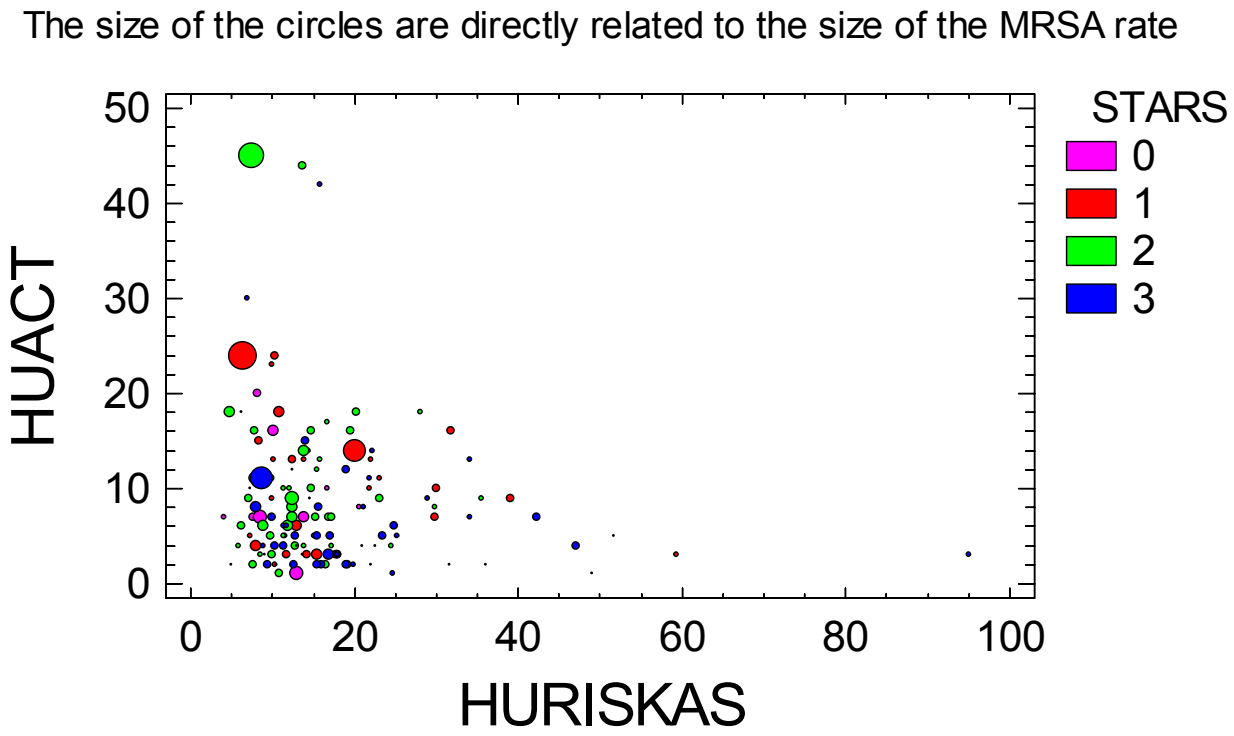


Value	Sickness	Proportion	%	Occurrences
$null$			1.31	2
1			9.15	14
2			21.57	33
3			39.87	61
4			19.61	30
5			8.5	13

MORTINDXGP
$null$ Higher Lower

Appendix 8

MRSA and the Human Resources Standard



Appendix 9

Environmental Management Criteria

Criterion	Environmental Management - Description	Score (mean)
1	Board level responsibility for environmental management is clearly defined and there are clear lines of accountability throughout the organisation, leading to the board.	71.4
2	The organisation has an effective policy and whole life strategy for environmental management which ha been endorsed by the board and adopted thoughout the organisation.	51.9
3	A thorough environmental review has been carried out to establish a register of significant environmental risks.	54.6
4	There are agreed environmental targets and objectives which are fulfilled by an ongoing programme.	38.1
5	The risk management process contained within the risk management system standard is applied to the management of environmental risk.	38.9
6	There is access to up-to-date information on environmental legislation and guidance to all within the organisation who require the information.	92.2
7	Appropriate training relevant to the achievement of environmental policies, objectives and targets is provided to all staff within the organisation.	34.5
8	Key indicators capable of showing improvements in environmental management and the management of associated risks are used at all levels of the organisation, including the board, and the efficacy and usefulness of the indicators is reviewed regularly.	40.3
9	The system in place for environmental management, including risk management arrangements, is monitored and reviewed by management and the board in order to make improvements to the system.	33.2
10	The Board seeks independent assurance that an appropriate and effective system of managing environmental risks is in place and that the necessary level of controls and monitoring are being implemented.	37.5

Appendix 10

Neural Clustering of Variables around the target Variable 'MRSA Rate'

Cluster 1: 32 records		Cluster 2: 31 records	COMMENTS
Numerics		**Numerics**	
KEYTARME 2.772		KEYTARME 2.903	Better key target score
CFOCMEAN 3.125		CFOCMEAN 3.306	Better clinical focus score
PATFOCME 3.038		PATFOCME 3.103	better patient focus score - but close
ASSSCORE 74.081		ASSSCORE 80.134	better controls assurance score
RISKSCOR 7.361		RISKSCOR 5.278	lower levels of risk
RISKASSU 13.145		RISKASSU 21.603	better levels of risk-assurance
PEAT score 61.531		PEAT score 63.0	higher PEAT score
IC standards score 77.031		IC standards score 86.645	higher assurance level in the IC standard
MRSA rate 2002-2003 0.411		MRSA rate 2002-2003 0.158	MRSA rate lower
Total % Bed Occupancy 85.984		Total % Bed Occupancy 86.023	bed occupancy higher but not significant
Overall mortality index for Trust 98.15		Overall mortality index for Trust 100.58	higher mortality index
Overall mortality change over last year -0.344		Overall mortality change over last year 0.194	mortality change is positive
Mortality index for patients with fractured neck of femur. 104.219		Mortality index for patients with fractured neck of femur. 96.452	lower mortality index for fractured neck of femur
nbedocc 1.531		nbedocc 1.516	bed occupancy similar
Symbolics		**Symbolics**	
CLINNEG 4		CLINNEG 4	same
DEATH30S 3		DEATH30S 3	same
INFECTIO 3		INFECTIO 3	same
CONSULTA 2		CONSULTA 3	more staff consultation
DATA_QUA 3		DATA_QUA 2	poorer data quality
FIRE_HS 3		FIRE_HS 3	same
INFORMAT 3		INFORMAT 3	same
JUNIOR_D 3		JUNIOR_D 3	same
SICKNESS 3		SICKNESS 3	same
STAFF_OP 3		STAFF_OP 3	same
CLINGOV 2		CLINGOV 2	same
NASSSCOR 1		NASSSCOR 2	better assurance scores
NRISKSCO 2		NRISKSCO 1	lower risks
NACTIONS 2		NACTIONS 1	lower numbers of actions (usually related to higher assurance levels)
NRISKASS 1		NRISKASS 2	better level of risk-assurance
Star rating 2		Star rating 3	higher star rating
IC standards ratings 3		IC standards ratings 3	same
MRSA bacteraemia improvement score 3		MRSA bacteraemia improvement score 3	same
MORTNECKGP Higher		MORTNECKGP Lower	lower rating for mortality through fractured femur of neck
MORTINDXGP Lower		MORTINDXGP Higher	higher mortality index
MRSA_RATGP Higher		MRSA_RATGP Lower	lower rate of MRSA
PEAT_SCOGP Lower		PEAT_SCOGP Higher	higher PEAT scores