Kent Community Health NHS
NHS Foundation Trust

Health Equalities Framework Validation Report

2017

Excellent care, healthy communities

Contents

Acknowledgements

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Acronyms and definitions

HEF	Health Equalities Framework
HoNOS-LD	Health of the Nation Outcome Scales for People with Learning Disabilities
KCHFT	Kent Community Health NHS Foundation Trust
NDTi	National Development Team for Inclusion
NHS	National Health Service
TOMs	Therapeutic Outcome Measures

Executive Summary

People with learning disabilities have shorter life expectancy than the general population. They also have poorer physical and mental health. These things are not inevitable; they are examples of health inequalities that can, to a significant extent, be avoided.[1]

People with learning disabilities also experience significant health inequalities. 'Death by Indifference[2]', detailed the continuing poor care that people with learning disabilities experience in health services and, 'a national response to Winterbourne View Hospital review[3]', highlights the need for a transparent way to measure outcomes for people with learning disabilities.

The Health Equalities Framework focuses on the determinants of health inequalities and the prevention and reduction of their impact, as opposed to the reactive approaches to the symptoms of health inequalities. Using the HEF enables the practitioner to demonstrate the impact of the known determinants of health inequalities and thus measures the effectiveness of services in taking steps to reduce the different adverse health outcomes experienced by people with learning disabilities.[4]

However, for a measure to be valid it needs to give a true and accurate representation of a concept[5] and there is a need to determine the degree of confidence which can be placed on the readings obtained. The validation methods verified the acceptability, ease of use and sensitivity to change of the HEF through criterion and construct validity approaches. The full report gives the full details of the methodology applied, and the context to the validation, as well as detailing the results and recommendations.

The validation project concluded that the HEF is an appropriate instrument for measuring outcomes in people with learning disabilities. However, the validation identified recommendations that can further enhancement and application of the tool.

Summary of Outcome

The conclusion from his study outlines Pearson's correlation coefficient validation scoring of between -0.57 and -0.63 which results in an outcome of the HEF being validated with strong assurance.

The construct face validity offers a conclusion of 92% which translates to a strong assurance of validation.

Given the strong results using the above 2 methods, the project has been able to successfully validate the HEF with a strong assurance of validity.

Introduction

Background

Liberating the NHS[6] set out a vision of an NHS that achieves health outcomes that are among the best in the world. To achieve this, it outlined two major shifts:

- a move away from centrally driven process targets which get in the way of patient care;
- a relentless focus on delivering the outcomes that matter most to people.[7]

There is an increased requirement for NHS organisations to focus on measuring outcomes to improve quality of care through evidence based service development, quality improvement and concentration on advancing effectiveness and efficiency.

Furthermore, additional influences have reinforced the need to develop guidance on clinical outcome measures, especially for people with learning disabilities. *Transforming Care: A National Response to Winterbourne View Hospital Review*[8] highlights the need for a transparent way to measure outcomes for people with learning disabilities. The work of the National Development Team for Inclusion and Improving Health and Lives has also recommended the use of outcome measures[9].

Subsequently the HEF was developed as an outcome focused measurement framework to enable practitioners to evidence their contribution to improving person centred health outcomes. Unlike many outcome measurement tools, the HEF measures the effectiveness of services in taking actions to reduce the different adverse health outcomes experienced by people with learning disabilities; this enables commissioners, providers, people with learning disabilities and their families understand the impact and value of services. The HEF is endorsed by the National Valuing Families Forum and professional senate. It is referenced in NHS England and Department of Health reports. It is also referenced in the Joint Self-Assessment Framework, can be implemented across health and social care, and can support local authorities with their duty to promote wellbeing under the Care Act 2014[10].

The HEF monitors the degree and impact of exposure of people with learning disabilities to acknowledged, evidence based determinants of health inequalities. Detailed evidence reported by the Public Health Observatory shows there to be five discernible determinants of the health inequalities commonly experienced by people with learning disabilities:

- Social determinants
- Genetic and biological determinants
- Communication difficulties and reduced health literacy
- Personal health behaviour and lifestyle risks
- Deficiencies in access to and quality of health provision

Resulting profiles of the HEF are not dependent on the complexity of a person's needs, their specific conditions or presentations but rather on the systems around them that ensure that their needs and long-term conditions are appropriately identified and responded to and that individuals are receiving the right support. The core outcome of service involvement should be a reduction in the adverse impact of exposure to such determinants and mitigation of any associated hazardous consequences. Outcomes are monitored through a programme of repeat profiling with individuals which allows changes to be mapped over time.

The project received funding from Health Education Kent, Surrey and Sussex to undertake and finalise the project findings within a 12 month period. Prior to commencing the project a

comprehensive plan was established to ensure the time period would not constrain the project outcome.

Field testing comprised of measuring the validity of the HEF by ascertaining the degree to which what has been measured corresponds with other independent measures obtained by different research tools[11]. Field testing was undertaken by volunteers from KCHFT due to the approachability of the workforce and accessibility of the client group.

Objectives

By analysing the Health Equalities Framework we aim to achieve greater understanding on its accuracy to record reduced health inequalities and validate its health outcomes. It is anticipated the project will deliver improved outcomes for workforce planning, enhance performance objectives and strengthen demographic intelligence for Kent, Surrey and Sussex. Increasing the face validity of a tool has been found to increase participation rates and increase professional care staff and clinicians' perceived relevance of the measure, induce cooperation in participants and promote acceptance of measures by policy makers and bureaucrats[12],[13],[14]. Therefore a supplementary intention of the project is to encourage clinicians, commissioners and providers to apply and operate the HEF to develop provision and support for people with learning disabilities.

Methodology and Validation Approach

A search was undertaken to identify tools which examined health inequalities for people with a learning disability. However, the HEF is unique in that there are no other tools which are designed to focus on health inequalities for people with a learning disability. Therefore the search was extended to include all outcome measures for people with a learning disability. Each outcome tool was examined and a set of criteria were developed against which measures should be assessed and excluded from the review if they demonstrated the following characteristics:

(1) Does not assess domains that align with the five determinants of the HEF
(2) Takes longer than two hours to administer
(3) Is not applicable to health and social care
(4) Does not measure change between two points in time
(5) Has not been rigorously tested and validated
(6) If the reliability of the tool is influenced by the degree of learning disability

There are three individual recognised ways of ascertaining validity: content, criterion and construct. Validity, broadly speaking, is the degree to which a measure assesses what it is intended to measure, and types of validity include face validity (the degree to which users or experts perceive that a measure is assessing what it is intended to measure), content validity (the extent to which a measure accurately and comprehensively measures what it is intended to measure), and construct validity (the degree to which an instrument accurately measures a nonphysical attribute or construct such as depression or anxiety, which is itself a means of summarizing or explaining different aspects of the entity being measured)[15].

Prior research has been undertaken to identify outcome tools which closely relates to the HEF in order that validation can occur through cross referencing case comparisons for people with

a learning disability. The Life Star and the TOMs relate to the HEF as all outcome tools work on similar health indicators, possess numerical basis with descriptors of each scale step and are best utilised when scoring is repeated at regular intervals to track progress.

HEF and Life Star
Four members of the Community Learning Disability Team volunteered to act as validators utilising the Life Star. The validators completed 30 comparisons of the HEF and Life Star at initial referral and at the point of discharge from the service. The sample of the clients ran for approximately 8 weeks. For each client at initial referral and point of discharge, the HEF and Life Star scores were compared to analyse results, identify correlations and ascertain any disparities.

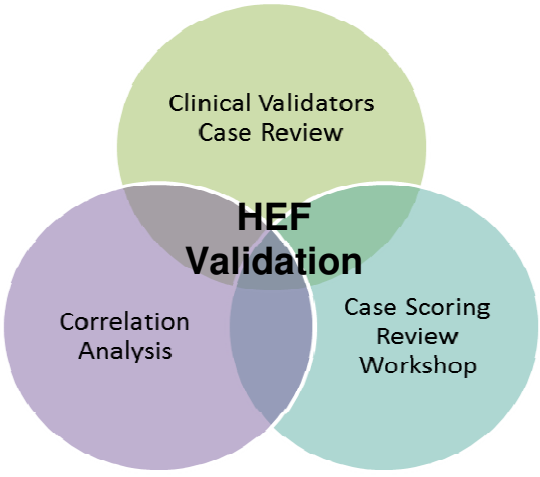
HEF and TOMs
Two members of the Community Learning Disability Team undertook the role of validators utilising the TOMs by conducting 30 comparisons of clinical notes and HEF and TOMs scorings at initial referral and at the point of discharge from the service. The sample used for the comparison was extracted from the sample utilised in the HEF and Life Star comparison; this will enable triangulation of data extracted from all 3 tools.

The validators were chosen at random on differing professional levels to ensure the validation process is as vigorous as possible. Multiple test sites were chosen to ensure a maximum range of differing types of cases were available. The validators were given limited information about the final validation process to ensure this does not affect their judgement in their validation role. The validators were instructed not to confer with their peers on specific cases.

Once all cases were scored and reviewed by the validators, a case scoring review workshop was held to examine the available information and to ensure all cases were applicable to the study. The case scoring review workshop scrutinised the summary of assurance reports to ensure they reflected the validators overall assessment.

The final stage of the validation was a correlation analysis which provided statistical reasoning to the validation of the HEF. The analysis considered all necessary information for each case and provided a final decision on the validity of the methodology utilised.

The validation and scrutiny model:



Sample

The below table illustrates the demographics of the sample utilised in the project.

Demographics	N	%
Gender		
Female	13	43%
Male	16	53%
Transgender	1	3%
Age range		
20-29	5	17%
30-39	5	17%
40-49	9	30%
50-59	9	30%
60-69	1	3%
70-79	1	3%
Ethnicity		
Black or Black British - African	2	7%
White - British	27	90%
White - other White background	1	3%
Degree of Learning Disability		
Mild	12	40%
Moderate	13	43%
Severe	5	17%

Data Collection and Limitations

Anonymity of the people involved with the sample was maintained through the use of a coding system; each person could only be identified by their allocated codes.

The nature of severe and profound learning disabilities means that there is an increased dependence on informant-based information, leading to greater opportunities for error. Research into available outcome measure tools was limited by the availability of resources which were readily accessible to the general public.

Interrater reliability is a concern to one degree or another in most large studies due to the fact that multiple people collecting data may experience and interpret the phenomena of interest differently[16] (McHugh, 2012). Training on the outcome tools was provided to data collectors prior to the field study to minimise the effects of variability between their interpretation and scoring.

Results of validation testing

Validation testing consisted of 30 cases with 2 sets of scorings completed over the period of 8 weeks. The overall scores for each of the 3 tools are set out in the table below.

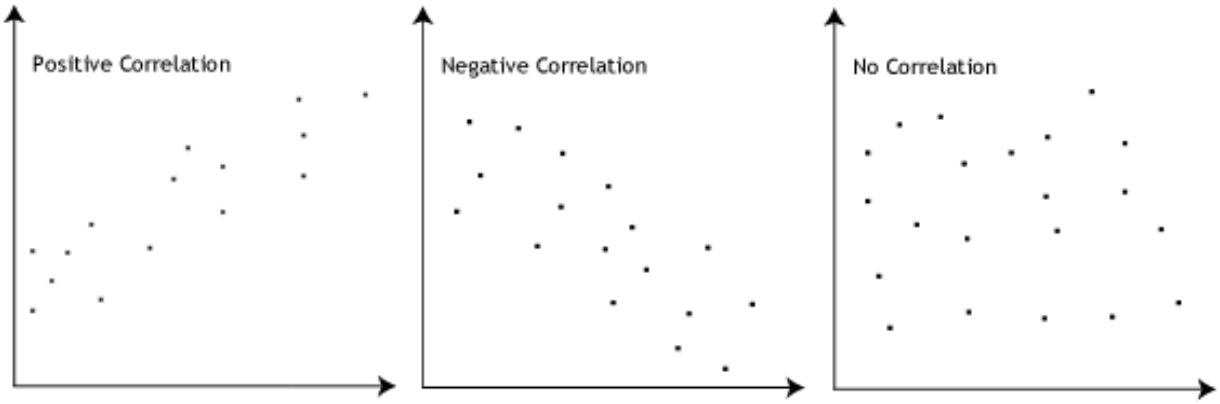
Client Scoring		HEF Score*	Life Star Score*	TOMs Score*
Client 1	First	41%	69%	77.5%
	Second	27%	75%	85%
Client 2	First	36%	58%	72.5%
	Second	34%	65%	80%
Client 3	First	66%	32%	50%
	Second	54%	44%	62.5%
Client 4	First	39%	76%	87.5%
	Second	39%	76%	87.5%
Client 5	First	29%	90%	87.5%
	Second	21%	90%	90%
Client 6	First	46%	60%	75%
	Second	36%	62%	80%
Client 7	First	45%	85%	70%
	Second	40%	84%	70%
Client 8	First	27%	70%	80%
	Second	24%	73%	80%
Client 9	First	66%	41%	55%
	Second	59%	42%	55%
Client 10	First	50%	53%	65%
	Second	42%	52%	67.5%
Client 11	First	57%	40%	60%
	Second	49%	61%	67.5%
Client 12	First	48%	57%	60%
	Second	48%	61%	62.5%
Client 13	First	66%	33%	47.5%
	Second	37%	50%	55%
Client 14	First	39%	60%	67.5%
	Second	28%	61%	67.5%
Client 15	First	60%	41%	55%
	Second	44%	57%	67.5%

Client Scoring		HEF Score*	Life Star Score*	TOMs Score*
Client 16	First	52%	48%	55%
	Second	39%	63%	75%
Client 17	First	69%	35%	42.5%
	Second	53%	41%	55%
Client 18	First	54%	55%	55%
	Second	43%	52%	62.5%
Client 19	First	66%	53%	40%
	Second	47%	58%	55%
Client 20	First	61%	51%	50%
	Second	55%	55%	55%
Client 21	First	79%	25%	32.5%
	Second	53%	37%	40%
Client 22	First	40%	27%	57.5%
	Second	30%	53%	80%
Client 23	First	58%	18%	50%
	Second	47%	34%	55%
Client 24	First	70%	24%	35%
	Second	39%	42%	55%
Client 25	First	74%	22%	35%
	Second	42%	36%	40%
Client 26	First	31%	32%	50%
	Second	36%	48%	60%
Client 27	First	52%	29%	42.5%
	Second	38%	39%	47.5%
Client 28	First	68%	31%	37.5%
	Second	32%	43%	42.5%
Client 29	First	39%	28%	35%
	Second	29%	41%	40%
Client 30	First	23%	45%	60%
	Second	25%	56%	65%

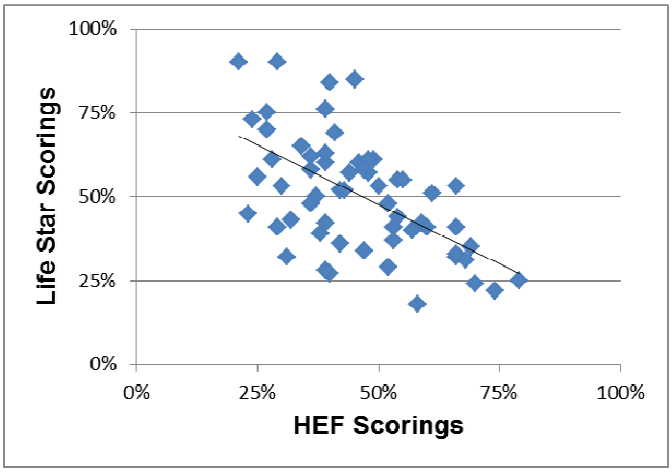
* All results have been translated into percentages to ensure Pearson's correlation coefficient measure can be accurately implemented.

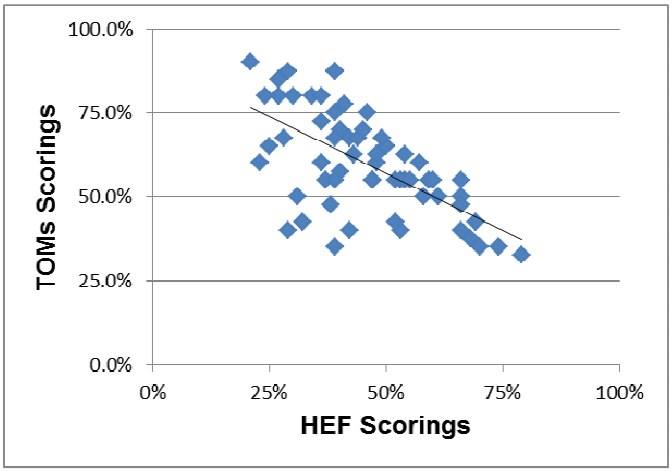
To ascertain if there is a clear correlation between the HEF and the Life Star and TOMs, the results from the table above has been formatted into a scatter graph. Once the data has been plotted onto a scatter graph, we can explore if there is a positive, negative or no correlation between the data.

The below illustrates the indicators of these correlation types.



In order for us to gain validation of the HEF we aim to achieve a negative correlation i.e. as the HEF score reduces, the Life Star and TOMs scores increase, meaning as health inequalities reduce, outcome scores increase.





To assess concurrent validity, Pearson's correlation coefficient was used to analyse the association between HEF scorings and the Life Star and TOMs scorings. Pearson's correlation coefficient measures the strength and direction of a linear relationship between two variables. The correlation coefficient is a number between –1 and +1 that determines

whether two paired sets of data are related. The closer to +1 the more confident we are of a positive linear correlation and the closer to –1 the more confident we are of a negative linear correlation.

Pearson's guidelines regarding the interpretation of the correlation coefficient scoring are identified in the table below:

Confidence of Correlation[17]	Coefficient, r	
	Positive	Negative
Small	0.1 to 0.3	-0.1 to -0.3
Medium	0.3 to 0.5	-0.3 to -0.5
Large	0.5 to 1.0	-0.5 to -1.0

Note. Pearson's formula of coefficient correlation is recorded in Appendix A and B.

Using Pearson's formula, the correlation between the Life Star and the HEF was r= -0.57, indicating a large coefficient correlation. The strength of correlation was greater for the TOMs and HEF, scoring r= -0.63.

Concurrent validity outcome
Both tools offer a significant correlation with the HEF, indicating a large assurance of concurrent validity.

The second part of the validation study consists of construct face validity. A direct measurement of face validity is obtained by asking people to rate the validity of a test as it appears to them[18].

To ascertain if there is a clear correlation between the HEF and the Life Star and TOMs, participants were asked to mark if there was a clear case for validation based on 30 case studies. The results from the construct face validation are set out in the table below.

Client Scoring	Validation between HEF and Life Star		Validation between HEF and TOMs	
	Yes	No	Yes	No
Client 1	☑		☑	
Client 2	☑		☑	
Client 3	☑		☑	
Client 4	☑		☑	
Client 5	☑		☑	
Client 6	☑		☑	
Client 7	☑		☑	
Client 8	☑		☑	
Client 9	☑		☑	
Client 10	☑		☑	
Client 11	☑		☑	
Client 12	☑		☑	
Client 13	☑		☑	
Client 14		☑	☑	
Client 15	☑		☑	

Client Scoring	Validation between HEF and Life Star		Validation between HEF and TOMs	
	Yes	No	Yes	No
Client 16	☑		☑	
Client 17	☑		☑	
Client 18		☑	☑	
Client 19		☑	☑	
Client 20	☑		☑	
Client 21	☑		☑	
Client 22	☑		☑	
Client 23	☑		☑	
Client 24	☑		☑	
Client 25	☑			☑
Client 26	☑		☑	
Client 27	☑		☑	
Client 28	☑			☑
Client 29	☑		☑	
Client 30	☑		☑	

Construct face validity is not quantified with statistical data, rather its presented as an opinion of a group of expert validators. Face validity helps to give participants greater confidence in the measurement procedure and the results. It can also give greater confidence to stakeholders of the study as well as participants.

Following the constructive face validity review, validators were asked to complete and submit the summary of assurance reports. The reports consisted of questions relating to the strength of validation, based upon the validators experience using the tools to assess a variety of cases. The case scoring review workshop scrutinised the reports to ascertain whether there is sufficient assurance to offer a construct validity outcome.

Construct validity outcome
Both tools offer significant construct face validity indicating an assurance of 92%.

Conclusion

The conclusion from his study outlines Pearson's correlation coefficient validation scoring of between -0.57 and -0.63 which results in an outcome of the HEF being validated with strong assurance.

The construct face validity offers a conclusion of 92% which translates to a strong assurance of validation.

Given the strong results using the above 2 methods, the project has been able to successfully validate the HEF with a strong assurance of validity.

In conclusion, the results demonstrate the validity and reliability of the HEF, and its good diagnostic use in identifying health inequalities. It has been concluded that it provides an accurate alternative to outcome measurement tools as there is a linear negative relationship between the scorings. The HEF may be used as a freely available outcome measure of health inequalities and has clinical use as a measurement tool for people with a learning disability.

Appendix A: Pearson Correlation Coefficient Calculation for the Life Star and the HEF

Client	Scoring	Life Star Scores (x)	HEF Score (y)	(xy)	x^2	y^2
1	1st	69	41	2829	4761	1681
	2nd	75	27	2025	5625	729
2	1st	58	36	2088	3364	1296
	2nd	65	34	2210	4225	1156
3	1st	32	66	2112	1024	4356
	2nd	44	54	2376	1936	2916
4	1st	76	39	2964	5776	1521
	2nd	76	39	2964	5776	1521
5	1st	90	29	2610	8100	841
	2nd	90	21	1890	8100	441
6	1st	60	46	2760	3600	2116
	2nd	62	36	2232	3844	1296
7	1st	85	45	3825	7225	2025
	2nd	84	40	3360	7056	1600
8	1st	70	27	1890	4900	729
	2nd	73	24	1752	5329	576
9	1st	41	66	2706	1681	4356
	2nd	42	59	2478	1764	3481
10	1st	53	50	2650	2809	2500
	2nd	52	42	2184	2704	1764
11	1st	40	57	2280	1600	3249
	2nd	61	49	2989	3721	2401
12	1st	57	48	2736	3249	2304
	2nd	61	48	2928	3721	2304
13	1st	33	66	2178	1089	4356
	2nd	50	37	1850	2500	1369
14	1st	60	39	2340	3600	1521
	2nd	61	28	1708	3721	784
15	1st	41	60	2460	1681	3600
	2nd	57	44	2508	3249	1936
16	1st	48	52	2496	2304	2704
	2nd	63	39	2457	3969	1521
17	1st	35	69	2415	1225	4761
	2nd	41	53	2173	1681	2809
18	1st	55	54	2970	3025	2916
	2nd	52	43	2236	2704	1849
19	1st	53	66	3498	2809	4356
	2nd	58	47	2726	3364	2209
20	1st	51	61	3111	2601	3721
	2nd	55	55	3025	3025	3025
21	1st	25	79	1975	625	6241
	2nd	37	53	1961	1369	2809
22	1st	27	40	1080	729	1600
	2nd	53	30	1590	2809	900
23	1st	18	58	1044	324	3364
	2nd	34	47	1598	1156	2209
24	1st	24	70	1680	576	4900
	2nd	42	39	1638	1764	1521
25	1st	22	74	1628	484	5476
	2nd	36	42	1512	1296	1764
26	1st	32	31	992	1024	961
	2nd	48	36	1728	2304	1296
27	1st	29	52	1508	841	2704
	2nd	39	38	1482	1521	1444
28	1st	31	68	2108	961	4624
	2nd	43	32	1376	1849	1024
29	1st	28	39	1092	784	1521
	2nd	41	29	1189	1681	841
30	1st	45	23	1035	2025	529
	2nd	56	25	1400	3136	625
∑		3039	2741	130,605	171,695	136,949

The Pearson Correlation Coefficient equation is:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

The above table illustrates:
n = 60 (sample size, 30 clients x by 2 scorings each)
∑x = 3,039 (sum of Life Star scores)
∑y = 2,741 (sum of HEF scores)
∑xy = 130,605 (sum of Life star scores x by sum of HEF scores)
∑x^2 = 171,695 (sum of squared Life Star scores)
∑y^2 = 136,949 (sum of squared HEF scores)

Step	Instruction	Working Out
Step 1	Replace the variables with the above values	$r = \frac{60(130{,}605) - (3{,}039)(2{,}741)}{\sqrt{[60(171{,}695) - (3{,}039)^2]\,[60(136{,}949) - (2{,}741)^2]}}$
Step 2	Multiply n by ∑xy	60 x 130,605 = 7,836,300
Step 3	Multiply ∑x by ∑y	3,039 x 2,741 = 8,329,899
Step 4	Subtract step 3 from step 2	7,836,300 - 8,329,899 = -493,599
Step 5	Multiply n by ∑x^2	60 x 171,695 = 10,301,700
Step 6	Square ∑x	3,039 x 3,039 = 9,235,521
Step 7	Subtract step 6 from step 5	10,301,700 - 9,235,521 = 1,066,179
Step 8	Multiply n by ∑y^2	60 x 136,949 = 8,216,940
Step 9	Square ∑y	2,741 x 2,741 = 7,513,081
Step 10	Subtract step 9 from step 8	8,216,940 – 7,513,081 = 703,859
Step 11	Multiple step 7 by step 10	10,301,700 x 703,859 = 750,439,684,761
Step 12	Find the square root of step 11	$\sqrt{750{,}439{,}684{,}761}$ = 866,279.2187054933617848
Step 13	Divide step 4 by step 12	-493,599 / 866,279.2187054933617848 = -0.5697920362647040908
Rounded up to show a correlation of -0.57 between the Life Star and the HEF		

Appendix B: Pearson Correlation Coefficient Calculation for the TOMs and the HEF

Client	Scoring	TOMs Scores (x)	HEF Score (y)	(xy)	x^2	y^2
1	1st	77.5	41	3177.5	6006.25	1681
	2nd	85	27	2295	7225	729
2	1st	72.5	36	2610	5256.25	1296
	2nd	80	34	2720	6400	1156
3	1st	50	66	3300	2500	4356
	2nd	62.5	54	3375	3906.25	2916
4	1st	87.5	39	3412.5	7656.25	1521
	2nd	87.5	39	3412.5	7656.25	1521
5	1st	87.5	29	2537.5	7656.25	841
	2nd	90	21	1890	8100	441
6	1st	75	46	3450	5625	2116
	2nd	80	36	2880	6400	1296
7	1st	70	45	3150	4900	2025
	2nd	70	40	2800	4900	1600
8	1st	80	27	2160	6400	729
	2nd	80	24	1920	6400	576
9	1st	55	66	3630	3025	4356
	2nd	55	59	3245	3025	3481
10	1st	65	50	3250	4225	2500
	2nd	67.5	42	2835	4556.25	1764
11	1st	60	57	3420	3600	3249
	2nd	67.5	49	3307.5	4556.25	2401
12	1st	60	48	2880	3600	2304
	2nd	62.5	48	3000	3906.25	2304
13	1st	47.5	66	3135	2256.25	4356
	2nd	55	37	2035	3025	1369
14	1st	67.5	39	2632.5	4556.25	1521
	2nd	67.5	28	1890	4556.25	784
15	1st	55	60	3300	3025	3600
	2nd	67.5	44	2970	4556.25	1936
16	1st	55	52	2860	3025	2704
	2nd	75	39	2925	5625	1521
17	1st	42.5	69	2932.5	1806.25	4761
	2nd	55	53	2915	3025	2809
18	1st	55	54	2970	3025	2916
	2nd	62.5	43	2687.5	3906.25	1849
19	1st	40	66	2640	1600	4356
	2nd	55	47	2585	3025	2209
20	1st	50	61	3050	2500	3721
	2nd	55	55	3025	3025	3025
21	1st	32.5	79	2567.5	1056.25	6241
	2nd	40	53	2120	1600	2809
22	1st	57.5	40	2300	3306.25	1600
	2nd	80	30	2400	6400	900
23	1st	50	58	2900	2500	3364
	2nd	55	47	2585	3025	2209
24	1st	35	70	2450	1225	4900
	2nd	55	39	2145	3025	1521
25	1st	35	74	2590	1225	5476
	2nd	40	42	1680	1600	1764
26	1st	50	31	1550	2500	961
	2nd	60	36	2160	3600	1296
27	1st	42.5	52	2210	1806.25	2704
	2nd	47.5	38	1805	2256.25	1444
28	1st	37.5	68	2550	1406.25	4624
	2nd	42.5	32	1360	1806.25	1024
29	1st	35	39	1365	1225	1521
	2nd	40	29	1160	1600	841
30	1st	60	23	1380	3600	529
	2nd	65	25	1625	4225	625
∑		3592.5	2741	156,113	229,006	136,949

The Pearson Correlation Coefficient equation is:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

The above table illustrates:
n = 60 (sample size, 30 clients x by 2 scorings each)
∑x = 3,592.50 (sum of TOMs scores)
∑y = 2,741 (sum of HEF scores)
∑xy = 156,113 (sum of TOMs scores x by sum of HEF scores)
∑x² = 229,006 (sum of squared TOMs scores)
∑y² = 136,949 (sum of squared HEF scores)

Step	Instruction	Working Out
Step 1	Replace the variables with the above values	$r = \frac{60(156{,}113) - (3{,}592.50)(2{,}741)}{\sqrt{[60(229{,}006) - (3{,}592.50)^2]\,[60(136{,}949) - (2{,}741)^2]}}$
Step 2	Multiply n by ∑xy	60 x 156,113 = 9,366,780
Step 3	Multiply ∑x by ∑y	3,592.50 x 2,741 = 9,847,042.50
Step 4	Subtract step 3 from step 2	9,366,780 - 9,847,042.50 = -480,262.50
Step 5	Multiply n by ∑x²	60 x 229,006 = 13,740,360
Step 6	Square ∑x	3,592.50 x 3,592.50 = 12,906,056.20
Step 7	Subtract step 6 from step 5	13,740,360 - 12,906,056.20 = 834,303.80
Step 8	Multiply n by ∑y²	60 x 136,949 = 8,216,940
Step 9	Square ∑y	2,741 x 2,741 = 7,513,081
Step 10	Subtract step 9 from step 8	8,216,940 – 7,513,081 = 703,859
Step 11	Multiple step 7 by step 10	834,303.80 x 703,859 = 587,232,238,364.20
Step 12	Find the square root of step 11	$\sqrt{587{,}232{,}238{,}364.20}$ = 766,310.7974994219014968
Step 13	Divide step 4 by step 12	-480,262.50 / 766,310.7974994219014968 = -0.6267202570643177007
Rounded up to show a correlation of -0.63 between the TOMs and the HEF		

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Summary of Recommendations

1. Increase scoring scale to incorporate greater flexibility to indicate slight but significant change in health inequalities.
2. HEF tool development to include reason for treatment/support to ensure improvements are being achieved in the area of the referral.
3. Introduction of an N/A box to allow for omission of irrelevant indicators.
4. Increase reliability of data through sharing case studies with the applicable scoring to check for inter-rater reliability.
5. To improve and test consistency amongst users, development of a HEF text book to provide resources, guidelines etc.
6. Further development of the aggregation tool to encompass range of scores, functionality and easier to use selection buttons
7. More focused attention on easy read information, i.e. developing the aggregator tool to produce a HEF Service User Outcome Report