STANDARDS PRESENTATION

AGM Workshop
Saturday 26th January 2019
Version 6

OUTLINE OF PRESENTATION

Introduction and summary of conclusions

Aims

Data Analysis

Statistical Modelling

Testing

Examples of revised standard

Outstanding issues

Key conclusions

Recommendation and next steps

BACKGROUND (1) – RECENT HISTORY

Current standards adopted in 2012 (modified 2013)

- Used a database of 27,000 veteran results mainly from 2008 to 2010
- Produced a statistical model and one formula to calculate the tables for any distance/time

Widely accepted as a fairer system

- Wider range of ages fill top positions in championships/competitions
- Women more prominent in the Top 10 - win BAR overall in 2018

Season long competitions also revised

- Revised calculation formula so overall result is more balanced
- New short-distance competition introduced

BACKGROUND (2) MEMBERS' CONCERNS

- Over 80 year olds have won the 3 Distance and Short Distance competitions every year for the last 4 years and by significant margins

- Specific examples – e.g. ECCA 50 in May
- Competition record fell to 1:34:37
- 2nd on actual was a 47-year-old vet with 01:39:11 (+39.32)
- But 1st on standard was an 88 year old vet. (+54.12)
- To beat him the 47 year old would have had to have done 1:24:31.
- i.e 10 mins 06 secs faster than senior competition record set in the event

- Women still seem at something of a disadvantage (e.g. compare age record plusses)

- There had always been the intention to have 'regular' reviews but the frequency had not been specified

BACKGROUND (3) – ACTION TAKEN

Sep 2018 - Review agreed by NEC

Oct 2018 – Review proposal sent to Groups

Oct-Dec 2018 – Steve Lockwood and NEC working group develop updated model and formula:

- 86,000 new results obtained from CTT for 2016-2018
- Multiple iterations of model and possible tables
- 'Back-testing' of recent BARs / championships / events

SUMMARY CONCLUSIONS

1. We should update the 2012 standards using the more recent data

2. Fundamentally different model not recommended for 2019 – helps make the update straightforward to implement

3. Some questions to consider going forward

HEADLINE CHANGES

1. Standards generally become a little harder (reflecting average speed increase)
2. Trikes – need greater compensation compared to solos
3. Women – standard should be easier for younger women
4. Older men – standard should become harder as speeds are not declining as quickly as had been expected after 80
5. Impact varies according to event distance and for 12/24 hours

AIMS = FAIRNESS – 'A LEVEL PLAYING FIELD'

1. A broadly even spread of ages and genders in the top places of VTTA events and competitions (relative to participation).
2. Best riders in each age band achieve broadly similar plusses

   Best riders in any age group should not require 'superhuman' performances to achieve the plus of the best riders in other age groups
3. The age records show broadly similar plusses on standard

The standards are 'estimates' of performance and there is no 'perfect' handicapping solution

DATA ANALYSIS

86,000 veteran results from 2016-2018 obtained from CTT site

Merged with 2012 data (27,000 results) and 2017 age records

Data validated to remove ‘spurious’ or incomplete results

Trike data is very limited so decided to just use age records

No separate analysis of Tandems, due to limited data, and complexity

We are using ‘real world’ data specific to our members – not a ‘theoretical’ model about age decline in athletic performance

DATA IS LIMITED BY DISTANCE

year	10M	25M	50M	100M	12H	24H
2016	9,023	6,745	1,779	588	164	39
2017	13,328	9,303	1,985	548	167	34
2018	9,724	6,447	1,394	268	92	41
Total	**32,075**	**22,495**	**5,158**	**1,404**	**423**	**114**
Percentage	**52%**	**36%**	**8%**	**2%**	**1%**	**<1%**

DATA IS LIMITED FOR WOMEN

Year	Male	Female
2016	18,072	1,987
2017	26,929	3,444
2018	16,913	2,223
Total	61,914	7,654
Percentage	89%	11%

M:F ratio slowly creeping up over time but still outnumbered 9:1

DATA LIMITED IN OLDEST AGE BANDS

Year	40-49	50-59	60-69	70-79	80-89	90+	Total
2016	9,236	6,828	2,655	1,194	144	2	20,059
2017	13,767	10,406	4,098	1,869	231	2	30,373
2018	8,023	7,022	2,716	1,218	157	0	19,136
Total	**31,026**	**24,256**	**9,469**	**4,281**	**532**	**4**	**69,568**
Percentage	**45%**	**35%**	**14%**	**6%**	**1%**	**0.01%**	**100%**

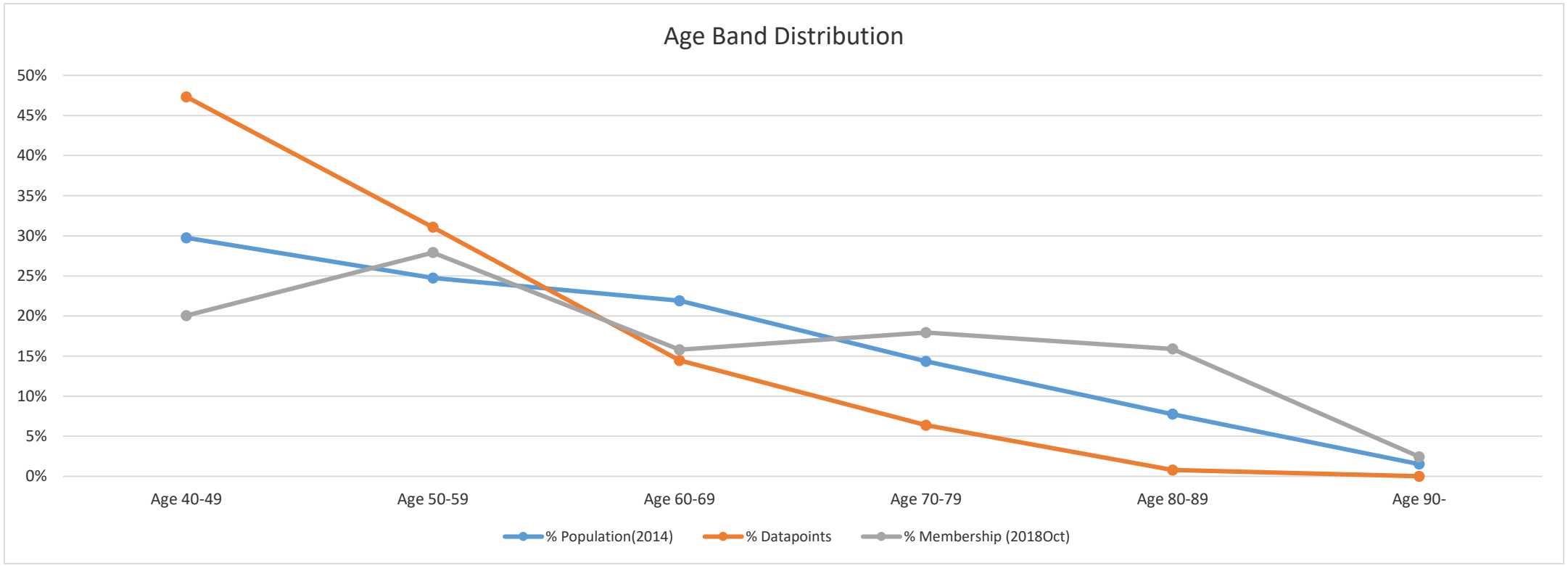
DATA IS LIMITED FOR TRIKES

Very little Trike data – so have used age records

Tricyclists have their own organisation and championships

But can compare performance of individuals who ride both solos and trikes

Comparison of age distribution – Rides vs VTTA Membership vs UK Population



- Membership age profile is fairly even (slightly declining) until 80s, then declines dramatically
- Population statistics declines with age in a consistent way
- Datapoints (Rides) tails off even quicker than population statics or membership data

DATA ANALYSIS - CONCLUSIONS

1. Average speeds for men have generally increased across distances and age bands, since 2011
2. The best over 80s men can achieve plusses beyond what is reasonably achievable by the best riders in younger age groups
3. Average speeds for women compared to men are somewhat slower than in 2012

- Identified concerns do need attention
- Data limitations do not demand a fundamentally different approach
- So use the previous formula approach but revise/refit the parameters

STATISTICAL MODELLING - VERSION DEVELOPMENT

V1 Initial load of the recent CTT data

V2 Add our 2012 data - data validation and cleansing

V3 Produce new model and tables – start back-testing

V4 Add weighting adjustment for age bands

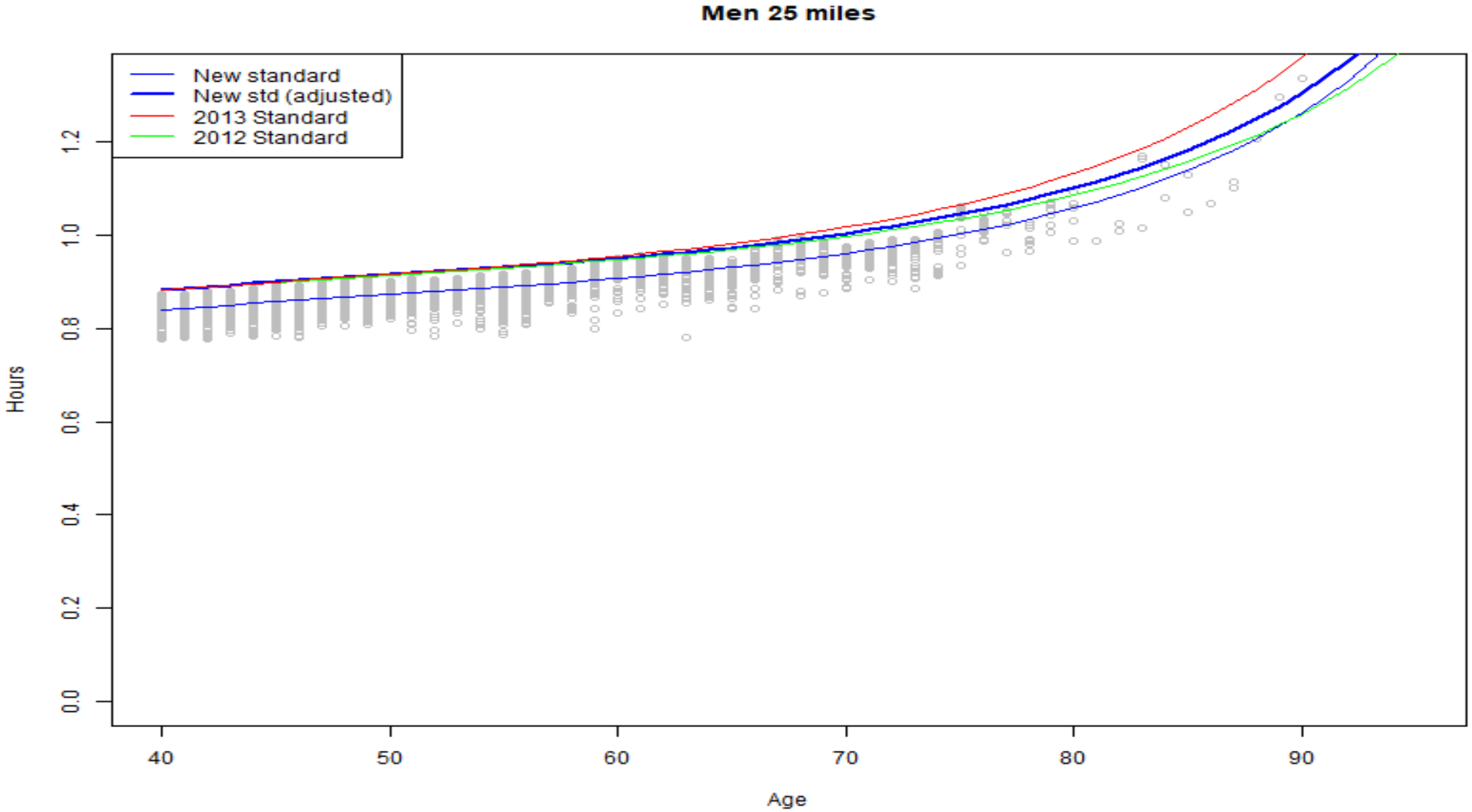
V5 Modify adjustment for older age bands

V6 Blend of versions 4 and 5 = current proposal

STATISTICAL MODELLING – THE LOCKWOOD FORMULA

1. Consider the top 10% of performances for each age of male riders on a solo bike - provides a better, more consistent sample of performances
2. Add a 'weighting' factor to ensure that all age groups carry equal significance
3. Run a regression analysis to establish a "line of best fit" for the age decline and distance ridden
4. This gives us a formula to calculate a standard for men for any distance or time
5. Derive 'scaling' factor for women and trikes
6. The formula is then used to calculate a new version of all the tables and an adjustment percentage for tandem bikes and trikes
7. The 'base point' is retained as 1:06:00 for a male 40 year old for 25 miles (so personal standards will not need to be 'reset' from scratch)

Example of plotting ‘line of best fit’



THE LOCKWOOD FORMULA – FURTHER DETAIL

The formula models the decline in speed with age and event distance (or time)

The power required to cycle increases as speed increases , so this is consistent with the underlying principle that power declines with age and the duration of an event

An "r-squared" value is a measure of how well our model fits the data. A value of 1 would be a perfect fit

So the closer to 1, the better the model fits the data.

- 2018 analysis the r-squared value is 0.895
- 2012 analysis the r-squared value is 0.803

TESTING THE LOCKWOOD FORMULA

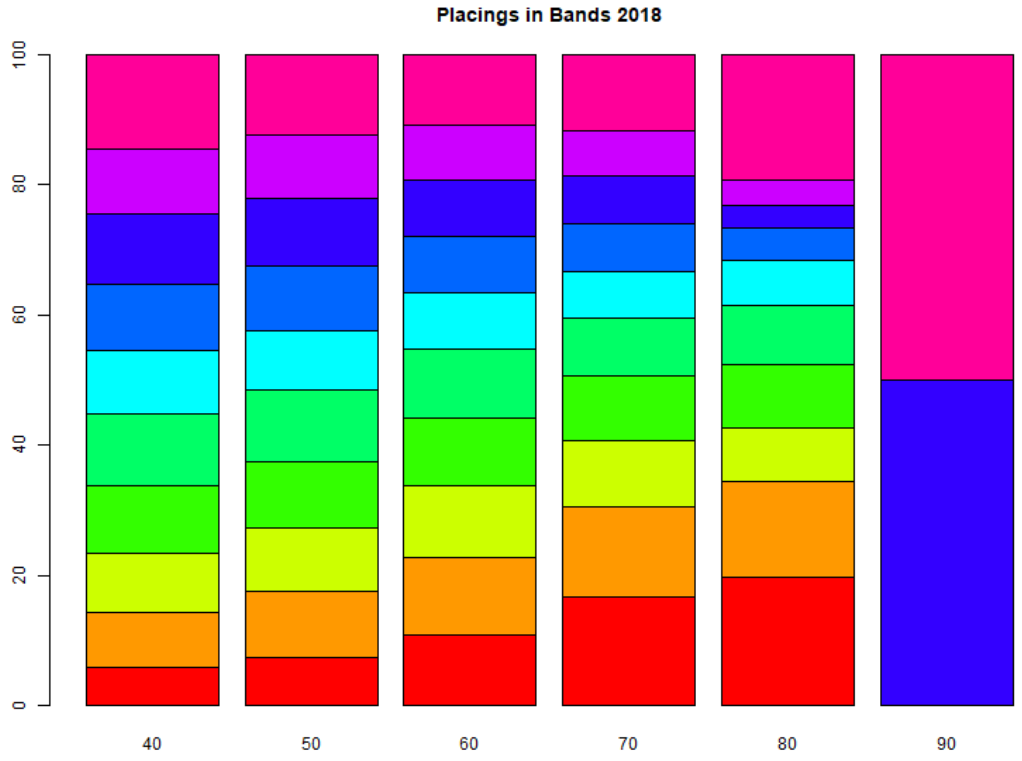
It is vital to test the resultant formula and tables – 'back-testing'

These test can both be quantitative and objective as well as subjective in terms of 'perceived fairness'

A range of back-tests was undertaken building on the tests that we undertook in 2011/12

In the following slides we provide a subset of the most enlightening tests

TESTING (1) AGE BAND PLACINGS



TESTING (1) - AGE BAND PLACINGS

1. Each coloured band represents 10% of the placings on standard.
2. The height of the band represents what percentage of the riders in each age group are in that band.
3. You can see that a greater proportion of riders in their 40s and 80s are in the top 10% of the field than riders in their 50s, 60s or 70s.
4. For the very few riders in their 90s, about 50% of them are in the top 10% of positions and ALL of them are in the top 30%

Overall - a reasonably balanced **statistical** distribution

TESTING (2) - 'BACK TESTING'

We reran the 2017 and 2018 results for all three season long competitions (which covers distances 10, 25, 50, 100 & 12 hour)

We reran a number of 2018 championships and other selected events

- 2017 Yorkshire VTTA 10
- 2018 Leo 30 - in both of which multiple age records were set.

Do the 'new standard' revised results, taken as a whole, give a fairer and credible outcome ?

BACKTEST EXAMPLE (1) — 2018 BAR (25,50,100 MILES AND 12 HOUR)

Age	Gender	New plus	New Posn	Original plus	Old Posn	Diff in plus	Diff in posn
53	F	01:21:04	1	01:23:04	1	-00:02:00	0
45	M	01:11:58	2	01:15:38	2	-00:03:40	0
57	M	01:11:23	3	01:15:27	3	-00:04:04	0
64/65	M	01:09:43	4	01:14:15	4	-00:04:33	0
47	M	01:07:42	6	01:11:14	5	-00:03:32	-1
42	F	01:08:38	5	01:10:04	6	-00:01:26	+1
42/43	M	01:06:14	8	01:09:57	7	-00:03:43	-1
55/56	M	01:04:23	11	01:09:50	8	-00:05:27	-3
43/44	M	01:05:44	9	01:09:34	9	-00:03:50	0
47	M	01:05:15	10	01:09:07	10	-00:03:52	0
72	F	01:06:19	7	01:07:44	11	-00:01:25	+4
50/51	M	01:03:08	12	01:06:31	12	-00:03:24	0

No major change at the top but women move up and winner's margin is greater

BACKTEST EXAMPLE (2) – 2018 THREE DISTANCE (25, 50, 100 MILES)

Age	Gender	New plus	New Posn	Old plus	Old Posn	Diff in plus	Diff in posn	
88	M	01:05:47	2	01:16:02	1	-00:10:15	-1	
65	M	01:04:19	3	01:06:28	2	-00:02:09	-1	
59	M	01:02:58	4	01:04:31	3	-00:01:33	-1	
71/72	M	00:57:45	7	01:00:56	4	-00:03:11	-3	
53	F	01:00:07	5	01:00:14	5	-00:00:07	0	
45	F	00:58:52	6	00:58:50	6	00:00:03	0	
53/54	M	00:55:49	8	00:57:03	7	-00:01:14	-1	
50	M	01:08:47	1	00:56:09	8	00:12:38	+7	Trike
67	M	00:53:13	11	00:55:37	9	-00:02:24	-2	
45	M	00:54:08	9	00:55:07	10	-00:00:59	+1	
47	M	00:53:37	10	00:54:37	11	-00:01:00	+1	
47	M	00:52:46	12	00:53:46	12	-00:01:00	0	

A Trike wins (with some record rides) - gaps noticeably closed between top 5 placings

BACKTEST EXAMPLE (3) – 2018 SHORT DISTANCE (2X10M 2X25M)

Age	Gender	New plus	Posn	Old plus	Posn	Diff in plus	Diff in posn
87/88	M	01:23:07	2	01:28:58	1	-00:05:51	-1
74	M	01:22:24	4	01:24:12	2	-00:01:48	-2
59	M	01:23:43	1	01:23:48	3	-00:00:05	+2
65	M	01:22:29	3	01:23:02	4	-00:00:33	1
88	M	01:14:59	12	01:21:08	5	-00:06:09	-7
42	M	01:18:36	6	01:18:19	6	00:00:17	0
53	F	01:18:49	5	01:17:05	7	00:01:44	+2
58	F	01:18:23	7	01:16:50	8	00:01:33	+1
49	F	01:18:01	8	01:16:10	9	00:01:51	+1
46	M	01:15:59	9	01:15:37	10	00:00:22	+1
45/46	M	01:15:52	10	01:15:29	11	00:00:23	+1
66	M	01:14:20	16	01:15:00	12	-00:00:40	-4

Top 4 swap places. Top 10 times are much closer. Very oldest riders lose plus. Women move up.

TESTING (3) – AGE RECORD PLUSSES (E.G.10 MILES)

Age	Age Record	New standard	Plus
41	00:17:47	00:26:07	00:08:20
45	00:17:49	00:26:27	00:08:38
50	00:18:02	00:26:49	00:08:47
56	00:18:44	00:27:17	00:08:33
60	00:19:49	00:27:39	00:07:50
65	00:19:51	00:28:13	00:08:22
73	00:20:21	00:29:32	00:09:11
74	00:21:08	00:29:45	00:08:37
80	00:22:56	00:31:22	00:08:26
86	00:24:24	00:33:54	00:09:30
87	00:26:22	00:34:27	00:08:05
89	00:29:21	00:35:44	00:06:23

Average plus (excl 89 years) is 08:34

EXAMPLES OF CHANGES

Showing new standard and the difference to 2012 standard

At distance events a ‘+’ denotes easier, a ‘-’ denotes harder standard time

10 miles

25 miles

50 miles

100 miles

At time events (12/24 hour) a ‘+’ denotes harder, a ‘-’ denotes easier

12 hours

10 MILES COMPARISON

	Men			Women	
Age	New standard	Diff		New standard	Diff
40	00:26:02	+0.03		00:28:14	+0.12
50	00:26:49	+0.04		00:29:06	+0.13
60	00:27:39	+0.01		00:30:02	+0.11
70	00:28:58	-0.04		00:31:30	+0.06
80	00:31:22	-0.15		00:34:10	-0.05
90	00:36:29	-0.37		00:39:50	-0.26

Quite modest changes until late 80s

25 MILES COMPARISON

	Men			Women	
Age	New standard	Diff		New standard	Diff
40	1:06:00	0.00		1:11:35	+0.21
50	1:08:03	-0.01		1:13:51	+0.23
60	1:10:14	-0.07		1:16:17	+0.16
70	1:13:42	-0.24		1:20:08	0.00
80	1:20:06	-0.56		1:27:14	-0.31
90	1:33:58	-2.08		1:42:39	-1.40

Similar to 10 miles – younger women have a slightly easier standard

50 Miles Comparison

	Men			Women	
Age	New standard	Diff		New standard	Diff
40	2:15:07	-0.28		2:26:32	+0.12
50	2:19:27	-0.33		2:31:21	+0.09
60	2:23:57	-1.08		2:36:21	-0.26
70	2:30:58	-2.24		2:44:09	-1.44
80	2:43:56	-5.06		2:58:33	-4.33
90	3:12:04	-12.41		3:29:48	-12.33

The more limited decline in speed at 80 years plus becomes more visible by this distance

100 Miles Comparison

	Men			Women	
Age	New standard	Diff		New standard	Diff
40	4:43:02	-3.05		5:06:58	-1.51
50	4:53:04	-3.32		5:18:06	-2.14
60	5:03:36	-5.13		5:29:49	-3.56
70	5:20:22	-8.51		5:48:25	-7.45
80	5:52:24	-17.12		6:24:01	-16.32
90	7:07:59	-45.54		7:47:58	-47.13

Similar pattern to 50 miles – standard harder across the age range

12 hour Comparison(+ve are harder !)

	Men			Women	
Age	New standard	Diff		New standard	Diff
40	217.10	+4.51		193.45	+0.26
50	202.92	+3.26		180.82	-0.72
60	189.50	+3.33		168.85	-0.51
70	170.80	+4.01		152.15	+0.31
80	142.11	+4.94		126.48	+1.48
90	97.94	+5.96		86.76	+2.95

Relatively small changes at 12 hours

ECCA 50 2018 Notes on Result using 2019 standards

88 year old rode 2.20.16.
47-year-old rode 1:39:11

New standard calculation:

- 47 year old plus is 39.03
- 88 Year old plus is 43.56 so still wins but by 4.53 not 14.40
- 47 year old would have had to beat comp record by 19 secs.

But the 88 year broke the age record by a huge 31.45
– and 46 secs slower than the 87 year old record

A very fast event would as usual favour the older (slower) rider

SOME OUTSTANDING ISSUES

'Fast' courses/events

- The maths of 'subtractive' plusses means that fast events will 'favour' slower (older) riders and slow events will favour faster (younger) riders

Multiple purpose of standards

- A level playing field for national championships/competitions (impact on 'elite' riders)
- Personal standard claims (impact on 'average' rider) – only around 10% of members claimed standards in 2018

Women's standards

- Standards seek to achieve 'gender neutrality'
- But we have separate women medallists to encourage participation

Trikes

- Very few trike riders - should we have a separate competition for Trikes (like tandems)?

KEY CONCLUSIONS

1. For most members the impact of the new standard is fairly modest
2. Men's standards are generally neutral to around 60 years old but then become progressively harder, except over 12/24 hours
3. Younger women's standards generally become a little easier
4. Trike standards are easier compared to solos (85.5% ratio compared to 93% previously)
5. Retain current tandem adjustment of 4% over solos

Overall impact is expected to be a narrowing of plusses in the top places in events/championships/BAR competitions, so they become

more competitive

RECOMMENDATIONS AND NEXT STEPS

1. Implement the revised tables for 2019

2. Ongoing assessment of 2019 results for 'objective' and 'perceived' fairness

3. Consider possible alternative approaches during 2019 (e.g. proportional plusses) but need to have as simple and workable a system as possible

4. Plan for another update in say 3-5 years time

APPENDIX: NOTE ON PROPORTIONAL PLUSSES

The effect of using proportional plusses has been explored.

Instead of calculating plusses by subtracting the time from the standard they are calculated by dividing the standard by the time

Using this approach should reduce the disproportionate effect that particularly fast or tough events have on riders

However it would need event organisers to use an automated spreadsheet to calculate such a result