Indoor Facility Indexing
For NCAA Running Event Performances

A Study commissioned by:
The NCAA Men's and Women's Track and Field Committee

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Preface

Qualifying for Track and Field Championship competition within the NCAA, for both the indoor and the outdoor season, is the result of a ranking in each event within the sport based on an individual's performance. The validity of this method is anchored with the acceptance of and adherence to qualifying regulations that promote the relative equality of the performances for comparative purposes.

Qualifying regulations do not alter a performance for competition related results, nor do they forbid an event or competition to be staged without adherence to the regulations. The qualifying regulations are the determining factors as to whether a performance is eligible for inclusion in the list of performances for an event from which selection is made for the championship. Examples of factors that do not affect a competition but do affect an acceptable qualifying performance are intensity of the wind, altitude and events that contain mixed genders.

The configuration of an Outdoor Track and Field running facility has been standardized in the size (overall circumference) of the oval for a very long time. There is very little departure from this standard. There is a standard for the size of an Indoor Track and Field running facility. The standard size for a facility in this indoor sport does not have the luxury of longevity as does its outdoor counterpart. Indoor running facilities were fabricated to fit into existing buildings, resulting in a size that has no relation to the current standard.

There was little question that varying running facility configurations produced inequalities in performance that affected the goal of valid comparison through an event performance ranking. The evidence was not massive or scientific, but differences could easily be shown to exist. Therefore, this variation in running facility configuration for Indoor Track and Field is the reason qualifying regulations, in the form of conversion differentials, were developed dependent on facility configuration.

The methods used over the years to determine these differentials have been based on limited personal experience, real-time conversion results and a small amount of gathered data. The conversions, based mainly on conjecture, were manipulated yearly within each Division Committee independent from one another.

In 2007, the collection of results from NCAA indoor competitions became well enough automated that performances for an entire season could be analyzed. The mandatory reporting of results starting in 2010 provided the opportunity to expand the analysis. The following presentation is the result of the data analysis on performances from indoor facilities of different configurations by the same individual during the last five NCAA Track & Field Indoor seasons.

Project

In September, 2011 the Chairs of the three Division Committees, the respective NCAA Liaisons, the Chairs of the three Standards Committees and a few other interested individuals came together to discuss bringing the three divisions together with common procedures in applying conversions in order to obtain comparative equivalence in the indoor and outdoor descending order performance lists used by each in their championship selection process. The topics included processes for event conversions, altitude conversions and indoor facility indexing. Within a relatively short time, the enormity of facility indexing was realized and authorization was granted to form a study group, separate from the division committees, for the sole purpose of gathering the data, analyzing the data and developing recommendations for facility indexing.

The marching orders to this study group from the Track and Field Committee were pretty straight forward. It is desirable that all three divisions have the same track type categories, both in number and type, and the same method of applying a facility conversion.

- Determine the number and type of facility categories.
- Determine if a formula based conversion approach is viable.
- Develop recommendations based on the findings.

To this end, full access to the data obtained from the mandatory reporting of results was give to the study group. Extensive data existed for all divisions for only one season. However, data was available in a lesser amount for at least three seasons.

Parameters

The study group, at its first meeting, easily determined that for the project to have any measure of success there would need to be limitations.

- The data would be analyzed on a season-by-season basis. Performances from different seasons on differing facilities would not be compared.
- The data points to be compared would be limited to approximately the period between January 15 and February 28. The goal is to use a six-week season window that reflects normal competition, not clouded by last-chance or conference championships.
- Analysis would be based on four major facility categories: Undersized, Flat, Banked and Oversized.
- Scarcity of comparative data for undersized facilities will limit extensive analysis for this category. Within the universe of facility types, 521 are flat, 34 oversized, 31 undersized and 22 banked. See Appendix A.
- No analysis would be attempted on actual variance in size, nor the influence of facility radius within a facility category.
- Some level of 'assumption' may be required to obtain an indexing formula, since the number of factors that affect performance must be limited and some, such as competitive spirit, cannot be measured.
- There is a true understanding that performance variation is easily affected by the other competitors in a race, training and coaching. Any analysis would vigorously focus only on the effect of the facility.
- If possible, guidance would be sought from a professional data analyst.
- A further refinement, after the conclusion of this study, using a greater number of measurable factors would be welcomed.
- A goal of this study is to use better information, than what had been available previously, to create a viable indexing methodology. The end product should be a reasonable set of guidelines, based on an established set of factors that can be translated into a formulary used by each division in a consistent manner, to create event specific conversions by facility type.

Process

In general, the process is to examine all performances by a competitor from an NCAA member institution within an event for a season. The mandatory reporting of meet results to the TFFRS system provided the lists which indicated the individual, performance, type of facility and performance date. In many cases, the list for an event contained more than 6,000 entries.

Each event list was refined by eliminating any performance where: a) it was the only performance by the individual in the event; b) all of the performances by the individual in the event were on the same type of facility. The remaining performances were multiple performances by the same individual on different facilities. These performances were then paired in as many ways possible to create comparisons of performances between two types of facilities.

The pairs were, for this first analysis, unabridged. They were not filtered in any way. The goal was to determine if there was any apparent correlation. This created the starting point for any further analysis. Charts depicting the results of these initial unabridged pairings, by season, are in Appendix B. It is unmistakably clear that a correlation between facility types does exist.

Work then began to refine and filter the data so that the analysis reflected facility type variation as much as possible. As an example of a filter in the Women's Mile, pairs were limited to a differential in performance of at least three seconds, performances for the pair had to occur within 21 days, performances had to occur within a six week calendar window and performances slower than six minutes were excluded. Similar filtering occurred for all events. An analysis was also undertaken to examine pairs from the same individual on the same type of facility in order to determine, and then exclude, the 'training effect'. The result made it possible to propose models that would isolate the 'training effect' and formulate a conversion ratio which would then be subjected to the scrutiny of further analysis. The preliminary finding during February, 2011, using mainly data from the 2010 and 2011 seasons, indicated: a) a practically identical relationship between a performance on a flat facility to a performance on either a banked or an oversized facility; b) a definite ratio relationship that could be used for conversions; c) the elimination of data variations at the significant extremes, which cannot be attributed to training or facility differences, greatly improve the reliability tests.

By mid-March, analysis was proceeding on four independent paths, each with the objective of finding the most correct methodology to use in creating reliable conversions. One study was done to determine if the

current differential conversions, by division, were in-line with the ratios predicted by the unabridged comparison charts. There were a fair number of consistencies, but many glaring gross variations. It was a simple confirmation that the current method of setting differential conversions utilized limited objective data, and therefore the consistencies were largely educated guesses.

Two independent evaluations approached the issue from as pure a statistical model as possible. A brief discussion of the statistical procedures, with a focus on the 200 Meter data, is presented in Appendix C and Appendix D. The underlying principles of the two evaluations became the approach for the study of each event. The two approaches took slightly different paths in compiling the study data. Approach one: a) Work with time differences in seconds; b) Tighten the window of actual times used in the study; c) Delete all data outside +/- 1 standard deviations; d) Delete training effect. Approach two: a) Work with percent differences between times; b) Delete all data outside +/- 3 standard deviations; c) Recalculate standard deviation, and then again delete all data outside +/- 3 standard deviations; d) Delete training effect. The two approaches achieved very similar results, thus validating the analysis to be highly reliable. Full documentation showing the results from the approaches with statistical validation is not included but readily available.

The end of March added the 2012 season data to that being studied by the group. There was then an opportunity to test theories against a new data set to see if projections would be valid. After applying the theories to the new data, there was affirmation of the work that had been done regarding the analysis of the data and the reliability of the results. It is safe to say that the group has performed an aggressive analysis of the data in order to confirm that the results would be reliable. To that end, there are some statements that can be made.
-- Absolute perfection in the establishment of a conversion formula for the different facility types is next to impossible due to an extreme number of varying and uncontrollable factors.

However, the analysis produces several encouraging and positive results.
-- A definite linear relationship between facility types does exist. This was first witnessed in the original unabridged charts.
-- Limitation of data examples to the most relevant has produced a very reliable conversion that stands-up to the tests for reliability. The limitation excludes extremes that exist both early and late in the season.
-- Data was tested with both limited and unlimited performance date differences. The result did not produce substantial variation.

With the realization that perfection was not possible due to an enormous number of factors, work continued by performing an analysis on the data from a different perspective. Further discussion and scrutiny of the data ensued. Examples were produced of what the conversion would be using a different model, race speed (time) vs. race distance (event). The ratios created and examined show a strong correlation and realization that race speed, for all events other than the 200 meter, is a better predictor,

The conclusion is that, while interesting and probably worth further examination, the overall goal of having a product in time for the Track and Field Committee to review and then implement for the upcoming indoor season, and the slight difference produced by the different model, a switch to a new model would not be too productive at this point. This conclusion fits an original parameter that this is an initial analysis and further study is welcomed.

There was agreement within the group that the results of the research done independently closely matched across the group. With that, there was a feeling that a presentation could be ready for presentation the Track and Field Committee at their summer meeting. The presentation would address:
-- Can a single common method of conversion be established across the three divisions for the indoor events?
-- Should the descending order list of qualifying marks be based on the same facility type for all three divisions, even though the championship may not be staged on that type of facility?
-- Can there be a common determination of the number of types of facilities that require conversion?
-- Are there determinable ratios for each event and facility type that can be utilized to convert performances so that there is a greater degree of reliability in comparing performances?
-- Can a method of conversion be established that provides better comparison and reliability than what is currently used?

It is a consensus of the group, that each of the above has fruitful answers and solutions.

Continued comment was made that this endeavor is made most difficult since the goal is to rate and rank a facility type without skewing the results due to factors related to 'pure competition'. In addition, there is no group of facilities that have a totally common specification. The results of this study, although zeroing in on an absolute answer based on data, will invariably be slightly skewed due to this fact. While absolute perfection may not be possible, nearing perfection is the goal. The effort to find 'the perfect conversion' cannot be considered finished after the presentation by this group. Further investigation, study, modeling and experimentation are the best ways to achieve a better result.

Proposal

There are many items in the final proposal. Please consider all of the following, not just the presentation of the conversion ratios. The items are not arranged in any pertinent order. One is not more relevant than another.

-- The new track indexing ratios are highly accurate and based solely on thousands of objective race performances collected through TFRRS. An immense amount of study has been used to focus the result on variation due solely to facility variation.
-- The new track indexing ratios apply to the full range of race performances (times), so that they may be utilized for NCAA Championships as well as conference championships in all divisions.
-- The 1000 meter conversion is included as a courtesy. Conversions for the 500 and 600 meter events can be easily established for use within conferences.
-- A ranked list, for the same type of facility, should be established for all divisions, not dependent on the type of facility used for the championship. This would promote consistency and comparison.
-- The single reference list should be the flat 200 meter facility. Based on the predominance of this type of facility, 85%, the flat 200 meter should be the standard.
-- Overwhelming evidence from objective data comparison supports equivalence between a banked and an oversized facility with regard to qualifying performance.
-- A sample of performance conversions using the current fixed qualifying standards and the new formula approach is presented in Appendix E.

Proposed Conversion Ratios Based on Average of NCAA Qualifying Performances

Men	Undersized-Flat	Banked-Flat	Oversized-Flat
200	0.9872	1.0179	1.0179
400	0.9901	1.0160	1.0160
600			
800	0.9923	1.0143	1.0143
1000	0.9929	1.0138	1.0138
Mile	0.9941	1.0128	1.0128
3000	0.9953	1.0116	1.0116
5000	0.9961	1.0107	1.0107
4x4	0.9901	1.0160	1.0160
DMR	0.9931	1.0136	1.0136

	Flat	Flat	Flat
200	0.9900	1.0155	1.0155
400	0.9929	1.0133	1.0133
600			
800	0.9951	1.0115	1.0115
1000	0.9958		
Mile	0.9969	1.0099	1.0099
3000	0.9981	1.0086	1.0086
5000	0.9989	1.0077	1.0077
4x4	0.9929	1.0133	1.0133
DMR	0.9959	1.0107	1.0107

Women	Undersized-	Banked-	Oversized-

Appendix A

Facility Name	State	Track_Type	Size
Abilene Christian	TX	flat	200
Adams State College-Plachy FH	CO	undersized	133.3
Adrian College	MI	flat	200
Air Force-Cadet Field House	CO	oversized	268
Akron-Field House	OH	oversized	300
Alabama A&M	AL	flat	200
Alabama State	AL	flat	200
Albany State	GA	flat	200
Albion	MI	flat	200
Albright College-Life Sports Center	PA	undersized	160
Albuquerque Convention Center	NM	banked	200
Alcorn State	MS	flat	200
Alfred U.	NY	flat	200
Allegheny	PA	flat	200
American	DC	flat	200
Anderson U.-Wellness Center	IN	flat	200
Angelo State	TX	flat	200
Appalachian State-Holmes Convocation Center	NC	oversized	300
Arizona	AZ	flat	200
Arizona State	AZ	flat	200
Arkansas State-Convocation Center	AR	flat	200
Arkansas-Little Rock	AR	flat	200
Arkansas-Pine Bluff	AR	flat	200
Arkansas-Randall Tyson Track	AR	banked	200
Armory Track & Field Center	NY	banked	200
Armstrong Atlantic	GA	flat	200
Army-Gillis FH	NY	flat	200
Arthur Ashe Center	VA	flat	200
Ashland U.	OH	flat	200
Auburn	AL	flat	200
Augsburg	MN	flat	200
Augustana	SD	flat	200
Augustana (Ill.)-PepsiCo Center	IL	flat	200
Augustana-Elmen Center	IL	undersized	160
Austin Peay	TN	flat	200
Baker	KS	flat	200
Baldwin-Wallace-Lou Higgins Center	OH	flat	200
Ball State University	IN	flat	200
Ball State-Field Sports Bldg	IN	flat	200
Baptist Bible	PA	flat	200
Bates College-Merrill Gymnasium	ME	flat	200
Baylor	TX	flat	200
Belmont	TN	flat	200
Bemidji State-Gillette Rec Center	MN	flat	200
Benedictine	KS	flat	200
Bethany	KS	flat	200
Bethany (CA)	CA	flat	200
Bethel	KS	flat	200
Bethel (IN)	IN	flat	200
Bethel U-Bethel FH	MN	flat	200
Bethune-Cookman	FL	flat	200
Binghamton--Indoor Track	NY	flat	200
Birmingham Metro CrossPlex	AL	banked	200
Black Hills St.-Donald Young Center	SD	flat	200
Boise State-Jackson's Track	ID	banked	200
Boo Williams Sports Complex	VA	flat	200
Boston College	MA	flat	200
Boston University-Track & Tennis Center	MA	banked	200
Bowdoin College-Farley Field House	ME	flat	200
Bowling Green-Perry Field House	OH	flat	200
Bradley	IL	flat	200
Brandeis -Gosman Sports Center	MA	flat	200
Brevard	NC	flat	200
Briar Cliff	IA	flat	200
Brown-Olney-Margolies AC	RI	flat	200
Bucknell-Gerhard Field House	PA	flat	200

Facility Name	State	Track_Type	Size
Buena Vista U-Lamberti Rec Center	IA	flat	200
Butler	IN	flat	200
BYU-Smith Field House	UT	oversized	352
Cal Poly	CA	flat	200
Cal St. Fullerton	CA	flat	200
Cal St. Northridge	CA	flat	200
Cal St. Sacramento	CA	flat	200
Cal U.	PA	flat	200
California	CA	flat	200
Calvin College	MI	flat	200
Campbell	NC	flat	200
Campbell County Recreation Center	WY	flat	200
Canisius	NY	flat	200
Capital U-Cap Center	OH	flat	200
Carleton College-Rec Center FH	MN	flat	200
Carnegie Mellon	PA	flat	200
Carroll College	WI	flat	200
Carthage-Tarble Athletic Center	WI	flat	200
Case Western-Veale Convocation Center	OH	flat	220
Cedarville-Doden FH	OH	flat	200
Central College	IA	flat	200
Central Connecticut	CT	flat	200
Central Methodist	MO	flat	200
Central Michigan-Indoor Athletic Complex	MI	flat	200
Central Missouri-Multipurpose Bldg	MO	flat	220
Central Oklahoma	OK	flat	200
Central State	OH	flat	200
Chadron State-Nelson Physical Activity Cen.	NE	undersized	170
Charleston	SC	flat	200
Charleston Southern	SC	flat	200
Charleston WV	WV	flat	200
Chattanooga	TN	flat	200
Chicago State	IL	flat	200
Christopher Newport -Freeman Center	VA	flat	200
Cincinnati	OH	flat	200
Citadel	SC	flat	200
Claflin	SC	flat	200
Clarion	PA	flat	200
Clark Atlanta	GA	flat	200
Clayton State	GA	flat	200
Clemson-Indoor Track Facility	SC	flat	200
Coast Guard-Roland Hall	CT	undersized	180
Coastal Carolina	SC	flat	200
Colgate U-Sanford FH	NY	flat	200
College of Wooster	OH	flat	200
Colorado College	CO	flat	200
Colorado Mines-Steinhauer FH	CO	undersized	193
Colorado St.	CO	flat	200
Colorado-Balch FH	CO	flat	200
Columbia	NY	flat	200
Concordia (MI)	MI	flat	200
Concordia (Neb.)-Bulldog FH	NE	flat	200
Concordia College-Olson Forum	MN	flat	200
Connecticut-Hugh Greer FH	CT	flat	200
Coppin State	MD	flat	200
Cornell College-Multi-Sport Center	IA	flat	200
Cornell-Barton Hall	NY	flat	200
CU Colorado Springs	CO	flat	200
Cumberland	KY	flat	200
Dallas Baptist	TX	flat	200
Dartmouth-Leverone FH	NH	flat	200
Davidson	NC	flat	200
Defiance	OH	flat	200
Delaware State	DE	flat	200

Appendix A

Facility Name	State	Track_Type	Size
Delaware-Delaware FH	DE	flat	200
Denison-Mitchell Center	OH	flat	200
Denver	CO	flat	200
DePaul	IL	flat	200
DePauw-Tennis & Track Center	IN	flat	200
Dickinson College-Kline Center	PA	flat	200
Doane College-Furher FH	NE	undersized	160
Dordt College-Dordt Rec Center	IA	flat	200
Drake	IA	flat	200
Dubuque-Chlapaty Rec Center	IA	flat	200
Duke	NC	flat	200
Duquesne	PA	flat	200
East Carolina	NC	flat	200
East Stroudsburg-Field House	PA	flat	200
East Tennessee State-Memorial Center	TN	oversized	280
Eastern Illinois-Lantz FH	IL	flat	200
Eastern Kentucky	KY	flat	200
Eastern Michigan-Bowen Fieldhouse	MI	flat	200
Eastern Washington-Thorpe FH	WA	flat	200
Eckerd	FL	flat	200
Edinboro-Zafirovski Rec Center	PA	oversized	230
Emory	GA	flat	200
Emporia State	KS	flat	200
Fairleigh Dickinson-Rothman Center	NJ	flat	200
Findlay-Malcolm AC	OH	flat	200
FIU	FL	flat	200
Flagler	FL	flat	200
Florida A&M	FL	flat	200
Florida Atlantic	FL	flat	200
Florida Memorial	FL	flat	200
Florida Southern	FL	flat	200
Florida State	FL	flat	200
Florida Tech	FL	flat	200
Florida-O'Connell Center	FL	flat	200
Fordham-Lombardi Center FH	NY	flat	200
Fort Hays State	KS	flat	200
Fort Valley State	GA	flat	200
Franklin & Marshall-ASFC FH	PA	flat	200
Fresno State-SaveMart Arena	CA	undersized	160
Friends	KS	flat	200
Frostburg State	MD	flat	200
Furman	SC	flat	200
Gardner-Webb	NC	flat	200
George Mason-Rec. Sports Complex	VA	flat	200
Georgetown Prep-Hanley Center	MD	flat	200
Georgia	GA	flat	200
Georgia Southern	GA	flat	200
Georgia State	GA	flat	200
Georgia Tech	GA	flat	200
Gonzaga	WA	flat	200
Graceland U-Closson Center	IA	flat	200
Grambling	LA	flat	200
Grand Valley State-Laker Turf Building	MI	oversized	300
Grand View-Johnson Wellness Center	IA	undersized	150
Grinnell-Bear Athletic Center	IA	flat	200
Gustavus Adolphus	MN	flat	200
Gwynedd-Mercy	PA	flat	200
Hagerstown CC-ARCC	MD	flat	200
Hamilton-South FH	NY	flat	200
Hamline	MN	flat	200
Hanover	IN	flat	200
Harding U.	AR	flat	200
Hartford	CT	flat	200
Harvard-Gordon Track and Tennis	MA	banked	200
Haskell Indian	KS	flat	200
Hastings	NE	flat	200
Haverford College-Alumni FH	PA	flat	200
Hawaii	HI	flat	200
Heidelberg	OH	flat	200
High Point	NC	flat	200
Highland CC	KS	undersized	160

Facility Name	State	Track_Type	Size
Hillsdale	MI	flat	200
Hiram	OH	flat	200
Hobart/William Smith-Bristol FH	NY	flat	200
Holy Cross	MA	flat	200
Hope College	MI	flat	200
Houston-Yeoman FH	TX	flat	200
Howard	DC	flat	200
Huntington College	IN	flat	200
Huston-Tillotson	TX	flat	200
Idaho State-Holt Arena	ID	banked	200
Idaho-Kibbe ASUI Activity Center	ID	oversized	290
Illinois College-King FH	IL	flat	200
Illinois State-Horton FH	IL	flat	200
Illinois Wesleyan-Shirk Center	IL	flat	200
Illinois-Armory	IL	flat	200
Illinois-Chicago	IL	flat	200
Indiana PA	PA	flat	200
Indiana State	IN	flat	200
Indiana Wesleyan-Indoor Sports Complex	IN	flat	200
Indiana-Gladstein FH	IN	banked	200
Indianapolis	IN	flat	200
Iona	NY	flat	200
Iowa State-Leid Rec Center	IA	oversized	300
Iowa-Recreation Building	IA	flat	200
IPFW-Hilliard Gates Center	IN	flat	200
Ithaca-Athletics & Events Center	NY	flat	200
Jacksonville	FL	flat	200
Jacksonville State	AL	flat	200
Jacksonville State	AL	flat	200
James Madison	VA	flat	200
JDL Fast Track	NC	flat	200
Jersey City Armory	NJ	flat	200
John Carroll	OH	flat	200
Johns Hopkins	MD	flat	200
Johnson and Wales	RI	flat	200
Kansas State-Ahearn FH	KS	flat	200
Kansas Wesleyan	KS	flat	200
Kansas-Anschutz FH	KS	flat	200
Kennesaw State	GA	flat	200
Kent State-Kent State FH	OH	oversized	292
Kentucky-Nutter FH	KY	oversized	291
Kenyon College-Kenyon	OH	flat	200
Keystone College	PA	flat	200
Knox College-T Fleming FH	IL	flat	200
Kutztown-Keystone FH	PA	flat	200
La Roche	PA	flat	200
La Salle	PA	flat	200
Lafayette-Kirby Sports Arena	PA	undersized	176
LaGrange College	GA	flat	200
Lake Superior State -Arbuckle Activity Center	MI	flat	200
Lawrenceville School-Lavino FH	NJ	banked	200
Lebanon Valley-Arnold Arena	PA	flat	200
Lehigh-Rauch FH	PA	flat	200
Lewis-Rec Center FH	IL	flat	200
Liberty-Tolsma Indoor Track Center	VA	flat	200
Life	GA	flat	200
Lincoln	MO	flat	200
Lincoln U.	PA	flat	200
Lindenwood U.	MO	flat	200
Livingstone	NC	flat	200
Long Beach St.	CA	flat	200
Long Island	NY	flat	200
Loras College	IA	flat	200
Louisiana Tech	LA	flat	200
Louisville	KY	flat	200
Loyola U Chicago-Alumni Gym	IL	undersized	125
LSU-Maddox FH	LA	flat	200
Luther College-Luther College	IA	oversized	299
Lynchburg-Wake Field House	VA	undersized	146
Lynn	FL	flat	200
Macalester-Leonard Center	MN	flat	200

Appendix A

Facility Name	state	track_type	Size
Macomb CC-Sports & Expo Center	MI	flat	200
Madison Square Garden	NY	undersized	160
Maine-Maine FH	ME	oversized	215
Malone	OH	flat	200
Manhattan College-Draddy Gymnasium	NY	flat	200
Marietta-Dyson Baudo Rec Center	OH	flat	200
Marist	NY	flat	200
Marquette	LA	flat	200
Marshall	WV	flat	200
Maryland	MD	flat	200
McKendree	IL	flat	200
McMurry	TX	flat	200
McNeese State-Rec Complex	LA	flat	200
McPherson	KS	flat	200
Medgar Evers	NY	flat	200
Memphis	TN	flat	200
Mercer	GA	flat	200
Mercyhurst	PA	flat	200
Methodist College	NC	flat	200
Miami	FL	flat	200
Miami Ohio	OH	flat	200
Michigan State U-Jenison FH	MI	flat	200
Michigan-Indoor Track Center	MI	flat	200
Middle Tennessee St.-Murphy Center	TN	oversized	280
Midland Lutheran	NE	flat	200
Millersville	PA	flat	200
Minnesota Stae U-Moo-Minnesota State-Moorhead	MN	flat	200
Minnesota-Duluth	MN	flat	200
Minnesota-Minnesota FH	MN	flat	200
Minot State-Indoor Track	ND	undersized	160
Mississippi	MS	flat	200
Mississippi College	MS	flat	200
Mississippi St.	MS	flat	200
Mississippi Valley	MS	flat	200
Missouri Baptist	MO	flat	200
Missouri S&T	MO	flat	200
Missouri Southern U-Leggett & Platt Ath. Center	MO	flat	200
Missouri Valley-Volney Ashford Gym	MO	undersized	160
Missouri-Hearnes FH	MO	flat	200
MIT-MIT Indoor Track	MA	flat	200
Monmouth College-Huff AC	IL	flat	200
Monmouth-Multi-Purpose AC	NJ	flat	200
Montana	MT	flat	200
Montana State-Breeden FH (Banked)	MT	banked	200
Montana State-Breeden FH (Flat)	MT	flat	200
Moravian College	PA	flat	200
Morehead State	KY	flat	200
Morehouse	GA	flat	200
Morgan State	MD	flat	200
Morris Brown	GA	flat	200
Morris College	SC	flat	200
Mount St. Mary's	MD	flat	200
Mount Union-Peterson FH	OH	flat	200
MSU-Mankato-Myers FH	MN	flat	200
Muhlenberg-Deitrich FH	PA	undersized	160
Murray State	KY	flat	200
Muskingum	OH	flat	200
Myers	OH	flat	200
N. Carolina A&T	NC	flat	200
Navy-Wesley A. Brown FH	MD	banked	200
NC State	NC	flat	200
Nebraska Wesleyan-Knight FH	NE	undersized	160
Nebraska-Devaney Center	NE	banked	200
Nebraska-Kearney-Cushing FH	NE	undersized	160
Nevada-Bill Cosby Indoor Facility	NV	banked	200
New Hampshire-Field House	NH	undersized	160
New Jersey City	NJ	flat	200
New Mexico St.	NM	flat	200
New Orleans	LA	flat	200

Facility Name	State	Track_Type	Size
Norfolk State	VA	flat	200
North Carolina-Eddie Smith FH	NC	flat	200
North Central (Minn.)-National Sports Center	MN	flat	200
North Central-Res/Rec Center	IL	flat	200
North Dakota	ND	flat	200
North Dakota St.-Bison Sports Arena	ND	flat	200
North Florida	FL	flat	200
North Park	IL	flat	200
North Texas	TX	flat	200
Northeastern	MA	flat	200
Northern Arizona-Skydome	AZ	oversized	300
Northern Colorado	CO	flat	200
Northern Iowa-UNI Dome	IA	flat	200
Northern Michigan-Superior Dome	MI	flat	200
Northern State	SD	undersized	160
Northland	WI	flat	200
Northwest Nazarene	ID	flat	200
Northwestern (IA)	IA	undersized	160
Northwestern College	MN	flat	200
Northwestern U.	IL	flat	200
Northwood U.	TX	flat	200
Notre Dame-Loftus Center	IN	oversized	352
Nova Southeastern	FL	flat	200
NW Missouri	MO	flat	200
NYIT	NY	flat	200
NYU	NY	flat	200
Oberlin-John Heisman FH	OH	flat	200
Ohio Northern-King Horn Sports Center	OH	flat	200
Ohio State-French FH	OH	flat	200
Ohio Wesleyan-Gordon FH	OH	flat	200
Oklahoma Baptist	OK	flat	200
Oklahoma Christian	OK	flat	200
Oklahoma State	OK	flat	200
Oklahoma-Mosier Indoor Track	OK	flat	200
Oral Roberts	OK	flat	200
Oswego State	NY	flat	200
Ottawa	KS	flat	200
Otterbein College-Rike Center	OH	flat	200
Palm Beach Atlantic	FL	flat	200
Park U.	MO	flat	200
Paul Quinn	TX	flat	200
Penn State-Ashenfelter Track (Banked)	PA	banked	200
Penn State-Ashenfelter Track (Flat)	PA	flat	200
Pittsburg State U-John Lantz Arena	KS	undersized	160
Pittsburgh-Fitzgerald FH	PA	flat	200
Plattsburgh	NY	flat	200
Portland State	OR	flat	200
Portland-Chiles Center	OR	oversized	240
Prairie View	TX	flat	200
Prince George's County Sports Complex	MD	flat	200
Princeton-Jadwin Gym	NJ	flat	220
Principia-Jim Crafton Training Center	IL	flat	200
Providence	RI	flat	200
Providence Career & Technical HS	RI	flat	200
PSU-Behrend	PA	flat	200
Pt. Loma Nazarene	CA	flat	200
Purdue-Lambert FH	IN	flat	200
Quinnipiac	CT	flat	200
Reggie Lewis Center	MA	banked	200
Regina	SK	flat	200
Rhode Island-Mackal FH	RI	flat	200
Rhodes	TN	flat	200
Rice	TX	flat	200
Richmond	VA	flat	200
Rider	NJ	flat	200
Rio Grande	OH	flat	200
RIT-Gordon FH	NY	flat	200
Robert Morris U-Robert Morris	PA	flat	200
Rollins	FL	flat	200

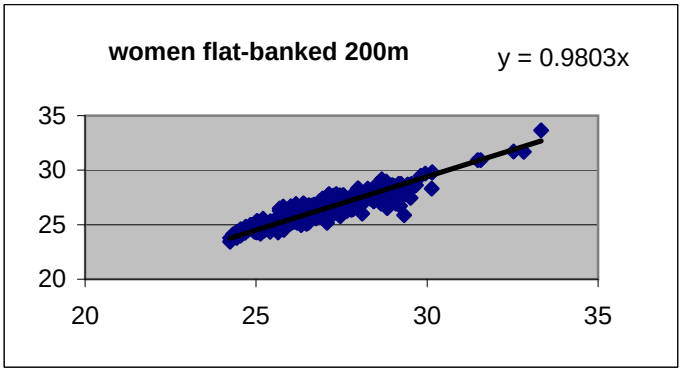
Appendix A

Facility Name	State	Track_Type	Size
Rose-Hulman-Sports & Rec Center	IN	flat	200
RPI	NY	flat	200
Rutgers-Busch Bubble	NJ	oversized	330
Rutgers-Camden	NJ	flat	200
Sacred Heart	CT	flat	200
Saginaw Valley St.-Ryder Center	MI	flat	200
Saint Augustine's	NC	flat	200
Saint John's U-McNeeley Spectrum	MN	flat	220
Saint Lawrence-Newell FH	NY	flat	200
Saint Leo	FL	flat	200
Saint Olaf College-Tostrud Center	MN	flat	200
Samford	AL	flat	200
San Francisco St.	CA	flat	200
Savannah State	GA	flat	200
SC State	SC	flat	200
SDSU	CA	flat	200
Seton Hall	NJ	flat	200
Seton Hall U-Regan FH	NJ	flat	200
Sewanee U-Fowler Center	TN	undersized	160
SI Edwardsville	IL	flat	200
Simpson	IA	flat	200
Slippery Rock U-Morrow Field House	PA	flat	200
Smith College-Indoor Track & Tennis	MA	flat	200
SMU	TX	flat	200
South Alabama	AL	flat	200
South Carolina-USC FH	SC	flat	200
South Dakota-Dakota Dome	SD	flat	200
South Florida	FL	flat	200
Southeast Missouri St.-Rec Center	MO	undersized	170
Southeastern College	FL	flat	200
Southern	LA	flat	200
Southern Arkansas	AR	flat	200
Southern Cal	CA	flat	200
Southern Colorado	CO	flat	200
Southern Connecticut-Moore FH	CT	flat	220
Southern Illinois-Rec Center FH	IL	flat	200
Southern Indiana	IN	flat	200
Southern Maine-USM Fieldhouse	ME	flat	200
Southern Miss.	MS	flat	200
Southern NO	LA	flat	200
Southwest (NM)	NM	flat	200
Southwest Baptist	MO	flat	200
Southwestern	KS	flat	200
Southwestern U.	TX	flat	200
Spelman	GA	flat	200
SPIRE Institute Indoor Track & Field Facility	OH	oversized	300
Springfield College	MA	flat	200
St. Ambrose-The Ambrose Dome	IA	flat	200
St. Anthony's High School	NY	flat	200
St. Benedict	MN	flat	200
St. Catherine	MN	flat	200
St. Cloud State	MN	flat	200
St. Francis (NY)	NY	flat	200
St. Francis (PA)	PA	flat	200
St. Gregory's	OK	flat	200
St. Joseph's	PA	flat	200
St. Mary's MN	MN	flat	200
St. Norbert	WI	flat	200
St. Peter's	NJ	flat	200
St. Scholastica-Burns Wellness Commons	MN	flat	200
Stanford	CA	flat	200
Sterling College	KS	flat	200
Stetson	FL	flat	200
Stevens Tech	NJ	flat	200
Stony Brook	NY	flat	200
SUNY Brockport	NY	flat	200
SUNY Cortland	NY	flat	200
SUNY Fredonia-Steele Hall	NY	undersized	160
SUNY Geneseo	NY	flat	200
Susquehanna-Garrett Sports Complex	PA	flat	200

Facility Name	State	Track_Type	Size
Swarthmore College-Swarthmore	PA	oversized	215
Syracuse-Manley FH	NY	flat	200
Tabor	KS	flat	200
Tampa	FL	flat	200
TAMU Commerce	TX	flat	200
Tarleton State	TX	flat	200
Taylor College-Kelser FH	IN	flat	200
Temple	PA	flat	200
Tennessee	TN	flat	200
Tennessee State-Indoor Track	TN	oversized	209
Tennessee-Martin	TN	flat	200
Texas	TX	flat	200
Texas A&M-CC	TX	flat	200
Texas A&M-Gilliam Indoor Track Stadium	TX	banked	200
Texas A&M-Kingsville	TX	flat	200
Texas Christian	TX	flat	200
Texas Lutheran	TX	flat	200
Texas Southern	TX	flat	200
Texas Tech-TTU Athletic Training Center	TX	oversized	233.33
Texas-Pan American	TX	flat	200
Texas-Permian Basin	TX	flat	200
Tiffin	OH	flat	200
Toledo	OH	flat	200
Towson	MD	flat	200
Trine-Indoor Track	IN	flat	200
Trinity U.	TX	flat	200
Trinity-Ferris AC	CT	undersized	160
Troy State	AL	flat	200
Truman State	MO	flat	200
Tufts-Gantcher FH	MA	flat	200
Tulane	LA	flat	200
Tulsa	OK	flat	200
U of Toronto-Varsity Center	ON	flat	200
U. of Chicago-Henry Crown FH	IL	flat	200
U. of Mary	ND	flat	200
U. of St. Thomas-Anderson FH	MN	flat	200
UAB	AL	flat	200
UC Irvine	CA	flat	200
UC Riverside	CA	flat	200
UC Santa Barbara	CA	flat	200
UCF	FL	flat	200
UCLA	CA	flat	200
UL-Lafayette	LA	flat	200
UM-Morris	MN	flat	200
UMass	MA	flat	200
UMBC	MD	flat	200
UMES-Hytche Center	MD	flat	200
UMKC	MO	flat	200
UNC Charlotte	NC	flat	200
UNC Greensboro	NC	flat	200
UNC-Wilmington	NC	flat	200
Union College	KY	flat	200
UNLV	NV	flat	200
UPenn	PA	flat	200
Ursinus College	PA	flat	200
Utah State-Nelson Field House	UT	banked	200
Utah-Olympic Ice Arena	UT	oversized	442
UTEP	TX	flat	200
UW-La Crosse-Mitchell Hall	WI	flat	200
UW-Milwaukee-Klotche Center	WI	flat	200
UW-Oshkosh-Kolf Sports Center	WI	flat	200
UW-Parkside-Petretti FH	WI	flat	200
UW-Stevens Point-Multi Activity Center	WI	flat	200
UW-Stout-Sports & Fitness Center	WI	flat	200
UW-Superior-Lydia Thering FH	WI	flat	200
UW-Whitewater-Kachel FH	WI	flat	200
Valdosta State	GA	flat	200
Valparaiso	IN	flat	200
Vanderbilt	TN	flat	200
VCU	VA	flat	200

Appendix A

Facility Name	State	Track_Type	Size
Vermont-Gardner Collins Indoor Track	VT	undersized	160
Virginia	VA	flat	200
Virginia Military In-Cormack FH	VA	banked	200
Virginia Tech-Rector FH	VA	banked	200
Wabash-Knowling FH	IN	flat	200
Wagner	NY	flat	200
Wake Forest	NC	flat	200
Warner	FL	flat	200
Wartburg College-FH at the W	IA	flat	200
Washington State-Indoor Facility	WA	flat	200
Washington U.	MO	flat	200
Washington-Dempsey Indoor	WA	oversized	307
Wayland Baptist	TX	flat	200
Wayne State-Rec Center	NE	undersized	160
Webber	FL	flat	200
Weber State U-Swenson Gym	UT	flat	200
Wesleyan-Bacon FH	CT	flat	200
West Florida	FL	flat	200
West Georgia	GA	flat	200
West Virginia Wesleyan	WV	flat	200
West Virginia-WVU Shell	WV	flat	200
Western Carolina	NC	flat	200
Western Kentucky	KY	flat	200
Western Michigan-Read FH	MI	flat	200
Western Ontario-Thompson Rec Center	ON	flat	200
Western State	CO	flat	200
Westwood Sports Center	IL	flat	200
Wheaton College-Haas Athletic Center	MA	flat	200
Wichita State-Heskett Center	KS	flat	200
Wilberforce	OH	flat	200
William and Mary	VA	flat	200
William Jewell	MO	flat	200
William Penn	IA	flat	200
William Woods	MO	flat	200
Williams-Lasell Gym	MA	undersized	195
Wilmington	OH	flat	200
Windsor U-St. Denis Center	ON	flat	200
Winona State	MN	flat	200
Winthrop	SC	flat	200
Wis.-Platteville-Williams FH	WI	flat	200
Wis.-River Falls-Knowles Phys Ed Bldg	WI	flat	200
Wisconsin-Eau Claire	WI	flat	200
Wisconsin-The Shell	WI	flat	200
Wittenberg	OH	flat	200
Wofford	SC	flat	200
Wyoming-War Memorial FH	WY	undersized	160
Yale-Coxe Cage	CT	banked	200
Youngstown State-WATTS	OH	oversized	300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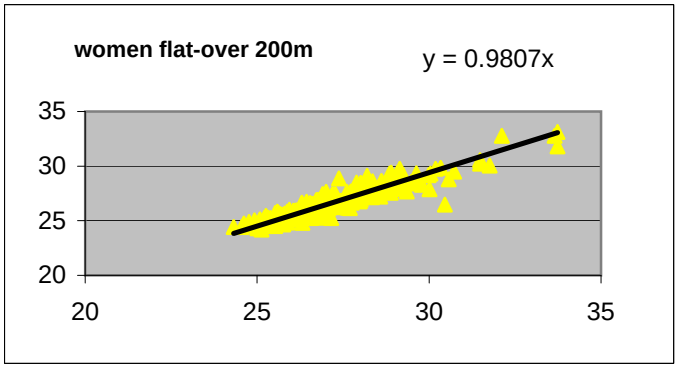
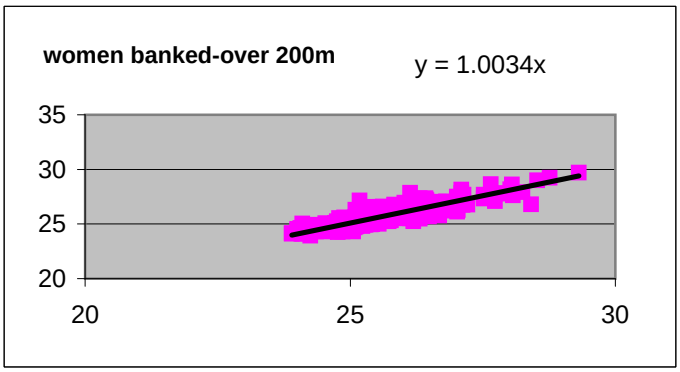
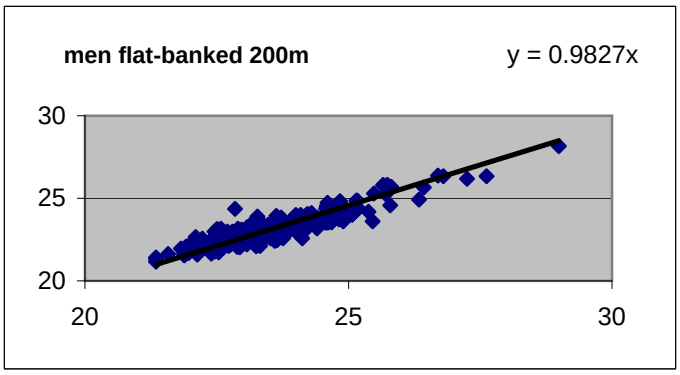
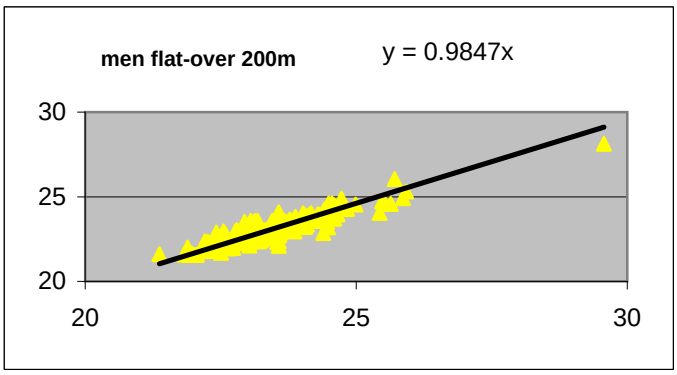
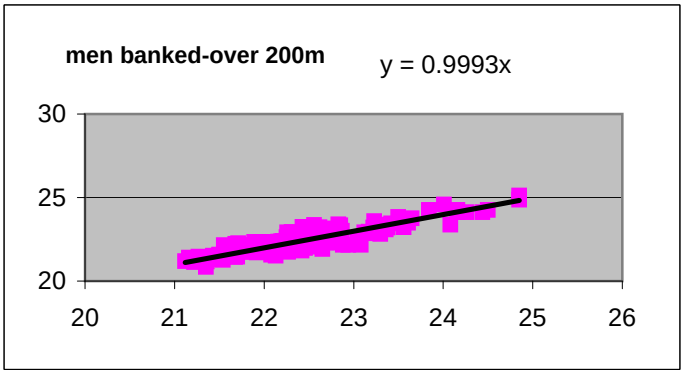
30
25
20
20
25
30
35

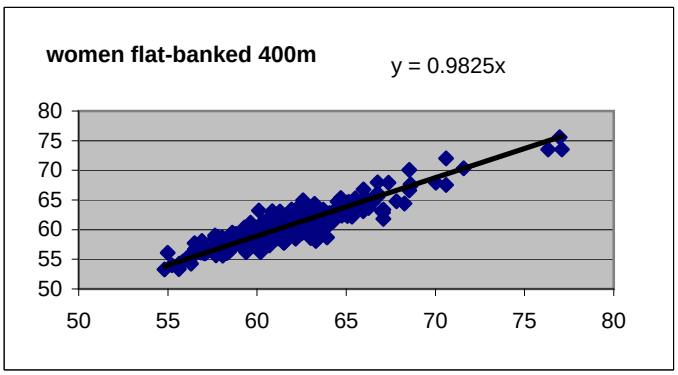

women flat-over 200m
y = 0.9807x
35
30
25
20
20
25
30
35

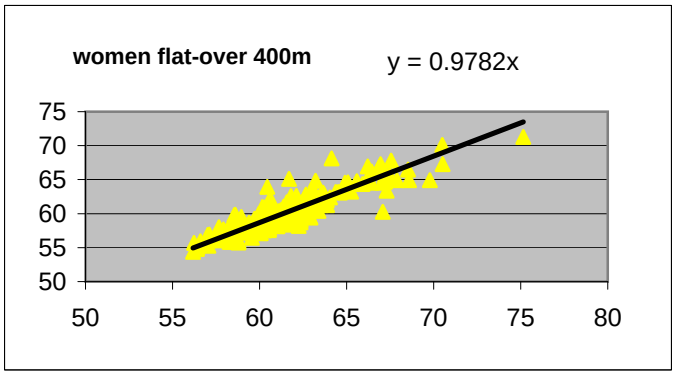

women banked-over 200m
y = 1.0034x
35
30
25
20
20
25
30

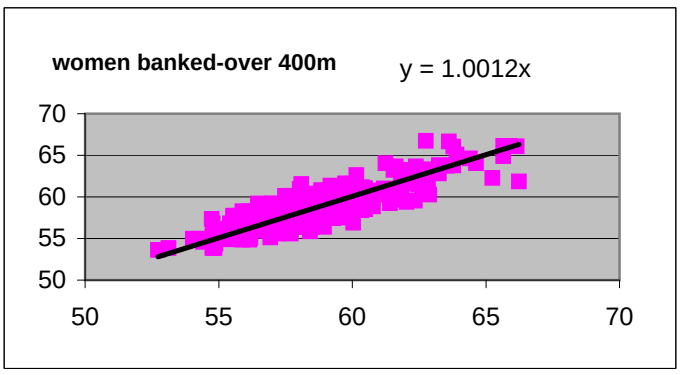

men flat-banked 200m
y = 0.9827x
30
25
20
20
25
30

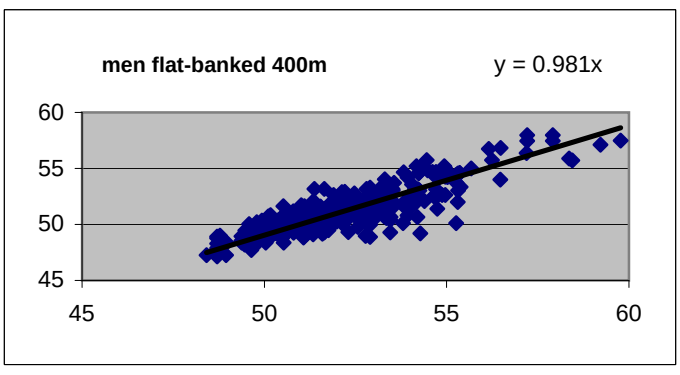

men flat-over 200m
y = 0.9847x
30
25
20
20
25
30

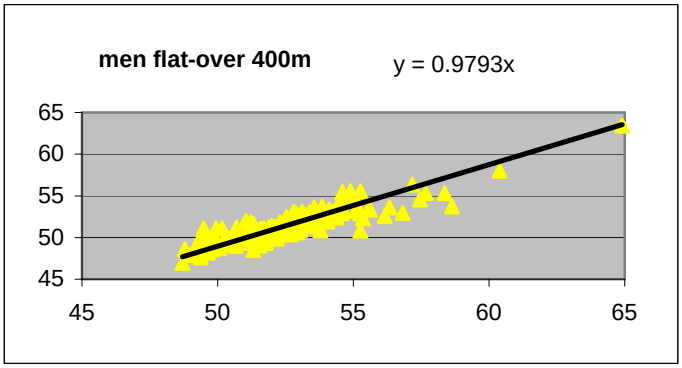

men banked-over 200m
y = 0.9993x
30
25
20
20
21
22
23
24
25
26

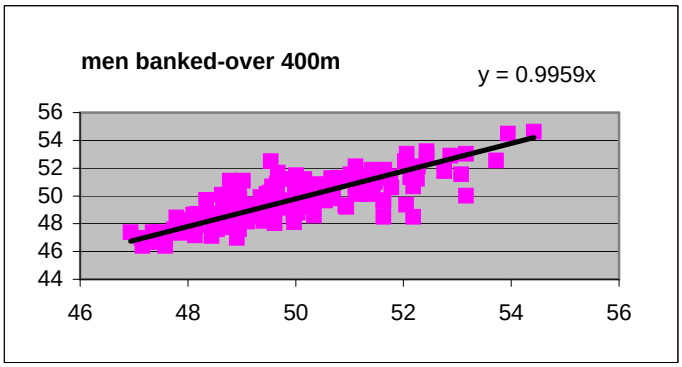

women flat-banked 400m
y = 0.9825x
80
75
70
65
60
55
50
50
55
60
65
70
75
80

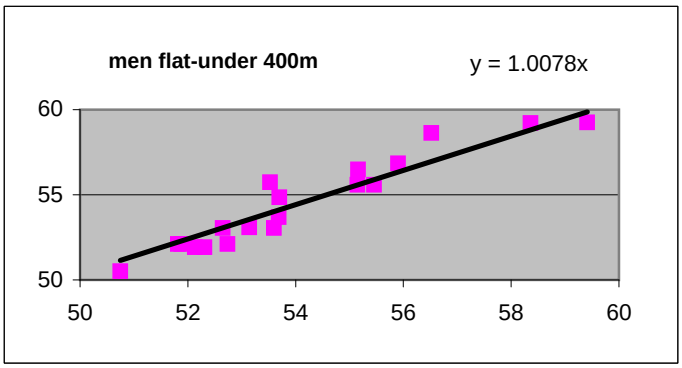

women flat-over 400m
y = 0.9782x
75
70
65
60
55
50
50
55
60
65
70
75
80

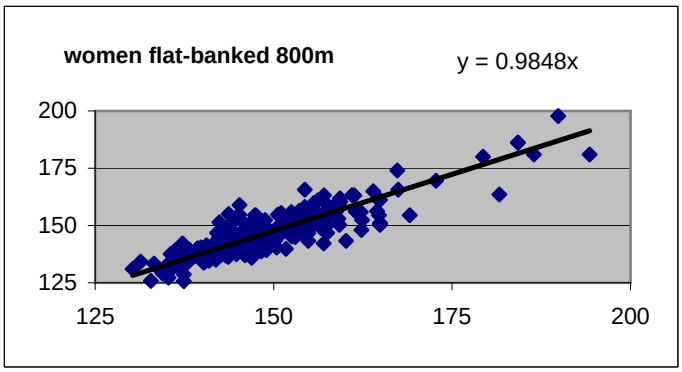

women banked-over 400m
y = 1.0012x
70
65
60
55
50
50
55
60
65
70

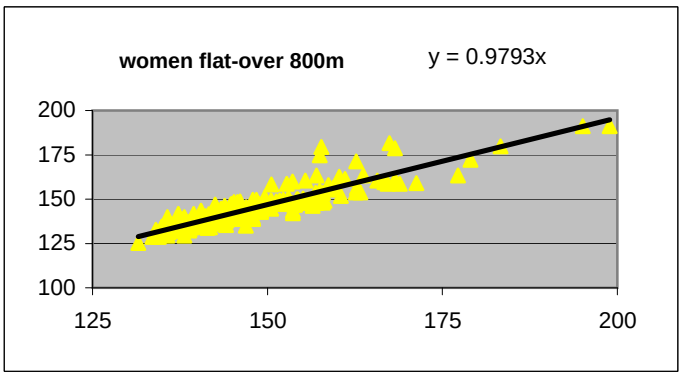

men flat-banked 400m
y = 0.981x
60
55
50
45
45
50
55
60

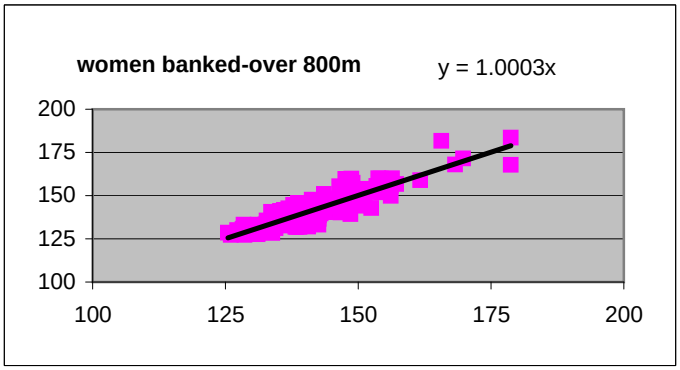

men flat-over 400m
y = 0.9793x
65
60
55
50
45
45
50
55
60
65

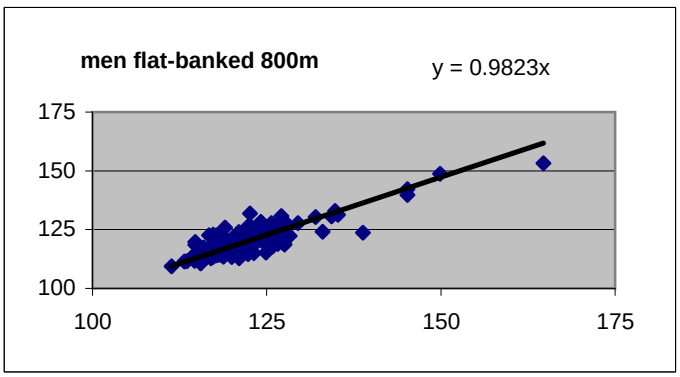

men banked-over 400m
y = 0.9959x
56
54
52
50
48
46
44
46
48
50
52
54
56

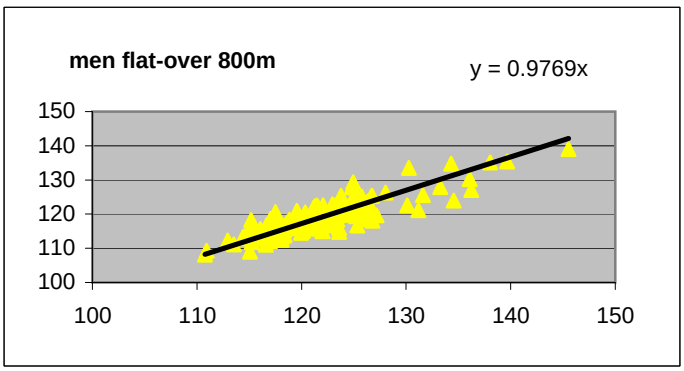

men flat-under 400m
y = 1.0078x
60
55
50
50
52
54
56
58
60

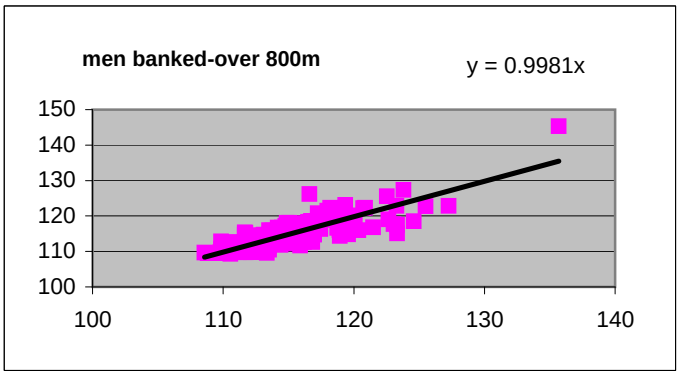

women flat-banked 800m
y = 0.9848x
200
175
150
125
125
150
175
200

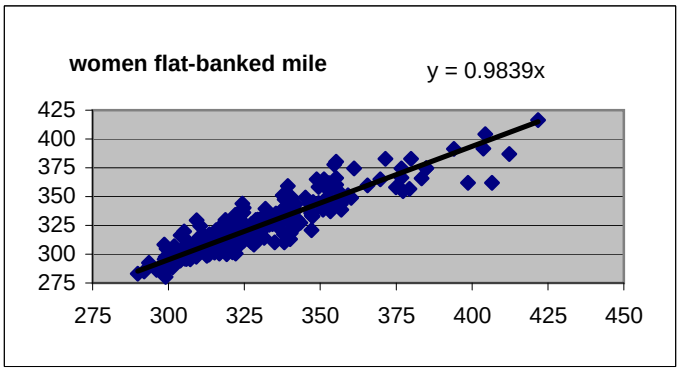

women flat-over 800m
y = 0.9793x
200
175
150
125
100
125
150
175
200

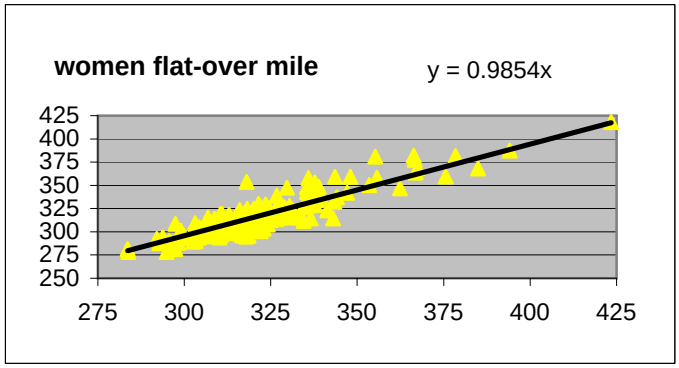

women banked-over 800m
y = 1.0003x
200
175
150
125
100
100
125
150
175
200

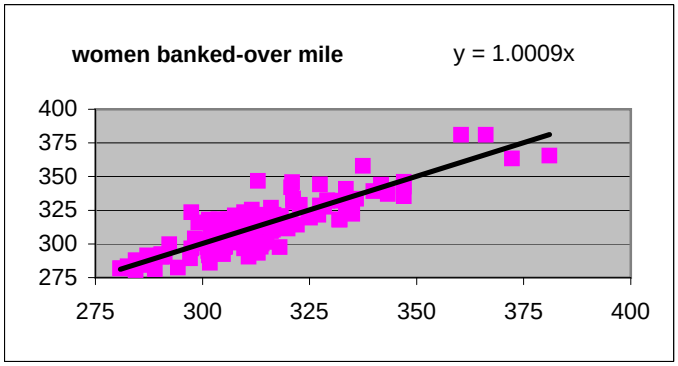

men flat-banked 800m
y = 0.9823x
175
150
125
100
100
125
150
175

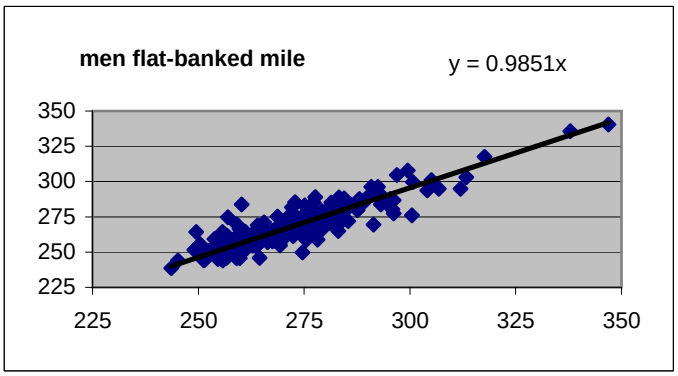

men flat-over 800m
y = 0.9769x
150
140
130
120
110
100
100
110
120
130
140
150

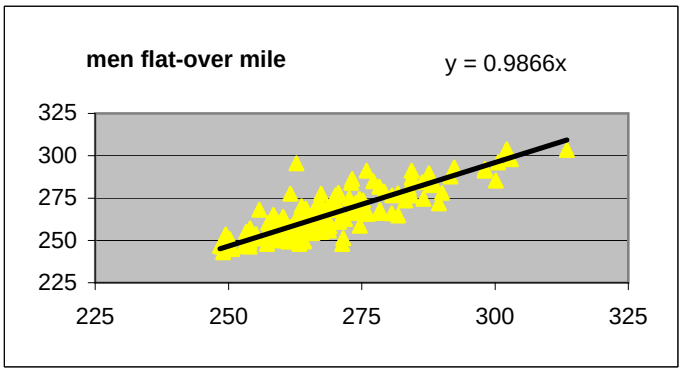

men banked-over 800m
y = 0.9981x
150
140
130
120
110
100
100
110
120
130
140

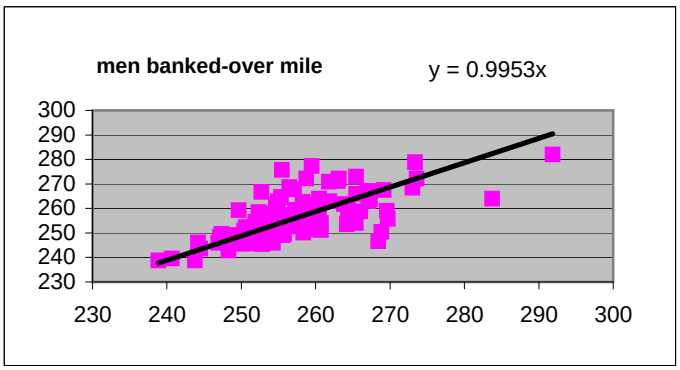

women flat-banked mile
y = 0.9839x
425
400
375
350
325
300
275
275
300
325
350
375
400
425
450

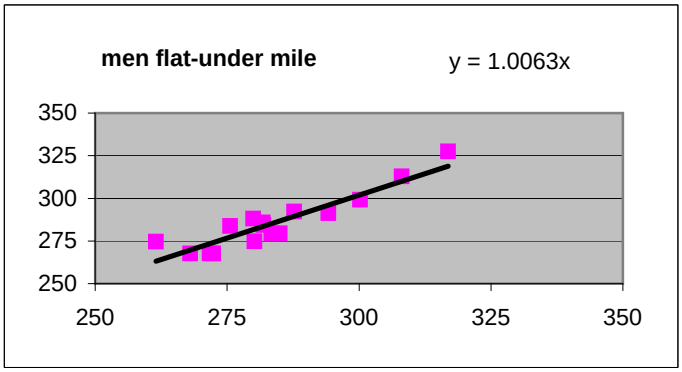

women flat-over mile
y = 0.9854x
425
400
375
350
325
300
275
250
275 300 325 350 375 400 425

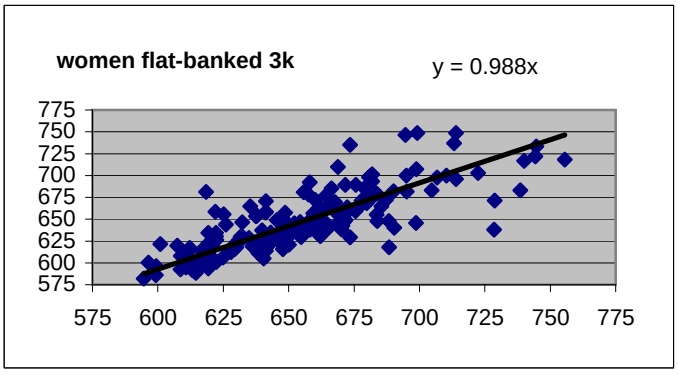

women banked-over mile
y = 1.0009x
400
375
350
325
300
275
275 300 325 350 375 400

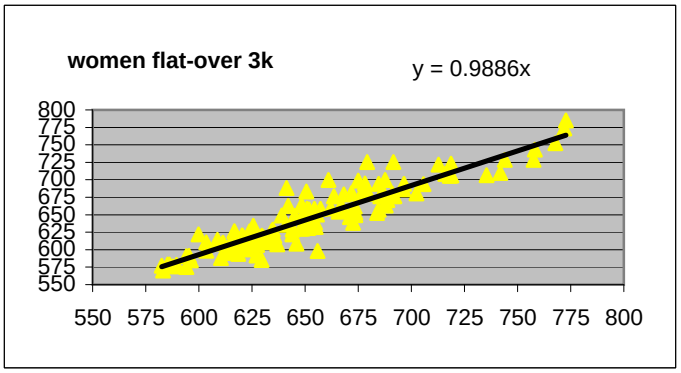

men flat-banked mile
y = 0.9851x
350
325
300
275
250
225
225 250 275 300 325 350


men flat-over mile
y = 0.9866x
325
300
275
250
225
225 250 275 300 325


men banked-over mile
y = 0.9953x
300
290
280
270
260
250
240
230
230 240 250 260 270 280 290 300


men flat-under mile
y = 1.0063x
350
325
300
275
250
250 275 300 325 350


women flat-banked 3k
y = 0.988x
775
750
725
700
675
650
625
600
575
575 600 625 650 675 700 725 750 775


women flat-over 3k
y = 0.9886x
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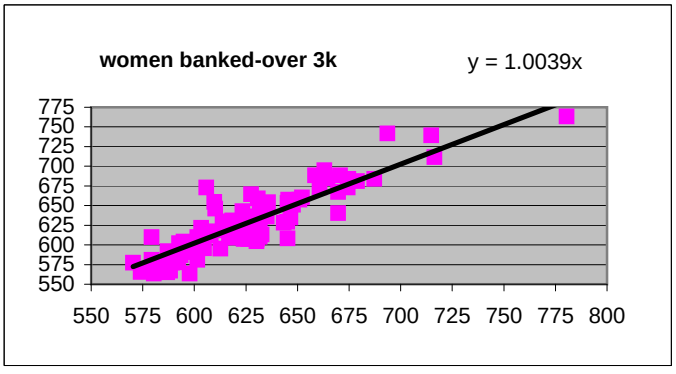
775
750
725
700
675
650
625
600
575
550
550 575 600 625 650 675 700 725 750 775 800


women banked-over 3k
y = 1.0039x
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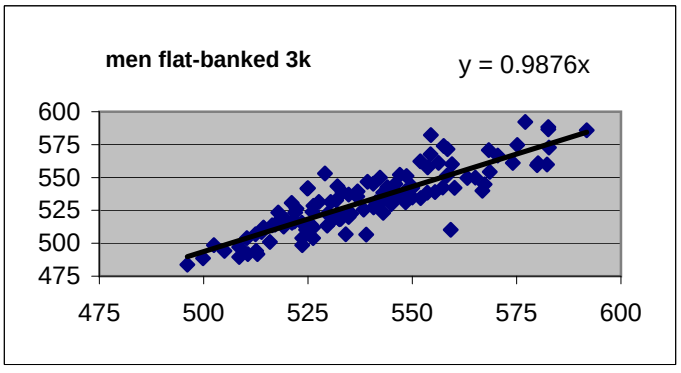
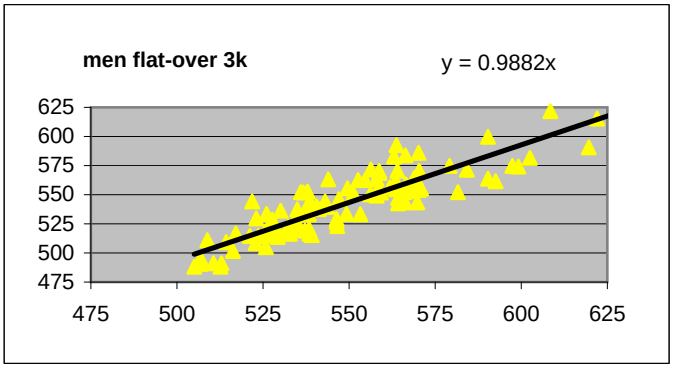
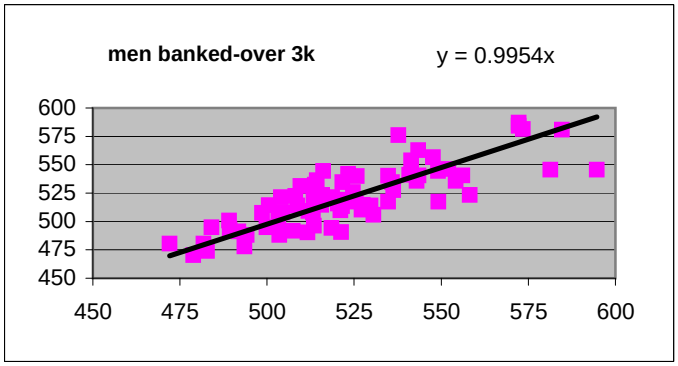
750
725
700
675
650
625
600
575
550
550 575 600 625 650 675 700 725 750 775 800


men flat-banked 3k
y = 0.9876x
600
575
550
525
500
475
475 500 525 550 575 600


men flat-over 3k
y = 0.9882x
625
600
575
550
525
500
475
475 500 525 550 575 600 625


men banked-over 3k
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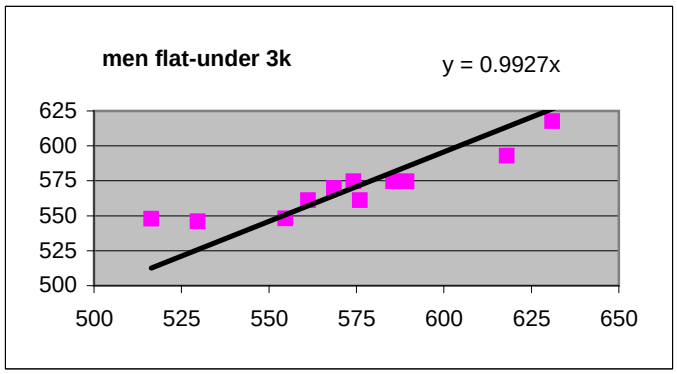
575
550
525
500
475
450
450 475 500 525 550 575 600


men flat-under 3k
y = 0.9927x
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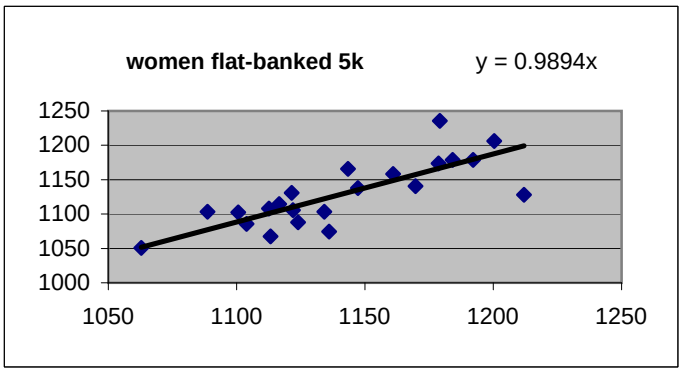
600
575
550
525
500
500 525 550 575 600 625 650


women flat-banked 5k
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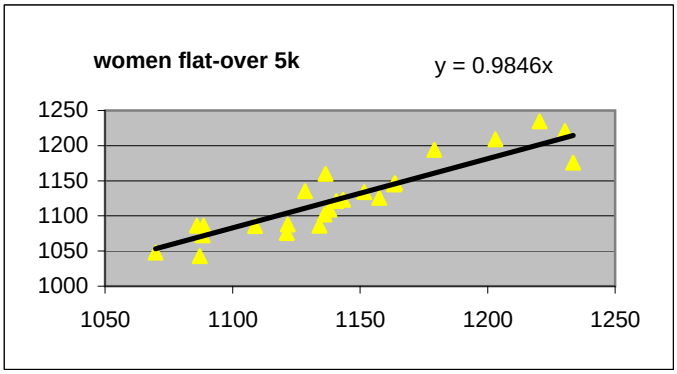
1200
1150
1100
1050
1000
1050 1100 1150 1200 1250


women flat-over 5k
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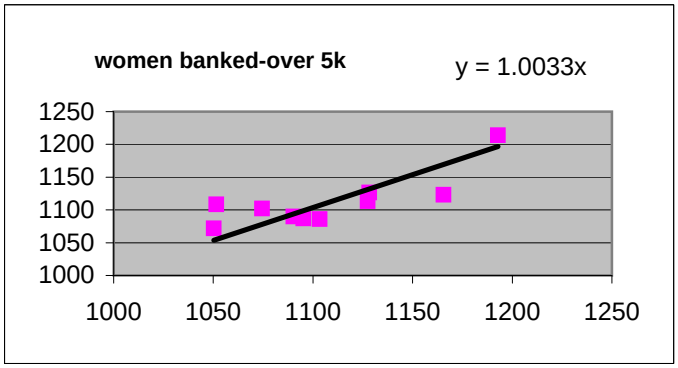
1200
1150
1100
1050
1000
1050 1100 1150 1200 1250


women banked-over 5k
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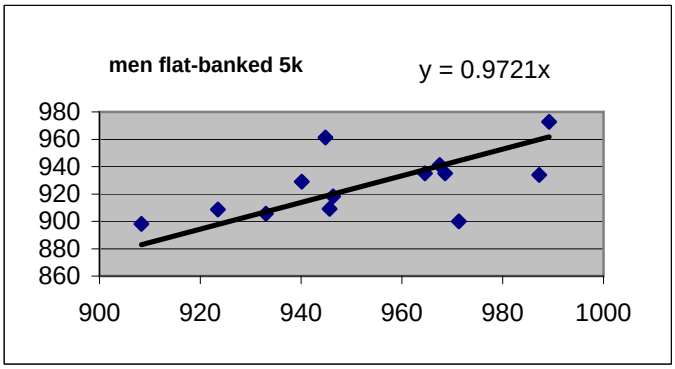
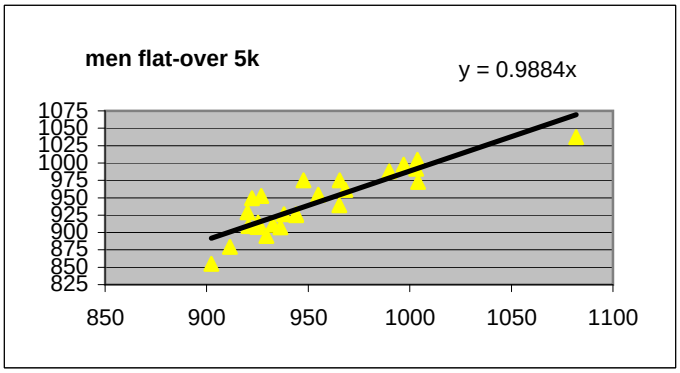
1200
1150
1100
1050
1000
1000 1050 1100 1150 1200 1250


men flat-banked 5k
y = 0.9721x
980
960
940
920
900
880
860
900 920 940 960 980 1000


men flat-over 5k
y = 0.9884x
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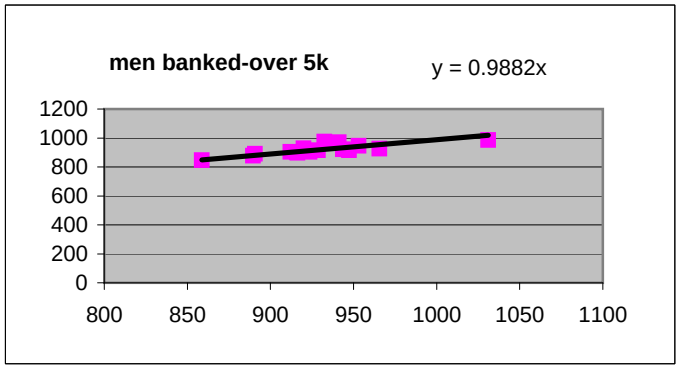
1050
1025
1000
975
950
925
900
875
850
825
850 900 950 1000 1050 1100


men banked-over 5k
y = 0.9882x
1200
1000
800
600
400
200
0
800 850 900 950 1000 1050 1100

Appendix C

A Preliminary Look at the 2010 and 2011 NCAA 200 Meter Data and Track Type Conversions

By Garrick Larson, Concordia College

In determining "fair" conversions between different track types we want to use data collected under the following scenario:

> **An athlete exerting near equal effort, from week to week, with no extraordinary physical or psychological variables.**

To utilize the most reliable and valid data (Figure 1) we need to parse out the data where:

1. …an athlete gives up mentally or physically.
2. …an athlete sustains an injury.

As coaches we are keenly aware of when one of our own athletes falls into either category above because we are familiar with the athlete and their ability, training, injury status, and temperament. The trick is how to objectively eliminate "bad" data.

The range of good data can be determined by the standard deviation of the sample population assuming the data is normally distributed, is not grossly skewed, and does not have extreme outliers (kurtosis).

A normal distribution is defined by a bell-shaped curve when the data are plotted as a histogram (Figure 2). When only a portion of the whole population of data is sampled, then the histogram will approximate a normal distribution (Figure 3).

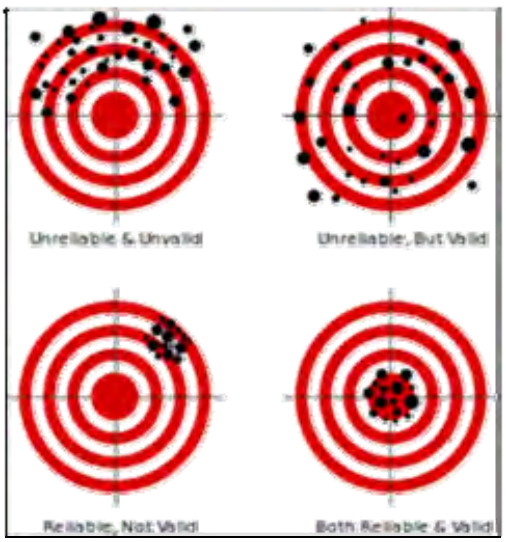


Figure 1: Reliable and Valid Data. (http://en.wikipedia.org/wiki/Reliability_(statistics))

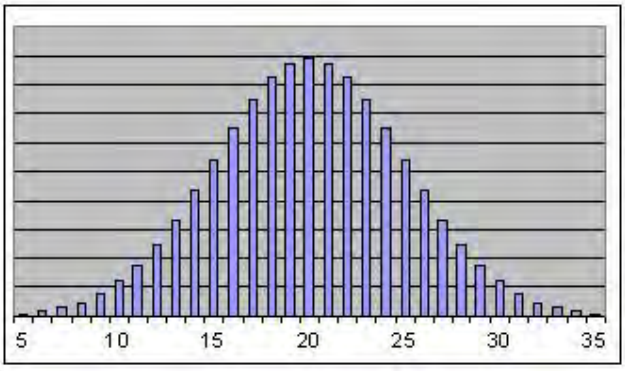


Figure 2: Bell-shaped Normal Distribution. (http://www.business-analysis-made-easy.com/Normal-Probability-Graphs.html)

Figure 3: Sample Distribution. (http://www.databison.com/wp-content/uploads/2009/06/generate-numbers-for-normal-distribution-data-

In a normal distribution, the majority of the data is centralized around the mean of the sample. 68% of the data will fall within one standard deviation of the mean, 95.4% of the data will be within two standard deviations, and 99.7% of the data will be within three standard deviations of the mean (Figure 4).

Appendix C

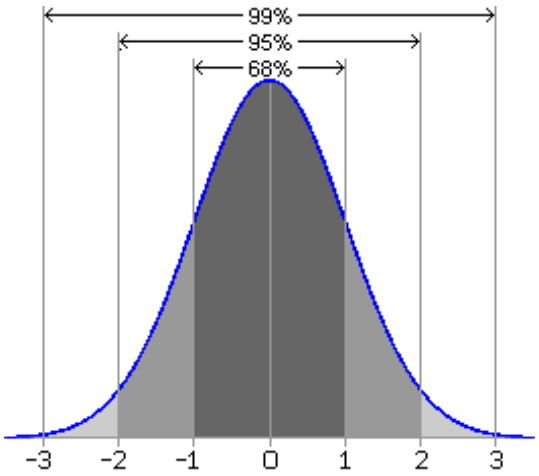


Figure 4: Percentage of data within standard deviatinos. (http://dsearls.org/courses/M120Concepts/ClassNotes/Statistics/520_standard_normal.htm)

Ideally, both halves of a distribution will be symmetrical. However, at times, data may be skewed towards one side of the distribution, meaning more data falls toward one tail or the other (Figure 5).

When a distribution is asymmetric it can be negatively skewed (skewed left) or positively skewed (skewed right). Statistically, skewness less than +/- 0.5 indicates a normal distribution.

Also of interest in a set of data is the kurtosis of the sample. Kurtosis measures the "peakedness" of distribution (Figure 6). Excess kurtosis means that the distribution gathers in two areas: a) in the center and b) in the tails. So a sample with high kurtosis would exhibit a high peak, but also infrequent, but extreme variations (outliers) in the tails of the distribution. Statistically,kurtosis >2 is not acceptable.

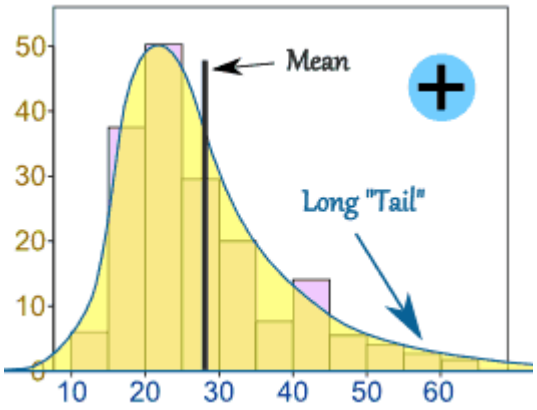


Figure 5: Positively Skewed Distribution. (http://www.mathsisfun.com/data/skewness.html)

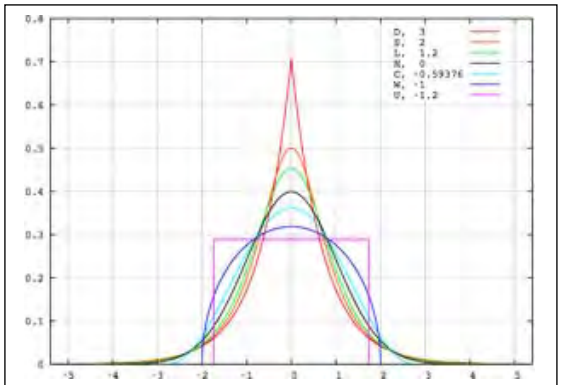


Figure 7: Highly Kurtotic Distributions Have A High Peak But More Data In The Tails. (http://en.wikipedia.org/wiki/Kurtosis)

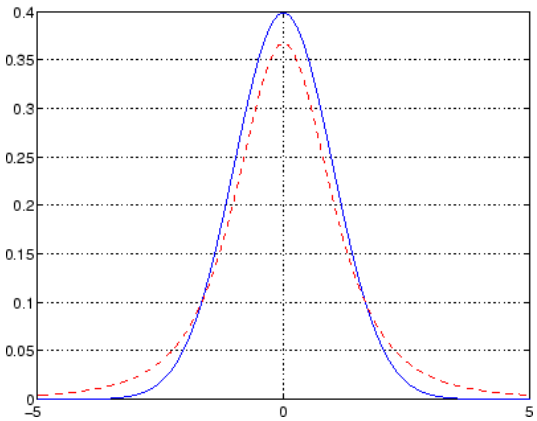


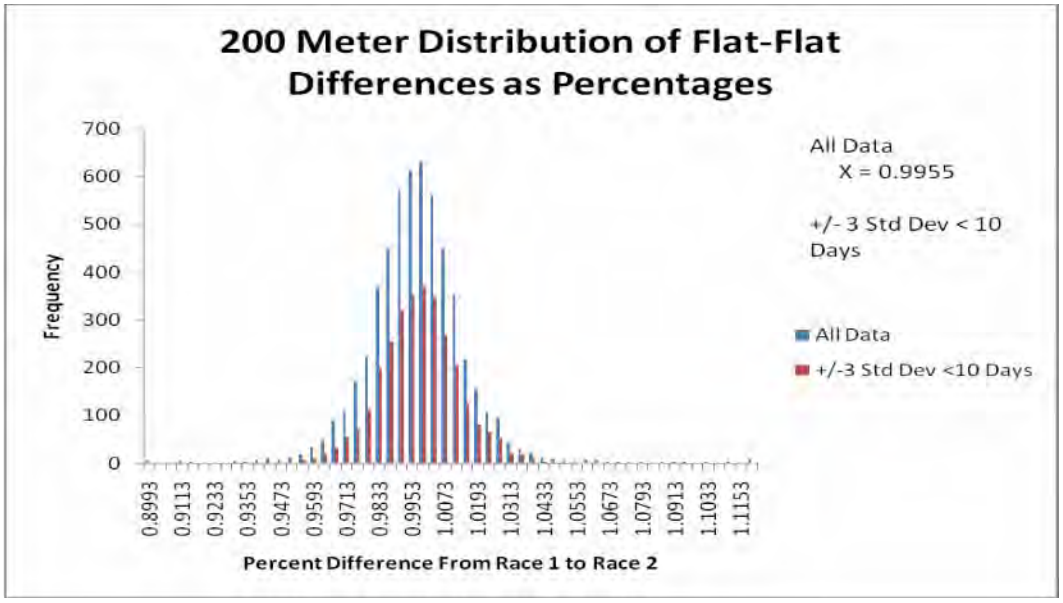
Figure 6: Kurtosis of Distributions. (http://www.kxcad.net/cae_MATLAB/toolbox/garch/f8-82329.html)

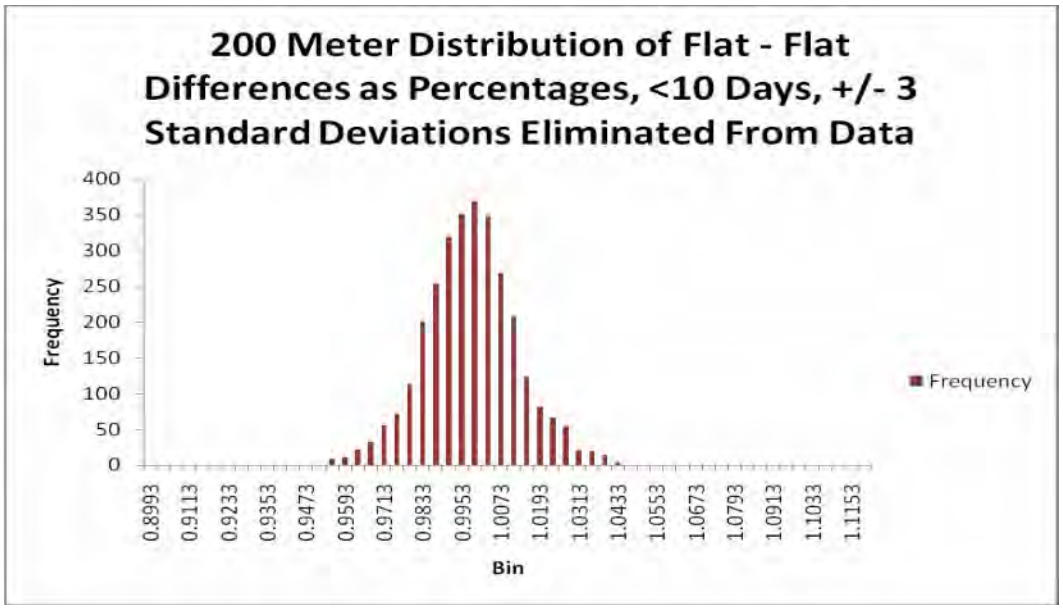
In looking at the 2010 and 2011 NCAA 200M data for flat track to flat track comparisons (Figure 8), the data as a whole presents two problems, kurtosis and positive skewness(skewed towards those that don't improve as much as possible). Figure 8 shows the troublesome kurtosis and skewness highlighted in red on the left side.

Appendix C

		Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %	Flat-Flat %
			1-10 days	1-10 days	4-10 days	11-17 days	18-24 days	25-31 days	32-38 days	39-45 days
Mean	Average of All Values	0.9955	0.9962	0.9961	0.9961	0.9942	0.9916	0.9901	0.9949	1.0032
Standard Error	How far values are from actual values.	0.0003	0.0003	0.0003	0.0003	0.0004	0.0007	0.0012	0.0013	0.0015
Standard Deviation	Standard Deviation. How spread out from mean.	0.0210	0.0149	0.0142	0.0142	0.0156	0.0176	0.0183	0.0168	0.0174
Sample Variance	Standard Deviation Squared.	0.0004	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Kurtosis	Peakedness of distribution. Higher Kurtosis = infrequent extreme variations.	92.5263	1.0125	0.3536	0.3562	1.2851	0.4050	1.1316	0.3449	1.0732
Skewness	Asymmetry of distribution. Negative = skewed left, positive = skewed right.	2.6058	0.0844	0.0719	0.0722	-0.0830	-0.0057	0.2488	-0.1967	-0.3355
Count	Number of Data Points.	5485	3042	3015	3013	1301	555	218	178	135
Confidence Level(95.0%)	Chance that the distribution does NOT include the actual value.	0.0006	0.0005	0.0005	0.0005	0.0008	0.0015	0.0024	0.0025	0.0030

Figure 8: Problems With Kurtosis and Skewness In Full Data Set.





Appendix C

For example, a conversion (as a percentage) is desired from 200 Meter Flat to 200 Meter Banked track types. Using data that is 1-10 days apart, having run on a 200 meter flat track first and a 200 meter banked track second, we can make an estimate of the percent advantage of running on a banked track. One confounding variable in this equation is week over week physical improvement, which may be related to fitness and/or skill acquisition. The confounding physical improvement variable would make the conversion better than it should be. In order to eliminate the effect of physical improvement, it becomes necessary to compare the 200 meter flat to 200 meter banked to a standard that ONLY measures improvement. This is easily done by using data that is 1-10 days apart, having run on a 200 meter flat track first and then another 200 meter flat track second. So to determine the actual conversion (as a percentage) we subtract the 200 meter flat to 200 meter flat conversion from the 200 meter flat to 200 meter banked conversion which will result in a more accurate percent of improvement for the flat to banked comparison.

Track Type Comparison	Measures	Conversion %
flat 200->flat 200, <10 days	Week over week improvement	0.9955
flat 200->banked 200, <10 days unadjusted	Week over week improvement, plus track type advantage	0.9828
Difference		0.0127
flat 200->banked 200, <10 days adjusted	Track type advantage	0.9866

So as an example, if we use ONLY the 200 meter flat to 200 meter banked conversion, then a runner with a time of 22.00 on a flat track will convert to a 21.62 on a banked track. However, if we eliminate the effect of physical improvement, then the same 22.00 runner will convert to a 21.70 on a banked track. Below are examples of unadjusted and adjusted 200 meter flat to 200 meter banked times:

Eliminating The Effect of Physical Improvement	**Conversion %**	**20.50**	**21.00**	**21.50**	**22.00**	**22.50**	**23.00**	**23.50**	**24.00**	**24.50**	**25.00**	**25.50**
flat 200->banked 200, <10 days unadjusted	0.9828	20.15	20.64	21.13	21.62	22.11	22.60	23.09	23.59	24.08	24.57	25.06
flat 200->banked 200, <10 days adjusted	0.9866	20.23	20.72	21.21	21.70	22.20	22.69	23.18	23.68	24.17	24.66	25.16
Garrick-Physical Improvement Factor (Seconds)		0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10
Scott-Physical Improvement Factor (Seconds)		0.08	0.08	0.08	0.08	0.08	0.08	0.08				

Appendix D

Procedural Discussion by Scott Jones, University of Akron

The starting point for the analysis of the effect of track geometry on performance is a statistical study of the time differences (deltas) between successive races. We define delta such that a positive value denotes an improvement in performance. With three primary track types (banked, flat and oversized, undersized tracks are treated as a special case) there are nine track-sequence combinations:

1. Banked – Banked
2. Banked – Flat
3. Banked – Oversized
4. Flat – Banked
5. Flat – Flat
6. Flat – Oversized
7. Oversized – Banked
8. Oversized – Flat
9. Oversized – Oversized.

We used TFRRS data for performances from January – March in the years concluding with NCAA Indoor Championships in 2010-2012. The calculations were limited to consecutive performances within a four-week window of each other with deltas within one standard deviation from the mean in both directions. The men's 200m data serves as a representative case. These results are shown in Table 1 below

Delta (seconds)	Banked	Flat	Oversized
Banked	0.09	-0.21	0.09
Flat	0.39	0.09	0.37
Oversized	0.05	-0.20	0.09

Table 1. Men's 200m. Time differences between successive races averaged by track sequence.

The first column denotes the track type for the first race and the subsequent columns label the track for the second race. The deltas for consecutive performances on the same track type (banked-banked, flat-flat, oversized-oversized) are all 0.09 seconds. This averaged improvement is qualitatively consistent for every event and is a consequence of what will be referred to as the "training effect." The training effect must be accounted for to isolate the contribution to delta from track geometry. Fortunately the improvement due to training effect is linear over the four-week range we limit successive performances to occur.

For the pairs of performances made on different track types the differences between banked and oversized are similar to those made on the same track type. There is an anomalous deficit in the oversized to banked delta that we attribute to unfamiliarity with running on a banked track. Those individuals who ran consecutive races on an oversized track followed by a banked track and subsequently ran a second banked race improved by an average of 0.17 seconds between the oversized and second banked race. A similar calculation for races exclusively on banked tracks yielded a 0.16 second average improvement. The 0.04 second deficit is fully overcome by the second race on a banked track. Thus in the men's 200m, as well as the other events we studied, we are unable to see strong and consistent evidence that suggests a measurable distinction between banked and oversized tracks that can be attributed to track layout.

The variation between flat to banked (or oversized) is substantially larger than the same track delta, almost 0.4 seconds, while going the opposite direction from banked (or oversized) to flat is substantially lower, ~--0.2 seconds. These results confirm the universally-held view that flat 200m tracks inhibit performance; however, to determine a fair conversion we must find one that is valid over a range of times and that is limited to accounting for the physical configuration of the track . Further, as noted above, we need to adjust the deltas to eliminate the training effect. Consequently we have recalculated the data with each delta adjusted by an amount proportional to the time interval between races. Table 2 shows the results

Delta w/o Training Effect (seconds)	Banked	Flat	Oversized
Banked	0.00	-0.31	-0.01
Flat	0.30	0.00	0.27
Oversized	-0.03	-0.29	-0.01

Table 2. Men's 200 deltas with training effect removed. The training effect has been eliminated but track type still influences the delta distribution.

Appendix D

Now the values for the same track types (or a combination of banked and oversized) are close to zero, demonstrating that the training effect has been filtered out correctly. The flat to banked (or oversized) and banked (or oversized) to flat deltas are approximately equal in magnitude (~0.3 seconds) and opposite in sign. This asymmetry will greatly aid in the calculation of a fair conversion ratio.

The next step is to calculate a conversion ratio to adjust the times made on a flat track. Rather than subtracting a constant from times made on a flat track, which would only be accurate around the mean sample time, we want to identify a multiplicative factor, or conversion ratio, valid over a wider range of times. To do this we introduce a tuning factor to multiply flat times to bring them into correspondence with banked or oversized times. This number, which will be close to the average banked time in our sample divided by the average flat time, is actually found by iteration. The results of a calculation in which every flat time is multiplied by 0.9871 are shown in Table 3.

Delta w/ adjusted flat times (seconds)	Banked	Flat	Oversized
Banked	0.09	0.09	0.09
Flat	0.09	0.09	0.08
Oversized	0.05	0.10	0.09

Table 3. Men's 200m deltas with adjusted flat times. The effect of track geometry has been removed but the training effect has been retained.

By accounting for track geometry the sets of deltas are all similar to the measured value for the training effect. If we eliminate both the training effect and differences due to track type we should be able to force all the deltas to approach zero. This is shown in Table 4.

Delta w/o training effect and w/ adjusted flat times (seconds)	Banked	Flat	Oversized
Banked	0.00	-0.01	0.00
Flat	0.00	0.00	-0.01
Oversized	-0.04	0.00	-0.01

Table 4. Men's 200m with track geometry and training effect eliminated. We successfully achieve numbers close to zero.

The results shown in the preceding sequence of tables emphatically suggest that the statistical approach can accurately identify and separate the effects of training and track geometry in the observed differences in times. With this knowledge we are confident that a fair and evidence-based set of conversion ratios can be determined for men and women of all divisions with the existing data.

We have done similar calculations for every event from 400m to 3000m. Plotting the conversion ratios we derive from those calculations versus race distance enables us to formulate a two-parameter model to compute conversion ratios for events for which we have no data (e.g. 1200m, which we need to determine a conversion ratio for the distance medley relay) or for events with sparse data that is statistically unreliable, like the 5000m. The values of the parameters are determined by a highly-correlated linear fit of the data. The parameters are then used to produce the curves shown in Figures 1 & 2. The measured data (solid triangles) fits the model curve.

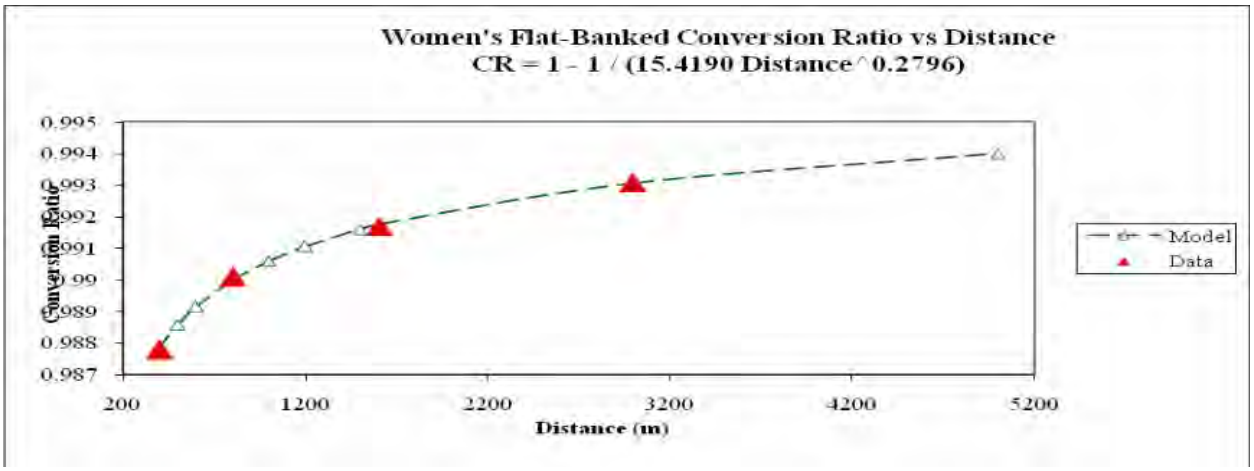


Figure 1. Women's Conversion ratio versus race distance

Appendix D

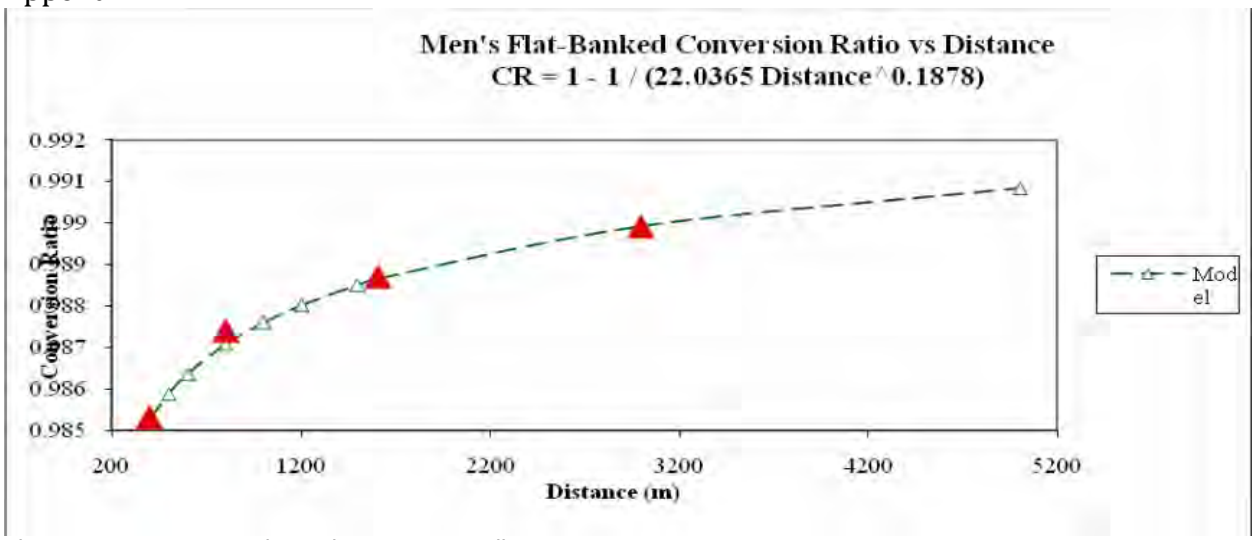


Figure 2. Men's Conversion ratio versus race distance

The model is used to extrapolate a conversion ratio for the 5000m (the model's upper bound is one, which limits the error inherent in an extrapolation) and to calculate a conversion ratio for the distance medley relay based on a distance-weighted average of the conversions for each relay leg. It can also be used to determine an adjustment for the 1000m race in the men's heptathlon.

Finally, we emphasize that the negative consequence of competing on a flat track arises from race speed, not race distance. As remarked above, the calculated conversion ratios are accurate near the mean sample speed for each distance. Unfortunately there is considerable overlap across distances in running speed and the speed range of significance for NCAA qualifying is at an extreme end of that range. To account for this we have numerically computed the relationship between conversion ratio and running speed, shown in figures 3 & 4 for women and men respectively, and applied this relation to qualifying-level performances to obtain our final conversion ratios that are published in the body of this report.

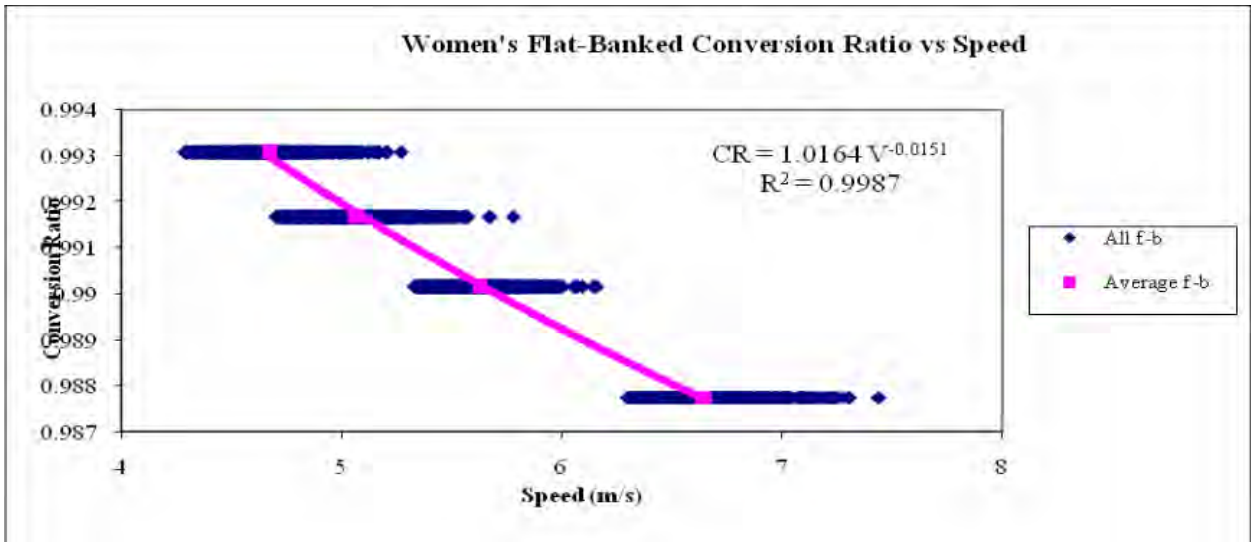


Figure 3. Women's conversion ratio versus speed

Appendix D

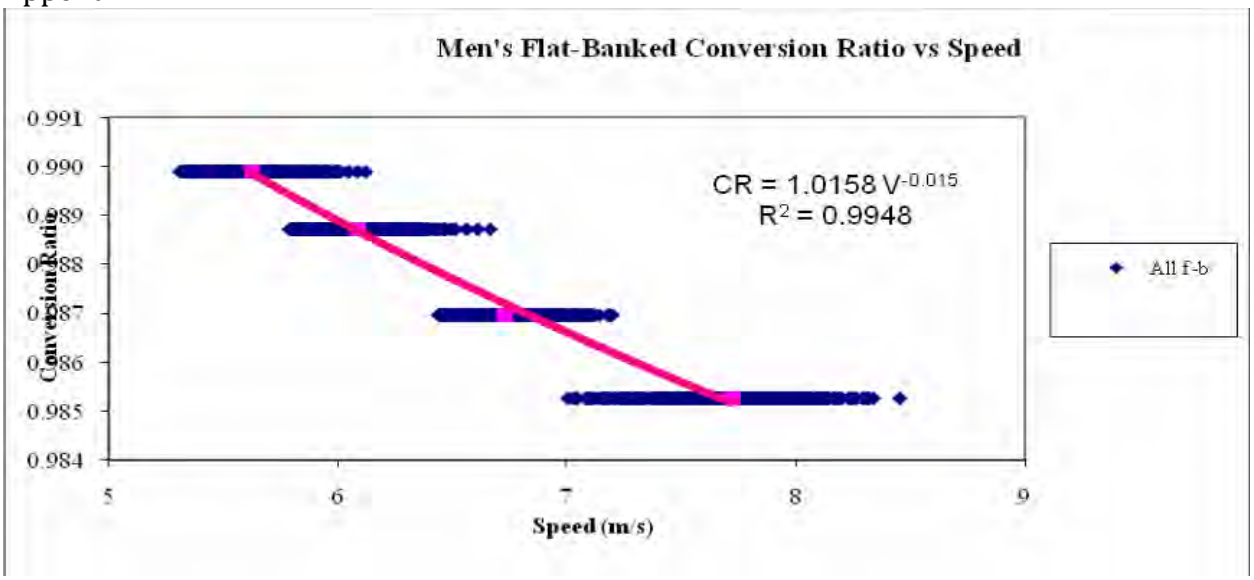


Figure 4. Men's conversion ratio versus speed

Appendix E

Sample Conversions

	Division I			**Division 2**			**Division 3**		
Men	Current banked performance	Current conversion to flat	New conversion to flat	Current banked performance	Current conversion to flat	New conversion to flat	Current banked performance	Current conversion to flat	New conversion to flat
200	20.89	21.29	21.26	21.52	21.82	21.91	21.85		22.24
400	46.40	47.00	47.14	47.85	48.25	48.62	48.96	49.46	49.74
800	01:48.05	01:48.95	01:49.60	01:52.04	01:52.54	01:53.64	01:53.61	01:54.21	01:55.23
Mile	03:58.88	04:00.68	04:01.94	04:08.20	04:09.00	04:11.38	04:11.97	04:12.97	04:15.45
3k	07:53.69	07:56.39	07:59.18				08:29.65		08:34.03
5k	13:46.93	13:50.73	13:55.78	14:19.08	14:21.28	14:28.27	14:38.48	14:42.08	14:47.88
4x4	03:06.66	03:09.06	03:09.65	03:15.18	03:16.78	03:18.30	03:17.16	03:19.16	03:20.31
DMR	09:31.88	09:34.88	09:39.66	09:57.07	09:59.47	10:05.19	10:00.43	10:03.43	10:06.60
Women									
200	23.39	23.89	23.75	24.61	24.91	24.99	25.28		25.67
400	53.16	53.86	53.87	55.93	56.23	56.67	57.23	57.63	58.40
800	02:05.25	02:06.25	02:06.69	02:12.08	02:12.38	02:14.00	02:14.55	02:15.05	02:15.60
Mile	04:38.65	04:40.55	04:41.41	04:54.61	04:55.21	04:57.53	04:58.72	04:59.62	05:01.68
3k	09:11.83	09:14.83	09:16.58				10:02.28		10:09.27
5k	16:04.12	16:09.12	16:11.54	17:00.14	17:01.94	17:08.00	17:22.07	17:25.37	17:30.09
4x4	03:34.89	03:37.69	03:37.75	03:49.96	03:51.16	03:53.02	03:54.92	03:56.52	03:58.04
DMR	11:05.73	11:11.63	11:12.85	11:54.80	11:56.50	12:02.45	11:58.06	12:00.56	12:05.74

Appendix E1

NCAA Division I 2012 Indoor Championship Seed Time Comparison

Women 200 Meter Dash

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Kamaria Brown	Texas A&M	22.86	B	22.86	23.21
Kimberlyn Duncan	LSU	23.07	O	23.07	23.43
Allison Peter	Texas	23.11	B	23.11	23.47
Dominique Duncan	Texas A&M	23.14	B	23.14	23.50
Kai Selvon	Auburn	23.15	O	23.15	23.51
Ashley Collier	Texas A&M	23.18	B	23.18	23.54
Ashley Spencer	Illinois	23.24	B	23.24	23.60
Dezerea Bryant	Clemson	23.26	B	23.26	23.62
Christy Udoh	Texas	23.46	B	23.46	23.82
Cambrya Jones	Pittsburgh	23.47	B	23.47	23.83
Paris Daniels	Kansas	23.48	B	23.48	23.84
Olivia Ekpone	Texas A&M	23.51	B	23.51	23.87
Nivea Smith	Auburn	23.52	O	23.52	23.88
Octavious Freeman	UCF	23.54	B	23.54	23.90
Tarika Williams	Miami	23.61	B	23.61	23.98
Stormy Kendrick	Clemson	23.66	B	23.66	24.03
Alexis Love	Murray State	23.66	O	23.66	24.03
Mahagony Jones	Penn State	23.68	B	23.68	24.05
Chaniqua Corinealdi	TCU	23.61	B-alt	23.68	24.05
Cierra White	Texas Tech	23.62	B-alt	23.69	24.06
Tiffany Hines	Arkansas	23.69	B	23.69	24.06
Keilah Tyson	Kentucky	23.69	O	23.69	24.06
Darshay Davis	Florida	23.71	B	23.71	24.08
Donique' Flemings	Texas A&M	23.71	B	23.71	24.08
Chalonda Goodman	Texas	23.71	B	23.71	24.08

Women 400 Meter Dash

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Marlena Wesh	Clemson	52.21	B	52.21	52.90
Diamond Dixon	Kansas	52.55	B	52.55	53.25
Rebecca Alexander	LSU	52.66	B	52.66	53.36
Regina George	Arkansas	52.73	B	52.73	53.43
Taylor Ellis-Watson	Pittsburgh	52.75	B	52.75	53.45
Lanie Whittaker	Florida	52.91	O	52.91	53.61
Ellen Wortham	Tennessee	52.99	B	52.99	53.69
Ebony Eutsey	Florida	53.06	O	53.06	53.77
Erica Rucker	South Carolina	53.08	O	53.08	53.79
Whitney Jones	Arkansas	53.13	B	53.13	53.84
Cassandra Tate	LSU	53.13	B	53.13	53.84
Phyllis Francis	Oregon	53.07	B-alt	53.18	53.89
Lenora Guion-Firmin	Maryland-ES	53.19	B	53.19	53.90
Stacey-Ann Smith	Texas	53.27	B	53.27	53.98
Endurance Abinuwa	UTEP	53.33	B	53.33	54.04
Briana Nelson	Texas	53.36	B	53.36	54.07
CeCe Williams	Auburn	53.37	O	53.37	54.08
Candace Jackson	Texas Tech	53.41	B	53.41	54.12
Sade Sealy	Illinois State	53.62	O	53.62	54.33
Alicia Peterson	Texas	53.70	B	53.70	54.41
Ibukun Mayungbe	Texas A&M	53.79	B	53.79	54.51
Brianna Frazier	North Florida	53.79	O	53.79	54.51
Kendra Chambers	Texas	53.94	B	53.94	54.66

Appendix E1

Women 800 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Natalja Piliusina	Oklahoma State	2:03.46	O	2:03.46	2:04.88
Nachelle Mackie	BYU	2:03.56	B	2:03.56	2:04.98
Katie Palmer	BYU	2:03.79	B	2:03.79	2:05.21
Charlene Lipsey	LSU	2:03.79	B	2:03.79	2:05.21
Stephanie Brown	Arkansas	2:03.93	B	2:03.93	2:05.36
Chanelle Price	Tennessee	2:04.25	B	2:04.25	2:05.68
Heather Wilson	Connecticut	2:04.34	B	2:04.34	2:05.77
Kathy Klump	Cincinnati	2:04.39	O	2:04.39	2:05.82
Tasha Stanley	North Carolina	2:04.70	B	2:04.70	2:06.13
Rebecca Addison	Michigan	2:04.87	O	2:04.87	2:06.31
Jillian Smith	Michigan	2:05.01	O	2:05.01	2:06.45
Laura Roesler	Oregon	2:05.07	O	2:05.07	2:06.51
Boglarka Bozzay	Kansas State	2:05.11	O	2:05.11	2:06.55
Frances Dowd	Virginia Tech	2:05.18	O	2:05.18	2:06.62
Brittany Ogunmokun	Baylor	2:05.30	O	2:05.30	2:06.74
Sofia Oberg	California	2:05.32	O	2:05.32	2:06.76
Nijgia Snapp	Tennessee	2:05.49	B	2:05.49	2:06.93
Lacey Bleazard	BYU	2:05.55	O	2:05.55	2:06.99
Cynthia Anais	Maryland-ES	2:05.66	B	2:05.66	2:07.11
Justine Fedronic	Stanford	2:05.68	O	2:05.68	2:07.13

Women 1 Mile Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Lucy Van Dalen	Stony Brook	4:11.78	B-1500	4:31.92	4:04.61
Anne Kesselring	Oregon	4:32.61	O	4:32.61	4:05.31
Cory McGee	Florida	4:34.06	O	4:34.06	4:06.77
Morgane Gay	Virginia	4:34.38	O	4:34.38	4:07.10
Kristen Gillespie	Arkansas	4:34.49	O	4:34.49	4:07.21
Agata Strausa	Florida	4:36.39	O	4:36.39	4:09.13
Jordan Hasay	Oregon	4:37.29	B	4:37.29	4:10.04
Emily Lipari	Villanova	4:37.43	B	4:37.43	4:10.18
Becca Friday	Oregon	4:37.53	B	4:37.53	4:10.28
Laura Carlyle	Oregon State	4:37.57	O	4:37.57	4:10.32
Aisha Praught	Illinois State	4:37.77	O	4:37.77	4:10.52
Hannah Brooks	Florida State	4:37.87	B	4:37.87	4:10.62
Shannon Osika	Michigan	4:38.42	O	4:38.42	4:11.18
Jess Palacio	Navy	4:38.43	B	4:38.43	4:11.19
Heidi Gregson	Iona	4:38.85	O	4:38.85	4:11.61
Josephine Moultrie	New Mexico	4:38.87	O	4:38.87	4:11.63
Lauren Penney	Syracuse	4:39.04	B	4:39.04	4:11.80
Caitlin Lane	Penn State	4:39.24	B	4:39.24	4:12.00
Amanda Mergaert	Utah	4:39.29	O	4:39.29	4:12.05
Shelby Houlihan	Arizona State	4:39.56	O	4:39.56	4:12.33
Chelsea Orr	Washington	4:39.78	O	4:39.78	4:12.55

Appendix E1

Women 3000 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Katie Flood	Washington	8:55.31	O	8:55.31	8:59.91
Emily Infeld	Georgetown	9:00.13	B	9:00.13	9:04.78
Chelsea Reilly	California	9:00.86	O	9:00.86	9:05.51
Abbey D'Agostino	Dartmouth	9:02.15	B	9:02.15	9:06.81
Deborah Maier	California	9:02.35	O	9:02.35	9:07.01
Jordan Hasay	Oregon	9:03.95	O	9:03.95	9:08.63
Emily Sisson	Providence	9:06.04	B	9:06.04	9:10.74
Betsy Saina	Iowa State	9:06.61	O	9:06.61	9:11.31
Hannah Kiser	Idaho	9:07.23	O	9:07.23	9:11.94
Lucy Van Dalen	Stony Brook	9:07.48	B	9:07.48	9:12.19
Aisling Cuffe	Stanford	9:07.79	O	9:07.79	9:12.50
Dani Stack	Iowa State	9:08.00	O	9:08.00	9:12.71
Megan Goethals	Washington	9:08.42	O	9:08.42	9:13.14
Waverly Neer	Columbia	9:08.72	B	9:08.72	9:13.44
Tara Erdmann	Loyola Marymt .	9:08.85	O	9:08.85	9:13.57
Kathy Kroeger	Stanford	9:09.44	O	9:09.44	9:14.17
Amanda Winslow	Florida State	9:09.83	O	9:09.83	9:14.56
Aliphine Tuliamuk	Wichita State	9:11.49	B	9:11.49	9:16.23
Bogdana Mimic	Villanova	9:14.95	F	9:11.95	9:14.95
Elvin Kibet	Arizona	9:12.05	O	9:12.05	9:16.80
Brittany Copeland	East Carolina	9:12.11	O	9:12.11	9:16.86
Lauren Penney	Syracuse	9:12.14	B	9:12.14	9:16.89
Jillian King	Boston College	9:12.51	B	9:12.51	9:17.26
Natosha Rogers	Texas A&M	9:12.83	B	9:12.83	9:17.58
Jessica Tonn	Stanford	9:12.97	O	9:12.97	9:17.73

Women 5000 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Deborah Maier	California	15:29.24	O	15:29.24	15:36.40
Betsy Saina	Iowa State	15:36.09	O	15:36.09	15:43.70
Aliphine Tuliamuk	Wichita State	15:36.53	O	15:36.53	15:43.74
Kathy Kroeger	Stanford	15:46.26	O	15:46.26	15:53.55
Alex Kosinski	Oregon	15:47.81	O	15:47.81	15:55.11
Meaghan Nelson	Iowa State	15:51.89	O	15:51.89	15:59.22
Natosha Rogers	Texas A&M	15:52.40	B	15:52.40	15:59.73
Megan Goethals	Washington	15:54.89	O	15:54.89	16:02.24
Bronwyn Crossman	Oregon	15:56.35	O	15:56.35	16:03.71
Dani Stack	Iowa State	15:57.20	O	15:57.20	16:04.57
Juli Accurso	Ohio U.	15:58.69	O	15:58.69	16:06.07
Elvin Kibet	Arizona	15:59.16	O	15:59.16	16:06.55
Sara Sutherland	Texas	15:59.75	B	15:59.75	16:07.14
Sarah Waldron	New Mexico	15:59.93	O	15:59.93	16:07.32
Becky Wade	Rice	16:03.13	O	16:03.13	16:10.55
Lydia Kosgei	Eastern Kentucky	16:03.66	O	16:03.66	16:11.08
Risper Kimaiyo	UTEP	16:04.88	O	16:04.88	16:12.31
Kara Millhouse	Penn State	16:06.82	O	16:06.82	16:14.26
Caitlin Comfort	Wisconsin	16:07.90	O	16:07.90	16:15.35
Jennifer Bergman	Arizona	16:08.26	O	16:08.26	16:15.72
Bradi Hutchison	Idaho State	16:11.33	O	16:11.33	16:18.81
Katie Kellner	Cornell	16:11.38	B	16:11.38	16:18.86
Florence Ngetich	Florida	16:12.64	O	16:12.64	16:20.13
Sarah Callister	Weber State	16:58.65	O-6k	16:13.22	16:20.71
Lindsay Flanagan	Washington	16:14.92	O	16:14.92	16:22.43

Appendix E1

Men 200 Meter Dash

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Ameer Webb	Texas A&M	20.62	B	20.62	20.99
Marquis Holston	Norfolk State	21.08	F	20.68	21.08
Maurice Mitchell	Florida State	20.70	B	20.70	21.07
Akheem Gauntlett	Arkansas	20.75	B	20.75	21.12
Horatio Williams	Florida State	20.83	B	20.83	21.20
Kind Butler	Indiana	20.85	O	20.85	21.22
Andre Walsh	Maryland-ES	20.89	B	20.89	21.26
Tavaris Tate	Mississippi State	20.93	B	20.93	21.30
Aaron Radden	Central Connecticut	20.96	B	20.96	21.34
Javon Young	Charleston Southern	20.97	B	20.97	21.35
Anaso Jobodwana	Jackson State	21.37	F	20.97	21.37
Prezel Hardy, Jr.	Texas A&M	20.99	B	20.99	21.37
Trey Hadnot	Louisiana Tech	21.44	F	21.04	21.44
Zye Boey	Eastern Illinois	21.07	B	21.07	21.45
Everett Walker	Baylor	21.08	B	21.08	21.46
Joe Morris	Colorado	21.09	B	21.09	21.47
Keenan Brock	Auburn	21.09	B	21.09	21.47
Blake Heriot	Baylor	21.09	O	21.09	21.47
Michael Bryan	Texas A&M	21.10	B	21.10	21.48
Shannon Grover	SE Louisiana	21.50	F	21.10	21.47
Charles Silmon	TCU	21.04	B-alt	21.11	21.44
Waymon Storey	Georgia	21.12	B	21.12	21.50
Aaron Ernest	LSU	21.13	O	21.13	21.51
Marcus Rowland	Auburn	21.14	B	21.14	21.52
Reggie Dixon	Hampton	21.15	B	21.15	21.53

Men 400 Meter Dash

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Torrin Lawrence	Georgia	46.01	O	46.01	46.75
Tavaris Tate	Mississippi State	46.10	O	46.10	46.84
Tony McQuay	Florida	46.11	O	46.11	46.85
Errol Nolan	Houston	46.12	B	46.12	46.86
Mike Berry	Oregon	46.16	O	46.16	46.90
Amaechi Morton	Stanford	46.16	O	46.16	46.90
Thomas Murdaugh	Ohio State	46.17	O	46.17	46.91
Hugh Graham, Jr	Florida	46.18	O	46.18	46.92
Cade Lindahl	BYU	46.25	O	46.25	46.99
Brycen Spratling	Pittsburgh	46.16	B-alt	46.27	47.01
Marek Niit	Arkansas	46.28	B	46.28	47.02
Neil Braddy	Arkansas	46.28	B	46.28	47.02
Caleb Williams	LSU	46.31	B	46.31	47.05
David Verburg	George Mason	46.33	O	46.33	47.07
Deon Lendore	Texas A&M	46.33	B	46.33	47.07
Cass Brown	Stephen F. Austin	46.39	B	46.39	47.13
Zwede Hewitt	Baylor	46.40	O	46.40	47.14
Riker Hylton	LSU	46.47	O	46.47	47.21
Patrick Feeney	Notre Dame	46.55	O	46.55	47.29
Ben Skidmore	Arkansas	46.57	B	46.57	47.32
Daundre Barnaby	Mississippi State	46.59	O	46.59	47.34
Ricky Babineaux	Texas A&M	46.61	B	46.61	47.36
Maurice McNeal	Washington	46.69	O	46.69	47.44

Appendix E1

Men 800 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Harun Abda	Minnesota	1:46.97	O	1:46.97	1:48.50
David Pachuta	Minnesota	1:46.98	O	1:46.98	1:48.51
Joey Roberts	Texas A&M	1:47.14	B	1:47.14	1:48.67
Sean Obinwa	Florida	1:47.22	B	1:47.22	1:48.75
Michael Preble	Texas A&M	1:47.52	B	1:47.52	1:49.06
Erik Sowinski	Iowa	1:47.62	B	1:47.62	1:49.16
Ricky West	Missouri	1:47.81	B	1:47.81	1:49.35
Mason McHenry	Arizona State	1:47.86	B	1:47.86	1:49.40
Aaron Evans	Georgia	1:47.88	O	1:47.88	1:49.42
Casimir Loxsom	Penn State	1:47.93	B	1:47.93	1:49.47
Travis Burkstrand	Minnesota	1:48.16	O	1:48.16	1:49.71
Declan Murray	Loyola (Ill.)	1:48.46	O	1:48.46	1:50.01
Patrick Schoenball	Baylor	1:48.47	B	1:48.47	1:50.02
Kyle Thompson	Texas	1:48.53	B	1:48.53	1:50.08
Ryan Waite	BYU	1:48.56	O	1:48.56	1:50.11
Oscar Ramirez	Texas A&M	1:48.57	B	1:48.57	1:50.12
Anthony Lieghio	Arkansas	1:48.58	B	1:48.58	1:50.13
Peter Sigilai	Eastern Kentucky	1:48.58	O	1:48.58	1:50.13
David Mokone	Western Kentucky	1:48.61	O	1:48.61	1:50.16
Robby Creese	Penn State	1:48.64	B	1:48.64	1:50.19
Joe Abbott	Washington State	1:48.65	O	1:48.65	1:50.20
Drew Butler	Arkansas	1:48.65	O	1:48.65	1:50.20
Blake Irwin	Missouri	1:48.69	B	1:48.69	1:50.24

Men 1 Mile Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Miles Batty	BYU	3:54.54	B	3:54.54	3:57.54
David McCarthy	Providence	3:55.75	B	3:55.75	3:58.77
Erik van Ingen	Binghamton	3:56.37	B	3:56.37	3:59.40
Chris O'Hare	Tulsa	3:56.63	B	3:56.63	3:59.66
Cory Leslie	Ohio State	3:56.85	B	3:56.85	3:59.88
Rich Peters	Boston U.	3:57.83	B	3:57.83	4:00.87
Sam McEntee	Villanova	3:57.86	B	3:57.86	4:00.90
Andrew Bayer	Indiana	3:58.23	B	3:58.23	4:01.28
Nick Happe	Arizona State	3:58.73	O	3:58.73	4:01.79
Peter Callahan	Princeton	3:58.76	O	3:58.76	4:01.82
George Alex	Oklahoma	3:58.76	B	3:58.76	4:01.82
Kirubel Erassa	Oklahoma State	3:58.84	O	3:58.84	4:01.90
Raul Botezan	Oklahoma State	3:58.94	B	3:58.94	4:02.00
Robby Creese	Penn State	3:58.94	O	3:58.94	4:02.00
Eric Harasyn	Oklahoma	3:58.99	B	3:58.99	4:02.05
Matt Maldonado	Long Beach St.	3:59.08	O	3:59.08	4:02.14
David Forrester	Florida State	3:59.13	O	3:59.13	4:02.19
Eric Jenkins	Northeastern	3:59.18	B	3:59.18	4:02.24
Julian Matthews	Providence	3:59.34	B	3:59.34	4:02.40
Kyle Merber	Columbia	3:59.44	B	3:59.44	4:02.50
Jordan Chipangama	Northern Arizona	4:08.50	O-6k	3:59.47	4:02.54
De'Sean Turner	Indiana	3:59.81	O	3:59.81	4:02.88
Michael Atchoo	Stanford	3:59.92	O	3:59.92	4:02.99

Appendix E1

Event 6 Men 3000 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Ryan Hill	North Carolina St.	7:43.08	O	7:43.08	7:48.45
Lawi Lalang	Arizona	7:44.48	O	7:44.48	7:49.87
Diego Estrada	Northern Arizona	7:44.63	O	7:44.63	7:50.02
Cameron Levins	Southern Utah	7:48.25	O	7:48.25	7:53.68
Ross Millington	New Mexico	7:49.11	O	7:49.11	7:54.55
Miles Batty	BYU	7:49.58	O	7:49.58	7:55.03
Paul Chelimo	UNC-Greensboro	7:49.87	O	7:49.87	7:55.32
Elliott Heath	Stanford	7:50.14	B	7:50.14	7:55.59
Chris Derrick	Stanford	7:50.18	B	7:50.18	7:55.63
Andrew Bayer	Indiana	7:50.23	O	7:50.23	7:55.68
Trevor Dunbar	Oregon	7:51.55	O	7:51.55	7:57.02
Stephen Sambu	Arizona	7:51.59	B	7:51.59	7:57.06
Mitch Goose	Iona	7:51.75	O	7:51.75	7:57.22
Leonard Korir	Iona	7:51.83	B	7:51.83	7:57.30
Ben Hubers	Indiana	7:52.02	B	7:52.02	7:57.50
Thomas Farrell	Oklahoma State	7:52.38	B	7:52.38	7:57.86
George Alex	Oklahoma	7:52.92	B	7:52.92	7:58.41
Richard Medina	Colorado	7:53.02	O	7:53.02	7:58.51
Joe Stilin	Princeton	7:53.15	O	7:53.15	7:58.64
Collin Jarvis	California	7:53.43	O	7:53.43	7:58.92
Rex Shields	BYU	7:53.59	O	7:53.59	7:59.08
Andrew Springer	Georgetown	7:53.69	O	7:53.69	7:59.18
Soufiane Bouchikhi	Eastern Kentucky	7:53.99	O	7:53.99	7:59.49
Mark Amirault	Virginia	7:54.08	O	7:54.08	7:59.58
Jake Riley	Stanford	7:54.51	O	7:54.51	8:00.01
Maverick Darling	Wisconsin	7:54.70	B	7:54.70	8:00.21
Nick Happe	Arizona State	7:55.08	O	7:55.08	8:00.59
Cody Rome	Navy	7:55.24	O	7:55.24	8:00.75
Parker Stinson	Oregon	7:55.60	O	7:55.60	8:01.12

Men 5000 Meter Run

Name	School	Original Time	Track Type	Current Seed Time	New Seed Time
Lawi Lalang	Arizona	13:08.28	B	13:08.28	13:16.71
Stephen Sambu	Arizona	13:13.74	B	13:13.74	13:22.23
Leonard Korir	Iona	13:19.54	B	13:19.54	13:28.10
Chris Derrick	Stanford	13:19.58	B	13:19.58	13:28.14
Hassan Mead	Minnesota	13:33.42	O	13:33.42	13:42.12
Parker Stinson	Oregon	13:39.22	O	13:39.22	13:47.99
Diego Estrada	Northern Arizona	13:39.54	B	13:39.54	13:48.31
Jake Riley	Stanford	13:39.58	O	13:39.58	13:48.35
Cameron Levins	Southern Utah	13:42.90	O	13:42.90	13:51.71
Donn Cabral	Princeton	13:45.92	O	13:45.92	13:54.76
Shadrack Kipchirchir	Oklahoma State	13:46.00	O	13:46.00	13:54.84
Soufiane Bouchikhi	Eastern Kentucky	13:46.06	O	13:46.06	13:54.90
Andrew Poore	Indiana	13:47.05	B	13:47.05	13:55.90
Brendan Gregg	Stanford	13:48.64	O	13:48.64	13:57.51
Dustin Fay	UCLA	13:49.96	O	13:49.96	13:58.84
Girma Mecheso	Oklahoma State	13:50.03	B	13:50.03	13:58.91
Kevin Williams	Oklahoma	13:50.28	B	13:50.28	13:59.16
Brian Pierre	Arizona State	13:50.37	O	13:50.37	13:59.25
Craig Forys	Michigan	13:51.57	B	13:51.57	14:00.47
Alden Bahr	BYU	13:51.68	O	13:51.68	14:00.58
Chris Kwiatkowski	Oregon	13:51.96	O	13:51.96	14:00.86

Appendix E3

2012 NCAA Division III Indoor
Evaluation of Who Qualifies Under New Conversion

How Many 2012 Qualifiers Change

Men	2012	Field Size
200*+	3	13
400+	1	13
800+	2	13
Mile+	2	13
3K*+	3	13
5K+	3	13
4x4#+	2	10
DMR#+	1	10
Women	2012	
200*+	3	15
400+	2	15
800+	2	15
Mile+	1	15
3K*+	2	15
5K+	1	15
4x4#+	2	10
DMR#+	0	10

Key
2012 NCAA Division III Indoor Qualifiers
Did Not Declare
Dropped from qualifier with new conversion
Added to qualifiers with new conversion

200	Potential New Event						
1	Bernstein, Sean	Oneonta	21.49		b	21.77	2
2	Dennis, Thurgood	Wis.-Eau Claire	21.56		f		1
3	Dedewo, Paul	CCNY	21.85		b	22.14	8
4	Brown, Ackeme	Ramapo	21.93		b	22.22	14
5	Crafton, Dylan	Wis.-Whitewater	21.95		f		3
6	Rindone, Alex	Augustana (Ill.)	21.97		f		4
7	Drew, LaDarius	Wesleyan	22.08		b	22.37	21
7	Law, Jalen	Buffalo State	22.08		f		5
9	Benton, Dan	North Central (Ill.)	22.11		f		6
9	Green, Kiante	Monmouth (Ill.)	22.11		f		6
11	Medina, Chris	TCNJ	22.13		b	22.42	22
12	Hackler, Dionte	North Central (Ill.)	22.18		f		9
12	Turner, Kenneth	McMurry	22.18		f		9
14	Gray, Bruce	Greenville	22.20		f		11
14	Odom, Trevon	McMurry	22.20		o	22.49	23
14	Rollins, Davon	Buffalo State	22.20		b	22.49	23
17	Bee, Nick	Wis.-Whitewater	22.21		f		12
17	Coleman, Sutton	Rose-Hulman	22.21		f		12

Appendix E3

400							
1	Hoeshcen, Aric	Wis.-La Crosse	48.01	47.41	=	48.12	1
2	Cunningham, Kevin	McMurry	48.45	47.95	=	48.67	3
3	Benton, Dan	North Central (Ill.)	48.53				2
4	Kersenbrock, John	Nebraska Wesleyan	48.85	48.35	=	49.07	8
5	Dennis, Thurgood	Wis.-Eau Claire	49.00				4
6	Farrell, Ben	Wis.-Platteville	49.01				5
7	Dedewo, Paul	CCNY	49.02	48.52	=	49.24	15
8	Prince, Cody	Wis.-Eau Claire	49.03				6
9	Tallman, Alexander	Washington and Lee	49.06				7
10	Scheetz, Ben	Amherst	49.07				8
11	Hackler, Dionte	North Central (Ill.)	49.09				10
12	Wood, Kyle	Central College	49.10				11
13	Hyland, LJ	Carroll	49.16				12
14	Schwab, Jacob	Ohio Northern	49.17				13
15	Curtis, Matthew	Rutgers-Camden	49.18	48.68	=	49.41	21
16	Campbell, James	Buffalo State	49.20	48.60	=	49.33	18
17	Cejka, John	Wis.-Oshkosh	49.23				14
800							
1	Scheetz, Ben	Amherst	1:48.03	1:47.43	=	1:48.83	1
2	Hutton, Mike	St. Thomas (Minn.)	1:50.21	1:49.31	=	1:50.74	2
3	Sullivan, Dan	Wis.-Stevens Point	1:51.50				3
4	Willett, Robert	Birmingham-Southern	1:51.83	1:51.23	=	1:52.68	5
5	Waterman, Jake	Wabash	1:51.86				4
6	Marvel, Jeff	Tufts	1:52.03	1:51.43	=	1:52.89	6
7	Melton, Matt	Amherst	1:52.64	1:52.04	=	1:53.50	9
8	Manning, Ben	Southern Maine	1:52.67	1:52.07	=	1:53.53	10
9	Nisky, Dylan	Colby	1:52.93	1:52.33	=	1:53.80	13
10	Schoch, Tim	Haverford	1:52.97	1:52.37	=	1:53.84	14
11	Vance, Luke	Wheaton (Ill.)	1:52.99				7
12	Clark, Drew	Principia	1:53.17				8
12	Ambrosi, Steve	Moravian	1:53.17	1:52.57	=	1:54.04	15
14	Klein, Patrick	Wis.-Platteville	1:53.20	1:52.30	=	1:53.77	12
15	Marx, Patrick	MIT	1:53.46	1:52.86	=	1:54.33	18
16	Parker, Samuel	MIT	1:53.58	1:52.98	=	1:54.46	20
17	Meier, Jacob	Principia	1:53.61				11
18	Carter, Chris	Geneseo St.	1:53.67	1:53.07	=	1:54.55	22
19	Schafer, Matt	Bethel (Minn.)	1:54.10				16
Mile							
1	Scheetz, Ben	Amherst	4:04.95	4:03.95	=	4:06.74	1
2	McCarthy, Kevin	Wabash	4:06.58	4:05.58	=	4:08.39	3
3	Brown, Chris	Brandeis	4:06.98	4:05.98	=	4:08.79	5
4	Hannon, Kyle	MIT	4:07.42	4:06.42	=	4:09.24	6
5	Klein, Patrick	Wis.-Platteville	4:08.32				2
6	Sullivan, Dan	Wis.-Stevens Point	4:08.44				4
7	Rose, Connor	Tufts	4:09.65	4:08.65	=	4:11.49	12
8	Turlip, Matt	NYU	4:09.88	4:08.88	=	4:11.72	13
9	Hillard, Matthew	Bowdoin	4:10.26	4:09.26	=	4:12.11	14
10	Saksa, Brian	St. Olaf	4:10.37				7
11	Schilit, Jordan	Haverford	4:10.57	4:09.57	=	4:12.42	17
12	Sathre, Ben	St. Thomas (Minn.)	4:10.59				8

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13	Speiden, Russell	Elizabethtown	4:10.62				9
14	Whittle, Greg	Calvin	4:11.06				10
15	Grimes, Patrick	Amherst	4:11.10	4:10.10	=	4:12.96	20
16	Davies, Jack	Middlebury	4:11.31	4:10.31	=	4:13.17	23
17	Brandenburg, Jared	Wis.-River Falls	4:11.48				11
18	Smith, Dan	Ohio Northern	4:11.61	4:09.41	=	4:12.26	15
19	Hebble, Patrick	Middlebury	4:11.74	4:10.74	=	4:13.61	24
20	Novara, Eddie	Geneseo St.	4:12.41				16
21	Gazzeloni, Julian	Southern Maine	4:12.45	4:11.45	=	4:14.32	26
22	Deichert, Jack	Hamline	4:12.46				18
23	Easker, Aaron	Wis.-Eau Claire	4:12.47				19
3000	Potential New Event	-	-				
1	Sathre, Ben	St. Thomas (Minn.)	8:07.02		f	-	1
2	Nelson, Tim	Wis.-Stout	8:15.47		f	-	2
3	Fuller, Brian	Springfield	8:21.42		b	8:26.54	4
4	Berube, Lee	Geneseo St.	8:25.00		f	-	3
5	Schmidt, Michael	Middlebury	8:25.32		f	-	5
6	Klein, Patrick	Wis.-Platteville	8:26.01		f	-	6
7	Kramer, Nick	Calvin	8:26.80		f	-	7
8	Monson, Devin	Hamline	8:27.44		f	-	8
9	Hannan, Tully	Bates	8:27.87		b	8:33.05	12
10	Kibler, Chris	Fitchburg St.	8:28.97		b	8:34.16	17
11	McCarthy, Kevin	Wabash	8:29.01		f	-	9
12	Mavrovic, Alex	Conn College	8:29.25		b	8:34.45	21
13	Marks, Kyle	Tufts	8:29.32		b	8:34.52	22
14	Schilit, Jordan	Haverford	8:31.57		b	8:36.79	23
15	Stadler, Chris	Haverford	8:31.67		f	-	10
16	Kubiak, Brett	Gwynedd-Mercy	8:32.26		b	8:37.49	24
17	Zitek, Andrew	NYU	8:32.52		b	8:37.75	25
18	Kramer, Alex	Brandeis	8:32.56		b	8:37.79	26
19	Wintheiser, Grant	St. Olaf	8:32.71		f	-	11
20	Love, Nathan	Hope	8:32.92		o	8:38.15	27
21	Herschman, Andy	TCNJ	8:32.93		b	8:38.16	28
22	Over, Bobby	Allegheny	8:33.20		f	-	13
5k							
1	Schmidt, Michael	Middlebury	14:13.90	14:10.30	=	14:18.20	1
2	Schilit, Jordan	Haverford	14:16.37	14:12.67	=	14:20.59	3
3	Sathre, Ben	St. Thomas (Minn.)	14:16.49	14:10.99	=	14:18.89	2
4	Nelson, Tim	Wis.-Stout	14:20.72				4
5	Kramer, Nick	Calvin	14:25.88	14:20.38	=	14:28.37	5
6	Salukombo, Makorobondo	Denison	14:28.18	14:24.58	=	14:32.61	6
7	Novara, Eddie	Geneseo St.	14:30.81	14:27.21	=	14:35.26	9
8	Breitbach, Thomas	Wis.-Eau Claire	14:32.96				7
9	Vander Roest, Matt	Calvin	14:35.12				8
10	Berube, Lee	Geneseo St.	14:35.76	14:32.16	=	14:40.26	14
11	Klein, Patrick	Wis.-Platteville	14:36.38				10
12	DuBois, Eric	Rowan	14:36.73	14:33.13	=	14:41.24	17
13	LeDuc, Michael	Conn College	14:36.77	14:33.17	=	14:41.28	18
14	Kerley, Dan	North Central (Ill.)	14:36.88				11
15	Rand, Matt	Tufts	14:38.52	14:34.92	=	14:43.04	21

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16	Whitmore, Billy	U. of Chicago	14:38.63				12
17	Zitek, Andrew	NYU	14:39.19	14:35.59	=	14:43.72	22
18	Kissin, Peter	Haverford	14:39.24				13
4x4							
1	North Central (Ill.) (J)						1
2	Wis.-Eau Claire (I)						2
3	McMurry (H)			3:14.94	=	3:17.85	4
4	Williams (E)			3:15.71	=	3:18.63	9
5	Wis.-Stevens Point (L)						3
6	MIT (G)			3:15.88	=	3:18.80	10
7	Wis.-Whitewater (K)						5
8	Wis.-Oshkosh (C)						6
9	Cortland St. (E)			3:16.21	=	3:19.14	12
10	Rowan (A)			3:16.34	=	3:19.27	14
11	Tufts (J)			3:16.36	=	3:19.29	15
12	Carthage (E)						7
13	Wis.-Platteville (A)						8
14	Nebraska Wesleyan (I)			3:16.37	=	3:19.30	16
15	Wis.-La Crosse (E)						11
16	Bethel (Minn.) (A)						13
DMR							
1	Bowdoin (B)			9:49.27	=	9:56.55	1
2	MIT (D)			9:49.45	=	9:56.73	2
3	Wabash (A)			9:50.49	=	9:57.78	3
4	Middlebury (A)			9:53.07	=	10:00.39	5
5	Wis.-Stevens Point (A)						3
6	Bates (A)			9:55.10	=	10:02.45	8
7	Elizabethtown (A)			9:56.80	=	10:04.17	10
8	North Central (Ill.) (R)						6
9	Wis.-La Crosse (B)						7
10	Tufts (D)			9:58.64	=	10:06.03	13
11	TCNJ (C)			9:58.81	=	10:06.21	14
12	Geneseo St. (A)			9:58.89	=	10:06.29	15
13	NYU (F)			9:59.87	=	10:07.28	16
14	Wis.-Eau Claire (A)						9
17	Southern Maine (B)			10:01.41	=	10:08.84	18
18	Ohio Northern (B)			10:00.38	=	10:07.80	17
19	Wis.-Whitewater (E)						11
20	Haverford (B)						12
Women							
200							
1	Wise, Briana	Worcester State	24.40		b	24.67	1
2	Jones, Portia	MIT	24.71		b	24.98	3
3	Dunham, Jazmin	Buffalo State	24.81		o	25.08	4
4	Morrison, Nevada	Wartburg	24.97		f		2

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5	Mahoney, Mary	Mount Union	25.12		f		5
6	Morrison, Skye	Wartburg	25.24		f		6
7	DeLude, Lauren	Utica	25.25		f		7
8	Alpert, Lauren	Illinois Wesleyan	25.26		f		8
9	Greenup, Jordanne	Wis.-Eau Claire	25.30		f		9
10	Davis, Tiffany	Denison	25.34		o	25.62	13
10	Jusme, Didi	Wheaton (Mass.)	25.34		b	25.62	13
12	Alli, Tobi	Lehman	25.42		b	25.70	17
13	Brew, Jacqueline	MIT	25.44		b	25.72	18
14	Emberts, Talisa	Wis.-Eau Claire	25.53		f		10
15	Little, Ashante	Wheaton (Mass.)	25.57		b	25.85	22
16	Millett, Elsa	Bowdoin	25.58		f		11
16	Rasmussen, Alyssa	Wis.-River Falls	25.58		f		11
18	VanNess, Jillian	UMass Dartmouth	25.61		b	25.89	23
19	Onyilagha, Frances	Colby	25.65		b	25.93	24
20	Burt, Faith	Wartburg	25.66		f		15
400							
1	Jones, Portia	MIT	55.58 #	55.18		56.00	1
2	Millett, Elsa	Bowdoin	56.08 #	55.68		56.51	6
3	Morrison, Nevada	Wartburg	56.19				2
4	Alpert, Lauren	Illinois Wesleyan	56.21				3
5	Morrison, Skye	Wartburg	56.32				4
5	Rock, Lauren	Illinois Wesleyan	56.32				5
7	Mahoney, Mary	Mount Union	56.51				6
8	Simmons, Jamie	MIT	56.78 #	56.38		57.22	10
8	Richard, Noelle	WPI	56.78 #	56.38		57.22	11
10	Emberts, Talisa	Wis.-Eau Claire	57.03				8
11	Kregel, Kendra	Wartburg	57.07				9
12	Little, Ashante	Wheaton (Mass.)	57.09 #	56.69		57.54	15
13	Gearity, Heather	Montclair State	57.10 #	56.70		57.55	16
14	Wiley, Hannah	Southern Maine	57.27 #	56.87		57.72	18
15	Rasmussen, Alyssa	Wis.-River Falls	57.29				12
15	Finnel, Keelie	Coe	57.29				13
17	Elliott, Claire	Wis.-La Crosse	57.46				14
800							
1	Cazzola, Christy	Wis.-Oshkosh	2:09.80				1
2	Finnel, Keelie	Coe	2:10.24				2
3	Graves, Carmen	Roanoke	2:10.37	2:09.87	=	2:11.18	4
4	Jackey, Erica	Washington U.	2:10.69				3
5	Tank, Ann	Wis.-Platteville	2:11.28	2:10.58	=	2:11.90	7
6	Crawley, Sheena	Franklin & Marshall	2:11.48				5
7	Clemens, Tara	Illinois Wesleyan	2:11.57				6
8	Ryan-Davis, Juliet	Middlebury	2:12.20	2:11.70	=	2:13.03	8
9	Thornton, Jessica	Birmingham-Southern	2:12.60	2:12.10	=	2:13.43	9
10	Hansen, Dira	Christopher Newport	2:12.77	2:12.27	=	2:13.61	11
11	McDonald, Kayla	U. of Chicago	2:12.93	2:12.43	=	2:13.77	13
12	Kowalewski, Cailin	Geneseo St.	2:13.07	2:12.57	=	2:13.91	14
13	Doyle, Kirkley	Kenyon	2:13.59				10
14	Schudrowitz, Emily	St. Norbert	2:13.70				12
15	Cramer, Margo	Middlebury	2:13.91	2:13.41	=	2:14.76	16

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16	Phillips, Liz	Washington U.	2:13.94	2:13.44	=	2:14.79	17
17	McCasland, Amy	Plattsburgh St.	2:14.27	2:13.77	=	2:15.12	19
18	Morrison, Nevada	Wartburg	2:14.46				15
19	Arens, Elizabeth	Bates	2:14.87	2:14.37	=	2:15.73	22
20	Reid, Katie	Ohio Wesleyan	2:14.95				18
21	Cota, Krista	North Central (Ill.)	2:15.23				20
22	Brunetto, Lauren	Oneonta	2:15.25	2:14.75	=	2:16.11	25
23	Mazzaferri, Emily	Mount Union	2:15.31				21
24	Hammond, Rebecca	Swarthmore	2:15.50	2:15.00	=	2:16.36	26
25	Wood, Keira	Geneseo St.	2:15.56	2:15.06	=	2:16.42	27
26	Howser, Kathryn	Elizabethtown	2:15.61	2:15.11	=	2:16.47	28
27	Balmer, Katie	Haverford	2:15.67	2:15.17	=	2:16.54	29
28	Bowden, Rachel	Monmouth (Ill.)	2:15.93				23
29	Brunscheen, Kelly	Geneseo St.	2:15.95	2:15.45	=	2:16.82	32
30	Bingham, Kala	North Central (Ill.)	2:16.10				24
Mile							
1	Cramer, Margo	Middlebury	4:51.93				1
2	Cazzola, Christy	Wis.-Oshkosh	4:52.77				2
3	Phillips, Liz	Washington U.	4:54.15				3
4	Jackey, Erica	Washington U.	4:54.16				4
5	Lambert, Keri	Amherst	4:54.66	4:53.76	=	4:56.19	5
5	Crawley, Sheena	Franklin & Marshall	4:54.66	4:53.76	=	4:56.19	5
7	Boots, Randelle	Wellesley	4:55.92	4:55.02	=	4:57.46	8
8	van den Heuvel, Louise	MIT	4:56.46	4:55.56	=	4:58.00	10
9	Arens, Elizabeth	Bates	4:56.49	4:55.59	=	4:58.03	11
10	Cota, Krista	North Central (Ill.)	4:56.86				7
11	Mirecki, Brianne	Williams	4:57.09	4:56.19	=	4:58.64	13
12	Martorella, Molly	Oberlin	4:57.63	4:56.73	=	4:59.18	14
13	Tousley, Addie	Middlebury	4:57.79				9
14	Naylon, Jordyn	Cortland St.	4:57.98	4:57.08	=	4:59.54	16
15	Haen, Kelly	Wis.-Stevens Point	4:58.44				12
16	Croteau, Chantal	Bowdoin	4:58.69	4:57.79	=	5:00.25	17
17	Randall, Jennifer	Ithaca	4:59.41	4:58.51	=	5:00.98	18
18	Orewiler, Jaime	Wheaton (Ill.)	4:59.53				15
19	Peacock, Jena	Rowan	4:59.70	4:58.80	=	5:01.27	20
20	Carl, Molly	Southern Maine	5:00.42	4:59.52	=	5:02.00	22
21	DeAngelis, Cara	Ohio Wesleyan	5:01.17				19
3k							
1	Sigmund, Laura	Wartburg	9:50.16		f		1
2	Warwick, Kate	Brandeis	9:57.86		b	10:02.01	3
3	Cheadle, Lucy	Washington U.	9:58.16		b	10:02.32	4
4	Del Piccolo, Chiara	Williams	9:58.66		b	10:02.82	5
5	Enabnit, Alana	Wartburg	9:58.73		f		2
6	Sizek, Julia	U. of Chicago	10:00.32		b	10:04.49	7
7	Fisher, Sarah	Washington U.	10:00.58		b	10:04.75	8
8	Zimmerling, Aubrey	Claremont-Mudd-Scripps	10:03.13		f		6
9	Braun, Stefanie	Plattsburgh St.	10:04.53		b	10:08.73	14
10	Liberati, Marissa	Geneseo St.	10:04.95		f		9
11	Tempone, Traci	Elizabethtown	10:05.51		f		10
12	Eckstein, Hannah	Johns Hopkins	10:05.78		f		11

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13	McVay , Elaine	MIT	10:05.97		b	10:10.18	16
14	Dalton, Alyson	Cortland St.	10:06.88		f		12
15	MacKenzie, Olivia	Bowdoin	10:06.97		b	10:11.19	17
16	Childs-Walker, Simone	Carleton	10:07.14		f		13
17	Campbell, Catherine	Dickinson	10:07.32		b	10:11.54	18
18	Zelinsky, Paige	NYU	10:07.65		b	10:11.87	21
19	Shanley, Molly	Wellesley	10:07.72		b	10:11.94	22
20	Gallegos, Tess	Emory	10:07.80		b	10:12.02	24
21	Manion , Dacie	MIT	10:08.27		b	10:12.50	25
22	Wobb, Emily	Carnegie Mellon	10:08.71		o	10:12.94	26
23	Smyth, Alison	Carleton	10:09.10		f		15
5k							
1	Del Piccolo, Chiara	Williams	16:57.98				1
2	Sigmund, Laura	Wartburg	16:59.18	16:53.98	=	17:00.10	2
3	Eckstein, Hannah	Johns Hopkins	17:03.18	16:59.88	=	17:06.04	3
4	Warwick, Kate	Brandeis	17:06.74	17:03.44	=	17:09.62	4
5	Evans, Maeve	NYU	17:10.19	17:06.98	=	17:13.18	5
6	Enabnit, Alana	Wartburg	17:10.95	17:05.75	=	17:11.94	6
7	Dalton, Alyson	Cortland St.	17:14.32	17:11.02	=	17:17.24	9
8	Steinbrunner, Alison	Ohio Northern	17:14.92	17:09.72	=	17:15.94	7
9	Peacock, Jena	Rowan	17:15.27	17:11.97	=	17:18.20	10
10	Campbell, Catherine	Dickinson	17:15.75	17:12.45	=	17:18.68	11
11	Childs-Walker, Simone	Carleton	17:15.91	17:10.71	=	17:16.93	8
12	Clarke, Holly	Johns Hopkins	17:18.35	17:15.05	=	17:21.30	12
13	Mills, Paige	Keene State	17:20.27	17:16.97	=	17:23.23	14
14	McVay , Elaine	MIT	17:20.73	17:17.43	=	17:23.69	15
15	Cheadle, Lucy	Washington U.	17:22.79				13
16	Braun, Stefanie	Plattsburgh St.	17:26.70	17:23.40	=	17:29.70	19
17	Hoekstra, Jodi	Calvin	17:26.73	17:21.53	=	17:27.82	16
18	Cazzola, Christy	Wis.-Oshkosh	17:28.00				17
19	O'Grady, Megan	Carroll	17:28.35				18
4x4							
1	Wartburg (O)			3:43.82	=	3:46.56	1
2	MIT (E)			3:49.28	=	3:52.09	3
3	Mount Union (A)						2
4	Illinois Wesleyan (F)						4
5	Wis.-La Crosse (A)						5
7	Coe (A)						6
8	Bowdoin (E)			3:52.92	=	3:55.77	11
9	Williams (G)			3:53.24	=	3:56.10	13
10	Wis.-Platteville (G)						7
11	Wis.-Eau Claire (K)						8
12	North Central (Ill.) (I)						9
13	Wis.-Whitewater (F)						10
14	Wheaton (Mass.) (D)			3:54.11	=	3:56.98	15
15	Emory (B)						12
16	Rhodes (A)						14
DMR							
1	Middlebury (A)			11:37.06	=	11:43.53	1

Appendix E3

2	Washington U. (B)						2
3	Wis.-Oshkosh (B)						3
4	Rowan (E)			11:49.15	=	11:55.73	5
5	Bates (A)			11:49.57	=	11:56.16	6
6	Wartburg (D)						4
7	MIT (B)			11:51.33	=	11:57.94	7
8	Amherst (E)			11:52.12	=	11:58.73	9
9	St. Thomas (Minn.) (A)						8
10	U. of Chicago (E)						10