

Introduction

The latest routine international evaluation for females fertility traits took place as scheduled at the Interbull Centre. Data from twentyone (21) countries were included in this evaluation.

International genetic evaluations for female fertility traits of bulls from Australia, Austria, Belgium, Canada, Czech Republic, Denmark-Finland-Sweden, France, Germany, Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Poland, Spain, Switzerland, South Africa, the United Kingdom, Uruguay, Japan and the United States of America were computed. Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental breed data were included in this evaluation.

Based on a decision made by Interbull Steering committee in August 2007, female fertility traits are classified as follows:

- T1 (HC): Maiden (H)eifer's ability to (C)onceive. A measure of confirmed conception, such as conception rate (CR), will be considered for this trait group. In the absence of confirmed conception an alternative measure, such as interval first-last insemination (FL), interval first insemination-conception (FC), number of inseminations (NI), or non-return rate (NR,preferably NR56) can be submitted;
- T2 (CR): Lactating (C)ow's ability to (R)ecycle after calving. The interval calving-first insemination (CF) is an example for this ability. In the absence of such a trait, a measure of the interval calving-conception, such as says oprn (DO) or calving interval (CI) can be submitted;
- T3 (C1): Lactating (C)ow's ability to conceive (1), expressed as a rate trait. Traits like conception rate (CR) and non-return rate (NR, preferably NR56) will be considered for this trait group;
- T4 (C2): Lactating (C)ow's ability to conceive (2), expressed as an interval trait. The interval first insemination-conception (FC) or interval first-last insemination (FL) will be considered for this trait group. As an alternative, number of inseminations (NI) can be submitted. In the absence of any of these traits, a measure of interval calving-conception such as days open (DO), or calving interval (CI) can be submitted. All countries are expected to submit data for this trait group, and as a last resort the trait submitted under T3 can be submitted for T4 as well.
- T5 (IT): Lactating cow's measurements of (I)nterval (T)raits calving-conception, such as days open (DO) and calving interval (CI).

Based on the above trait definitions the following traits have been submitted for international genetic evaluation of female fertility traits.

Country	Traits	Submitted traits and their definitions
AUS	T4=C2 T5=IT	Calving interval converted to 42 days pregnancy rate Calving interval converted to 42 days pregnancy rate
BEL	T2=CY T4=C2 T5=IT	PR=Pregnancy Rate ($=\frac{21}{(DO-45+11)}*100$, with DO=days open) PR=Pregnancy Rate ($=\frac{21}{(DO-45+11)}*100$, with DO=days open) PR=Pregnancy Rate ($=\frac{21}{(DO-45+11)}*100$, with DO=days open)
CAN	T1=HC T2=CY T3=C1 T4=C2 T5=IT	NR=Non Return Rate after 56 Days in heifers (NRR), % CF=Interval from Calving to First Service in cows(CF) NR=Non Return Rate after 56 Days in cows(NRR), % FC=Interval first insemination-conception in cows DO=Days open
CHE	T1=HC T2=CR T3=C1	CR=Heifers' Conception rate CF=Interval from Calving to First Service (ICF), days NR=Non Return Rate after 56 Days (NRR), %

	T4=C2	FL=Interval from first to last insemination cows
CZE	T1=HC	CR=Heifers' Conception rate (pregnant or not after 3 months)
	T3=C1	CR=Cows' Conception rate (pregnant or not after 3 months)
	T4=C2	CR=Cows' Conception rate (pregnant or not after 3 months)
AUT/DEU	T1=HC	NR=Heifers' Non Return Rate after 56 days
	T2=CY	CF=Interval from calving to first insemination cows (days)
	T3=C1	NR=Cows' Non Return Rate after 56 days
	T4=C2	FL=Interval from first to last insemination cows (days)
	T5=IT	DO=Days open (days)
DFS	T1=HC	CR=Heifers' Conception rate for maiden heifers
	T2=CY	CF=Interval from calving to first insemination cows (days)
	T3=C1	CR=Cows' conception rate for cows
	T4=C2	FL=Interval from first to last insemination cows (days)
	T5=IT	DO=Days open (days)
ESP	T2=CY	Interval from Calving to First Service (ICF)
	T3=C1	Conception rate
	T4=C2	Interval from first to last insemination (IFL)
	T5=IT	Sum of Interval to first to last insemination and interval from calving to first service (IFL+ICF)
FRA	T1=HC	CR=Heifers' Conception rate (binary trait) for maiden heifers
	T2=CY	Interval between calving and first AI
	T3=C1	CR=Cows' Conception rate (binary trait)
	T4=C2	FL=Interval from first to last insemination cows (days)
	T5=IT	FL=Interval from first to last insemination cows (days)
GBR	T2=CY	CI=days between 1st and 2nd calvings
	T3=C1	NR=1st lactation non return at 56 days
	T4=C2	CI=days between 1st and 2nd calvings
	T5=IT	CI=days between 1st and 2nd calvings
IRL	T2=CY	CI=Calving interval
	T4=C2	CI=Calving interval
	T5=IT	CI=Calving interval
ISR	T3=C1	CR=Inverse of the number of insemination to conception (%)
	T4=C2	CR=Inverse of the number of insemination to conception (%)
ITA	T1=HC	NR= non-return rate 56 days (heifers)
	T2=CY	CF=Days to first service
	T3=C1	NR=Non-return rate at 56 days (%)
	T4=C2	FL=Interval from first to last insemination cows (days)
	T5=IT	DO=days open (days)
ITA(BSW)	T2=CY	CF=Interval calving to first insemination
	T4=C2	Days Open
	T5=IT	CI=Calving interval
NLD	T1=HC	CR=Heifers' Conception rate
	T2=CY	CF=Interval calving to first insemination (days)
	T3=C1	CR=Cows' Conception rate (binary trait) for cows
	T4=C2	FL=Interval from first to last insemination cows (days)
	T5=IT	CI=Calving Interval (days)
NOR	T1=HC	NI=Number of inseminations (heifers)
	T2=CY	CF=Days from calving to first insemination (days)
	T3=C1	NI=Number of inseminations (cows)
	T4=C2	NI=Number of inseminations (cows)
	T5=IT	CF=Days from calving to first insemination (days)
NZL	T2=CY	PM=Lactating cow's ability to start cycling
	T4=C2	PC=Lactating cow's ability to conceive (CR42)
	T5=IT	PC=Lactating cow's ability to conceive (CR42)

POL T1=HC CR=Conception Rate (heifer)
T2=CR CF=Interval from calving to first insemination
T3=C1 CR=Conception Rate (cow)
T4=IT DO=Days open
T5=IT DO=Days open

URY T4=C2 Days open expressed as Daughter Pregnancy Rate
T5=IT Days open expressed as Daughter Pregnancy Rate

USA T1=HC CR=Conception rate (heifer)
T2=CY CF=Interval from calving to first insemination
T3=C1 CR=Conception rate (cow)
T4=C2 DP=Daughter Pregnancy Rate
T5=IT DP=Daughter Pregnancy Rate

ZAF T4=IT CI=Calving Interval
T5=IT CI=Calving Interval

JPN T1=HC CR=Heifers'Conception rate
T3=C1 CR=Cows'Conception rate
T4=C2 DO=Days open
T5=IT DO=Days open

CHANGES IN NATIONAL PROCEDURES

Changes in the national genetic evaluation of female fertility traits are as follows:

NOR (RDC) Genetic parameters have been updated. The rolling definition of hys (random) and herdX4yr (fixed) is causing the daughters to distribute somewhat differently over classes at each evaluation. Therefore some bulls occasionally may loose edc and reliability although number of daughters remain the same. If the oldest herdx4yr class is small, the data gets dropped. This cause a random loss of 1 to 2 daughters for old bulls, somewhat more if the daughter group was large.

DEU (ALL) Performance data: phenotypic data from 2000 onwards (used to be 1995 before), Pedigree: sire and maternal grandsire of animals having own performance mul5564st be known, Breed: breed of animal having own performance must be consistent with the breeds of parents. Therefore many bulls (especially older ones) have lost quite a number of daughters and in addition their remaining daughters have lost their observation as heifer. As a consequence many bulls (older ones) have changed publication status. Herd-years with uninformative NonReturn56, i.e., 100% NR56 ae excluded. Some traits are verified with the subsequent calving, e.g. interval first to last insemination, insemination dates must match with calving dates and result in reasonable gestation length. Thus there are always some bulls having number of herds/daughters/EDC decreased, being not publishable anymore or in case number of herds drop below 10 herds, bulls are even not sent anymore. Few bulls missing, as they have less than 10 herds now. Base change

NLD (ALL) Data edits for fertility, which result in a decrease in information for some bulls. Base change, now the cows born in 2015 are the base (it was 2010)

NZL (ALL) Results based on brand new models which are based on the most recent version of LICâ s genetic evaluation software based on a multiple trait models. The new multiple traits have caused a general drop in reliability. It contains a number of enhancements which result in more accurate genetic evaluations and reduces the time taken to compute genetic evaluations. Implementation of Parent Average Adjustment (PAA), changes to the daughter count for all traits. When the single trait models are combined into a multi trait BV the single trait daughter count that was the greatest (which is always the 2 year old daughter count)was taken into account. The old routine for Fertility and longevity were based on having a record for that trait or a production record, this is now change so that it is a count of that particular trait.

AUS (ALL) Pedigree corrections based on genotype information has caused drops in information. Changed the method for calculation of reliabilities

USA (ALL) Base change

POL (HOL) Base change

JPN (HOL) Small decrease in information due to additional records and modification of pedigree.

BEL (HOL) Some change in type of proof due to changes in pedigree information and the fact that the program that determines the type of proof for bulls is based on pedigree information

ISR (HOL) Small decrease in information due to pedigree corrections.

ITA (HOL) Base change plus cut off of 1 year of data causing decreases in information.

ITA (BSW) Base change applied a rolling base including a cow born between 15 an 12 year before the evaluation date.

DEA (BSW) Base change

POL (HOL) Decrease in information due to data edits

CHE (ALL) Base change, small drops in information due to manual editings. BSW: few bulls missing in this evaluation due to change in status of bulls.

CAN (ALL) Base change

FRA (ALL) Base change

URY (HOL) Base change

GBR (ALL) Drops in daughters due to minor data editings. For RDC some daughters of these bulls were duplicated with some of them having eartag numbers and herd book numbers. Data providers have now correctly eliminated the eartag numbers of these cows, so that only the herd-book numbers are now included. Base change

USA (ALL) Pedigree corrections and herd-year minimum edits causing drops in information

INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

Subsetting:

As decided by the ITC in Orlando, new subsetting was introduced in the september test run. Sub-setting is necessary for operational purposes and restrictions of time scales. To minimize the effect of subsetting, larger subsets with 10-12 countries and with 4 link providing countries have been applied.

Window:

According to the decision taken by ITC in Orlando, the following changes have been introduced in regards to the windows used for post processing:

The upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations. The lower values have been set to about the 25% percentile value. The largest changes are for the lower values for conformation traits, with the lowest window being 40% for OFL otherwise it is about 50% for all other confirmation traits. It is anticipated that these low values may not have large impact on evaluations since there were very few countries combinations whose estimated correlations fell between the old limit of 0.30 and these new limits.

The window so far applied for MAS evaluation have been found too high compared to the within-country genetic correlation between mastitis and SCS available from the literature. It has been an ITC recommendation to adjust the windows for MAS in this test run to make them more in line with the values available from the literature. The recommendation has been approved by the Steering committee. Also, according to the decision taken by ITC in Orlando (2015) to review all windows every five (5) years, an overall review of the windows for all traits will take place during the first half of 2020 with the aim of implementation set for the September 2020 test run.

DATA AND METHOD OF ANALYSIS

Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:
Schaeffer, 1994. J. Dairy Sci. 77:2671-2678
Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:
Klei et al., 2002. Interbull Bulletin 29:178-182.
Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:

Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:

Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219

Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:

Klei and Weigel, 1998, Interbull Bulletin 17:8-14

Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:

Mark et al., 2003, Interbull Bulletin 30:126-135

Jorjani et al., 2003. J. Dairy Sci. 86:677-679

<https://wiki.interbull.org/public/rG%20procedure?action=print>

Time edits

Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

International reliability estimation

Harris and Johnson. 1998. Interbull Bulletin 17:31-36

NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for the next routine evaluation can be found on

<http://www.interbull.org/ib/servicecalendar>.

NEXT TEST INTERNATIONAL EVALUATION

Dates for the next test run can be found on

<http://www.interbull.org/ib/servicecalendar>.

PUBLICATION OF INTERBULL ROUTINE RUN

Results were distributed by the Interbull Centre to designated representatives in each country. The international evaluation file comprised international proofs expressed on the base and unit of each country included in the analysis. Such records readily provide more information on bull performance in various countries, thereby minimizing the need to resort to conversions.

At the same time, all recipients of Interbull results are expected to honor the agreed code of practice, decided by the Interbull Steering Committee, and only publish international evaluations on their own country scale. Evaluations expressed on another country scale are confidential and may only be used internally for research and review purposes.

PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be published.

^LTable 1. National evaluation data considered in the Interbull evaluation for fertility (April Routine Evaluation 2020).
Number of records for lactating cow's ability to conceive (cc2) by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		141	8129	1769	729	
BEL			1865			

CAN	157	45	9273	536	544
CHE	2798		3356		
CZE			3794		
DEA	5508				
DEU			23736		285
DFS			16137	2391	9999
ESP			5395		
EST					
FRA	389		16446		
FRM					
GBR	96	239	6831	560	397
HUN					
IRL			2889	185	63
ISR			1449		
ITA	1796		9474		
JPN			5864		
KOR					
LTU					
LVA					
NLD	192		15484	166	81
NOR					2973
NZL	59	58	7981	4720	1368
POL			7606		
PRT					
SVK					
SVN					
URY			1619		
USA	1101	762	39175	4771	710
ZAF			1256	710	151
HRV					
MEX					
CAM					

No. Records	12096	1245	187759	15808	17300	
Pub. Proofs	11109	1023	151634	13316	17214	0

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

BSW hco

	CAN	DEA	FRA	USA	CHE	NLD
CAN	8.52					
DEA	0.85	9.79				
FRA	0.78	0.84	0.90			
USA	0.79	0.78	0.89	2.72		
CHE	0.92	0.95	0.88	0.88	13.13	
NLD	0.75	0.70	0.88	0.88	0.87	3.96

BSW crc

	CAN	CHE	DEA	NLD	NZL	USA	GBR	FRA	ITA
CAN	7.07								
CHE	0.85	11.36							
DEA	0.85	0.94	14.29						
NLD	0.87	0.88	0.87	3.94					
NZL	0.62	0.64	0.75	0.64	0.09				
USA	0.85	0.86	0.84	0.85	0.62	3.30			
GBR	0.74	0.76	0.75	0.79	0.64	0.84	3.84		
FRA	0.86	0.96	0.94	0.91	0.64	0.86	0.78	1.81	
ITA	0.85	0.85	0.84	0.85	0.69	0.84	0.79	0.86	17.74

BSW	cc1						
	CAN	CHE	DEA	NLD	USA	GBR	FRA
CAN	7.99						
CHE	0.79	11.77					
DEA	0.79	0.95	11.04				
NLD	0.75	0.71	0.67	4.20			
USA	0.75	0.68	0.67	0.89	2.83		
GBR	0.72	0.79	0.75	0.71	0.67	0.04	
FRA	0.72	0.69	0.67	0.92	0.91	0.70	0.96

BSW	cc2								
	CAN	CHE	DEA	NLD	NZL	USA	GBR	FRA	ITA
CAN	6.79								
CHE	0.74	11.10							
DEA	0.84	0.91	11.76						
NLD	0.88	0.82	0.85	3.57					
NZL	0.67	0.57	0.67	0.65	7.66				
USA	0.86	0.84	0.85	0.85	0.67	2.37			
GBR	0.84	0.79	0.86	0.84	0.71	0.85	3.84		
FRA	0.86	0.86	0.88	0.88	0.65	0.86	0.85	0.96	
ITA	0.85	0.69	0.85	0.85	0.60	0.88	0.81	0.85	23.05

BSW	int						
	CAN	DEA	NLD	NZL	USA	GBR	ITA
CAN	7.29						
DEA	0.88	13.65					
NLD	0.89	0.87	3.61				
NZL	0.64	0.71	0.67	7.39			
USA	0.93	0.87	0.87	0.63	2.37		
GBR	0.87	0.88	0.89	0.69	0.87	3.84	
ITA	0.88	0.93	0.88	0.68	0.89	0.88	17.91

GUE	crc				
	CAN	GBR	NZL	USA	AUS
CAN	7.59				
GBR	0.75	5.11			
NZL	0.61	0.64	0.11		
USA	0.84	0.88	0.62	3.25	
AUS	0.78	0.88	0.91	0.77	6.96

GUE	cc1		
	CAN	GBR	USA
CAN	7.52		
GBR	0.72	0.03	
USA	0.80	0.72	3.41

GUE	cc2				
	CAN	GBR	NZL	USA	AUS
CAN	6.92				
GBR	0.84	5.11			
NZL	0.65	0.71	7.66		
USA	0.86	0.85	0.67	2.63	
AUS	0.70	0.70	0.75	0.75	10.33

GUE	int				
	CAN	GBR	NZL	USA	AUS
CAN	7.82				
GBR	0.87	5.11			
NZL	0.62	0.67	7.66		
USA	0.92	0.87	0.63	2.63	
AUS	0.87	0.87	0.73	0.87	10.33

HOL	hco										
	CAN	CZE	DEU	DFS	FRA	USA	POL	CHE	NLD	ITA	JPN
CAN	7.88										
CZE	0.76	18.76									
DEU	0.92	0.78	15.26								
DFS	0.81	0.87	0.85	13.68							
FRA	0.82	0.88	0.82	0.88	0.84						
USA	0.84	0.88	0.85	0.89	0.89	2.38					
POL	0.69	0.88	0.70	0.86	0.85	0.86	19.40				
CHE	0.95	0.86	0.93	0.87	0.88	0.88	0.82	14.06			
NLD	0.77	0.88	0.78	0.87	0.88	0.88	0.85	0.87	4.69		
ITA	0.84	0.87	0.92	0.88	0.88	0.88	0.87	0.90	0.88	0.04	
JPN	0.84	0.74	0.79	0.74	0.77	0.83	0.68	0.84	0.73	0.73	6.27

HOL	crc													
	BEL	CAN	CHE	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	FRA
BEL	4.72													
CAN	0.72	7.08												
CHE	0.80	0.84	12.43											
DEU	0.72	0.85	0.88	11.07										
DFS	0.79	0.89	0.94	0.91	11.76									
ESP	0.87	0.85	0.90	0.88	0.90	11.16								
GBR	0.89	0.74	0.77	0.73	0.80	0.87	4.62							
IRL	0.87	0.72	0.72	0.72	0.72	0.87	0.87	3.47						
ITA	0.79	0.85	0.88	0.87	0.88	0.94	0.81	0.72	8.19					
NLD	0.81	0.87	0.93	0.90	0.96	0.88	0.79	0.72	0.86	5.07				
NZL	0.63	0.60	0.61	0.60	0.61	0.62	0.63	0.61	0.71	0.60	0.08			
USA	0.84	0.84	0.84	0.84	0.84	0.84	0.88	0.76	0.84	0.84	0.60	3.20		
POL	0.74	0.89	0.90	0.86	0.86	0.92	0.74	0.72	0.94	0.85	0.62	0.84	14.27	
FRA	0.76	0.86	0.94	0.92	0.94	0.91	0.80	0.72	0.91	0.94	0.62	0.84	0.88	1.19

HOL	cc1												
	CAN	CHE	CZE	DEU	DFS	FRA	GBR	ISR	ITA	NLD	USA	POL	JPN
CAN	6.64												
CHE	0.92	11.09											
CZE	0.81	0.75	18.02										
DEU	0.90	0.93	0.78	14.79									
DFS	0.74	0.72	0.89	0.75	13.28								
FRA	0.76	0.75	0.89	0.72	0.88	1.01							
GBR	0.72	0.77	0.71	0.78	0.67	0.70	0.03						
ISR	0.77	0.68	0.91	0.74	0.86	0.87	0.74	3.18					
ITA	0.87	0.88	0.76	0.95	0.69	0.70	0.77	0.75	0.05				
NLD	0.77	0.75	0.90	0.75	0.92	0.93	0.71	0.89	0.71	5.09			
USA	0.80	0.72	0.96	0.73	0.88	0.89	0.66	0.92	0.75	0.89	2.77		
POL	0.74	0.75	0.88	0.79	0.87	0.86	0.66	0.85	0.78	0.86	0.86	20.06	
JPN	0.77	0.69	0.89	0.70	0.83	0.80	0.70	0.82	0.70	0.81	0.90	0.67	7.69

HOL	cc2																			
	BEL	CAN	CHE	CZE	DEU	DFS	ESP	FRA	GBR	IRL	ISR	ITA	NLD	NZL	USA	POL	ZAF	AUS	URY	JPN

BEL	4.72																			
CAN	0.84	6.05																		
CHE	0.80	0.87	11.18																	
CZE	0.65	0.84	0.87	18.03																
DEU	0.83	0.93	0.91	0.89	13.44															
DFS	0.84	0.85	0.86	0.80	0.94	12.91														
ESP	0.85	0.87	0.83	0.80	0.91	0.85	11.15													
FRA	0.84	0.87	0.91	0.81	0.91	0.85	0.88	0.98												
GBR	0.89	0.84	0.74	0.65	0.83	0.84	0.86	0.83	4.62											
IRL	0.84	0.83	0.81	0.67	0.83	0.83	0.85	0.84	0.85	3.47										
ISR	0.55	0.64	0.65	0.83	0.76	0.71	0.70	0.67	0.58	0.62	3.18									
ITA	0.75	0.85	0.86	0.90	0.91	0.84	0.88	0.84	0.77	0.78	0.83	15.78								
NLD	0.84	0.89	0.89	0.84	0.95	0.91	0.88	0.91	0.84	0.84	0.74	0.85	4.82							
NZL	0.74	0.64	0.53	0.48	0.64	0.64	0.66	0.64	0.71	0.74	0.47	0.57	0.64	5.03						
USA	0.84	0.86	0.85	0.87	0.91	0.88	0.88	0.85	0.84	0.84	0.77	0.92	0.86	0.65	2.31					
POL	0.84	0.83	0.74	0.62	0.83	0.83	0.84	0.82	0.84	0.83	0.56	0.78	0.83	0.65	0.84	13.72				
ZAF	0.76	0.78	0.81	0.71	0.82	0.77	0.82	0.80	0.80	0.87	0.58	0.84	0.78	0.71	0.87	0.78	15.85			
AUS	0.71	0.70	0.74	0.64	0.71	0.66	0.72	0.72	0.71	0.87	0.58	0.71	0.67	0.70	0.75	0.63	0.83	8.27		
URY	0.84	0.81	0.68	0.60	0.81	0.81	0.82	0.81	0.85	0.84	0.49	0.65	0.82	0.76	0.83	0.86	0.77	0.68	1.43	
JPN	0.83	0.85	0.83	0.74	0.85	0.85	0.87	0.85	0.86	0.84	0.61	0.86	0.84	0.64	0.92	0.89	0.87	0.73	0.82	18.57

HOL int

	BEL	CAN	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	ZAF	AUS	URY	FRA	JPN			
BEL	4.72																			
CAN	0.87	6.53																		
DEU	0.87	0.89	12.32																	
DFS	0.90	0.91	0.94	12.85																
ESP	0.89	0.89	0.89	0.89	11.15															
GBR	0.89	0.87	0.87	0.89	0.88	4.62														
IRL	0.87	0.87	0.87	0.87	0.87	0.87	3.47													
ITA	0.87	0.89	0.90	0.90	0.93	0.87	0.87	20.71												
NLD	0.93	0.90	0.91	0.95	0.88	0.90	0.87	0.87	4.81											
NZL	0.75	0.61	0.59	0.59	0.63	0.72	0.74	0.66	0.64	5.03										
USA	0.87	0.93	0.91	0.89	0.91	0.87	0.87	0.93	0.87	0.60	2.31									
POL	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.90	0.87	0.68	0.87	13.71								
ZAF	0.87	0.87	0.87	0.87	0.87	0.87	0.89	0.89	0.87	0.72	0.89	0.87	15.86							
AUS	0.87	0.87	0.87	0.87	0.87	0.87	0.88	0.87	0.87	0.68	0.87	0.87	0.87	8.27						
URY	0.87	0.86	0.87	0.86	0.86	0.87	0.87	0.87	0.87	0.77	0.87	0.87	0.87	1.43						
FRA	0.79	0.85	0.78	0.79	0.84	0.71	0.78	0.80	0.79	0.52	0.82	0.69	0.79	0.73	0.62	0.98				
JPN	0.87	0.93	0.90	0.90	0.90	0.87	0.87	0.94	0.87	0.63	0.92	0.91	0.89	0.87	0.87	0.77	18.57			

JER hco

	CAN	DFS	USA	NLD																
CAN	8.06																			
DFS	0.76	17.51																		
USA	0.82	0.88	2.73																	
NLD	0.76	0.87	0.88	4.52																

JER crc

	CAN	DFS	GBR	NLD	NZL	USA	IRL													
CAN	6.64																			
DFS	0.87	13.58																		
GBR	0.73	0.85	4.05																	
NLD	0.87	0.91	0.77	4.23																
NZL	0.62	0.67	0.71	0.61	0.07															
USA	0.84	0.84	0.84	0.84	0.64	3.71														
IRL	0.74	0.73	0.87	0.73	0.62	0.75	2.00													

JER cc1

	CAN	DFS	GBR	NLD	USA
CAN	6.80				
DFS	0.72	15.58			
GBR	0.76	0.68	0.03		
NLD	0.76	0.91	0.70	4.07	
USA	0.74	0.89	0.67	0.89	2.90

JER cc2

	CAN	DFS	GBR	NLD	NZL	USA	ZAF	AUS	IRL
CAN	6.71								
DFS	0.86	15.69							
GBR	0.85	0.85	4.06						
NLD	0.89	0.89	0.85	3.65					
NZL	0.65	0.65	0.76	0.65	4.07				
USA	0.86	0.86	0.85	0.86	0.67	2.58			
ZAF	0.69	0.69	0.75	0.72	0.76	0.86	11.11		
AUS	0.67	0.66	0.67	0.67	0.70	0.69	0.75	6.34	
IRL	0.84	0.85	0.85	0.85	0.67	0.85	0.73	0.75	2.00

JER int

	CAN	DFS	GBR	NLD	NZL	USA	ZAF	AUS	IRL
CAN	6.46								
DFS	0.89	15.42							
GBR	0.87	0.88	4.06						
NLD	0.89	0.91	0.88	3.71					
NZL	0.63	0.60	0.75	0.60	4.07				
USA	0.89	0.88	0.87	0.87	0.65	2.58			
ZAF	0.87	0.87	0.87	0.86	0.73	0.87	11.11		
AUS	0.87	0.87	0.87	0.87	0.60	0.87	0.87	6.34	
IRL	0.86	0.86	0.85	0.87	0.46	0.86	0.84	0.87	2.00

RDC hco

	CAN	DEU	DFS	NOR	USA	NLD
CAN	7.55					
DEU	0.91	14.24				
DFS	0.79	0.80	12.33			
NOR	0.86	0.87	0.86	16.59		
USA	0.84	0.83	0.89	0.74	2.63	
NLD	0.75	0.77	0.88	0.72	0.88	5.02

RDC crc

	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	IRL
CAN	6.39								
DEU	0.85	9.98							
DFS	0.87	0.90	12.69						
GBR	0.76	0.74	0.76	4.16					
NOR	0.89	0.87	0.86	0.74	13.85				
NZL	0.63	0.62	0.61	0.65	0.65	0.11			
USA	0.84	0.84	0.84	0.82	0.85	0.76	3.40		
NLD	0.87	0.90	0.92	0.79	0.86	0.62	0.84	3.47	
IRL	0.73	0.73	0.74	0.87	0.74	0.63	0.76	0.73	2.67

RDC cc1

	CAN	DEU	DFS	GBR	NOR	NLD	USA
CAN	7.09						

DEU	0.90	13.47									
DFS	0.76	0.77	13.10								
GBR	0.72	0.78	0.72	0.03							
NOR	0.79	0.87	0.93	0.72	13.85						
NLD	0.78	0.78	0.91	0.71	0.78	4.26					
USA	0.84	0.74	0.88	0.67	0.77	0.89	2.63				

RDC cc2

	CAN	DEU	DFS	GBR	NOR	NZL	USA	ZAF	NLD	AUS	IRL
CAN	6.79										
DEU	0.92	10.94									
DFS	0.85	0.94	12.85								
GBR	0.85	0.84	0.85	4.17							
NOR	0.88	0.87	0.90	0.86	13.85						
NZL	0.65	0.65	0.65	0.69	0.66	6.78					
USA	0.88	0.90	0.86	0.85	0.86	0.72	2.36				
ZAF	0.70	0.82	0.74	0.72	0.70	0.73	0.85	17.69			
NLD	0.89	0.95	0.90	0.85	0.86	0.65	0.86	0.77	3.71		
AUS	0.68	0.70	0.66	0.70	0.66	0.70	0.71	0.76	0.67	7.60	
IRL	0.84	0.84	0.85	0.85	0.86	0.72	0.85	0.84	0.85	0.82	2.67

RDC int

	CAN	DEU	DFS	GBR	NOR	NZL	USA	ZAF	NLD	AUS	IRL
CAN	6.65										
DEU	0.89	10.79									
DFS	0.89	0.94	13.14								
GBR	0.87	0.87	0.88	4.17							
NOR	0.89	0.89	0.87	0.88	13.85						
NZL	0.68	0.58	0.59	0.68	0.63	6.78					
USA	0.92	0.90	0.88	0.87	0.87	0.71	2.37				
ZAF	0.87	0.87	0.87	0.87	0.90	0.71	0.88	17.69			
NLD	0.90	0.91	0.93	0.89	0.88	0.62	0.87	0.87	3.54		
AUS	0.87	0.87	0.87	0.87	0.88	0.69	0.87	0.88	0.87	7.60	
IRL	0.87	0.87	0.87	0.87	0.88	0.68	0.87	0.89	0.88	0.88	2.67

^LAPPENDIX II. Number of common bulls

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	DEA	FRA	USA	CHE	NLD
CAN	0	85	50	95	88	29
DEA	72	0	196	176	576	131
FRA	43	141	0	70	155	71
USA	85	134	52	0	195	46
CHE	72	482	114	159	0	84
NLD	26	123	58	42	79	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	NLD	NZL	USA	GBR	FRA	ITA
CAN	0	106	101	36	20	126	44	67	97
CHE	85	0	558	92	26	256	57	157	411
DEA	84	459	0	145	34	214	56	199	557
NLD	32	84	135	0	25	54	36	77	115
NZL	18	21	28	20	0	21	17	21	28

USA	118	223	166	49	18	0	58	92	163
GBR	38	40	38	27	13	50	0	44	62
FRA	56	114	145	62	17	62	34	0	173
ITA	81	346	430	92	21	115	41	130	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	DEA	NLD	USA	GBR	FRA
CAN	0	107	102	36	127	44	72
CHE	86	0	554	91	256	58	165
DEA	85	455	0	143	214	59	210
NLD	32	84	135	0	54	36	82
USA	119	223	166	49	0	60	97
GBR	39	42	40	27	52	0	48
FRA	61	121	156	68	68	39	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	DEA	NLD	NZL	USA	GBR	FRA	ITA
CAN	0	94	90	35	19	118	41	65	89
CHE	74	0	548	92	27	311	57	165	411
DEA	74	452	0	143	36	308	55	208	546
NLD	31	84	134	0	26	77	36	82	115
NZL	17	22	29	20	0	30	17	22	29
USA	106	289	271	66	26	0	68	117	210
GBR	34	40	38	27	13	60	0	46	62
FRA	56	121	155	68	18	82	37	0	185
ITA	73	346	424	92	22	147	41	141	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	DEA	NLD	NZL	USA	GBR	ITA
CAN	0	94	37	20	122	43	94
DEA	77	0	145	36	307	55	659
NLD	34	137	0	26	78	36	123
NZL	18	29	20	0	30	17	30
USA	110	271	69	26	0	68	228
GBR	36	38	27	13	60	0	63
ITA	77	558	102	23	162	41	0

GUE

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	GBR	NZL	USA	AUS
CAN	0	15	3	38	18
GBR	12	0	13	51	28
NZL	2	11	0	9	26
USA	37	48	7	0	19
AUS	13	22	24	16	0

GUE

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	GBR	USA
CAN	0	15	38
GBR	12	0	52
USA	37	49	0

GUE

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	GBR	NZL	USA	AUS
CAN	0	11	2	36	20
GBR	8	0	13	83	32
NZL	2	11	0	29	26
USA	34	84	28	0	61
AUS	16	26	26	57	0

GUE

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	GBR	NZL	USA	AUS
CAN	0	11	2	36	20
GBR	8	0	13	83	32
NZL	2	11	0	29	26
USA	34	84	28	0	61
AUS	16	26	26	57	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CZE	DEU	DFS	FRA	USA	POL	CHE	NLD	ITA	JPN
CAN	0	950	1975	1140	1187	2509	1050	782	1193	1610	1040
CZE	672	0	1635	1082	1132	1274	980	462	1317	1183	740
DEU	1507	1204	0	2260	2170	2618	1792	1065	2714	2432	1218
DFS	1030	681	1605	0	1548	1427	1111	677	1927	1539	885
FRA	861	671	1159	844	0	1560	1242	668	1824	1687	1073
USA	2842	980	1922	1211	896	0	1485	814	1622	2145	1335
POL	885	733	1471	839	768	1460	0	460	1267	1238	718
CHE	665	306	941	589	597	729	348	0	853	726	439
NLD	1146	1127	2307	1614	1161	1377	1069	823	0	1655	965
ITA	1326	799	1592	1157	937	1646	893	647	1339	0	1124
JPN	550	299	501	428	370	655	362	260	455	473	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	CHE	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	FRA
BEL	0	684	562	1104	772	813	792	487	761	1135	476	734	470	881
CAN	680	0	806	2120	1219	1361	1421	505	1655	1322	642	2655	945	1275
CHE	567	691	0	1103	678	660	694	395	716	867	395	866	413	672
DEU	1125	1559	973	0	2452	2014	2002	864	2516	3138	942	2858	1565	2399
DFS	708	1108	599	1696	0	1325	1459	720	1521	1947	786	1565	1005	1557
ESP	869	1110	604	1723	1103	0	1340	664	1556	1503	683	1586	938	1520
GBR	778	1478	630	1476	1097	1209	0	934	1535	1686	900	1779	837	1508
IRL	483	500	400	755	595	684	976	0	638	870	706	606	340	727
ITA	728	1374	641	1660	1154	1351	1176	564	0	1709	729	2273	1088	1687
NLD	1291	1279	837	2781	1683	1542	1448	820	1407	0	1007	1859	1126	1925
NZL	389	594	329	718	552	567	775	612	549	911	0	760	385	786

USA	693	3009	773	1999	1290	1299	1677	589	1684	1603	692	0	1338	1753
POL	379	774	303	1197	737	696	590	252	745	906	276	1259	0	1136
FRA	866	941	591	1285	829	1409	953	588	928	1198	470	990	665	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	CZE	DEU	DFS	FRA	GBR	ISR	ITA	NLD	USA	POL	JPN
CAN	0	808	983	2121	1224	1278	1491	98	1664	1332	2707	985	1166
CHE	693	0	452	1101	678	676	704	53	716	867	867	436	458
CZE	723	303	0	1636	1045	1120	930	97	1155	1298	1340	946	741
DEU	1557	968	1214	0	2451	2408	2053	140	2500	3124	2838	1691	1388
DFS	1111	599	687	1690	0	1565	1490	127	1521	1946	1568	1072	926
FRA	960	602	676	1302	845	0	1538	112	1697	1940	1756	1196	1193
GBR	1558	643	601	1519	1117	976	0	119	1586	1743	1874	886	1022
ISR	73	32	76	118	100	63	86	0	126	132	128	84	91
ITA	1387	640	805	1649	1153	951	1228	99	0	1706	2269	1137	1154
NLD	1290	837	1125	2766	1682	1224	1508	109	1404	0	1859	1222	1019
USA	3081	774	1030	1975	1290	1012	1790	119	1682	1603	0	1392	1504
POL	824	331	712	1390	827	720	639	60	803	1040	1329	0	705
JPN	647	294	331	576	484	429	519	42	533	532	784	374	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	CHE	CZE	DEU	DFS	ESP	FRA	GBR	IRL	ISR	ITA	NLD	NZL	USA	POL	ZAF	AUS	URY	JPN
BEL	0	674	562	540	1100	773	813	876	794	489	68	761	1137	476	886	461	325	696	317	483
CAN	668	0	795	966	2039	1194	1349	1232	1393	494	94	1616	1286	626	2800	914	436	1155	638	1080
CHE	567	676	0	452	1096	679	660	663	694	395	54	715	867	395	982	400	269	594	289	427
CZE	410	691	303	0	1636	1048	984	1114	920	438	97	1155	1301	514	1468	882	317	726	438	707
DEU	1119	1481	961	1208	0	2441	2017	2373	1994	862	141	2481	3095	940	3387	1517	546	1569	697	1319
DFS	708	1077	600	687	1680	0	1333	1553	1462	720	129	1518	1950	791	1957	978	500	1194	579	880
ESP	869	1084	604	761	1717	1110	0	1523	1343	665	115	1561	1509	687	1905	923	507	1089	590	1012
FRA	856	894	582	665	1242	814	1401	0	1501	730	115	1669	1907	791	2436	1116	475	1230	554	1136
GBR	778	1444	630	590	1456	1097	1210	939	0	935	120	1532	1688	902	2155	822	494	1321	596	968
IRL	483	482	400	312	748	595	684	585	976	0	87	637	873	708	770	332	332	712	344	421
ISR	42	69	32	76	117	100	90	62	85	69	0	126	134	98	153	80	57	93	73	89
ITA	726	1319	639	799	1616	1142	1350	907	1171	562	96	0	1697	730	2558	1059	476	1141	625	1096
NLD	1293	1238	837	1125	2713	1684	1546	1171	1448	821	109	1388	0	1010	2421	1094	494	1389	597	964
NZL	389	573	330	350	711	554	570	465	776	613	83	550	915	0	1049	376	353	1161	463	530
USA	772	3088	869	1090	2234	1423	1563	1271	1917	690	137	1785	2039	990	0	1341	624	1793	997	1816
POL	366	730	290	622	1135	712	679	641	572	241	52	714	866	267	1226	0	216	624	381	641
ZAF	267	397	217	203	417	362	458	325	429	287	38	374	408	282	595	144	0	467	304	398
AUS	595	1144	516	457	1129	831	861	814	1135	613	61	840	1183	1157	1746	426	404	0	592	826
URY	227	594	205	282	471	380	509	318	474	266	37	440	452	377	1216	281	251	449	0	506
JPN	289	532	252	283	485	418	449	366	444	254	32	449	448	248	671	299	248	408	240	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	ZAF	AUS	URY	FRA	JPN
BEL	0	677	1098	773	813	794	489	760	1143	476	886	460	325	696	317	876	483
CAN	673	0	2044	1202	1356	1402	500	1624	1307	632	2814	916	438	1163	644	1241	1084
DEU	1118	1490	0	2440	2016	1994	862	2481	3117	940	3384	1511	545	1569	697	2372	1319
DFS	708	1087	1679	0	1333	1462	720	1518	1960	791	1957	978	499	1194	579	1553	880
ESP	869	1100	1717	1110	0	1343	665	1560	1517	687	1902	923	506	1088	590	1522	1011
GBR	778	1457	1456	1097	1210	0	935	1532	1699	902	2155	822	493	1321	596	1501	968
IRL	483	490	748	595	684	976	0	637	876	708	770	332	332	712	344	730	421
ITA	726	1334	1617	1142	1349	1171	562	0	1708	730	2558	1057	476	1141	625	1669	1096
NLD	1305	1271	2750	1698	1567	1463	825	1405	0	1012	2437	1100	496	1395	603	1913	975

NZL	389	578	712	554	570	776	613	551	919	0	1049	376	352	1161	463	791	530
USA	772	3118	2234	1423	1563	1917	690	1785	2064	990	0	1339	623	1793	997	2436	1816
POL	366	735	1133	712	679	572	241	714	874	267	1226	0	216	624	381	1116	641
ZAF	267	403	417	362	458	429	287	374	410	282	595	144	0	466	304	475	397
AUS	595	1149	1129	831	861	1135	613	840	1194	1157	1746	426	404	0	592	1230	826
URY	227	602	471	380	509	474	266	440	458	377	1216	281	251	449	0	554	506
FRA	856	903	1242	814	1401	939	585	907	1181	465	1271	641	325	814	318	0	1136
JPN	289	534	485	418	449	444	254	449	454	248	671	299	248	408	240	366	0

JER

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS USA NLD

CAN	0	58	289	25
DFS	48	0	99	60
USA	272	79	0	53
NLD	18	56	51	0

JER

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS GBR NLD NZL USA IRL

CAN	0	63	130	28	144	328	8
DFS	50	0	132	96	116	114	40
GBR	128	121	0	72	194	190	63
NLD	24	91	65	0	65	69	27
NZL	144	90	197	58	0	255	111
USA	326	94	203	73	279	0	36
IRL	7	34	65	27	124	38	0

JER

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS GBR NLD USA

CAN	0	63	134	28	335
DFS	50	0	134	96	114
GBR	130	121	0	72	192
NLD	24	91	66	0	69
USA	333	94	204	73	0

JER

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS GBR NLD NZL USA ZAF AUS IRL

CAN	0	62	128	28	140	334	123	197	8
DFS	49	0	133	96	120	158	125	122	40
GBR	124	121	0	72	196	217	160	199	63
NLD	22	91	65	0	66	82	67	64	27
NZL	137	92	197	59	0	354	200	423	111
USA	327	124	236	88	425	0	295	464	42
ZAF	121	101	161	63	209	305	0	230	38
AUS	189	87	205	58	457	503	219	0	52
IRL	7	34	65	27	124	44	39	50	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	DFS	GBR	NLD	NZL	USA	ZAF	AUS	IRL
CAN	0	63	129	28	142	337	125	199	8
DFS	50	0	133	100	120	158	125	122	40
GBR	126	121	0	76	196	217	160	199	63
NLD	24	96	69	0	69	86	70	66	28
NZL	140	92	197	63	0	354	200	423	111
USA	332	124	236	93	425	0	295	464	42
ZAF	123	101	161	67	209	305	0	230	38
AUS	192	87	205	60	457	503	219	0	52
IRL	7	34	65	27	124	44	39	50	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	DEU	DFS	NOR	USA	NLD
CAN	0	9	147	6	90	5
DEU	9	0	45	13	15	10
DFS	151	36	0	114	143	48
NOR	5	12	91	0	61	33
USA	85	15	135	61	0	30
NLD	5	10	45	33	28	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	IRL
CAN	0	12	148	65	6	66	128	6	4
DEU	11	0	52	14	14	15	17	13	5
DFS	152	40	0	94	134	164	157	49	18
GBR	66	13	89	0	49	69	83	30	19
NOR	6	13	105	51	0	40	68	39	53
NZL	66	15	160	66	39	0	90	17	12
USA	124	17	152	79	69	93	0	34	26
NLD	6	13	47	29	39	17	32	0	11
IRL	4	5	13	18	52	12	26	11	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	DEU	DFS	GBR	NOR	NLD	USA
CAN	0	12	149	68	6	6	128
DEU	11	0	52	14	14	13	17
DFS	153	40	0	97	121	50	158
GBR	67	13	90	0	50	31	85
NOR	6	13	96	52	0	37	68
NLD	6	13	47	30	37	0	34
USA	124	17	153	80	69	32	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	DEU	DFS	GBR	NOR	NZL	USA	ZAF	NLD	AUS	IRL
CAN	0	12	144	61	5	64	148	72	5	67	4
DEU	11	0	51	14	14	15	18	3	13	39	5
DFS	148	40	0	94	121	165	176	57	50	190	18
GBR	62	13	89	0	48	72	95	41	30	72	19
NOR	5	13	96	50	0	39	70	0	37	59	53

NZL	64	15	161	68	38	0	115	40	17	134	12
USA	149	18	173	93	71	117	0	72	36	116	27
ZAF	76	3	55	39	0	38	67	0	3	42	3
NLD	5	13	47	29	37	17	34	3	0	24	11
AUS	67	38	166	70	49	134	117	43	22	0	16
IRL	4	5	13	18	52	12	27	3	11	15	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	DEU	DFS	GBR	NOR	NZL	USA	ZAF	NLD	AUS	IRL
CAN	0	12	146	62	6	65	150	72	7	68	4
DEU	11	0	51	14	14	15	18	3	13	39	5
DFS	150	40	0	94	134	165	177	57	50	190	18
GBR	63	13	89	0	49	72	95	41	31	72	19
NOR	6	13	105	51	0	40	70	0	40	63	53
NZL	65	15	161	68	39	0	115	40	17	134	12
USA	151	18	174	93	71	117	0	72	38	116	27
ZAF	76	3	55	39	0	38	67	0	3	42	3
NLD	7	13	47	30	40	17	36	3	0	24	11
AUS	68	38	166	70	53	134	117	43	22	0	16
IRL	4	5	13	18	52	12	27	3	11	15	0

SIM

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