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Cite as: T. Prabhakar Reddy et al., " A Method for Resetting the Target in Interrupted Twenty20 Cricket Match" pp.226-234, Journal of Physical Education and Sport Science ISSN 2229-7049, Vol. 2, 2014.

A METHOD FOR RESETTING THE TARGET IN INTERRUPTED TWENTY20 CRICKET MATCH

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ABSTRACT. Unpredictable game of the limited-over cricket brings with it excitement for the audience, expecting mayhem on the field. The huge expectation of audience to watch a good match may be ruined with an interruption due to bad weather or circumstances. Therefore, it is very much necessary to adjust the target score at the time of resumption of an interrupted match in a reasonable manner. Several mathematical models for resetting the target in interrupted one-day international (ODI) cricket matches are available in the literature; none of them is optimal for Twenty20 (T20) format to apply. The purpose of this note is to review the existing Rain Rules to reset the targets in an interrupted ODI cricket matches and to propose a method for resetting the targets in an interrupted T20 cricket match with suitable illustrative examples.

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1. Introduction

The Mathematical Modeling and Statistical analysis plays a pivot role in illustrating performances of players in various sports, cricket in particular. For instance, factors such as winning the toss and the home team advantages affecting the results of ODI games have been studied in the literature (Clarke (2003) and De Silva (1997)), while Kimber and Hansford (1993) proposed a nonparametric approach based on runs scored for assessing batting performance. Surprisingly, the methods of statistics are not only confined to post-match analysis but also useful in adjusting targets of interrupted cricket matches (also known as Rain Rules). Clarke (1988) used a dynamic programming model to calculate the expected score for games with rain interruptions, so that both teams have the same chance of winning the game. Duckworth and Lewis (1998) introduced a technique for revising the target for games that are shortened due to weather interruptions. The focus of the paper is to find a method to revise the target in an interrupted Twenty20 matches with suitable illustrations.

2. A Review of Existing Rain Rules.

Frank Duckworth and Tony Lewis (1998) proposed a method based on a Mathematical formulation designed to calculate an appropriate target for the team batting second (Team 2) in a limited overs match interrupted by weather or other circumstances, especially for One-day International Cricket Matches (ODI), since then it was adopted by the International Cricket Council (ICC) to address the problem of delayed ODI. To outline the basic idea of their method, consider the most common situation where two teams play a full length game along with 100% of the resources (50 overs, 10 wickets in hand) available to them. Team 2 simply has to beat Team 1's score, without adjustment. Now consider a game where Team 1 has an uninterrupted 50 over innings, but at some point in Team 2's innings it rains and ten overs are lost. Team 2 now only bats for a total 40 overs. This clearly hurts their chances of beating Team 1's score so an adjustment is need. The Duckworth/Lewis (D/L) method makes this adjustment based on the ratio of resources available to Team 2 to the resources available to Team 1. The resources lost depend on the number of overs and wickets remaining at the time of the interruption as shown in Figure 1 below.

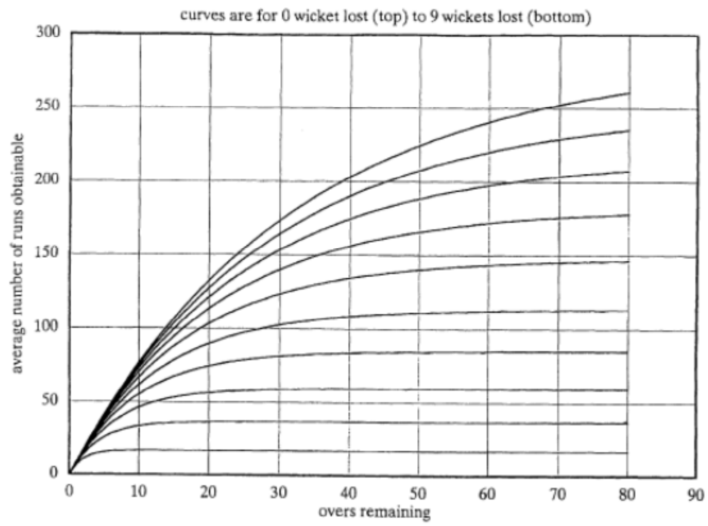

Figure 1 Average number of runs from overs remaining with wickets lost.

The D/L method may overcome a few disadvantages available in methods adopted by ICC prior to 1999 ODI matches. Most of them do not take account of the stage of the innings at which the overs are lost or of the number of wickets that have fallen. We now provide details of a few Pre-Duckworth/Lewis methods as follows:

1. Average run Rate(ARR)

The winning team is decided by the higher average number of runs per over that each team has had the opportunity to receive. It is a simple calculation but the major problem with this method is that it very frequently alters the balance of the match, usually in favor of the team batting second.

2. Most Productive Overs (MPO)

The target is determined for the overs the team batting second (Team 2) are to receive by totaling the same number of the highest scoring overs of Team 1. The process of determining the target involves substantial bookwork for match officials and the scoring pattern for Team 1 is a criterion in deciding the winner. We believe that it is only Team 1's total that should be used in setting the target and not the way by which it was obtained. The method strongly tends to favor Team 1. The most notorious example came in the 1992 Cricket World Cup, where the MPO method was used; in the simi-final between England and South Africa, rain stopped play for 12 minutes with South Africa needing 22 runs from 13 balls chasing England's 252/6 off 45 overs. The revised target left South Africa needing 21 runs from one ball, which was a reduction of only one run compared to a reduction of two overs and a preposterous target given that the maximum score from one ball is generally six runs. The D/L method avoids this flaw; in this match, the revised D/L target would have left South Africa four to tie or five to win from the final ball.

3. Discounted Most Productive overs (DMPO)

The total from the most productive overs is discounted by 0.5% for each over lost. This reduces slightly the advantage MPO gives to Team 1 but still has the same intrinsic weaknesses of that method.

4. Parabola (PARAB)

This method, by a young South African (do Rego), calculates a table of norms y, for over s of an innings, s, using the parabola $y = 7.46x - 0.059x^2$ to model, rather in appropriately since it has a turning point at about 63 overs, the diminishing return's nature of the relationship between average total runs scored and total number of overs available. The method is an improvement upon ARR but takes no account of the stage of the innings at which the overs are lost or of the number of wickets that have fallen.

5. Clark Curves (CLARK)

This method fully described on the Internet, attempts to correct for the limitations of the PARAB method. It defines six types of stoppage, three for each innings, for stoppages occurring before the innings. It applies different rules for each type of stoppage some of which, but not all, allow for wickets which have fallen. There are discontinuities between the revised target scores at the meeting points of two adjacent types of stoppage.

The objective of Duckworth and Lewis was to find a method that must follow criteria given below

1. It must be equally fair to both sides; that is the relative positions of the two teams should be exactly the same after the interruption as they were before it.
2. It must give sensible results in all conceivable situations.
3. It should be independent of Team 1's scoring pattern, as indeed is the target in an uninterrupted game.
4. It should be easy to apply, requiring no more than a table of numbers and a pocket calculator.
5. It should be easy to understand by all involved in the game, players, officials, spectators and reporters.

Citing reasons of commercial confidentiality, Duckworth and Lewis have provided only partial information concerning the construction of the resources table. However, they do disclose that the table entries are based on the estimation of the 20 parameters $Z_0(w)$ and $b(w)$, $w = 0,1,\ldots,9$ corresponding to the average total score function

$$Z(u) = Z_0[1 - \exp(-bu)],$$

Where Z_0 is the asymptotic average total score in unlimited overs (but under ODI rules) and b is the exponential decay constant.

The next stage of development of a suitable two-factor relationship to revise the above equation for when w wickets have already been lost but u overs are still left to be received. The asymptote will be lower and the decay constant will be higher and both will be functions of w. The revised relationship is of the form

$$Z(u) = Z_0(w)[1 - \exp(-b(w)u)],$$

Where $Z_0(w)$ is the asymptotic average total score from the last $10 - w$ wickets in unlimited overs and $b(w)$ is the exponential decay constant, both of which depend on the number of wickets already lost.

For 50-over matches, each team must face at least 20 overs before D/L can decide the game, unless one or both sides have been bowled out in less than 20 overs and/or the team batting second has reached its target in less than 20 overs. If these prerequisites are not met, the match is declared a no result.

The D/L method has been criticized on the grounds that wickets are a much more heavily weighted resource than overs, leading to the suggestion that if teams are chasing big targets, and there is the prospect of ran, a winning strategy could be to not lose wickets and score at what would seem to be a losing rate. Another criticism is that the D/L method does not account for changes in proportion of the innings for which field restrictions are in place compared to a completed match. More common informal criticism from cricket fans and journalist of the D/L method is that it is overly complex and can be misunderstood.

. **V. Jayadevan(VJD) Method**

In 2011 World Cup, where D/L method was used; in the match between Sri Lanka and Australia, the match was called off: Sri Lanka, after choosing to bat, was 146 for 3 in 32.5 overs, going at a run-rate of 4.44. Considering the pitch was offering turn and bounce, Sri Lanka was arguably ahead on points at that stage. Not a ball was bowled after that, the rains eased up later, allowing two more hours of play - Sri Lanka's innings would have been curtailed at the point of interruption and Australia would have got 30 overs in which to chase a revised target. An upward revision is clearly needed since it's assumed that Sri Lanka paced their innings expecting it to last 50 overs. The revised target according to the D/L method left Australia 199 to win in 30 overs at an asking rate of 6.63 runs per over, almost 50% more than Sri Lanka’s run rate at the time of the interruption.

An alternative to the D/L method, which has been adopted in Indian domestic cricket, is the V. Jayadevan system, devised by an engineer from Kerala. According to this method, Australia's target would have been 185, which is a required run rate of 6.17. The difference between the two targets is 14 runs, which is significant in a 30-over innings. It's debatable as to which is the fairer target, but the VJD method has shown itself to be an alternative that deserves close scrutiny (see [7]).

The Comparison of D/L and VJD methods in ODIs

Scenario	D/L Target	VJD target
Team A 60 for 0 in 20 overs, innings terminated. Target for Team B in 20	147	121
Team A 100 for 0 in 20 overs, innings terminated.Target for Team B in 20	158	165
Team A 130 for 0 in 20 overs, innings terminated. Target for team B in 20	174	194

The D/L method has come in for criticism especially for its handling of situations in Twenty20 games. Paul Collingwood was vocal in his criticism after England were beaten by West Indies in successive World Twenty20s, as in World Twenty20, 2010, England's score of 191 in 20 turned out to be a losing one after D/L decided that West Indies' revised target in six overs was 60 (they were 30 without loss in 2.2 overs, 11 ahead of the par score, at the time of the interruption). VJD's method would have given a revised target of 62, which wouldn't have helped England's cause much, suggesting that VJD Method is better than D/L Method.

The Comparison of D/L and VJD methods in T20 format

Scenario	D/L Target	VJD target
Team A 41 for 0 in 7 overs, innings terminated. Target for Team B in 7	64	59
Team A 50 for 0 in 7 overs, innings terminated. Target for Team B in 7	65	67
Team A 35 for 0 in 6 overs, innings terminated. Target for team B in 6	56	51
Team A 50 for 0 in 6 overs, innings terminated. Target for Team B in 6	60	65
Team A 50 for 0 in 7 overs, innings terminated. Target for Team B in 7	65	67
Team A 50 for 0 in 8 overs, innings terminated. Target for Team B in 7	64	61

3. Rain Rules for Twenty-Twenty Cricket Matches

A full-length game of Twenty20 (T20) cricket consists of each team sequentially batting for an innings of 120 balls, divided in 20 “overs” of six balls each. In contrast to the ODI, T20 matches have completion times that are comparable to other popular team sports. The D/L resource table (Standard Edition) for T20 can be constructed in which the entries are obtained by dividing the corresponding entry in Table 1 by 0.566 (the resources remaining in a one-day match where twenty overs are available and zero wickets taken).

Although T20 cricket is similar to one-day cricket, there exist subtle variations in the rules between the two versions of cricket. The variations in the rules, and most importantly, the reduction of overs from 50 to 20 suggest that scoring patterns in T20 may differ from the one-day game. In particular, T20 is seen as a more explosive game where the ability to score 4’s and 6’s is more highly valued than in one-day cricket. Since the D/L method are based on the scoring patterns in one-day cricket, it is therefore reasonable to ask whether the D/L method appropriate for T20. In [1], R. Bhattacharya et al. proposed a nonparametric approach based on Gibbs sampling as a probable alternative to D/L method to T20.

Instead of revising the existing D/L resource table by dividing the corresponding entry in Duckworth-Lewis Resource Table 1 (Standard Edition) by 0.566 to suit T20 format, we can still use the same resource table for a T20 matches. Since the T20 format is 2.5 times shorter than a 50-over match, it is reasonable to convert the resources (runs scored and overs consumed, keeping wickets lost unchanged) at the time of interruption in a T20 match into a 50-over match by multiplying them by 2.5, thereby we can use the existing D/L method (or VJD method) devised for a 50-over match to reset the targets which suits 50-over match. We now can find the adjusted target to the original interrupted T20 match by dividing the obtained target (runs and overs remaining) by 2.5.

The current rules of ICC to implement D/L method to a T20 match, each team must face at least five overs before D/L can decide the game, unless one or both sides have been bowled out in less than five overs and/or the team batting second has reached its target in less than five overs. If these prerequisites are not met, the match is declared a no result. However, these pre-requisites are criticized by experts and players in several occasions. For instance, Pakistan’s former leg-spinner Abdul Qadir said one needs to revisit the system and its use in the shortest version of the game.
"To decide any match on the basis of five overs was a farce like it happened in the Sri Lanka and Zimbabwe and the England and West Indies matches (in T20 World Cup, 2010)," Qadir said.

To implement the method proposed herein, we need to adjust five over restriction (of ICC) to eight overs as 2.5 times eight is “20 overs”, a restriction in a 50-over match adopted by ICC.

To explain our method we consider England and West Indies match in T20 World Cup, 2010. Team 1 (England) has scored 191 from its allocation of 20 overs in an uninterrupted innings. Team 2 (West Indies) has received 2.2 overs and scored 30 without loss of a wicket. Then play is suspended and 11.4 overs are lost. Number of overs at start of match, N=20. Converting these values into 50-over format by multiplying with 2.5, we get Team 1 score will be 477.5 (rounded to 478) in 50-overs, Team 2’s score will be 75/0 in 5.5 overs.

We now apply D/L method to calculate revised target to this adjusted score as follows:

Team 1’s innings was uninterrupted, so its resource percentage available, R1=100%,

Resource percentage available to Team 2 at start of innings = 100%,

Resource Percentage remaining at suspension (18.4 x 2.5 = 46 overs, 0 wickets lost) = 96.1%

Resource percentage remaining at resumption (6 x 2.5 =15 overs, 0 wickets lost) = 45.2 %,

Resource percentage lost due to suspension = 96.1 – 45.2 = 50.9%,

Resource percentage available to Team 2 = R2 = 100-50.9 = 49.1 %,

R2 is less than R1; S=478.

Team 2's revised target is $T = S \times \frac{R2}{R1} + 1 = 478 \times \frac{49.1}{100} + 1 = 235.698$, approximately 236 runs, and it needs a further 236-75 = 161 runs from 15 overs.

We now convert the revised target 161 runs in 15 overs to T20 scenario by dividing these values with 2.5 we get 64 runs in 6 overs

Therefore, our method would have given a revised target of 64 runs to score in six over left, better than D/L and VJD's revised targets 60 and 62 respectively. If we implement our method along with VJD's instead of D/L's method then the revised target will be 68 runs to score in six over, seems to be much more reasonable.

4. Conclusion

In this paper we have proposed a method of finding targets in an interrupted Twenty20 match using the existing Rain Rules along with an illustration. Our method can also be applicable to several other type of interrupted matches in which interruption may occur in the first innings or in the second innings of a match.

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Abbreviated version of Duckworth-Lewis Resource Table 1 (Standard Edition) is given below. The table entries indicate the percentage of resources remaining in a match with the specified number of wickets lost and over available.

	Wickets Lost									
Overs Available	0	1	2	3	4	5	6	7	8	9
50	100.0	93.4	85.1	74.9	62.7	49.0	34.9	22.0	11.9	4.7
40	89.3	84.2	77.8	69.6	59.5	47.6	34.6	22.0	11.9	4.7
30	75.1	71.8	67.3	61.6	54.1	44.7	33.6	21.8	11.9	4.7
25	66.5	63.9	60.5	56.0	50.0	42.2	32.6	21.6	11.9	4.7
20	56.6	54.8	52.4	49.1	44.6	38.6	30.8	21.2	11.9	4.7
10	32.1	31.6	30.8	29.8	28.3	26.1	22.8	17.9	11.4	4.7
5	17.2	17.0	16.8	16.5	16.1	15.4	14.3	12.5	9.4	4.6
1	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.4	3.2	2.5
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The Duckworth-Lewis Resource Table 1 (Standard Edition) is given below. The table entries indicate the percentage of resources remaining in a match with the specified number of wickets lost and over available

OVERS LEFT	WICKETS LOST 0	1	2	3	4	5	6	7	8	9	OVERS LEFT
50	100.0	93.4	85.1	74.9	62.7	49.0	34.9	22.0	11.9	4.7	50
49	99.1	92.6	84.5	74.4	62.5	48.9	34.9	22.0	11.9	4.7	49
48	98.1	91.7	83.8	74.0	62.2	48.8	34.9	22.0	11.9	4.7	48
47	97.1	90.9	83.2	73.5	61.9	48.6	34.9	22.0	11.9	4.7	47
46	96.1	90.0	82.5	73.0	61.6	48.5	34.8	22.0	11.9	4.7	46
45	95.0	89.1	81.8	72.5	61.3	48.4	34.8	22.0	11.9	4.7	45
44	93.9	88.2	81.0	72.0	61.0	48.3	34.8	22.0	11.9	4.7	44
43	92.8	87.3	80.3	71.4	60.7	48.1	34.7	22.0	11.9	4.7	43
42	91.7	86.3	79.5	70.9	60.3	47.9	34.7	22.0	11.9	4.7	42
41	90.5	85.3	78.7	70.3	59.9	47.8	34.6	22.0	11.9	4.7	41
40	89.3	84.2	77.8	69.6	59.5	47.6	34.6	22.0	11.9	4.7	40
39	88.0	83.1	76.9	69.0	59.1	47.4	34.5	22.0	11.9	4.7	39
38	86.7	82.0	76.0	68.3	58.7	47.1	34.5	21.9	11.9	4.7	38
37	85.4	80.9	75.0	67.6	58.2	46.9	34.4	21.9	11.9	4.7	37
36	84.1	79.7	74.1	66.8	57.7	46.6	34.3	21.9	11.9	4.7	36
35	82.7	78.5	73.0	66.0	57.2	46.4	34.2	21.9	11.9	4.7	35
34	81.3	77.2	72.0	65.2	56.6	46.1	34.1	21.9	11.9	4.7	34
33	79.8	75.9	70.9	64.4	56.0	45.8	34.0	21.9	11.9	4.7	33
32	78.3	74.6	69.7	63.5	55.4	45.4	33.9	21.9	11.9	4.7	32
31	76.7	73.2	68.6	62.5	54.8	45.1	33.7	21.9	11.9	4.7	31
30	75.1	71.8	67.3	61.6	54.1	44.7	33.6	21.8	11.9	4.7	30
29	73.5	70.3	66.1	60.5	53.4	44.2	33.4	21.8	11.9	4.7	29
28	71.8	68.8	64.8	59.5	52.6	43.8	33.2	21.8	11.9	4.7	28
27	70.1	67.2	63.4	58.4	51.8	43.3	33.0	21.7	11.9	4.7	27
26	68.3	65.6	62.0	57.2	50.9	42.8	32.8	21.7	11.9	4.7	26
25	66.5	63.9	60.5	56.0	50.0	42.2	32.6	21.6	11.9	4.7	25
24	64.6	62.2	59.0	54.7	49.0	41.6	32.3	21.6	11.9	4.7	24
23	62.7	60.4	57.4	53.4	48.0	40.9	32.0	21.5	11.9	4.7	23
22	60.7	58.6	55.8	52.0	47.0	40.2	31.6	21.4	11.9	4.7	22
21	58.7	56.7	54.1	50.6	45.8	39.4	31.2	21.3	11.9	4.7	21
20	56.6	54.8	52.4	49.1	44.6	38.6	30.8	21.2	11.9	4.7	20
19	54.4	52.8	50.5	47.5	43.4	37.7	30.3	21.1	11.9	4.7	19
18	52.2	50.7	48.6	45.9	42.0	36.8	29.8	20.9	11.9	4.7	18
17	49.9	48.5	46.7	44.1	40.6	35.8	29.2	20.7	11.9	4.7	17
16	47.6	46.3	44.7	42.3	39.1	34.7	28.5	20.5	11.8	4.7	16
15	45.2	44.1	42.6	40.5	37.6	33.5	27.8	20.2	11.8	4.7	15
14	42.7	41.7	40.4	38.5	35.9	32.2	27.0	19.9	11.8	4.7	14
13	40.2	39.3	38.1	36.5	34.2	30.8	26.1	19.5	11.7	4.7	13
12	37.6	36.8	35.8	34.3	32.3	29.4	25.1	19.0	11.6	4.7	12
11	34.9	34.2	33.4	32.1	30.4	27.8	24.0	18.5	11.5	4.7	11
10	32.1	31.6	30.8	29.8	28.3	26.1	22.8	17.9	11.4	4.7	10
9	29.3	28.9	28.2	27.4	26.1	24.2	21.4	17.1	11.2	4.7	9
8	26.4	26.0	25.5	24.8	23.8	22.3	19.9	16.2	10.9	4.7	8
7	23.4	23.1	22.7	22.2	21.4	20.1	18.2	15.2	10.5	4.7	7
6	20.3	20.1	19.8	19.4	18.8	17.8	16.4	13.9	10.1	4.6	6
5	17.2	17.0	16.8	16.5	16.1	15.4	14.3	12.5	9.4	4.6	5
4	13.9	13.8	13.7	13.5	13.2	12.7	12.0	10.7	8.4	4.5	4
3	10.6	10.5	10.4	10.3	10.2	9.9	9.5	8.7	7.2	4.2	3
2	7.2	7.1	7.1	7.0	7.0	6.8	6.6	6.2	5.5	3.7	2
1	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.4	3.2	2.5	1
0	0	0	0	0	0	0	0	0	0	0	0

The Duckworth-Lewis Resource Table 2 (Standard Edition) scaled for Twenty20 (by dividing each entry from 0 to 20 over in Table 1 by 0.566). The table entries indicate the percentage of resources remaining in a match with the specified number of wickets lost and over available.

Wickets Lost

Overs Available	0	1	2	3	4	5	6	7	8	9
20	100.0	96.8	92.6	86.7	78.8	68.2	54.4	37.5	21.3	8.3
19	96.1	93.3	89.2	83.9	76.7	66.6	53.5	37.3	21.0	8.3
18	92.2	89.6	85.9	81.1	74.2	65.0	52.7	36.9	21.0	8.3
17	88.2	85.7	82.5	77.9	71.7	63.3	51.6	36.6	21.0	8.3
16	84.1	81.8	79.0	74.7	69.1	61.3	50.4	36.2	20.8	8.3
15	79.9	77.9	75.3	71.6	66.4	59.2	49.1	35.7	20.8	8.3
14	75.4	73.7	71.4	68.0	63.4	56.9	47.7	35.2	20.8	8.3
13	71.0	69.4	67.3	64.5	60.4	54.4	46.1	34.5	20.7	8.3
12	66.4	65.0	63.3	60.6	57.1	51.9	44.3	33.6	20.5	8.3
11	61.7	60.4	59.0	56.7	53.7	49.1	42.4	32.7	20.3	8.3
10	56.7	55.8	54.4	52.7	50.0	46.1	40.3	31.6	20.1	8.3
9	51.8	51.1	49.8	48.4	46.1	42.8	37.8	30.2	19.8	8.3
8	46.6	45.9	45.1	43.8	42.0	39.4	35.2	28.6	19.3	8.3
7	41.3	40.8	40.1	39.2	37.8	35.5	32.2	26.9	18.6	8.3
6	35.9	35.5	35.0	34.3	33.2	31.4	29.0	24.6	17.8	8.1
5	30.4	30.0	29.7	29.2	28.4	27.2	25.3	22.1	16.6	8.1
4	24.6	24.4	24.2	23.9	23.3	22.4	21.2	18.9	14.8	8.0
3	18.7	18.6	18.4	18.2	18.0	17.5	16.8	15.4	12.7	7.4
2	12.7	12.5	12.5	12.4	12.4	12.0	11.7	11.0	9.7	6.5
1	6.4	6.4	6.4	6.4	6.4	6.2	6.2	6.0	5.7	4.4

A nonparametric resource table for Twenty20 based on Gibbs sampling developed by R. Bhattacharya (see [1]). The table entries indicated the percentage of resources remaining in a match with the specified number of wickets lost and overs available.

Wickets Lost

Overs Available	0	1	2	3	4	5	6	7	8	9
20	100.0	96.9	93.0	87.9	81.3	72.2	59.9	44.8	29.7	17.6
19	95.6	90.9	87.7	83.0	76.9	68.3	56.5	42.0	27.2	15.3
18	91.7	86.7	82.9	78.7	73.2	65.4	54.2	40.2	25.7	13.9
17	87.7	82.3	78.9	73.8	69.7	62.8	52.2	38.7	24.6	12.8
16	83.5	78.2	75.3	70.5	66.4	60.2	50.3	37.4	23.5	12.0
15	79.2	74.3	70.9	66.9	62.6	57.4	48.4	36.2	22.7	11.2
14	75.1	70.7	67.3	63.7	59.3	54.6	46.4	35.0	21.8	10.5
13	71.5	67.4	63.6	60.3	56.2	51.5	44.3	33.8	21.0	9.8
12	68.3	63.7	60.2	56.8	52.9	47.5	41.9	32.6	20.2	9.1
11	65.0	59.9	56.6	53.3	49.7	43.9	39.3	31.3	19.4	8.5
10	61.3	56.0	52.6	50.1	46.0	40.8	36.1	30.0	18.6	7.9
9	57.9	52.3	47.9	46.1	42.5	37.8	33.1	28.3	17.7	7.2
8	54.0	48.3	44.3	41.7	38.9	34.9	30.2	26.1	16.7	6.6
7	49.3	44.2	40.2	37.4	35.4	32.1	27.2	23.4	15.7	5.9
6	41.7	38.5	35.7	33.0	31.7	29.0	24.2	20.0	14.5	5.2
5	36.2	33.4	31.0	28.6	27.3	25.5	21.5	17.0	12.2	4.4
4	30.8	28.0	26.1	24.1	22.4	20.7	18.3	14.2	10.0	3.5
3	25.4	22.8	21.1	19.4	17.7	16.5	14.4	11.6	7.9	2.5
2	19.7	17.2	15.5	14.1	12.7	11.9	10.6	9.3	6.2	1.6
1	13.7	11.3	9.7	8.5	7.3	6.7	6.0	5.2	4.2	0.9