Statistical Modeling of Height and Weight Effects on the Performance of the Top Fifty Bowlers In T-20 International Cricket

Qamruz Zaman[*a], Muhammad Dawood Shah[b], Nisar Ullah[c], Mujeeb Hussain[d], Sofia[e], Syed Habib Shah[f], Neelam[g]

[a,b,g]Department of Statistics, University of Peshawar, Pakistan. [c]Government Degree College, Banda Daud Shah Karak, Pakistan. [d]Government College Peshawar, Pakistan. [e]College of Home Economics, University of Peshawar, Pakistan. [f]Institute of Numerical Sciences Kohat University of Science

[*]**Email:** cricsportsresearchgroup@gmail.com

Abstract: This study investigates the impact of height and weight on the performance of the top fifty T-20 International Cricket bowlers. Using a dataset of performance metrics, heights, and weights collected from ESPN Cricinfo, MRFTyer (ICC Ranking), and Cricbuzz, the research employs various statistical techniques, including descriptive statistics, chi-square tests, odds ratios, and distributions such as geometric and Poisson.The analysis aims to uncover how these physical attributes influence a bowler's effectiveness in the T-20 format. The findings support existing research that highlights the role of height and weight in enhancing a bowler's ability to generate bounce and movement, which are critical for success. Additionally, the study explores how weight affects aspects such as bowling economy and wicket-taking capabilities, linking body composition to overall performance.The results provide valuable insights for coaches, analysts, and players, improving understanding of factors that contribute to success in T-20 cricket. The study also offers implications for talent identification, player development, and strategic planning within the sport.

Keywords: Bowling Performance, Height and Weight, T-20 International Cricket, Statistics and Metrics ,Economy Rate, Strike Rate.

1. Introduction

Statistics are crucial in various fields, including cricket, where they help analyze player and team performance (Perera,2008). Key metrics for bowlers include the number of wickets taken, economy rate, strike rate, and bowling average. The economy rate reflects how many runs a bowler concedes per over, while the strike rate shows the average number of balls bowled per wicket. Other important metrics are fielding percentage, win percentage, and head-to-head records.

Different formats of cricket—such as Twenty20 (T20), One Day Internationals (ODI), and Test matches—require distinct analytical approaches. Performance can be influenced by factors like pitch conditions, weather, and opposition strength. Advanced analytics, such as expected wickets and runs, further enrich the assessment of a bowler's effectiveness (Gregory et.al. 2017).

Cricket, a globally popular sport, involves two teams of eleven players each. The game's formats, particularly T20 cricket, have gained significant attention since its introduction in 2005. This research focuses on the impact of physical characteristics, such as height and weight, on bowlers' performance in T20 cricket. The study aims to evaluate how these factors influence performance and identify the top-performing bowlers (Lewis, 2005).

Table 1.1: Fast and medium bowlers'classification.

Type	Km/h	Mph
Fast	≥ 141	≥ 88
Fast-Medium	130-140	81-88
Medium-Fast	120-129	75-80
Medium	100-119	62-74

In T20 International cricket, bowlers are restricted to a single bounce before the ball reaches the batsman and are limited to four overs per match, necessitating the use of at least five bowlers per innings. The initial six overs, known as the Power Play, impose fielding restrictions, allowing only two fielders outside the 30-yard circle and a maximum of five on the leg side(Mukherjee, 2014). Bowling types in cricket are primarily categorized into fast and spin. Fast bowlers are identified by their speed and are further classified into medium-fast and medium-slow categories, while spin bowlers are grouped together for simplicity.

Table 1.2: Bowling Styles

Bowling Type	Bowling Style	Description
Fast	Raf	Right-arm fast
	Laf	Left-arm fast
	Rafm	Right-arm fast medium
	Lafm	Left-arm fast medium
Medium	Ram	Right-arm medium
	Lam	Left-arm medium
	Ramf	Right-arm medium fast
	Lamf	Left-arm medium fast
Spin	Lb/leg	Legbreak
	Lbg/lg	Legbreak googly
	Raob/rao	Right-arm offbreak
	Ralb	Right-arm legbreak
	Laob	Left-arm offbreak
	Slao/laos	Slow left-arm
		Orthodox/left-arm
		Orthodox spin
	Slac	Slow left-arm chinaman
	Lag	Left-arm googly

In cricket, when a batsman is dismissed, it is referred to as losing a wicket, and once all ten batsmen are out, the team is considered "all out." Assessing a bowler's performance involves considering factors like experience, playing conditions, and statistical analysis, such as regression, to explore how physical attributes like height and weight impact their performance in T20 cricket. Tracking performance trends and using advanced models can further evaluate a bowler's effectiveness (Lourens, 2009). This study focuses on the T20 format and seeks to understand the influence of height and weight on a bowler's performance, offering valuable insights for team selection.

2. Methodology and Data
The study's data were sourced from official websites such as ESPN Cricinfo, MRFT yers (ICC Ranking), and Cricbuzz. The analysis focuses on the top 50 bowlers in T20 international cricket, as ranked by the International Cricket Council (ICC) (Hughes, 2002). Key data includes each bowler's height, weight, and other performance metrics like average wickets taken. To evaluate bowlers' performance in terms of wicket-taking, the study will use Geometric and Poisson probability distributions. The Geometric distribution will model the number of deliveries required to achieve the first wicket, while the Poisson distribution will assess the number of wickets taken within a specified period (over).

2.1 Geometric Distribution

The geometric distribution is a discrete probability distribution used to model the number of failures before achieving a first success in a series of Bernoulli trials(Weinberg, 1998). Each trial has two possible outcomes: success or failure. The distribution is employed when trials are repeated until the first success occurs. In practical terms, it is used to determine the probability of the number of attempts needed to achieve the initial success. In this research, a successful outcome is defined as a bowler taking a wicket. The probability distribution function (PDF) of the geometric distribution provides the likelihood of obtaining this first wicket after a certain number of deliveries.

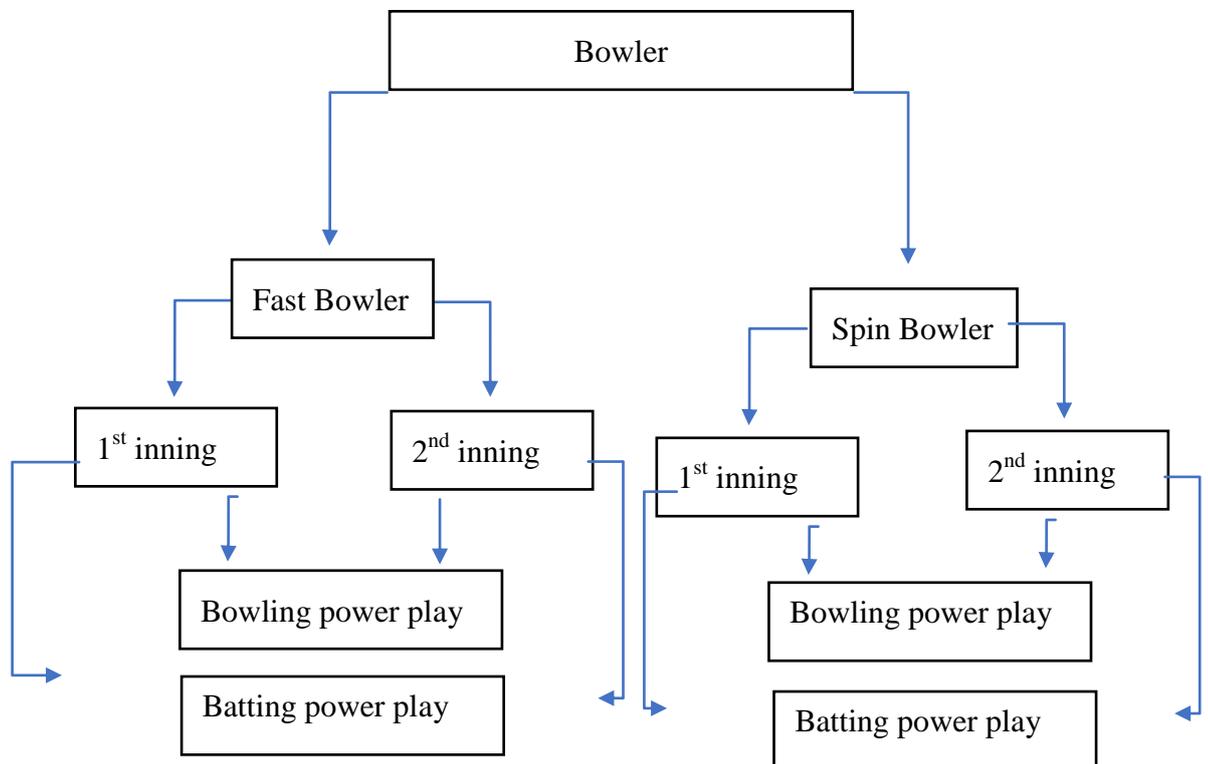$$P(X = x_i) = pq^{x-1}, \quad x = 1, 2, 3, \ldots$$

Where
X = No. of Matches
x_i = i^{th} match
p = probability of taking wicket in a single match.
q = probability of failure in taking wicket
The performance of the player will be analyzed through the aspects described in Figure 2.1.

2.2 Poisson Distribution

The Poisson distribution is a probability distribution used to model the number of events occurring within a fixed interval, given a constant average rate and event independence. It is characterized by a single parameter, λ (lambda), which represents the average rate of events(Shenin, 2001). As a discrete distribution, it deals with non-negative integers and calculates the probability of observing a specific number of events within the interval. In the Poisson distribution, events are assumed to occur independently, meaning the occurrence of one event does not influence another. Additionally, the average rate of events remains constant throughout the time or space interval, ensuring that the probability of an event occurring is uniform.The probability mass function (PMF) of the Poisson distribution is given by:

P(X=x) = $\frac{\lambda^x e^{-\lambda}}{x!}$ $x = 1, 2, 3, \cdots, \infty$

where X = is number of matches
$x_i = i^{th}$ no. of matches, i.e rare events (3 wickets)
λ = The average
e = 2.71828

The Poisson distribution is often used in various fields, such as:

Physics: To model the distribution of particles in a radioactive decay process.
Biology: To model the number of mutations in a given DNA segment.
Economics: To model rare events like customer arrivals at a service point.
Telecommunications: To model the number of phone calls arriving at a call center in a given time interval.

In One Day International (ODI) cricket, a 5-wicket haul is a significant milestone for bowlers. Similarly, in T20 cricket, achieving 3 wickets in a 4-over game is a rare feat. To evaluate this rare event, the Poisson distribution will be used to analyze bowler performance.

$$P(X=x) = \frac{\lambda^x e^{-\lambda}}{x!} \qquad x = 1, 2, 3, \cdots, \infty$$

where X = is number of matches
$x_i = i^{th}$ no. of matches, i.e rare events (3 wickets)
λ = The average，e = 2.71828

3. Result and Discussion

In this chapter, we employed Chi-square tests, Odds Ratios, Geometric distribution, and Poisson distribution to analyze player performance. Chi-square and Odds Ratios were used to assess the relationship between height and weight, with visual representations provided. Geometric distribution helped determine players' initial success, and Poisson distribution was used to calculate weighted means and variances, showing that these values are approximately equal.

The Chi-square test highlighted a strong link between height and weight among T20 bowlers. Most players had above-average height and weight, with fewer players having below-average height but above-average weight. The odds of a player's height being below or equal to the average weight are higher than the odds of their weight being above the average.

We also classified the top 50 T20 bowlers into five rank-based groups, calculated the mean and variance for each group, and found that results across different strategies were consistent. Performance data for bowlers, including their success in various match intervals, was analyzed, showing patterns in when they achieved their first wickets.

The table includes mean, variance, and weighted statistics for the top 50 players, with the data capturing performance metrics such as the number of matches and performance-related variables.

In this chapter, we employed Chi-square tests, Odds ratios, Geometric distribution, and Poisson distribution to analyze cricket data. Chi-square and Odds ratios were used to examine the relationship between height and weight, with results presented in graphs. The Geometric distribution was applied to determine each player's first success, while combining and weighted probabilities were calculated. Players were categorized into five groups, and mean and variance were calculated for each group. The Poisson distribution was used to analyze weighted mean and variance, confirming that events are independent. For the top 50 T20 bowlers, the average height was 5.867 feet and the average weight was 75.54 kilograms.
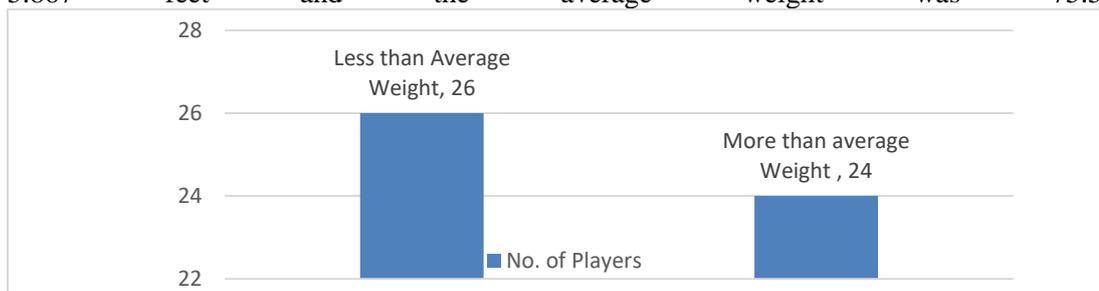
Figure 2.3: Distribution of Players w.r.t Weight
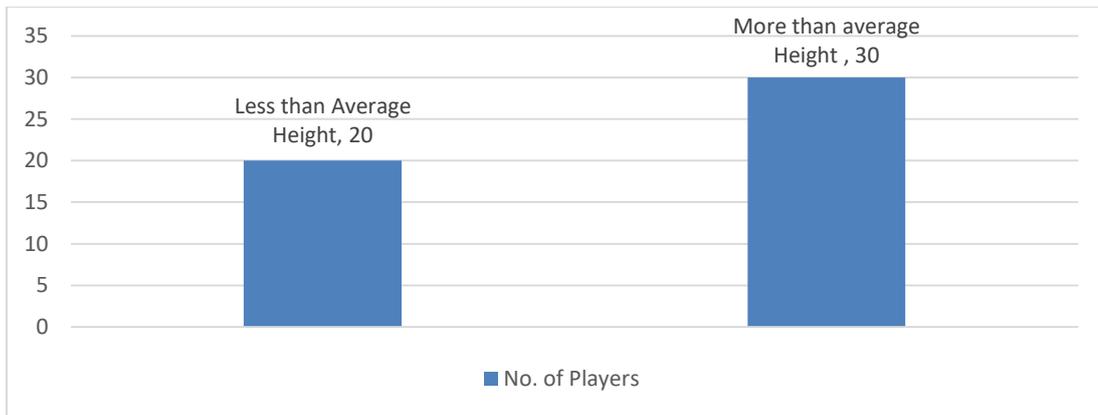
Figure 2.4: Distribution of Players w.r.t Height

Table 2.5: Weight and Height Crosstabulation

	equal to average height	ge height
equal to average weight		
ge weight		

The chi-square test, with a value of 7.065 and a p-value of 0.008, showed a significant association between height and weight in T20 bowlers. Table 4.1 shows that 19 out of 50 players are above average in both height and weight, while only 5 players have below-average height but above-average weight.
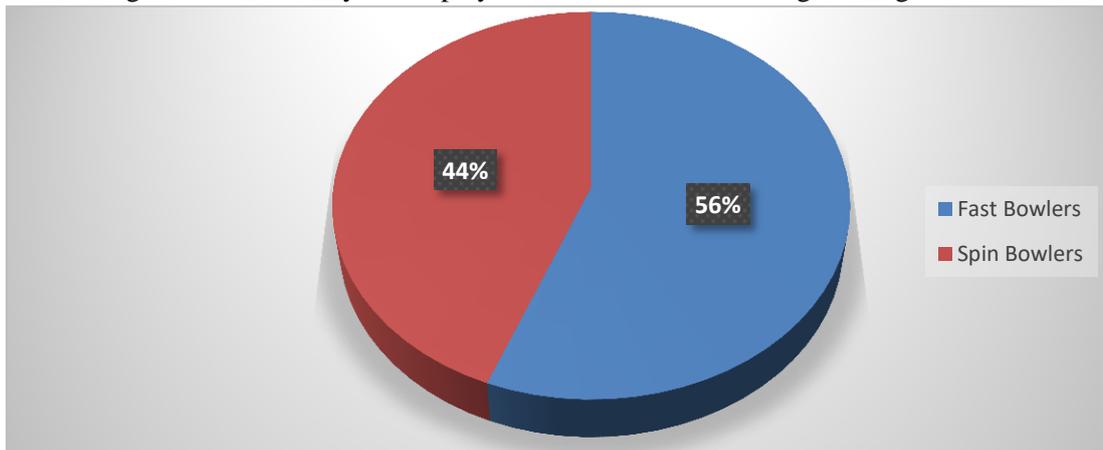
Figure 2.6: Fast and Spin bowlers

Table 2.2: Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Weight (Less than or equal to average weight / Above average weight)	5.182	1.477	18.183
For cohort Height = Less than or equl to average height	2.769	1.188	6.456
For cohort Height_rec = Above average height	.534	.326	.875
N of Valid Cases	50		

The odds analysis shows that players with below-average height and weight are 0.72 times less likely to succeed, while those with below-average height but above-average weight are 1.37 times less likely. In strategy I, the success probability for the top 50 players is 0.720984, and in strategy II, a weighted approach gives a geometric probability of 0.45376, with nin_ini representing matches required for the first wicket. Strategy III involves dividing the top 50 bowlers into five ranked groups, repeating the analysis for each group.

Table 2.3: Combine and weighted probabilities

S. no	Bowler Names	First Wicket taken $n_i =$ no. of matches	Geometric Distribution $\hat{p}_i = P\left(X = x_i\right) = pq^{x-1}$	$n_i p_i$
1	Tabraiz Shamsi	3	0.1481	0.4443
2	Adil Usman Rashid	1	1	1
3	Josh Reginald Hazlewood	1	1	1
4	Adam Zampa	7	0.056	0.392
5	Rashid Khan Arman	1	1	1
6	PinnaduwageWaninduHasaranga de Silva	1	1	1
7	Anrich Arno Nortje	2	0.25	0.5
8	Mujeeb Ur Rahman	2	0.25	0.5
9	Nasum Ahmed	1	1	1
10	Shaheen Shah Afridi	2	0.25	0.5
11	Timothy Grant Southee	1	1	1
12	Ashton Charles Agar	1	1	1
13	Mahedi Hasan	4	0.105	0.42
14	Shadab Khan	1	1	1
15	Mitchell Josef Santner	1	1	1
16	Akeal Jerome Hosein	7	0.056	0.392
17	Trent Alexander Boult	1	1	1
18	Bhuvneshwar Kumar Singh	1	1	1
19	Shakib Al Hasan	1	1	1
20	Inderbir Singh Sodhi	1	1	1
21	Mustafizur Rahman	1	1	1

22	Mark Robert James Watt	5	0.0819	0.4095
23	Christopher James Jordan	1	1	1
24	MorawakageMaheeshTheekshana	1	1	1
25	Jason Omar Holder	1	1	1
26	Bilal Khan	1	1	1
27	Haris Rauf	1	1	1
28	Jasprit JasbirsinghBumrah	1	1	1
29	Pathira Vasan Dushmantha Chameera	1	1	1
30	Yuzvendra Singh Chahal	1	1	1
31	Mohammad Nabi	1	1	1
32	Dwaine Pretorius	2	0.25	0.5
33	Sheldon Shane Cottrell	1	1	1
34	Moeen Munir Ali	7	0.056	0.392
35	Mohammad Shoriful Islam	2	0.25	0.5
36	Richard Ngarava	1	1	1
37	ChandradasaBrahammanaRalalage Lahiru Sudesh Kum	2	0.25	0.5
38	Sandeep Lamichhane	3	0.1481	0.4443
39	Kane William Richardson	1	1	1
40	Zahoor Khan	2	0.25	0.5
41	Blessing Muzarabani	1	1	1
42	Deepak LokandersinghChahar	1	1	1
43	Syed Imad Wasim	2	0.25	0.5
44	Mark Richard Adair	1	1	1
45	Wellington Pedzisai Masakadza	1	1	1
46	Mark Andrew Wood	1	1	1
47	Brandon Dale Glover	1	1	1
48	Joshua Brian Little	3	0.1481	0.4443
49	Mitchell Aaron Starc	1	1	1
50	Kagiso Rabada	2	0.25	0.5
Total		$\sum_{i=1}^{50} n_i = 90$	$\sum_{i=1}^{50} \hat{p}_i = 36.0492$	$\sum_{i=1}^{50} n_i \hat{p}_i = 40.8384$
			combine probability $\hat{p}_c = \dfrac{\sum_{i=1}^{50} \hat{p}_i}{n}$	weighted probability $\hat{p}_w = \dfrac{\sum_{i=1}^{50} n_i \hat{p}_i}{\sum_{i=1}^{50} n_i}$
			0.720984	0.45376

Table 2.4. Combine and weighted probabilities from 1---50 range

S. no	Bowler Names	1-10nis	1-10pis	1-20nis	1-20pis	1-30nis	1-30pis	1-40nis	1-40pis	1-50nis	1-50pis
1	Tabraiz Shamsi	3	0.1481	3	0.1481	3	0.1481	3	0.1481	3	0.1481
2	Adil Usman Rashid	1	1	1	1	1	1	1	1	1	1
3	Josh Reginald Hazlewood	1	1	1	1	1	1	1	1	1	1
4	Adam Zampa	7	0.056	7	0.056	7	0.056	7	0.056	7	0.056
5	Rashid Khan Arman	1	1	1	1	1	1	1	1	1	1
6	PinnaduwageWaninduHasaranga de Silva	1	1	1	1	1	1	1	1	1	1
7	Anrich Arno Nortje	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25
8	Mujeeb Ur Rahman	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25
9	Nasum Ahmed	1	1	1	1	1	1	1	1	1	1
10	Shaheen Shah Afridi	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25
11	Timothy Grant Southee			1	1	1	1	1	1	1	1
12	Ashton Charles Agar			1	1	1	1	1	1	1	1
13	Mahedi Hasan			4	0.105	4	0.105	4	0.105	4	0.105
14	Shadab Khan			1	1	1	1	1	1	1	1
15	Mitchell Josef Santner			1	1	1	1	1	1	1	1
16	Akeal Jerome Hosein			7	0.056	7	0.056	7	0.056	7	0.056
17	Trent Alexander Boult			1	1	1	1	1	1	1	1
18	Bhuvneshwar Kumar Singh			1	1	1	1	1	1	1	1
19	Shakib Al Hasan			1	1	1	1	1	1	1	1
20	Inderbir Singh Sodhi			1	1	1	1	1	1	1	1
21	Mustafizur Rahman					1	1	1	1	1	1
22	Mark Robert James Watt					5	0.0819	5	0.0819	5	0.0819
23	Christopher James Jordan					1	1	1	1	1	1
24	MorawakageMaheeshTheekshana					1	1	1	1	1	1

25	Jason Omar Holder	1	1	1	1	1	1
26	Bilal Khan	1	1	1	1	1	1
27	Haris Rauf	1	1	1	1	1	1
28	Jasprit JasbirsinghBumrah	1	1	1	1	1	1
29	Pathira Vasan Dushmantha Chameera	1	1	1	1	1	1
30	Yuzvendra Singh Chahal	1	1	1	1	1	1
31	Mohammad Nabi			1	1	1	1
32	Dwaine Pretorius			2	0.25	2	0.25
33	Sheldon Shane Cottrell			1	1	1	1
34	Moeen Munir Ali			7	0.056	7	0.056
35	Mohammad Shoriful Islam			2	0.25	2	0.25
36	Richard Ngarava			1	1	1	1
37	ChandradasaBrahammanaRalalage Lahiru Sudesh Kum			2	0.25	2	0.25
38	Sandeep Lamichhane			3	0.1481	3	0.1481
39	Kane William Richardson			1	1	1	1
40	Zahoor Khan			2	0.25	2	0.25
41	Blessing Muzarabani					1	1
42	Deepak LokandersinghChahar					1	1
43	Syed Imad Wasim					2	0.25
44	Mark Richard Adair					1	1
45	Wellington Pedzisai Masakadza					1	1
46	Mark Andrew Wood					1	1
47	Brandon Dale Glover					1	1
48	Joshua Brian Little					3	0.1481
49	Mitchell Aaron Starc					1	1
50	Kagiso Rabada					2	0.25

Total ni's and pi,s	21	5.9541	40	14.1151	54	23.197	76	28.4011	90	36.0492
		0.283529		0.352878		0.429574		0.373699		0.400547

Table 4.2 outlines the performance of various cricket bowlers across different match intervals, showing the number of wickets taken and their corresponding performance indices (probabilities). Key highlights include Tabraiz Shamsi, who took his first wicket in the 3rd match with a probability of 0.1481, and Adil Rashid, Josh Hazlewood, and Adam Zampa, who each achieved their first success in their first match with a probability of 1. Bowlers like WaninduHasaranga, Nasum Ahmed, and Shaheen Afridi had consistent success across all intervals with a probability of 0.25. The cumulative data shows that all bowlers took 21 wickets in the first 10 overs with a total performance index of 0.283529.

Table 2.5: Combine and weighted probabilities (11—20, 21—30, 31—40, and 41--50).

s.no	11—20 $n_{i's}$	11—20 $p_{i's}$	$n_{i's}\,p_{i's}$	21--30 $n_{i's}$	21--30 $p_{i's}$	$n_{i's}\,p_{i's}$	31--40 $n_{i's}$	31--40 $p_{i's}$	$n_{i's}\,p_{i's}$	41—50 $n_{i's}$	41--50 $p_{i's}$	$n_{i's}\,p_{i's}$
1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	5	0.0819	0.4095	2	0.25	0.5	1	1	1
3	4	0.105	0.42	1	1	1	1	1	1	2	0.25	0.5
4	1	1	1	1	1	1	7	0.056	0.392	1	1	1
5	1	1	1	1	1	1	2	0.25	0.5	1	1	1
6	7	0.056	0.392	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	2	0.25	0.5	1	1	1
8	1	1	1	1	1	1	3	0.1481	0.4443	3	0.1481	0.4443
9	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	2	0.25	0.5	2	0.25	0.5
Total	19	8.161	8.812	14	9.0819	9.4095	22	5.2041	6.8363	14	7.6481	8.4443
$p_c = \dfrac{\sum_{i=}^{10} p_i}{10}$		0.8161			0.90819			0.52041			0.76481	

	0.8812	0.94095	0.68363	0.84443
$$p_w = \dfrac{\sum_{i=}^{10} n_i p_i}{\sum_{i=1}^{10} n_i}$$				

The table provides details about cricket bowlers, their bowling styles (fast or spin), and their performance in various innings and power play phases. It includes columns such as serial number, bowler names, bowling style, performance in the first and second innings, performance during the bowling and batting power plays, and the number of overs bowled. For example, Tabraiz Shamsi, a spin bowler, bowled 1 over in the first inning, 2 overs in the second inning, and 2 overs during the bowling power play.

Table 2.6. Classification of top 50 bowler in T-20 international cricket.

S.no	Bowler Names	Fast/Spin Fast = 1 Spin = 2	1st Inning/sec inning 1st inning = 1 2nd inning = 2	Bowling power play /Batting power play Bowling power play = 1 Batting power play = 2	No. of overs
1	Tabraiz Shamsi	2	1	2	10
2	Adil Usman Rashid	2	2	2	9
3	Josh Reginald Hazlewood	1	1	1	2
4	Adam Zampa	2	1	2	10
5	Rashid Khan Arman	2	1	2	13
6	PinnaduwageWaninduHasaranga de Silva	2	2	2	8
7	Anrich Arno Nortje	1	2	2	20
8	Mujeeb Ur Rahman	2	2	1	3
9	Nasum Ahmed	2	1	1	1
10	Shaheen Shah Afridi	1	2	1	5
11	Timothy Grant Southee	1	1	2	18
12	Ashton Charles Agar	2	1	2	15
13	Mahedi Hasan	2	1	2	14
14	Shadab Khan	2	1	2	8
15	Mitchell Josef Santner	2	1	1	3
16	Akeal Jerome Hosein	2	2	1	5
17	Trent Alexander Boult	1	1	2	18
18	Bhuvneshwar Kumar Singh	1	2	1	1
19	Shakib Al Hasan	2			
20	Inderbir Singh Sodhi	2	1	2	15
21	Mustafizur Rahman	1	2	2	11
22	Mark Robert James Watt	2	1	2	9
23	Christopher James Jordan	1	1	2	15
24	MorawakageMaheeshTheekshana	2	1	2	13
25	Jason Omar Holder	1	2	1	1
26	Bilal Khan	1	1	1	1
27	Haris Rauf	1	1	2	18
28	Jasprit JasbirsinghBumrah	1	2	1	6
29	Pathira Vasan Dushmantha Chameera	1	2	2	9
30	Yuzvendra Singh Chahal	2	1	2	13
31	Mohammad Nabi	2	2	2	14
32	Dwaine Pretorius	1	2	2	12
33	Sheldon Shane Cottrell	1	1	2	11
34	Moeen Munir Ali	2	2	1	2
35	Mohammad Shoriful Islam	1	1	2	7
36	Richard Ngarava	1	1	2	18
37	ChandradasaBrahammanaRalalage Lahiru Sudesh Kum	1	2	2	12
38	Sandeep Lamichhane	2	1	1	2
39	Kane William Richardson	1	1	2	8
40	Zahoor Khan	1	1	2	14

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41	Blessing Muzarabani	1	2	1	4
42	Deepak LokandersinghChahar	1	1	2	10
43	Syed Imad Wasim	2	2	2	10
44	Mark Richard Adair	1	1	1	4
45	Wellington Pedzisai Masakadza	2	2	2	8
46	Mark Andrew Wood	1	2	1	4
47	Brandon Dale Glover	1	2	1	3
48	Joshua Brian Little	1	1	2	11
49	Mitchell Aaron Starc	1	1	1	2
50	Kagiso Rabada	1	2	2	12

The Poisson distribution approximates the binomial distribution when there are many trials and a low probability of success, with a fixed average rate ($\lambda = n * p$). To analyze this, we first calculated the mean and variance for each player, followed by the overall mean and variance. By multiplying each player's total matches by their individual mean and variance, we determined the overall weighted mean and variance. The results show that the overall weighted mean and variance are approximately equal, reflecting the properties of a Poisson distribution. The table presents the top 50 players' mean, variance, weighted mean, and weighted variance.

$$Weighted \ \text{Mean} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2 + n_3\bar{x}_3 + ... + n_{50}\bar{x}_{50}}{n_1 + n_2 + n_3 + ... + n_{50}} = 1.347344$$

$$Weighted \ \text{variance} = \frac{n_1v_1 + n_2v_2 + n_3v_3 + ... + n_{50}v_{50}}{n_1 + n_2 + n_3 + ... + n_{50}} = 1.292514$$

Table 2.7: Top 50 players mean, variance, weighted mean and weighted variance

players	Mean	Variance	No of Matches	niXi	niSi
1.	1.237288	1.425482	59	72.99999	84.10344
2.	1.157143	0.916977	73	84.47144	66.93932
3.	1.481481	1.951567	27	39.99999	52.69231
4.	1.163934	1.106011	62	72.16391	68.57268
5.	1.810345	1.630067	58	105	94.54389
6.	1.727273	1.267045	35	60.45456	44.34658
7.	1.1	0.621053	21	23.1	13.04211
8.	1.391304	1.703557	23	31.99999	39.18181
9.	1.3	1.905263	20	26	38.10526
10.	1.175	0.96859	40	47	38.7436
11.	1.23333	1.237079	92	113.4664	113.8113
12.	1.069767	1.733112	43	45.99998	74.52382
13.	0.83333	0.626437	31	25.83323	19.41955
14.	1.216667	1.189548	64	77.86669	76.13107
15.	1.08196	1.143169	62	67.08152	70.87648
16.	0.882353	0.985294	20	17.64706	19.70588
17.	1.409091	1.131078	44	62	49.76743
18.	0.983051	1.120397	59	58.00001	66.10342
19.	1.252632	1.403583	96	120.2527	134.744
20.	1.296875	1.132688	66	85.59375	74.75741
21.	1.380952	1.658956	63	86.99998	104.5142

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22.	1.244444	1.234343	47	58.48887	58.01412
23.	1.081081	1.226213	75	81.08108	91.96598
24.	0.933333	1.495238	15	14	22.42857
25.	1.147059	1.644385	37	42.44118	60.84225
26.	1.4	1.7	46	64.4	78.2
27.	1.272727	0.892045	35	44.54545	31.22158
28.	1.196429	0.869565	57	68.19645	49.56521
29.	1	1.478686	47	47	69.49824
30.	1.259259	1.058808	54	67.99999	57.17563
31.	0.850575	1.607895	88	74.8506	141.4948
32.	1.15	1.035897	22	25.3	22.78973
33.	1.2	0.709059	41	49.2	29.07142
34.	0.785714	0.894737	49	38.49999	43.84211
35.	1.315789	0.526144	19	24.99999	9.996736
36.	0.944444	0.800654	18	16.99999	14.41177
37.	1.277778	1.219973	19	24.27778	23.17949
38.	1.871795	1.219973	39	73.00001	47.57895
39.	1.23333	1.288506	30	36.9999	38.65518
40.	1.25	1.096774	32	40	35.09677
41.	1.190476	1.0619505	21	25	22.30096
42.	1.3	1.905263	20	26	38.10526
43.	0.964912	1.070175	58	55.9649	62.07015
44.	1.512821	1.519568	39	59.00002	59.26315
45.	0.928571	0.957672	28	25.99999	26.81482
46.	1.3685	0.912281	19	26.0015	17.33334
47.	1.428571	1.757143	21	29.99999	36.9
48.	0.939394	1.058712	34	31.9394	35.99621
49.	1.2	0.897959	50	60	44.89795
50.	1.225	0.999359	40	49	39.97436

Weighted mean = 1.347344
Weighted Variance = 1.292514

The data pertains to the performance of different players, providing statistical measures for each. The columns include "Players" (identifying the players), "Mean" (representing the average performance measure), "Variance" (showing how much the performance varies from the mean), and "No of Matches" (indicating the number of games each player participated in). "niXi": This column seems to be a product of the number of matches (ni) and some variable (Xi) associated with each player's performance. "niSi": This column also seems to be a product of the number of matches (ni) and another variable (Si) associated with each player's performance.

The data includes a performance overview of players, with measures such as mean, variance, and the number of matches. The top 50 players are divided into five groups based on their ranks: the top 10, ranks 11 to 20, ranks 21 to 30, ranks 31 to 40, and ranks 41 to 50. For each group, the mean and variance are calculated, and the weighted mean and variance for the groups are also found to be approximately equal, as shown in the table.

Group 1

$$Weighted\ \text{Mean}= \frac{n_1\bar{x}_1 + n_2\bar{x}_2 + n_3\bar{x}_3 + ... + n_{10}\bar{x}_{10}}{n_1 + n_2 + n_3 + ... + n_{10}} = 1.347344$$

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$$\textit{Weighted } \text{variance} = \frac{n_1 v_1 + n_2 v_2 + n_3 v_3 + ... + n_{10} v_{10}}{n_1 + n_2 + n_3 + ... + n_{10}} = 1.292514$$

Table 4.8: For weighted mean and variance

S.No	Mean	Variance	No of Matchs	niXi	niSi
1	1.237288	1.425482	59	72.99999	84.10344
2	1.157143	0.916977	73	84.47144	66.93932
3	1.481481	1.951567	27	39.99999	52.69231
4	1.163934	1.106011	62	72.16391	68.57268
5	1.810345	1.630067	58	105	94.54389
6	1.727273	1.267045	35	60.45456	44.34658
7	1.1	0.621053	21	23.1	13.04211
8	1.391304	1.703557	23	31.99999	39.18181
9	1.3	1.905263	20	26	38.10526
10	1.175	0.96859	40	47	38.7436
Overall weighted mean and variance				**1.347344**	**1.292514**

Weighted mean = 1.347344

Weighted variance = 1.292514

The data provides statistical measures for various observations, likely related to player performance in sports or gaming. The columns include:

S.No: Serial number or identifier for each data set.

Mean: Average performance value for each data set, with the first data set's mean being approximately 1.237.

Variance: Measures the variability of performance values around the mean, with the first data set's variance being approximately 1.425.

No of Matches: The number of matches or games associated with each player.

"niXi": Represents the product of the number of matches and a performance-related variable, indicating the cumulative effect of performance across matches. For example, 59 matches multiplied by a mean value of approximately 1.237 results in 72.99999.

"niSi": Similar to "niXi," but involves another performance variable "Si," reflecting a different performance aspect.

Overall Weighted Mean and Variance: Summarizes the weighted average and variance across all data sets, with weights based on the number of matches.

This data captures performance-related metrics for different data sets (likely players), with the weighted mean and variance providing an overall view of performance distribution.

Group 2

$$\textit{Weighted } \text{Mean} = \frac{n_{11}\overline{x}_{11} + n_{12}\overline{x}_{12} + n_{13}\overline{x}_{13} + ... + n_{20}\overline{x}_{20}}{n_{11} + n_{12} + n_{13} + ... + n_{20}} = 1.167663$$

$$\textit{Weighted } \text{variance} = \frac{n_{11} v_{11} + n_{12} v_{12} + n_{13} v_{13} + ... + n_{20} v_{20}}{n_{11} + n_{12} + n_{13} + ... + n_{20}} = 1.21289$$

Table 2.8

S.No	Mean	Variance	No of Matchs	niXi	niSi
11	1.23333	1.237079	92	113.4664	113.8113
12	1.069767	1.733112	43	45.99998	74.52382

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13	0.83333	0.626437	31	25.83323	19.41955
14	1.216667	1.189548	64	77.86669	76.13107
15	1.08196	1.143169	62	67.08152	70.87648
16	0.882353	0.985294	20	17.64706	19.70588
17	1.409091	1.131078	44	62	49.76743
18	0.983051	1.120397	59	58.00001	66.10342
19	1.252632	1.403583	96	120.2527	134.744
20	1.296875	1.132688	66	85.59375	74.75741

Weighted mean = 1.167663
Weighted variance = 1.21289
Group 3

$$Weighted\ \text{Mean} = \frac{n_{21}\bar{x}_{21} + n_{22}\bar{x}_{22} + n_{23}\bar{x}_{23} + ... + n_{30}\bar{x}_{30}}{n_{21} + n_{22} + n_{23} + ... + n_{30}} = 1.208305$$

$$Weighted\ \text{variance} = \frac{n_{21}v_{21} + n_{22}v_{22} + n_{23}v_{23} + ... + n_{30}v_{30}}{n_{21} + n_{22} + n_{23} + ... + n_{30}} = 1.309718$$

s.no	Mean	Variance	No of Matchs	niXi	niSi
21	1.380952	1.659	63	86.99998	104.5142
22	1.244444	1.234	47	58.48887	58.01412
23	1.081081	1.226	75	81.08108	91.96598
24	0.933333	1.495	15	14	22.42857
25	1.147059	1.644	37	42.44118	60.84225
26	1.4	1.700	46	64.4	78.2
27	1.272727	0.892	35	44.54545	31.22158
28	1.196429	0.870	57	68.19645	49.56521
29	1	1.479	47	47	69.49824
30	1.259259	1.059	54	67.99999	57.17563

Weighted mean = 1.208305
Weighted variance = 1.309718
Group 4

$$Weighted\ \text{Mean} = \frac{n_{1}\bar{x}_{41} + n_{32}\bar{x}_{32} + n_{33}\bar{x}_{33} + ... + n_{40}\bar{x}_{40}}{n_{41} + n_{42} + n_{43} + ... + n_{40}} = 1.132012$$

$$Weighted\ \text{variance} = \frac{n_{31}v_{31} + n_{32}v_{32} + n_{33}v_{33} + ... + n_{40}v_{40}}{n_{31} + n_{32} + n_{33} + ... + n_{40}} = 1.137582$$

s.no	Mean	Variance	No of Matchs	niXi	niSi
31	0.850575	1.607895	88	74.8506	141.4948
32	1.15	1.035897	22	25.3	22.78973
33	1.2	0.709059	41	49.2	29.07142
34	0.785714	0.894737	49	38.49999	43.84211
35	1.315789	0.526144	19	24.99999	9.996736
36	0.944444	0.800654	18	16.99999	14.41177
37	1.277778	1.219973	19	24.27778	23.17949

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38	1.871795	1.219973	39	73.00001	47.57895
39	1.23333	1.288506	30	36.9999	38.65518
40	1.25	1.096774	32	40	35.09677

Weighted mean = 1.132012
Weighted variance = 1.137582

Group 5: *Weighted* Mean$=\dfrac{n_{41}\bar{x}_{41} + n_{42}\bar{x}_{42} + n_{43}\bar{x}_{43} + ... + n_{50}\bar{x}_{50}}{n_{41} + n_{42} + n_{43} + ... + n_{50}} = 1.78502$

Weighted variance$=\dfrac{n_{41}v_{41} + n_{42}v_{42} + n_{43}v_{43} + ... + n_{50}v_{50}}{n_{41} + n_{42} + n_{43} + ... + n_{50}} = 1.162595$

s.no	Mean	Variance	No of Matchs	niXi	niSi
41	1.190476	1.061951	21	25	22.30096
42	1.3	1.905263	20	26	38.10526
43	0.964912	1.070175	58	55.9649	62.07015
44	1.512821	1.519568	39	59.00002	59.26315
45	0.928571	0.957672	28	25.99999	26.81482
46	1.3685	0.912281	19	26.0015	17.33334
47	1.428571	1.757143	21	29.99999	36.9
48	0.939394	1.058712	34	31.9394	35.99621
49	1.2	0.897959	50	60	44.89795
50	1.225	0.999359	40	49	39.97436

Weighted mean = 1.78502
Weighted variance = 1.162595

4. Conclusion

This study explored how height and weight affect the performance of the top fifty T20 International Cricket bowlers. Utilizing a range of statistical techniques—including descriptive statistics, chi-square tests, odds ratios, geometric distribution, and Poisson distribution—the research aimed to determine how these physical attributes influence bowling effectiveness in the fast-paced T20 format.The findings corroborate previous research emphasizing the importance of physical attributes, such as height and weight, in bowling performance. Height and weight were shown to play a crucial role in a bowler's ability to generate bounce and movement, directly impacting their effectiveness. Additionally, the study reinforced the significance of physical fitness and body composition, revealing that weight affects factors like agility, endurance, and injury susceptibility. The research extended this understanding by examining how body composition relates to bowling economy and wicket-taking ability.These insights are valuable for coaches, analysts, and players, offering a deeper understanding of what drives success in T20 cricket. The study aids in talent identification and player development, as well as strategic planning. By quantifying the effects of physical attributes on performance, the research enriches the existing literature and provides a comprehensive view of the complex dynamics at play in T20 cricket.In summary, the research highlights the substantial impact of height and weight on the performance of elite T20 bowlers, contributing important knowledge to cricket scholarship and serving as a guide for navigating the relationship between physical attributes and cricketing success.

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