CHAPTER ONE

A Forerunner

1.1 PROBABILISTIC INFERENCE—AN EARLY EXAMPLE

An early use of inferred probabilistic reasoning is described by Rabinovitch (1970).

In the Book of Numbers, Chapter 18, verse 5, there is a biblical injunction which enjoins the father to redeem his wife's first-born male child by payment of five pieces of silver to a priest (Laws of First Fruits). In the 12th Century the theologian, physician and philosopher, Maimonides addressed himself to the following problem with a solution. Suppose one or more women have given birth to a number of children and the order of birth is unknown, nor is it known how many children each mother bore, nor which child belongs to which mother. What is the probability that a particular woman bore boys and girls in a specified sequence? (All permutations are assumed equally likely and the chances of male or female births is equal.)

Maimonides ruled as follows: Two wives of different husbands, one primiparous (P) (a woman who has given birth to her first child) and one not ($\bar{P}$). Let H be the event that the husband of P pays the priest. If they gave birth to two males (and they were mixed up), $P(H) = 1$ – if they bore a male (M) and a female (F) $- P(H) = 0$ (since the probability is only $1/2$ that the primipara gave birth to the boy). Now if they bore 2 males and a female, $P(H) = 1$.

Case 1	(P)	$(\bar{P})$	Case 2	(P)	$(\bar{P})$
M, M	M	M	M, F	M	F
				F	M
		$P(H) = 1$			$P(H) = \frac{1}{2}$

Modes of Parametric Statistical Inference, by Seymour Geisser

			PAYMENT	
Case 3	(P)	$(\bar{P})$	*Yes*	*No*
M, M, F	M, M	F	$\surd$	
	F, M	M		$\surd$
	M, F	M	$\surd$	
	F	M, M		$\surd$
	M	F, M	$\surd$	
	M	M, F	$\surd$	

$$P(H) = \tfrac{2}{3}$$

Maimonides ruled that the husband of P pays in Case 3. This indicates that a probability of $2/3$ is sufficient for the priest to receive his 5 pieces of silver but $1/2$ is not. This leaves a gap in which the minimum probability is determined for payment.

What has been illustrated here is that the conception of equally likely events, independence of events, and the use of probability in making decisions were not unknown during the 12th century, although it took many additional centuries to understand the use of sampling in determining probabilities.

REFERENCES

Rabinovitch, N. L. (1970). Studies in the history of probability and statistics, XXIV Combinations and probability in rabbinic literature. *Biometrika*, **57**, 203–205.