In a tort action, the injured party is generally entitled to compensation for all losses sustained at the hands of the defendant. It is generally conceded that the major objective of American tort law is to compensate a wrongfully injured person and thereby place him in the position in which he would have been but for the wrong [Prosser, 1971 pp. 1-27]. The courts, however, continually face the problem of establishing reasonable damages in negligence cases involving human injury or death.

The purpose of this article is to develop a generalized methodology for calculating the value of lost earnings resulting from impaired earning capacity or death. It should be noted that the methodology and procedures here apply directly to calculation of the extent of damages resulting from a variety of causes—e.g., medical malpractice suits—and can be logically extended to other types of cases involving losses. The procedure does not, however, attempt to make any monetary assessment for suffering or grief resulting from impairment or death.

The Model

The model presented here seeks to establish a definitive quantitative means of establishing the loss in earnings resulting from physical or mental impairment or death. Procedures employed in part those developed by the Department of Commerce for estimating lifetime earnings of individuals [U.S. Department of Commerce, 1967]. Following the mathematical formulation, a typical case where such a model might be used will be presented.

Mathematical Formulation

The initial step in the model is to calculate the amount the individual experiencing impairment or death might have earned prior to his disability or death. At this point, no change in earnings due to productivity or price level influences will be assumed.

\[
FE_n = \sum_{i=1}^{n} B_i \tag{1}
\]

where,

- \(FE_n = \) Expected lifetime earnings prior to impairment or death, assuming no productivity or price level influences, after \(n\) years;
- \(B_i = \) Expected annual earnings at end of \(i^{th}\) year;
- \(n = \) Number of years of remaining work-life; and
- \(i = \) Year of impairment where \(i = 1, 2, \ldots, n\).

To incorporate the effect that improvements in technology and in the quality and skills of the labor force have on lifetime earnings, adjustments for productivity must be made. Increases in productivity in the use of resources is an important factor which permits increases in earnings. Thus,

\[
FG_n = \sum_{i=1}^{n} B_i (1 + \alpha)^{n-i} \tag{2}
\]

where,

- \(FG_n = \) Expected future value of lifetime earnings prior to impairment or
death, with productivity adjustments, after \( n \) years; and

\[ \alpha = \text{Expected annual rate of change in earnings due to productivity influences.} \]

Prices are also related as causes of changes in earnings. Changes in the general price level have greatly affected purchasing power of money and will continue to influence earnings in the future. Therefore, some means of accounting for price level influences must be incorporated into the model.

\[
\text{FGP}_n = \sum_{i=1}^{n} B_i (1 + \alpha)^{n-i} (1 + \beta)^{n-i} \tag{3}
\]

where,

\[ \text{FGP}_n = \text{Expected future value of lifetime earnings prior to impairment or death, with adjustments for changes in productivity and the general price level, after } n \text{ years; and} \]

\[ \beta = \text{Expected annual rate of change in earnings due to price level influences.} \]

Equation (3) may be rewritten:

\[
\text{FGP}_n = \sum_{i=1}^{n} B_i (1 + \alpha + \beta + \alpha \beta)^{n-i} \tag{3A}
\]

At this point, the model provides the technique for estimating the expected lifetime earnings of the individual by incorporating effects of changes in productivity and the general price level over the estimated or assumed lifetime of the individual. The actual loss in earnings incurred as a result of impairment or death has not been considered. In the case of death, \( \text{FGP}_n \) represents the accumulated expected loss of lifetime earnings assuming the individual would have had a remaining worklife of \( n \) years. Where impairment occurs, however, estimated earnings of the individual after the disability would have to be subtracted from \( \text{FGP}_n \).

\[
\text{FGP}_n = \sum_{i=1}^{n} B_i (1 + \alpha + \beta + \alpha \beta)^{n-i} - A_i (1 + \alpha + \beta + \alpha \beta)^{n-i} \tag{4}
\]

where,

\[ \text{FGP}_n = \text{Expected future value of loss in lifetime earnings after } n \text{ years; and} \]

\[ A_i = \text{Expected annual earnings after impairment at end of } i^{th} \text{ year.} \]

It should be pointed out that increases in earnings due to productivity gains, \( \alpha \), may be diminished after impairment. Thus, a value less than \( \alpha \) may be more appropriately used depending upon the nature and type of impairment.

The expected loss in lifetime earnings associated with diminished earning capacity, \( \text{FGP}_n \), must be discounted to present value. Equation (5) treats present value where impairment has occurred.

\[
\text{PVI}_n = \sum_{i=1}^{n} B_i (1 + \alpha + \beta + \alpha \beta)^{n-i} - A_i (1 + \alpha + \beta + \alpha \beta)^{n-i} \tag{5}
\]

\[ (1 + \lambda)^{n-i} \]

where,

\[ \text{PVI}_n = \text{Expected present value of lifetime earnings resulting from impairment after } n \text{ years; and} \]

\[ \lambda = \text{Expected discount rate.} \]

It should be noted that the second term in the numerator in equation (5) would not be applicable in cases involving death and would be omitted.

In determining lost earnings for a deceased person, however, calculations should include an estimate of probable maintenance cost during the balance of the deceased person's expected or assumed working lifetime.\(^2\) Maintenance cost must be subtracted from equation (5).

\[
\text{PVD}_n = \]

\(^2\)To a large degree, amount of maintenance costs depends on the person's family income and expenditures [U.S. Department of Commerce, 1975].