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Center

## Effective Use of Scatter Charts

- |                 |                                                                                                                                                                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>  | This tool provides guidelines and tips on how to effectively use scatter charts to communicate research findings.                                                                                                                                       |
| <b>Format</b>   | This tool provides guidance on scatter charts and their purposes, shows examples of preferred practices and practical tips for scatter charts, and provides cautions and examples of misuse and poor use of scatter charts and how to make corrections. |
| <b>Audience</b> | This tool is designed primarily for researchers from the Model Systems that are funded by the National Institute on Disability and Rehabilitation Research (NIDILRR). The tool can be adapted by other NIDILRR-funded grantees and the general public.  |

The contents of this tool were developed under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90DP0012-01-00). The contents of this fact sheet do not necessarily represent the policy of Department of Health and Human Services, and you should not assume endorsement by the Federal Government.

# Overview and Organization

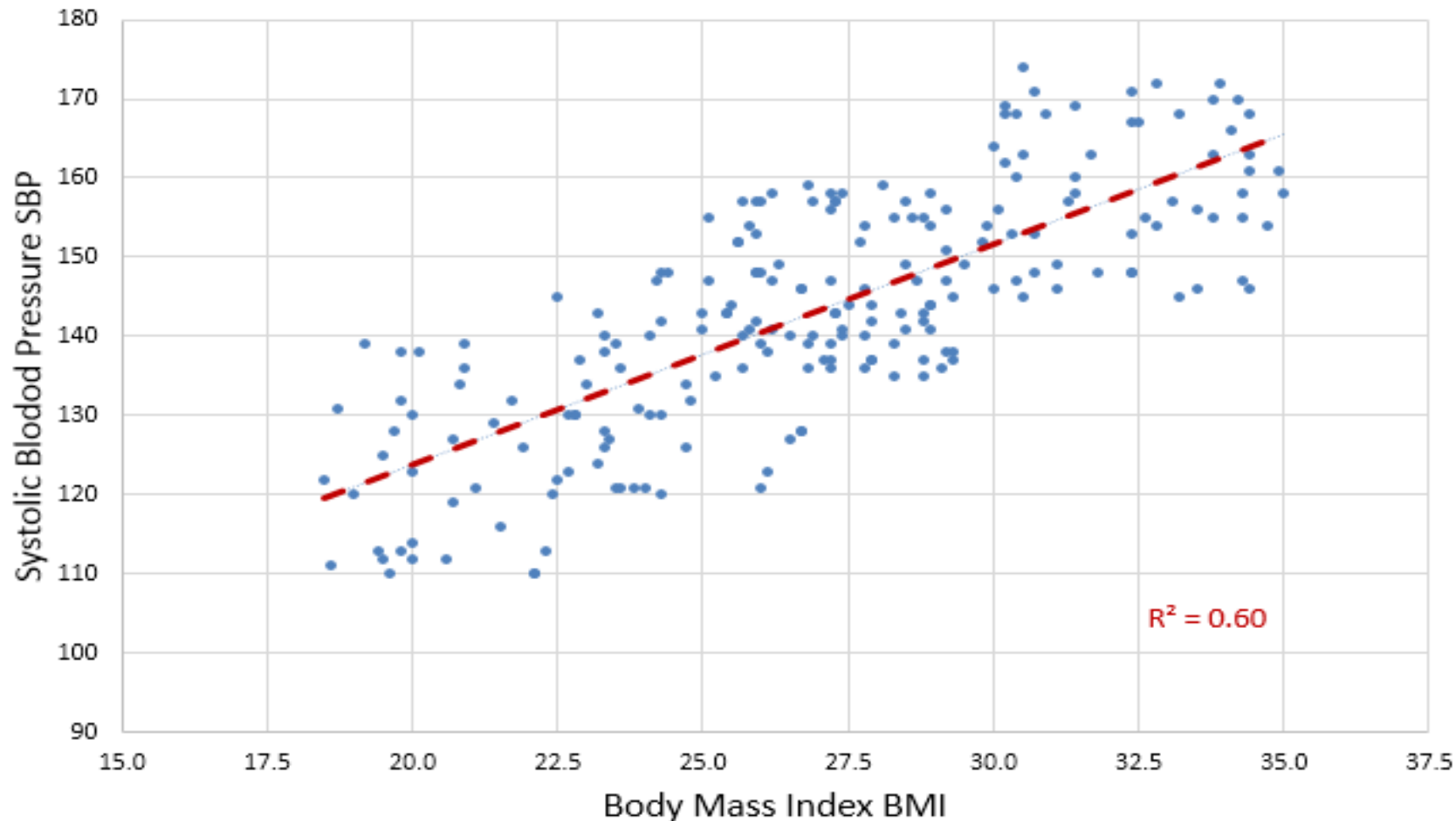
- ▶ [Positive Relationship](#).....4
- ▶ [Negative Relationship](#).....7
- ▶ [No Relationship](#).....8

# XY Scatter Charts

- ▶ The primary use of XY Scatter Charts is to display two paired measurements obtained from the same individual (or entity) (such a person's height vs his-her weight) and to combine these dual (paired) measurements from a group of individuals (or entities) to determine if a relationship (correlation) exists between the data elements under investigation (e.g. do taller persons generally weigh more than shorter persons).
- ▶ One of the data elements from a given individual (such as the person's weight) is plotted along the horizontal axis (the "X" axis). The other data element obtained from the same individual (such as his or her height) is plotted on the vertical axis (the "Y" axis). Hence the term "XY".
- ▶ When the height and weight of, say, 30 or more persons is plotted, the resultant data points tend to "scatter" in a reasonably predictable way. In this example, the scatter of the plotted data points would suggest that, on the whole, taller persons tend to weigh more than shorter persons.

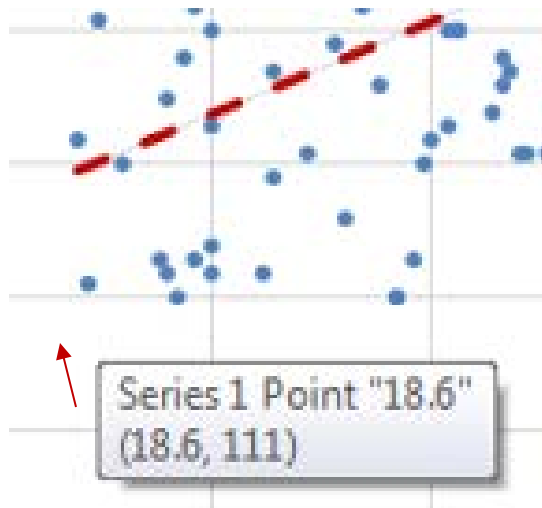
# XY Scatter Charts – Positive Relationship

Body Mass Index as Related to Systolic Blood Pressure  
Males 18 and Older - Untreated - US - 2014



Adult Males with high Body Mass Index also tend to have Higher Systolic Blood Pressure. Lower BMI = Lower SBP.

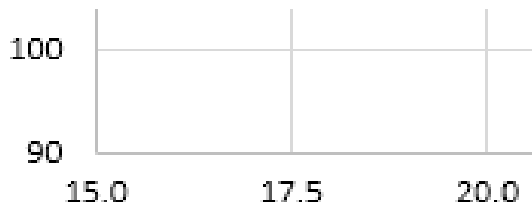
# XY Scatter Charts



Added Trend Line – Red Dashed Line.

This is a positive relationship. Higher BMI is associated with higher SBP

Each dot shows the BMI and SBP data for one adult male. This person had a BMI of 18.6 and an SBP of 111.



For XY charts, often OK to truncate the axes to better display the scatter of the data points. Also used gridlines for readability.



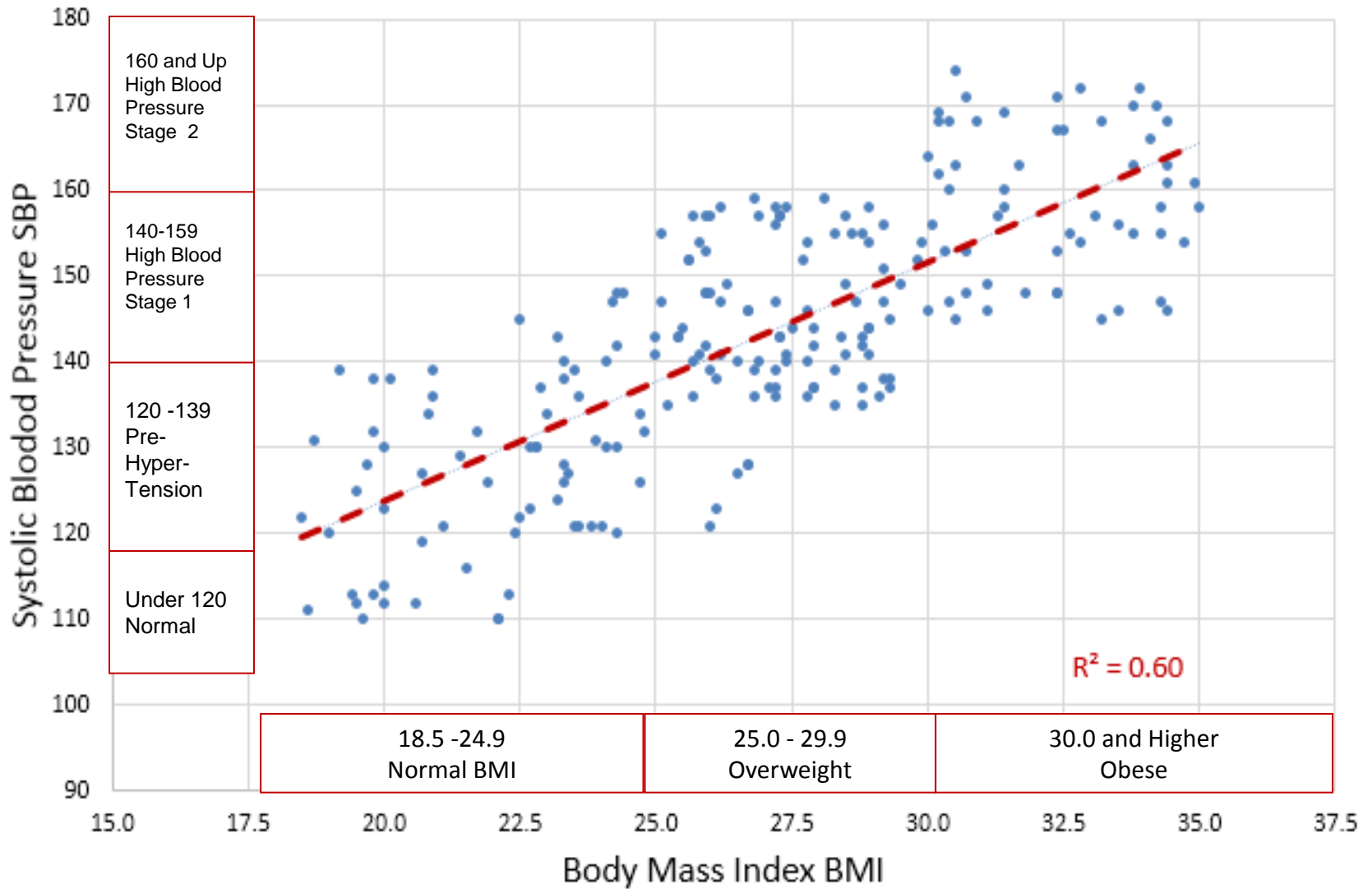
Generally include the axis titles for XY Scatter charts so the reader clearly understands which data is on which axis

$$R^2 = 0.60$$

R-Squared is a measure of strength of the relationship. Range 0.00 to 1.00. Tighter pattern around trend line = higher  $R^2$

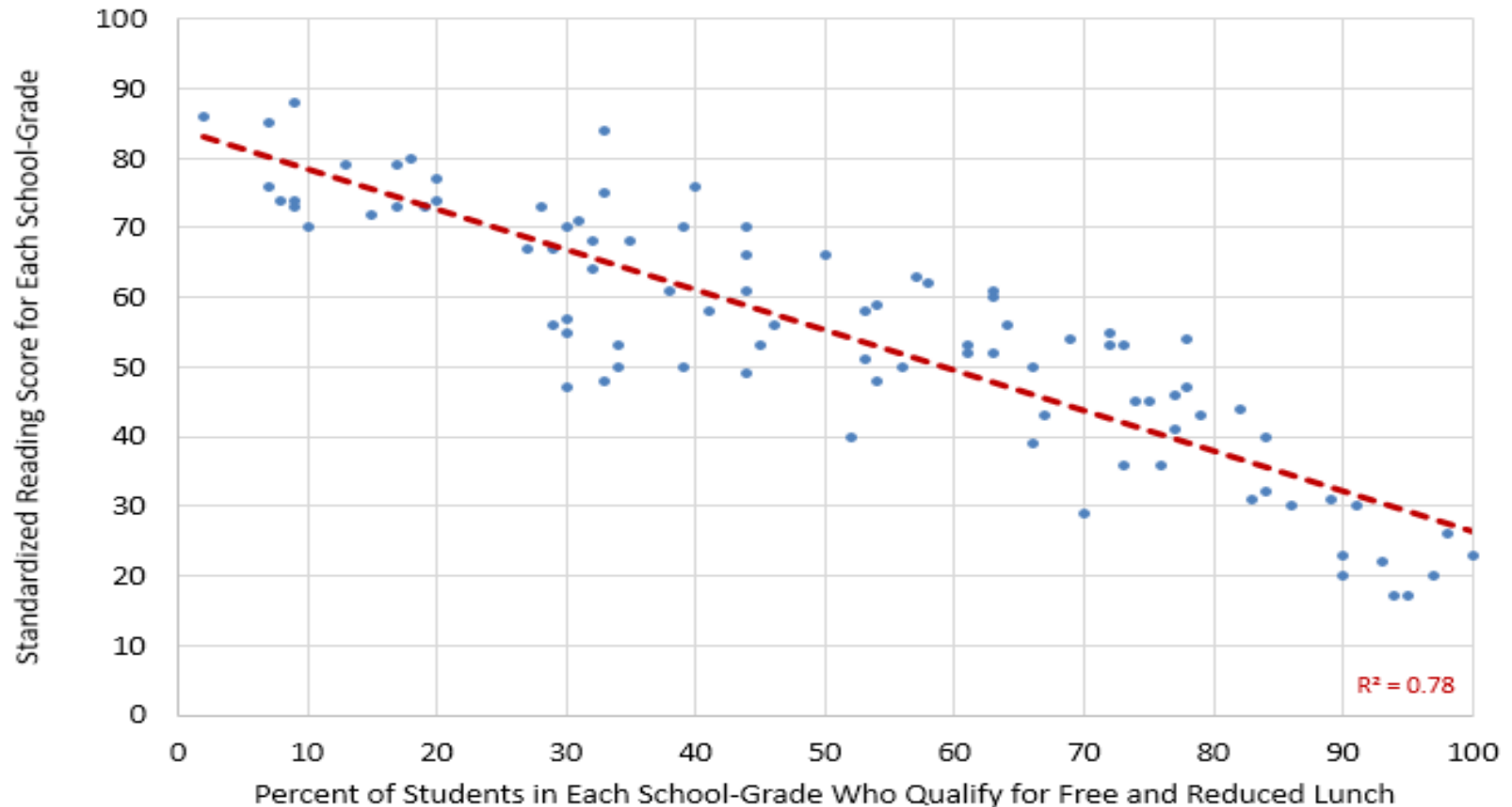
# Body Mass Index as Related to Systolic Blood Pressure

## Males 18 and Older - Untreated - US - 2014



# XY Scatter Charts – Negative Relationship

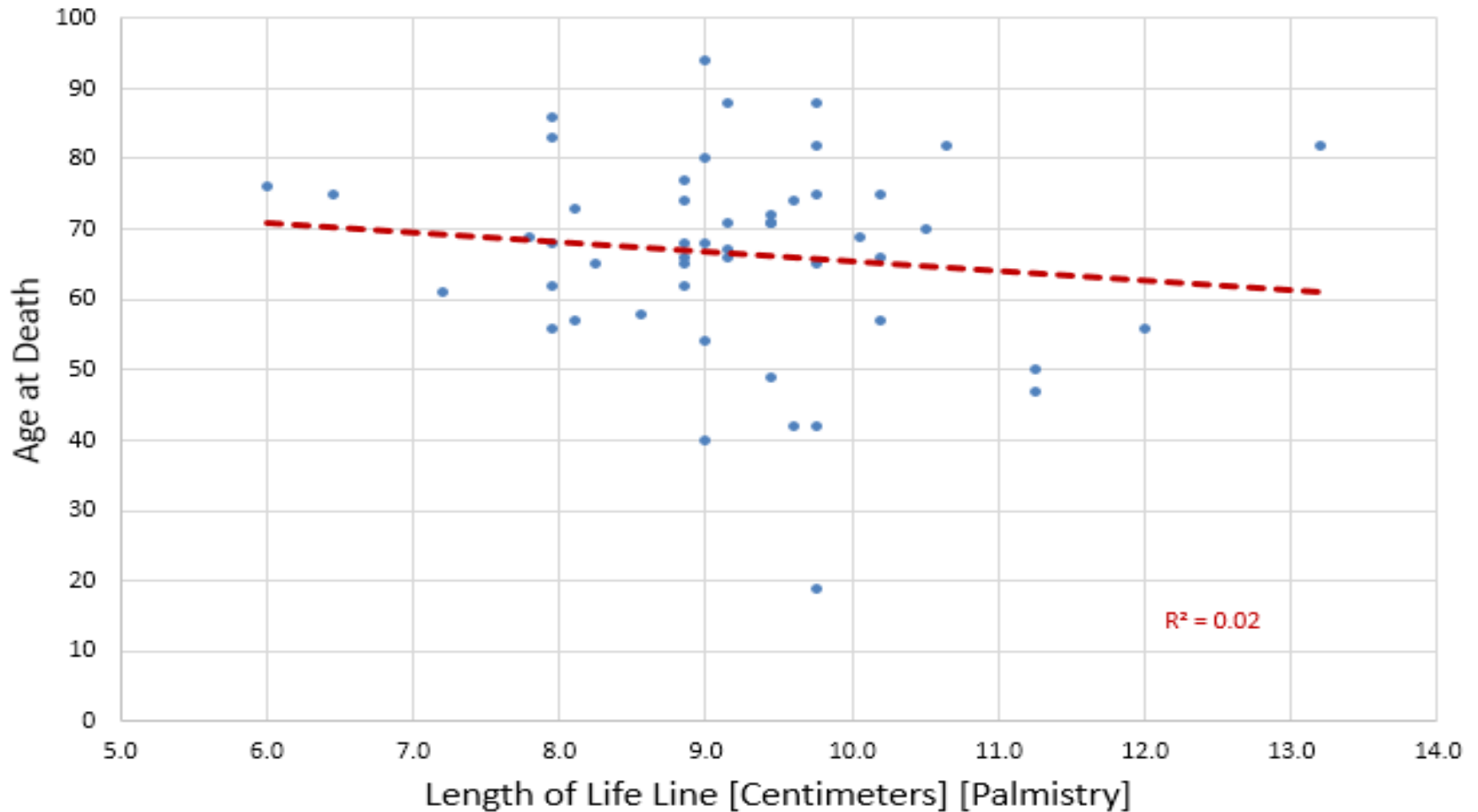
Economically Disadvantaged Students As Related  
To Reading Performance - State XX - 2014



Unit of analysis is a grade level within a school. Negative Relationship.  
School-Grades with a high proportion of economically disadvantaged students  
tend to have lower standardized reading scores in that school-grade level.

# XY Scatter Charts – No Relationship

Length of Life Line As Related to Longevity  
Deceased Males - 18 and Older - US



No Relationship. The length of one's Life Line [Palmistry] is not related to the length of one's life.