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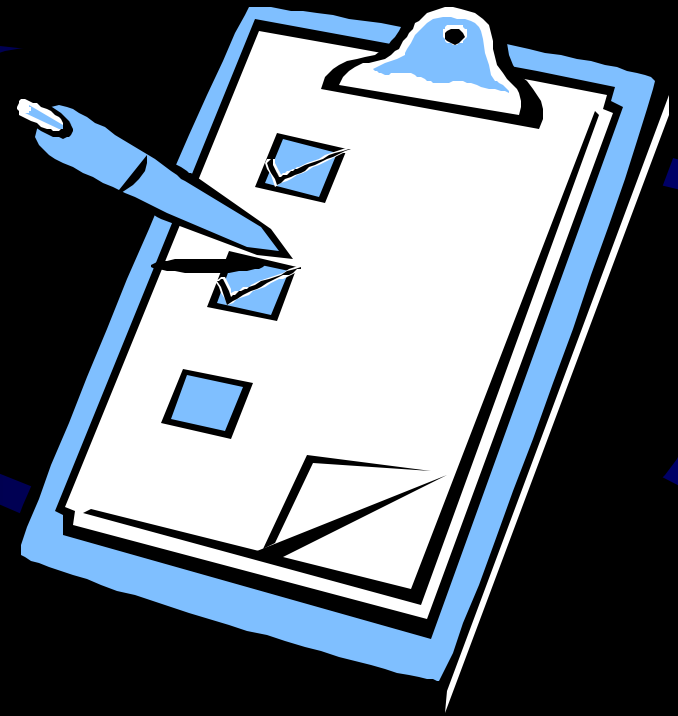
Derivation of 2002 Worklife Expectancy Tables

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Vocational Economics, Inc.

Derivation Agenda

- ❖ Definition of worklife expectancy
- ❖ Current Population Survey
- ❖ Participation and employment
- ❖ Life
- ❖ Putting it together



Definition



- ❖ Years of employment
 - From given age
 - Through end of working years
- ❖ Statistical measure
 - Probability-based
 - Not continuous

Computation Example

❖ Demographics

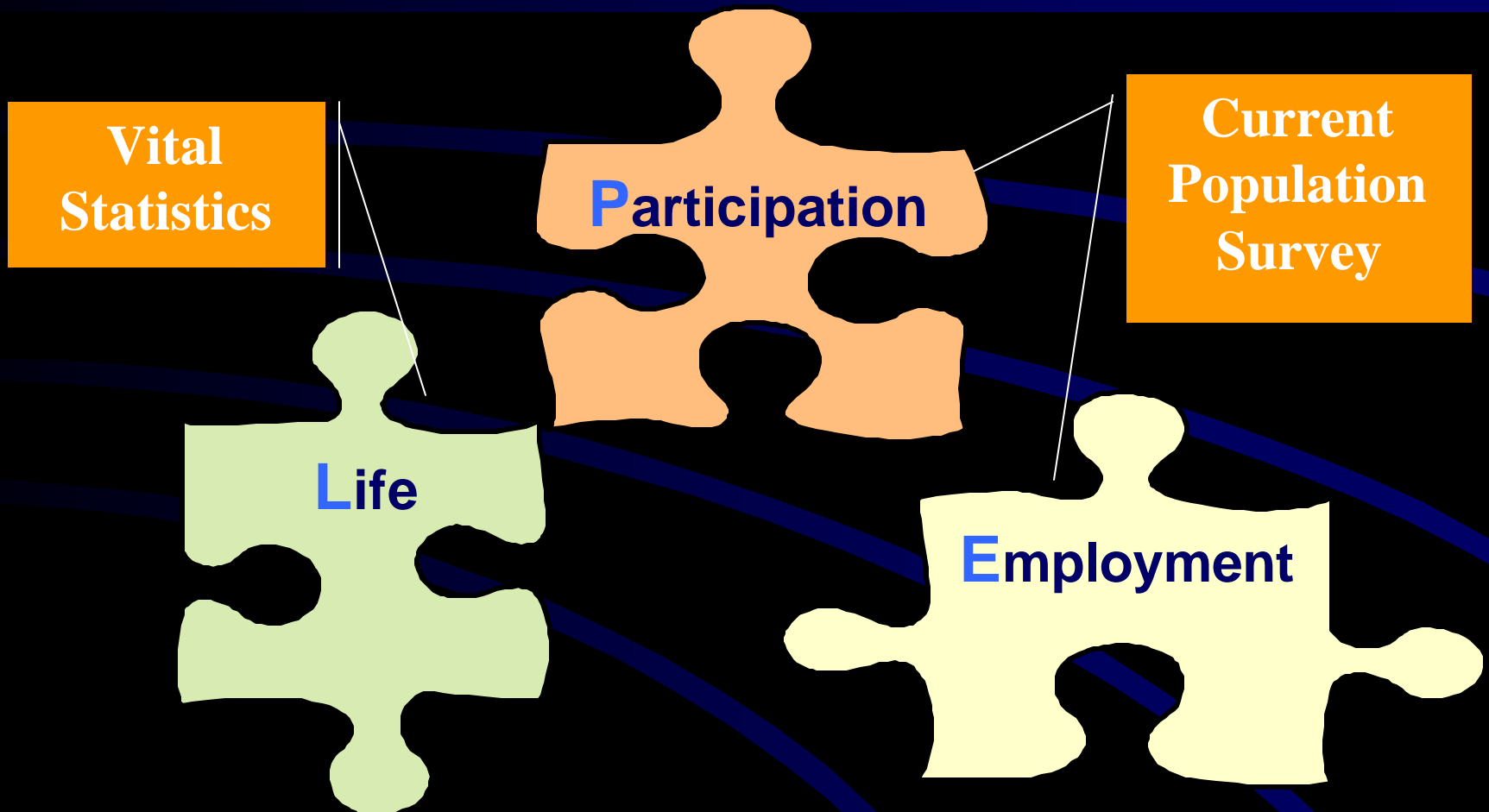
- Male
- 60-years-old
- College education
- Not severe work disability

❖ Computation

- Probability of working by year
- Sum probabilities

Start Age	Probabilities			
	Life (L)	Part. (P)	Emp. (E)	Work (LPE)
60	0.987	0.613	0.948	0.574
61	0.972	0.613	0.948	0.565
62	0.957	0.613	0.948	0.556
63	0.941	0.613	0.948	0.547
64	0.923	0.613	0.948	0.536
65	0.904	0.214	0.958	0.185
66	0.884	0.214	0.958	0.181
67	0.862	0.214	0.958	0.177
83	0.352	0.085	0.965	0.029
84	0.314	0.085	0.965	0.026
85	0.278	0.018	1.000	0.005
86	0.242	0.018	1.000	0.004
87	0.208	0.018	1.000	0.004
88	0.177	0.018	1.000	0.003
89	0.148	0.018	1.000	<u>0.003</u>
			Total	4.824

LPE Puzzle Pieces

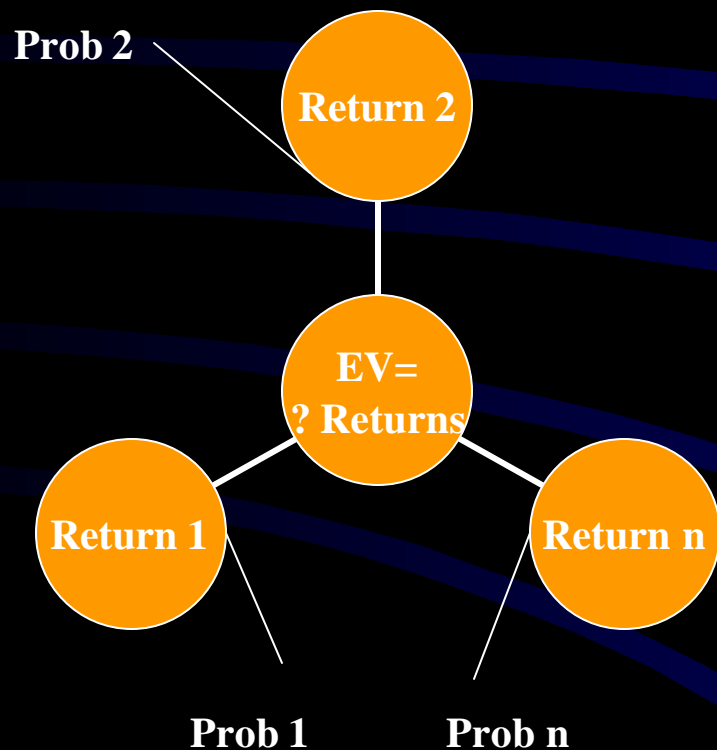


Statistics Refresher: Conditional Probability

- ❖ Compound multiple probabilities
 - Multiply individual independent probabilities
 - $P(A \text{ and } B) = P(A) \times P(B)$
- ❖ Life, Participation, AND Employment
 - $P(L) \times P(P) \times P(E)$
 - Probability alive and employed future year
- ❖ Derive probabilities: fraction of population



Statistics Refresher: Expected Value



❖ Probable return

- Outcome value \times probability of outcome
- Sum for all possible outcomes

❖ WLE ramifications

- Year of employment \times probability
- Sum for all future years
- Limit by reasonability

Computation Example Reprise

❖ Demographics

- Male
- 60-years-old
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❖ Computation

- Probability of working by year
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Start Age	Probabilities			
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			Total	4.824

Current Population Survey

- ❖ Primary source US labor market
- ❖ Monthly
 - Standard questions
 - Cycle of participation: 4-8-4
- ❖ Supplements
 - Annual Demographic Survey
 - Various others

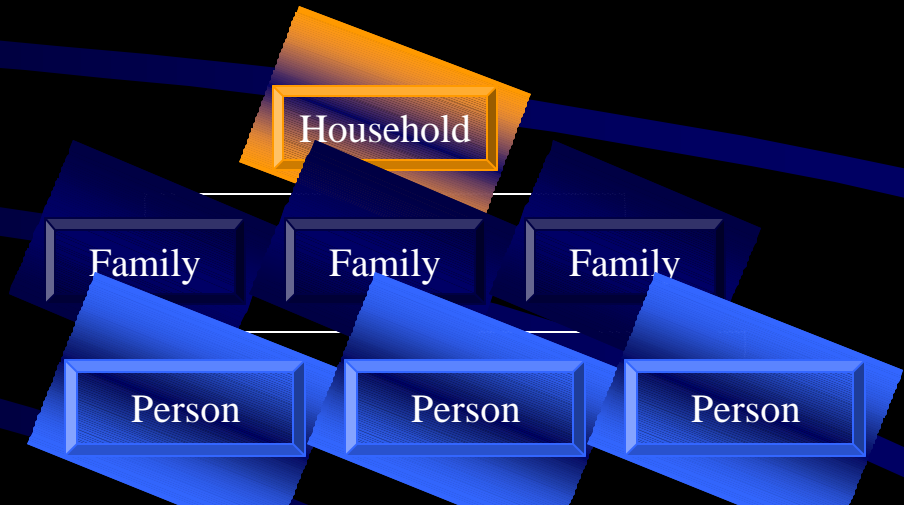


CPS: A Roof-top Survey

64,362 Households

56,480 Families

128,820 Persons



CPS Person Quantity

- ❖ 2001 survey
- ❖ 128,820 total persons
- ❖ By age group
- ❖ By education

< 16	30,919
16-24	15,418
25-64	66,953
65-89	15,063
>89	467
< HS Degree	20,448
HS Degree	30,301
Some Coll.	25,009
Bachelor +	21,288

Disability Definition

Not Severe	“Does anyone in this household have a health problem or disability which prevents them from working or which limits the kind or amount of work they can do?”
	“Is there anyone in this household who ever retired or left a job for health reasons?”
	Received VA disability income in previous year.
Severe	Not in the labor force because of a disability that is expected to last for at least six months.
	Did not work at all in the previous year because of illness or disability.
	Under 65 and covered by Medicare.
	Under 65 and received Supplemental Security Income (SSI).

Key WLE variables

Variable	Description
A-Sex	Gender
A-HGA	Highest grade achieved
A-Age	Age
PEMLR	Monthly Labor Force Recode, 1 or 2 for employed workers
MarSupWt	March supplement weight
Dis-HP	Health problem or a disability: 1 st disability criteria when equal to 1
Dis-CS	Retire or leave a job for health reasons: 2 nd disability criteria when equal to 1
Vet-Typ1	Veterans disability: 3 rd disability criteria when equal to 1
RsnNotW	Not working for illness or disability: 4 th disability criteria when equal to 1
PEMLR	Prevented from working due to disability: 5 th disability criteria when equal to 6
MCare	Medicare coverage: 6 th disability criteria when equal to 1 and age below 65
SSIVal	Supplemental Security Income: 7 th disability criteria when non-zero and age below 65

Sample CPS Group Tabulation

Participate?	Employed?
Yes	Yes
Yes	Yes
No	No
Yes	No
Yes	Yes

Participate?	Employed?
No	No
Yes	Yes
Yes	Yes
Yes	No
Yes	Yes

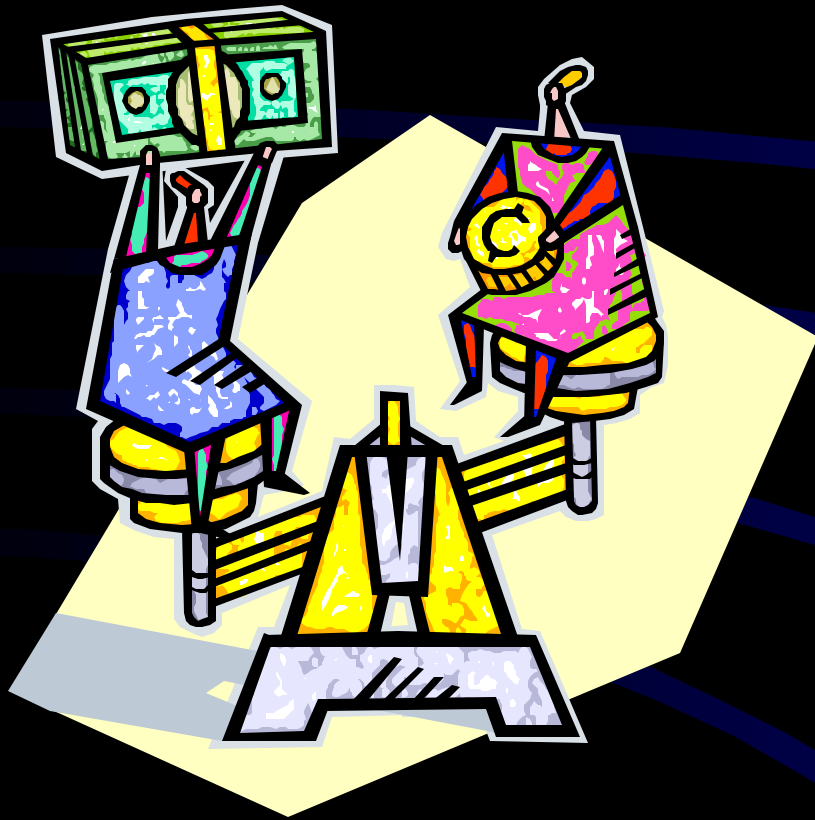
10 Observations, 8 Participating, 6 Employed

Sample PE Computation

- ❖ Observations: 10
- ❖ Probability of participation (P)
 - Number: 8
 - Rate: $8 \div 10 = 0.800$
- ❖ Probability of employment (E)
 - Number: 7
 - Rate: $7 \div 8 = 0.875$
- ❖ Joint PE
 - $0.800 \times 0.875 = 0.700$
 - **Or, $7 \div 10 = 0.700$**



CPS Weights



- ❖ Used to project US population
- ❖ Each respondent represents
 - Average of 2,147
 - Range 67 to 18,483

Weighted PE Tabulation

Employed?	Weight
Yes	2,000
Yes	1,000
No	10,000
No	3,000
Yes	4,000

Employed	Weight
No	5,000
Yes	4,000
Yes	2,000
No	3,000
Yes	3,000

43,000 Total; 22,000 Employed

Weighted PE Computation

	Simple	Weighted
Quantity	10	43,000
Employed	7	22,000
PE Rate	0.700	0.512



PE Grouping



	Notes	Groups
Gender	Male / Female	2
Age	10-year spans	8
Disability	ND, NSD, SD	3
Education	< HS, HS, SC, Col+	4

$$2 \times 8 \times 3 \times 4 = 192 \text{ Cells}$$

Pooling Of Years

❖ Appendix D

❖ 10 years: 92-01

❖ Cell

➤ Males

➤ 55-64

➤ Less than HS

➤ Not disabled

Year	Est. Pop. (000)		n
	Total	Empl.	
<i>Age Group: 55 to 64 Years Old</i>			
1992	1,836	1,311	1,119
1993	1,685	1,207	979
1994	1,469	1,034	868
1995	1,332	965	801
1996	1,431	1,073	727
1997	1,383	1,037	689
1998	1,252	968	639
1999	1,269	977	620
2000	1,244	960	634
2001	<u>1,211</u>	<u>897</u>	<u>614</u>
	14,112	10,429	7,690
PE	0.739		

Pooled Sample Size

	Not Disabled	Not Severely	Severely	Total
< High School	184,735	20,135	30,271	235,141
High School	293,458	21,858	22,604	337,920
Some College	234,591	14,360	10,644	259,595
College Degree	<u>198,867</u>	<u>8,471</u>	<u>4,218</u>	<u>211,556</u>
Total	911,651	64,824	67,737	1,044,212

Pooled Sample 16-89 years old

External Validation

❖ Census cross-tabs

❖ Table 2

	----- With a severe work disability -----				
	----- Percent -----				
	Number	In labor force	----- Employed ----- Total	----- Full time	Not in labor force
55 to 64 years old	1627	7.8	6.9	2.3	92.2
12th grade					
(no diploma) or less	590	5.7	5.2	1.6	94.3
High school graduate	556	8.2	7.3	1.0	91.8
Associate's degree or					
some college with no degree	310	6.8	5.2	1.1	93.2
Bachelor's degree or more	170	15.6	14.4	11.0	84.4

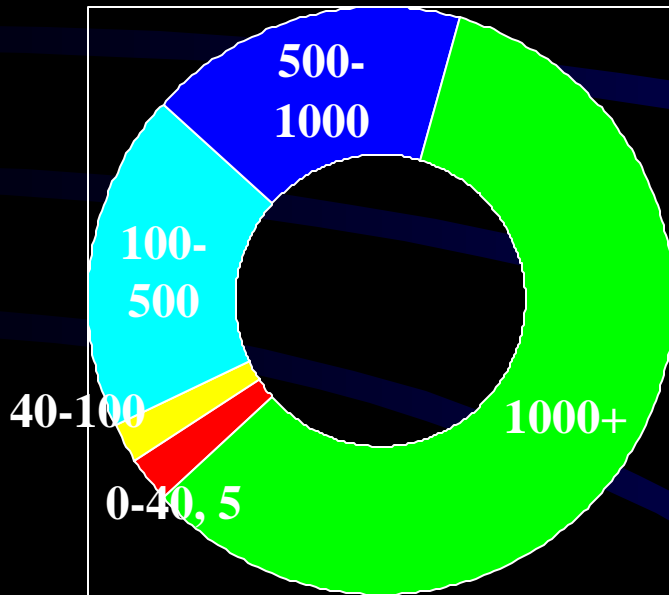
Insufficient Observations

- ❖ 192 cells when subdivided
- ❖ Some still small
- ❖ If less than 39
 - Use nondisabled
 - Adjust for disability ratio
- ❖ Only 5 impacted cells

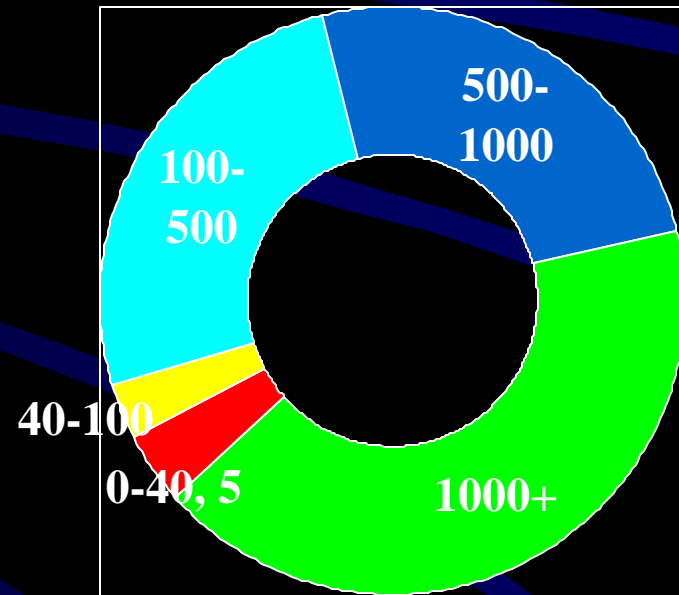


Cell Sizes

All Cells

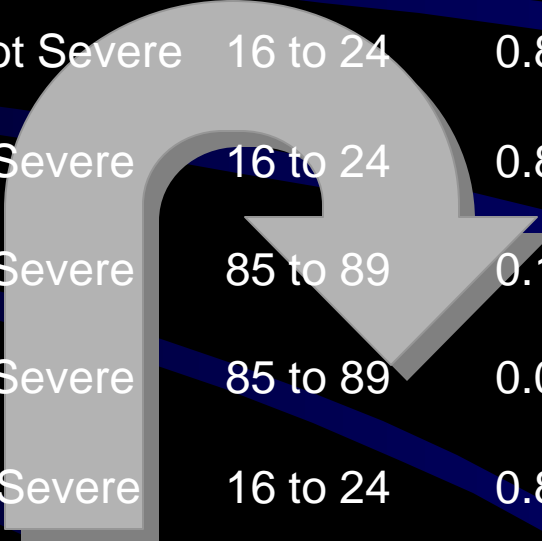


Disability Cells

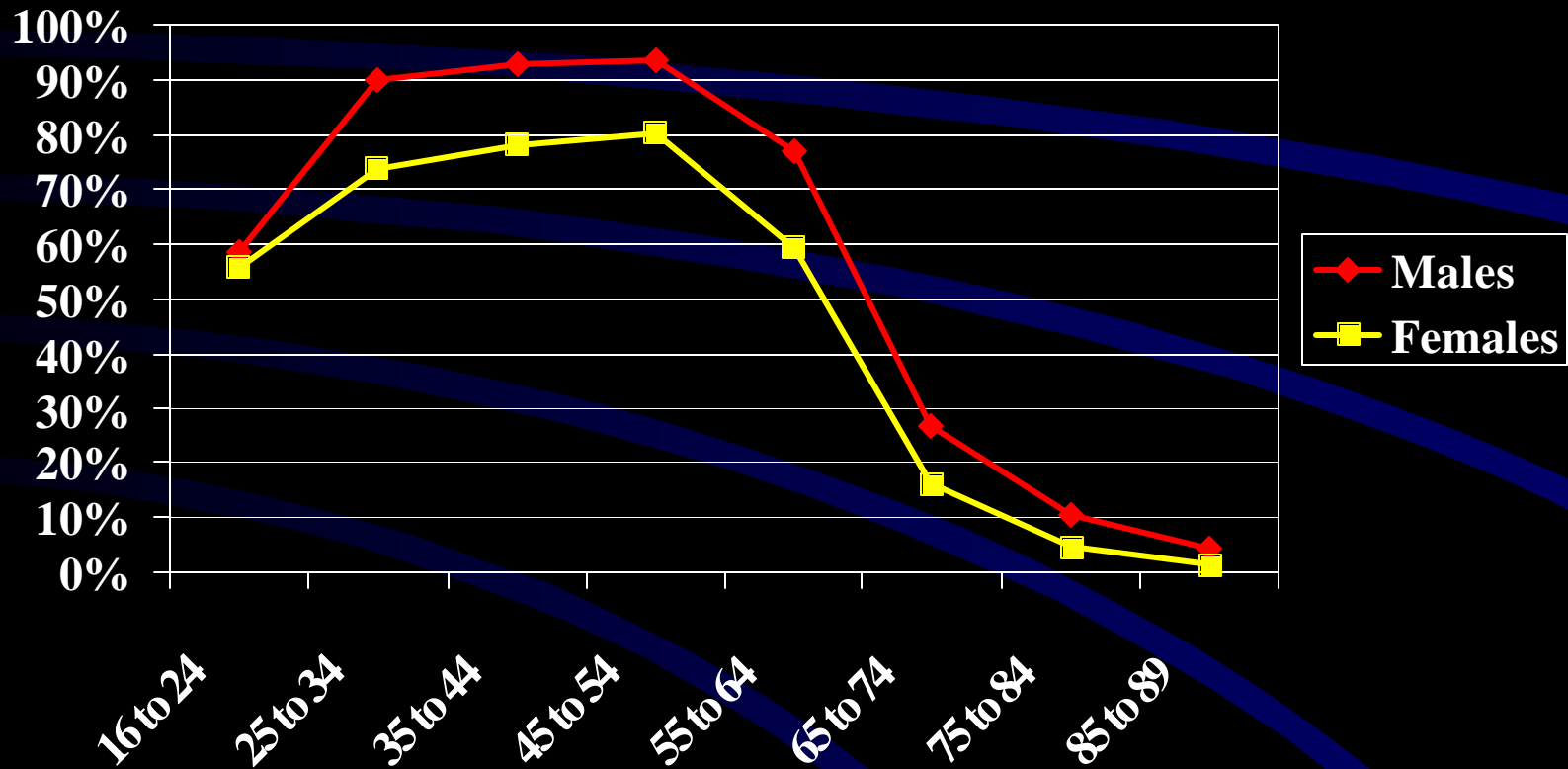


Cells Adjusted

Gender	Education	Disability Status	Age	Nondis. Rate	Disab. Ratio	Est. PE
Male	College Degree	Not Severe	16 to 24	0.814	94.2%	0.767
Male	College Degree	Severe	16 to 24	0.814	27.2%	0.221
Male	College Degree	Severe	85 to 89	0.110	0.0%	0.000
Male	Some College	Severe	85 to 89	0.048	0.0%	0.000
Female	College Degree	Severe	16 to 24	0.851	32.3%	0.275



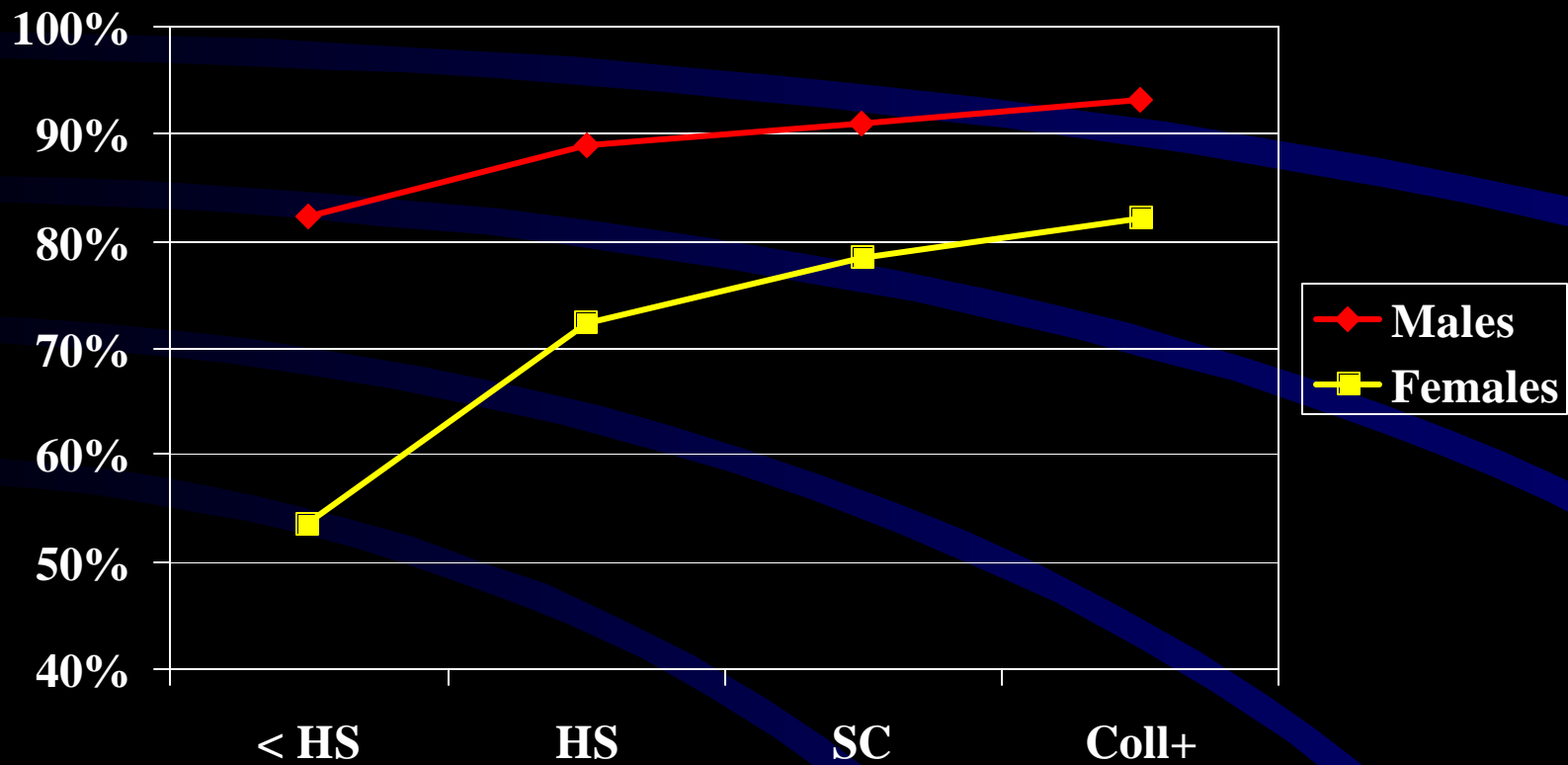
Not Disabled PE Rates by Age



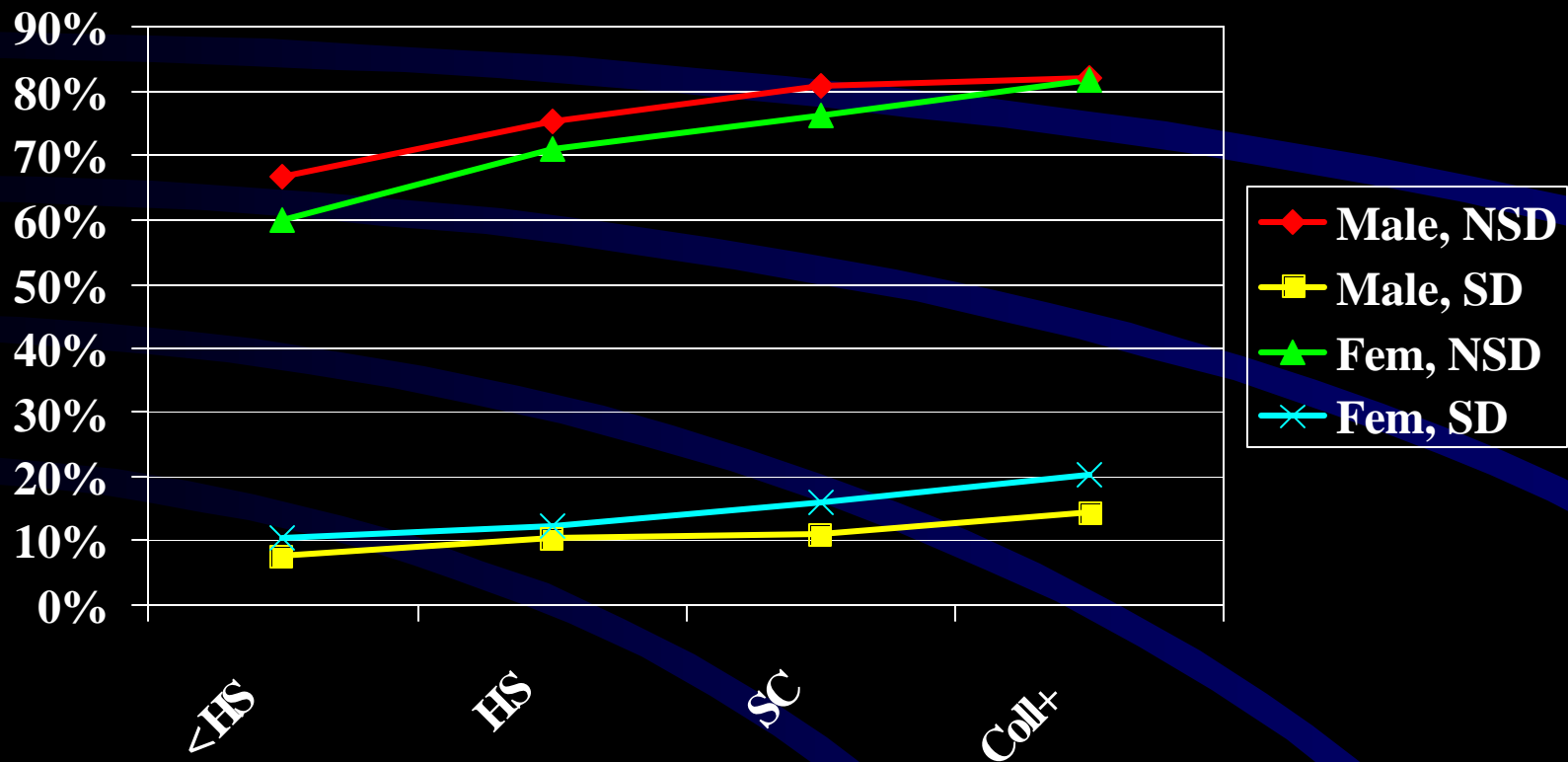
Disabled PE Rates by Age



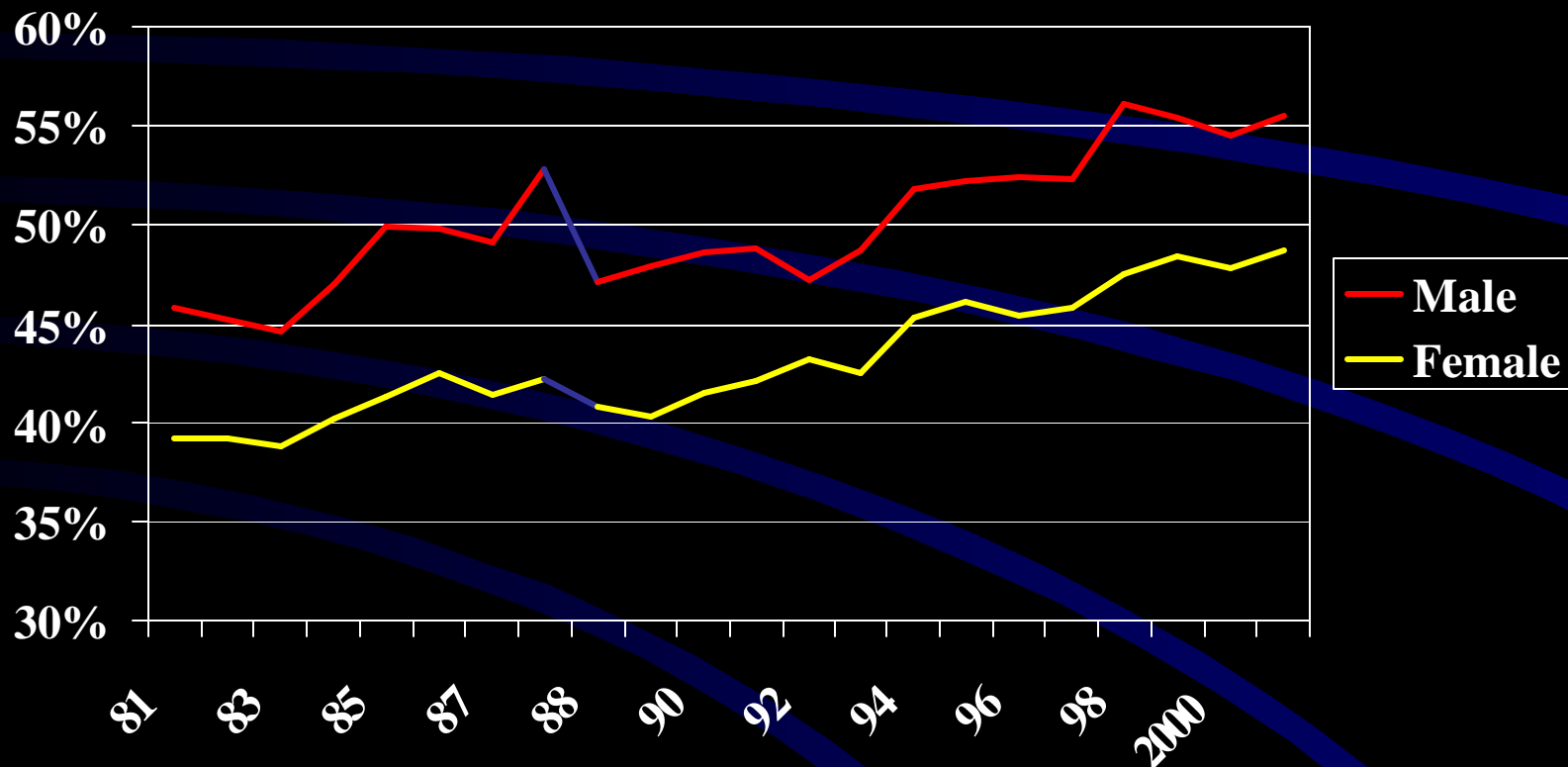
Not Disabled Rates by Education



Disabled Rates by Education

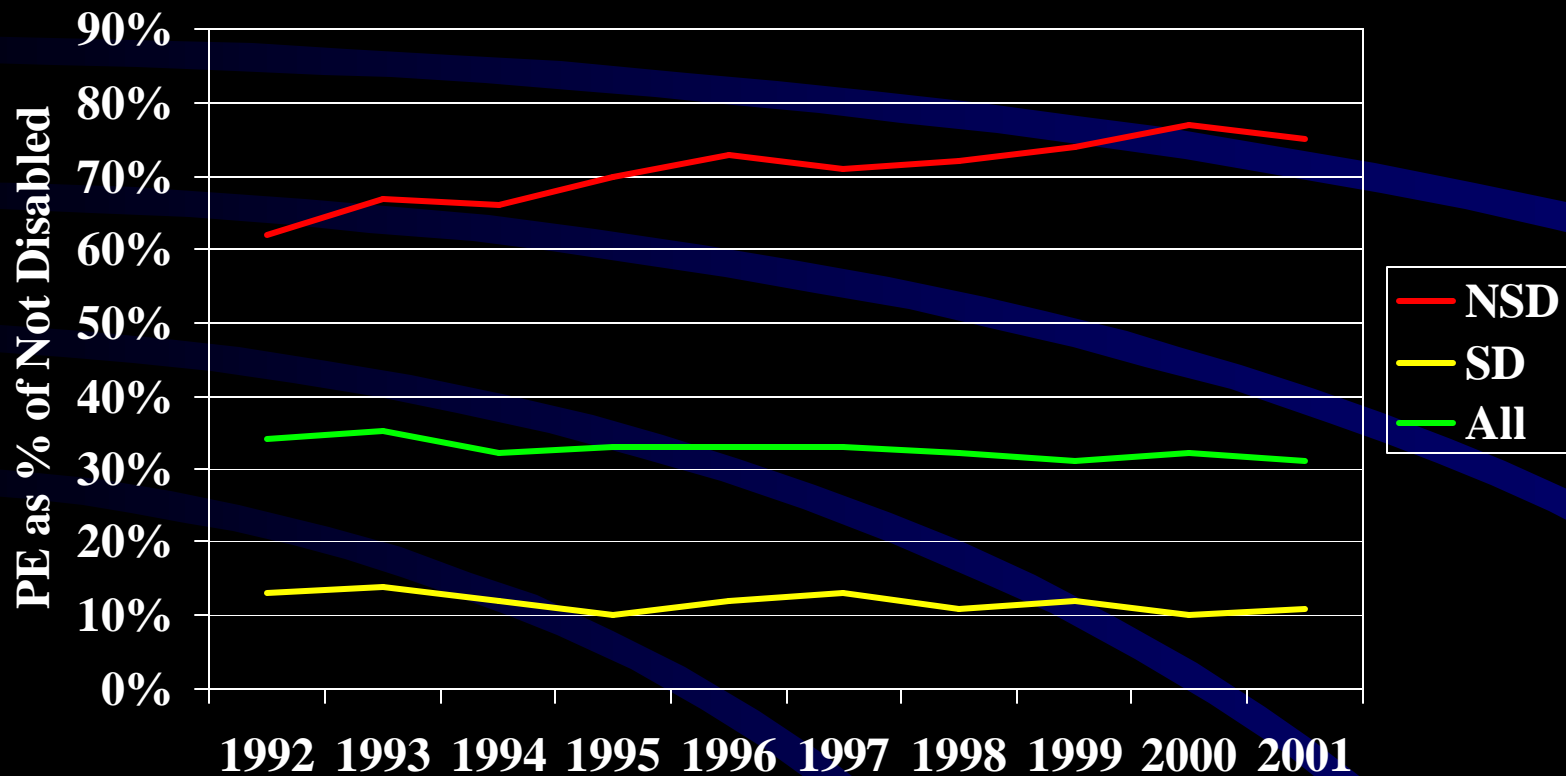


Disability Decrement Trend

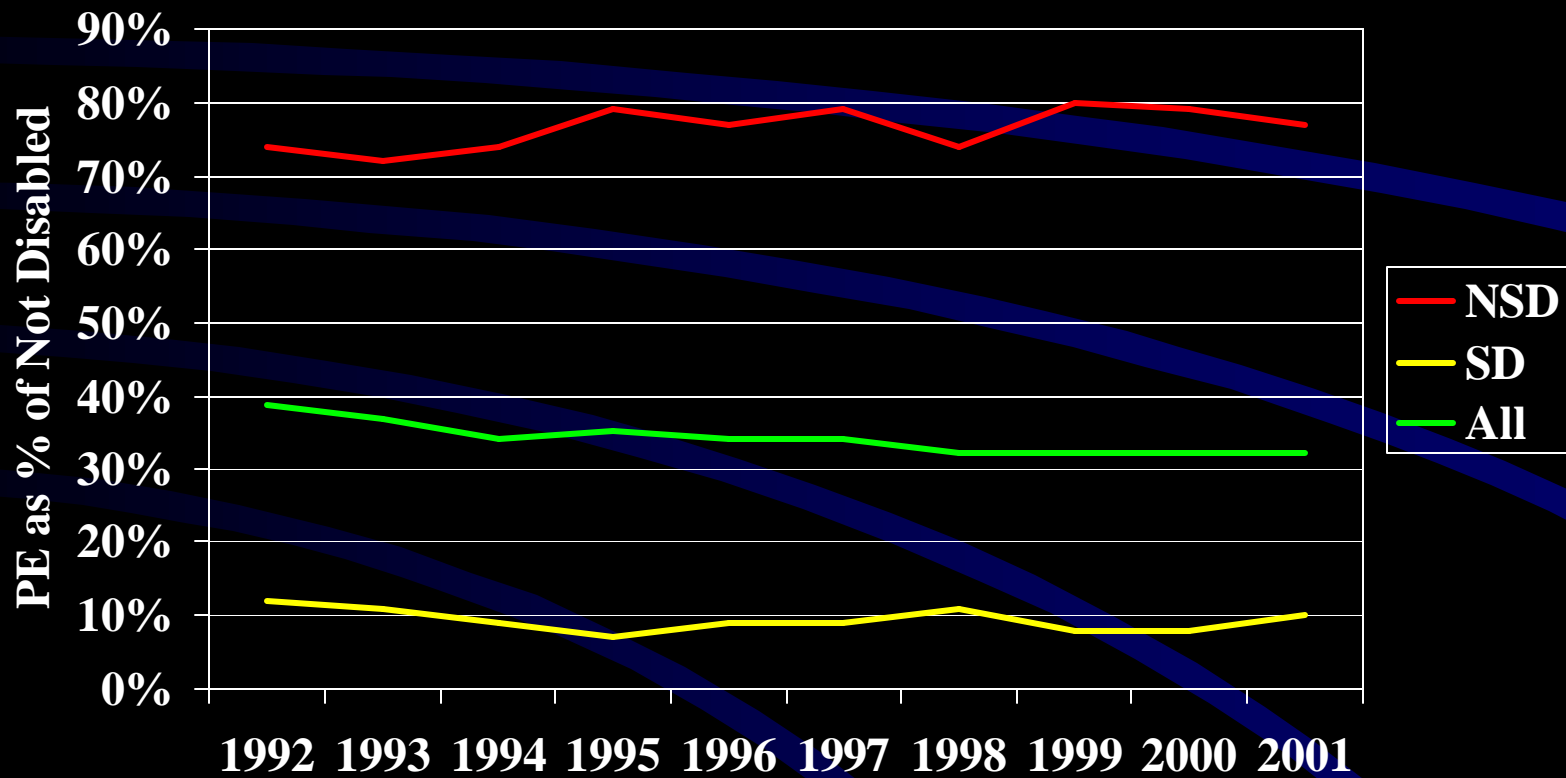


Note: ADA passed in 1990, and was phased in from 1992 - 1994

Disability Ratio Trend - Females



Disability Ratio Trend - Males



Probability of Life



❖ To apply PE

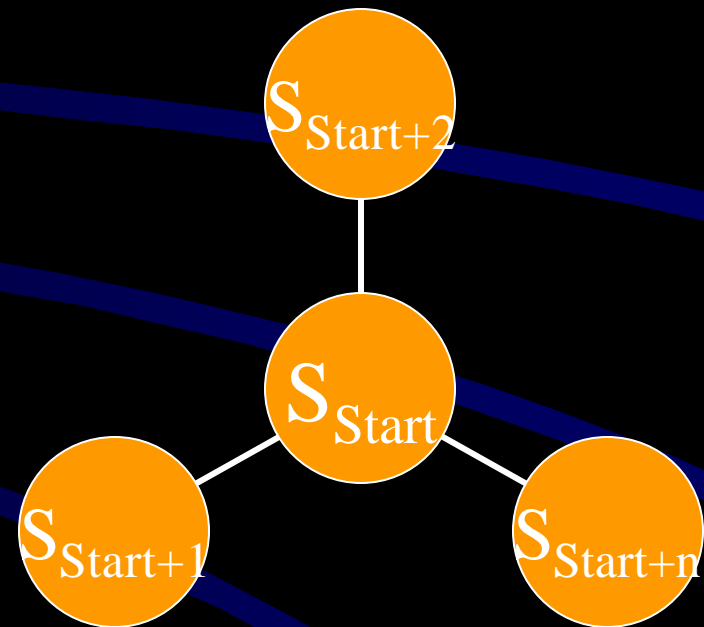
- Need to factor L
- Probability of living to that age

❖ For worklife at age x

- Likelihood of living to $x+1$
- ... $x + 30$

Life Survivors

- ❖ Vital Statistics of US
- ❖ Start with 100,000 live births
- ❖ Show number alive at each birthday
- ❖ Use to compute conditional probability
 - Determine survivors at start age (S_{Start})
 - Determine survivors at target age (S_{Target})
 - Probability alive at target age = $S_{\text{Target}} \div S_{\text{Start}}$



Life Survivors Table

❖ Appendix C

❖ Gender-specific

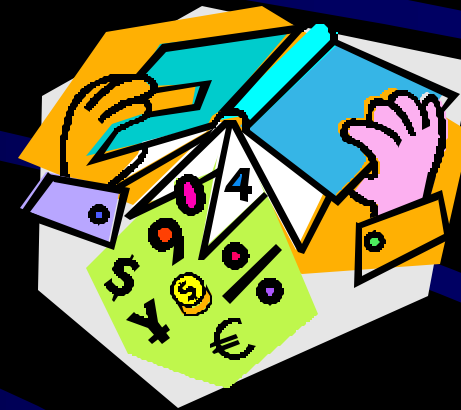
➤ Not education

➤ Not disability

Age	Male	Female	Age	Male	Female	Age	Male	Female
16	98,788	99,050	41	94,998	97,281	66	76,135	85,179
17	98,704	99,011	42	94,733	97,129	67	74,437	83,991
18	98,605	98,968	43	94,449	96,965	68	72,628	82,711
19	98,496	98,922	44	94,141	96,789	69	70,695	81,331
20	98,379	98,876	45	93,808	96,599	70	68,632	79,843
21	98,254	98,830	46	93,445	96,393	71	66,448	78,251
22	98,121	98,784	47	93,050	96,171	72	64,157	76,555
23	97,982	98,736	48	92,624	95,929	73	61,759	74,747
24	97,842	98,688	49	92,168	95,668	74	59,256	72,813
25	97,704	98,639	50	91,683	95,384	75	56,651	70,741
26	97,569	98,588	51	91,168	95,077	76	53,954	68,535
27	97,435	98,535	52	90,620	94,744	77	51,180	66,199
28	97,303	98,480	53	90,033	94,381	78	48,333	63,726
29	97,168	98,422	54	89,399	93,986	79	45,410	61,104
30	97,030	98,361	55	88,710	93,554	80	42,406	58,317
31	96,887	98,297	56	87,957	93,079	81	39,312	55,365
32	96,739	98,229	57	87,134	92,556	82	36,136	52,249
33	96,585	98,156	58	86,239	91,982	83	32,905	48,965
34	96,423	98,075	59	85,271	91,356	84	29,672	45,518
35	96,253	97,987	60	84,232	90,677	85	26,487	41,923
36	96,074	97,891	61	83,115	89,939	86	23,377	38,253
37	95,886	97,787	62	81,913	89,134	87	20,382	34,551
38	95,686	97,674	63	80,619	88,259	88	17,542	30,865
39	95,473	97,553	64	79,226	87,310	89	14,889	27,248
40	95,244	97,422	65	77,730	86,283	90	12,453	23,749

Worklife Computation

Start Age	End Age	Survivors		Probabilities		
		Base Age	At End Age	Life (L)	PE	Work (LPE)
60	61	84,232	83,115	0.987	0.581	0.573
61	62	84,232	81,913	0.972	0.581	0.565
62	63	84,232	80,619	0.957	0.581	0.556
63	64	84,232	79,226	0.941	0.581	0.547
64	65	84,232	77,730	0.923	0.581	0.536
65	66	84,232	76,135	0.904	0.205	0.185
66	67	84,232	74,437	0.884	0.205	0.181
67	68	84,232	72,628	0.862	0.205	0.177
83	84	84,232	29,672	0.352	0.082	0.029
84	85	84,232	26,487	0.314	0.082	0.026
85	86	84,232	23,377	0.278	0.018	0.005
86	87	84,232	20,382	0.242	0.018	0.004
87	88	84,232	17,542	0.208	0.018	0.004
88	89	84,232	14,889	0.177	0.018	0.003
89	90	84,232	12,453	0.148	0.018	<u>0.003</u>



Expected Value Again



- ❖ **Worklife not continuous**
 - Sum probabilities of many years
 - Not correct to multiply by earnings
- ❖ **Evaluate expected earnings**
 - $P(W) \times$ annual earnings
 - Sum expected earnings
 - Not necessary with offset

Worklife Probability Example

Date	Age Years		<i>Pre-Injury</i>				
			Prob . Life	Prob . PE	Prob. Wrklif	Base Earnin	Adjuste d
7/24/2002	60.0	1.00	0.987	0.807	0.797	80,000	77,787
7/24/2003	61.0	1.00	0.972	0.807	0.784	80,000	76,518
7/24/2004	62.0	1.00	0.957	0.807	0.772	80,000	75,347
7/24/2005	63.0	1.00	0.941	0.807	0.759	80,000	74,078
7/24/2006	64.0	1.00	0.923	0.807	0.745	80,000	72,712
7/24/2007	65.0	1.00	0.904	0.370	0.334	80,000	32,598
7/24/2008	66.0	1.00	0.884	0.370	0.327	80,000	31,915
7/24/2009	67.0	1.00	0.862	0.370	0.319	80,000	31,134
7/24/2010	68.0	1.00	0.839	0.370	0.310	80,000	30,256
7/24/2011	69.0	1.00	0.815	0.370	0.302	80,000	29,475

Summary

❖ Statistics

- Probabilities
- Expected value
- Averages

❖ Employment: CPS

❖ Life

❖ Applied to earnings

