## Lecture 11

Hypothesis Testing: Comparing Parameters (Means, Proportions, Incidence Rates) Between More Than 2 Populations With One Test

Section A: (Hypothesis Testing) Comparing Means Between More Than Two Populations: Analysis of Variance (ANOVA)

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## Learning Objectives

- In this lecture section you will learn to interpret a p-value from a hypothesis test for (any) mean differences between more than two populations
- The method for getting the p-value is called the Analysis of Variance (frequently called ANOVA)

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## Example 1

- Researchers were interested in the relationship between smoking and mid-expiratory flow (FEF), a measure of pulmonary health. The researchers recruited study subjects and classified them into one of six smoking categories[1]
  - Nonsmokers (NS)
  - Passive smokers (PS)
  - Non-inhaling smokers (NI)
  - Light smokers (LS)
  - Moderate smokers (MS)
  - Heavy smokers (HS)

[1] White, J.R., Froeb, H.F. Small-Airways Dysfunction in Non-Smokers Chronically Exposed to Tobacco Smoke, *New England Journal of Medicine* 302: 13 (1980)

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## Example 1

- To start, the researchers were interested in whether there were any statistically significant differences in pulmonary outcomes (FEV1, FEF, etc..) between the six underlying populations
- One strategy would be to perform lots of two-sample t-tests (for each possible two-group comparison)
- In this example, there would be 15 such comparisons !
  - NS to PS, NS to NI, and so on . . .

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## Example 1

- Analysis of Variance (One-Way ANOVA) is an extension of the two-sample (unpaired) t-test to compare means between more than two populations with one test
- General idea behind ANOVA, comparing means for k-groups (k > 2):

$H_o : \mu_1 = \mu_2 = \ldots\ldots \mu_k$

$H_A :$ At least one mean different

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## Example 1

- Smoking and FEF
  - From a pool of over 5,200 potential participants, a random sample of 200 men and 200 women was drawn from each smoking group (except for the non-inhalers, where 50 men and 50 women were selected)
  - FEF measurements were taken on each of the subjects

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## Example 1

- Table 1



Table 1. Vital Capacities and Expiratory Flow Rate (Mean ±S.D.) in Male and Female Smokers and Nonsmokers.

| Group | No. of Subjects | Sex | Age | Height | FVC | | FEV$_1$ | | FEF 25-75% | | FEF 75-85% | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | yr | cm | liters | % predicted | liters | % predicted | liter/sec | % predicted | liter/sec | % predicted |
| 1 — Nonsmokers, no smoky environment | 200 | F | 47.77±7.0 | 162.05±6.58 | 3.35±0.63 | 102 | 2.63±0.63 | 104 | 3.17±0.74 | 108 | 1.03±0.38 | 112 |
| | 200 | M | 48.8±7.59 | 176.3±7.77 | 4.91±0.75 | 102 | 3.72±0.65 | 103 | 3.78±0.79 | 104 | 1.22±0.35 | 120 |
| 2 — Nonsmokers, smoky environment >20 yr | 200 | F | 45.91±6.94 | 161.8±6.68 | 3.23±0.46 | 98 | 2.47±0.63 | 99 | 2.72±0.71* | 93 | 0.78±0.36* | 85 |
| | 200 | M | 49.1±7.61 | 176.02±6.55 | 4.78±0.77 | 99 | 3.54±0.61 | 98 | 3.30±0.77* | 91 | 0.97±0.34* | 95 |
| 3—Smokers not inhaling cigarettes, pipe, or cigars >20 yr | 50 | F | 46.93±7.10 | 159±7.09 | 3.19±0.52 | 97 | 2.49±0.74 | 99 | 2.71±0.87* | 92 | 0.78±0.43* | 85 |
| | 50 | M | 47.6±7.38 | 174.5±7.42 | 4.63±0.86 | 96 | 3.56±0.76 | 99 | 3.32±0.86* | 92 | 0.89±0.47 | 87 |
| 4 — Smokers inhaling 1–10 cigarettes per day >20 yr | 200 | F | 47.36±7.0 | 159.77±7.44 | 3.15±0.39 | 96 | 2.40±0.62 | 98 | 2.63±0.73* | 89 | 0.76±0.31* | 83 |
| | 200 | M | 48.5±7.51 | 175.9±7.44 | 4.58±0.77* | 95 | 3.49±0.62* | 97 | 3.23±0.78* | 89 | 0.79±0.36* | 77 |
| 5 — Smokers inhaling 11–39 cigarettes per day >20 yr | 200 | F | 45.72±6.87 | 160±6.99 | 2.80±0.38* | 83 | 2.13±0.62* | 85 | 2.29±0.70* | 78 | 0.63±0.31* | 69 |
| | 200 | M | 48.3±7.49 | 176.02±7.67 | 4.04±0.74* | 84 | 3.08±0.61* | 86 | 2.73±0.81* | 76 | 0.69±0.29 | 68 |
| 6 — Smokers inhaling >40 cigarettes per day >20 yr | 200 | F | 45.98±6.73 | 159.26±7.29 | 2.55±0.38* | 78 | 2.01±0.64* | 80 | 2.12±0.72* | 72 | 0.57±0.33* | 62 |
| | 200 | M | 47.8±7.44 | 176.53±7.9 | 3.92±0.73* | 82 | 2.77±0.60* | 77 | 2.59±0.82* | 72 | 0.61±0.31* | 60 |
| Prediction for age: 46.8 yr, height 160.53 cm † | 1050 | F | 46.61±6.94 | 160.3±6.99 | 3.28 | — | 2.52 | — | 2.94 | — | 0.92 | — |
| Prediction for age: 48.3 yr, height 175.77 cm † | 1050 | M | 48.35±7.50 | 175.77±7.54 | 4.81 | — | 3.60 | — | 3.62 | — | 1.02 | — |

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## Example 1

- Data Summary, Males (FEF 25- 75%)

| Group | Mean FEF | SD FEF | |
|---|---|---|---|
| | (L/s) | (L/s) | n |
| NS | 3.78 | 0.79 | 200 |
| PS | 3.30 | 0.77 | 200 |
| NI | 3.32 | 0.86 | 50 |
| LS | 3.23 | 0.78 | 200 |
| MS | 2.73 | 0.81 | 200 |
| HS | 2.59 | 0.82 | 200 |

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## Example 1

- ANOVA comparing FEF values for males by smoking group

  $H_o$: $\mu_{NS}=\mu_{PS}=\mu_{NI}=\mu_{LS}=\mu_{MS}=\mu_{HS}$
  $H_A$: At least two groups have different means

- The p-value from ANOVA is very small: $p < 0.01$
  - Conclusion?

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## Example 1

- Overall summary of pulmonary comparisons, from abstract (based on follow-up two sample comparisons)

(P<0.005). When we looked at the extent to which smoke exposure is related to graded abnormality, we found that nonsmokers in smoke-free working environments have the highest scores on the spirometric tests; passive smokers, smokers who do not inhale, and light smokers score similarly and significantly lower; and heavy smokers score the lowest (P<0.005). We conclude that chronic exposure to tobacco smoke in the work environment is deleterious to the nonsmoker and significantly reduces small-airways function. (N Engl J Med. 1980; 302: 720-3.)

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## Example 2

- FEV1 and three medical centers [2]
  - Data was collected on 60 patients with coronary artery disease at 3 difference medical centers (Johns Hopkins, Ranchos Los Amigos Medical Center, St. Louis University School of Medicine)
  - Purpose of study to investigate effects of carbon monoxide exposure on these patients
  - Prior to analyzing CO effects data, researchers wished to compared the respiratory health of these patients across the three medical centers

[2] Pagano M, Gauvreau K. *Principles of Biostatistics. Second Edition.* Duxbury Press (2000).

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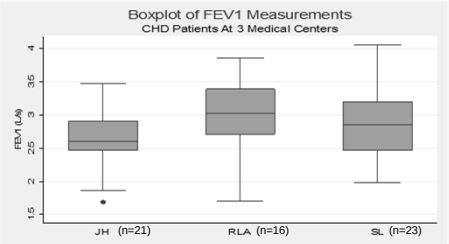
## Boxplots

- FEV1 Values by Center

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## Boxplots

- ANOVA
- Conclusions?

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## Example 2

- ANOVA approach, conceptually
  - Assume the null hypothesis is true
  - Compute a measure of discrepancy between what was observed in the sample compared to what is expected under the null (in ANOVA this is called a "F-statistic"
  - Compared this measure of discrepancy (F-statistic) to the distribution of such measures because of random sampling variability, when the null is true
  - Convert to a p-value

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## Example 2

- For this example, the F-statistic is 3.12. To get a p-value, this observed value is compared to a F-distribution with 2 numerator, and 57 denominator degrees of freedom

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## Example 3: Academic Physician Salaries[3]

- From abstract

**Results** The mean salary within our cohort was $167 669 (95% CI, $158 417-$176 922) for women and $200 433 (95% CI, $194 249-$206 617) for men. Male gender was associated with higher salary (+$13 399; *P* = .001) even after adjustment in the final model for specialty, academic rank, leadership positions, publications, and research time. Peters-Belson analysis (use of coefficients derived from regression model for men applied to women) indicated that the expected mean salary for women, if they retained their other measured characteristics but their gender was male, would be $12 194 higher than observed.

**Conclusion** Gender differences in salary exist in this select, homogeneous cohort of mid-career academic physicians, even after adjustment for differences in specialty, institutional characteristics, academic productivity, academic rank, work hours, and other factors.

*JAMA. 2012;307(22):2410-2417* www.jama.com

[3] Jagsi R, et al. Gender Differences in the Salaries of Physician Researchers. *Journal of the American Medical Association* (2012); 307(22); 2410-2417.

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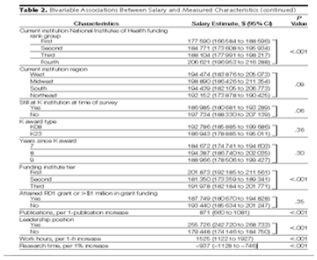
## Example

- Article Table



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## Example 4: Academic Physician Salaries

- Article Table

**Table 2.** Bivariable Associations Between Salary and Measured Characteristics (continued)

| Characteristics | Salary Estimate, $ (95% CI) | *P* Value |
|---|---|---|
| Current institution National Institutes of Health funding rank group | | |
| First | 177 590 (166 584 to 188 596) | <.001 |
| Second | 184 771 (173 608 to 195 934) | |
| Third | 188 104 (177 991 to 198 217) | |
| Fourth | 206 621 (196 953 to 216 288) | |
| Current institution region | | |
| West | 194 474 (183 876 to 205 073) | .09 |
| Midwest | 198 890 (186 426 to 211 354) | |
| South | 194 439 (182 105 to 206 773) | |
| Northeast | 192 152 (173 878 to 190 425) | |
| Still at K institution at time of survey | | |

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## Summary

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Section B: (Hypothesis Testing) Comparing Proportions Between More Than Two Populations: Chi-Square Tests

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## Learning Objectives

- In this lecture set you will learn to interpret a p-value for a hypothesis test comparing proportions between more than two populations
- The method for getting the p-value is an extension of the chi square test shown in lecture 10, and is also called a chi square test

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## Example 1

- Health care indicators by immigrant status[1]

*Objectives.* We examined the health status and patterns of health care use of children in US immigrant families.

*Methods.* Data from the 1999 National Survey of America's Families were used to create 3 subgroups of immigrant children: US-born children with noncitizen parents, foreign-born children who were naturalized US citizens, and foreign-born children with noncitizen parents. Chi-square and logistic regression analyses were used to examine relationships between immigrant status and health access variables. Subgroup analyses were conducted with low-income families.

*Results.* Foreign-born noncitizen children were 4 times more likely than children from native families to lack health insurance coverage and to have not visited a mental health specialist in the preceding year. They were 40% and 80% more likely to have not visited a doctor or dentist in the previous year and twice as likely to lack a usual source of care. US-born children with noncitizen parents were also at a disadvantage in many of these aspects of care.

*Conclusions.* We found that, overall, children from immigrant families were in worse physical health than children from non-immigrant families and used health care services at a significantly lower frequency. (*Am J Public Health.* 2006;96: 634–640. doi:10.2105/AJPH.2004.049791)

[1] Huang, Z., et al. Health Status and Health Service Access and Use Among Children in U.S. Immigrant Families, *American Journal of Public Health* 96: 4 (2006)

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## Example 1

- Example: health care indicators by immigrant status[1]

**TABLE 2—Health Status, Health Care Access, and Health Care Use, by Immigrant Status: National Survey of America's Families, 1999**

| | US Born, % (SE) | | Foreign Born, % (SE) | |
|---|---|---|---|---|
| | Citizen Parents | Noncitizen Parents | Citizen (Naturalized) | Noncitizen |
| Health and well-being | | | | |
| Fair/poor current health status | 3.93 (0.22) | 13.52 (1.95) | 4.95 (2.65) | 12.22 (1.95) |
| Negative behavior at ages 6–11 y | 6.46 (0.56) | 6.91 (2.00) | 2.74 (1.76) | 2.10 (1.05) |
| Negative behavior at ages 12–17 y | 7.50 (0.42) | 3.58 (1.04) | 1.43 (0.81) | 6.46 (2.67) |
| No involvement in activities at ages 6–17 y | 16.75 (0.53) | 42.64 (3.23) | 15.21 (3.67) | 29.12 (2.50) |
| Health insurance coverage and health care use and access | | | | |
| Lack of medical insurance at any time in past 12 mo | 15.34 (0.55) | 34.37 (2.62) | 12.86 (3.68) | 52.3 (2.77) |
| No usual source of care other than ER | 5.78 (0.27) | 18.21(1.93) | 12.19 (4.18) | 27.93 (2.63) |
| At least one doctor visit in past year | 77.03 (0.54) | 65.43 (2.28) | 77.04 (5.38) | 51.75 (2.48) |
| ER visit in past year | 25.43 (0.47) | 23.47 (1.96) | 11.59 (3.62) | 12.45 (1.72) |
| At least one visit to dentist in past year (≥3 y old) | 80.47 (0.44) | 62.73 (2.81) | 84.65 (3.42) | 55.59 (2.81) |
| Visit to mental health specialist in past year (≥3y old) | 7.17 (0.32) | 2.83 (0.89) | 5.55 (1.86) | 1.77 (0.46) |
| Subset of items targeted specifically to families with incomes at or below 200% of FPL | | | | |
| Lack of medical insurance at any time in past 12 mo | 26.66 (1.12) | 38.76 (3.23) | 37.19 (10.58) | 68.58 (3.58) |
| Current Medicaid/SCHIP/state coverage | 43.66 (0.97) | 49.83 (3.30) | 19.26 (5.49) | 19.57 (2.50) |
| Aware of separate SCHIP program | 50.25 (1.20) | 49.51 (3.14) | 46.6 (11.74) | 39.71 (4.16) |
| Aware of Medicaid program | 80.85 (0.73) | 90.83 (1.27) | 80.95 (4.26) | 80.79 (3.10) |

Note. ER = emergency room; FPL = federal poverty level; SCHIP = State Child Health Insurance Program. All $\chi^2$ *Ps* were less than .05.

[1] Huang, Z., et al. Health Status and Health Service Access and Use Among Children in U.S. Immigrant Families, *American Journal of Public Health* 96: 4 (2006)

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## Example 1

- Zoom in

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## Example 1

- Chi Square Approach

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## Example 1

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## Example 2

- Out of pocket spending, medication adherence: dialysis patients, 12 countries[2]

**ABSTRACT:** Few studies have examined drug costs and adherence in similar patient cohorts across countries. Using representative samples of hemodialysis patients from twelve countries, we examined out-of-pocket medication spending and cost-related nonadherence. Mean monthly spending ranged from $8 in the United Kingdom to $114 in the United States. The proportion of patients reporting nonadherence because of cost ranged from 3 percent in Japan to 29 percent in the United States. Out-of-pocket spending was related to national pharmaceutical financing policies and predicted national nonadherence rates. However, inconsistencies in the relationship between patient costs and nonadherence suggested that other social or policy factors also matter. [*Health Affairs* 27, no. 1 (2008): 89–102; 10.1377/hlthaff.27.1.89]

[2] Hirth R, et al. Out-Of-Pocket Spending And Medication Adherence Among Dialysis Patients In Twelve Countries. Health Affairs (2008). 27 (1).

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## Example 2

- Characteristics of dialysis patients, 12 countries (six shown)

**EXHIBIT 1**
**Descriptive Measures Of The Prevalent Cross-Sectional Patient Sample, Dialysis Patients In Twelve Countries, 2002–2004**

| | A/NZ (n = 561) | BEL (n = 468) | CAN (n = 503 | FRA (n = 481) | GER (n = 524) | ITA (n = 540) |
|---|---|---|---|---|---|---|
| Mean age (years) | 59.9 (14.7) | 66.2 (13.4) | 62.1 (14.7) | 64.1 (14.5) | 61.7 (14.1) | 64 (13.7) |
| Minority[a] | 21.5% | 5.3% | 18.7% | 7.1% | 0.4% | 0.4% |
| Income ($US) | | | | | | |
| <$20,000 | 65.0% | 73.4% | 71.6% | 67.0% | 59.7% | 78.3% |
| $20,000–$39,000 | 9.1 | 17.5 | 20.6 | 21.8 | 27.1 | 17.4 |
| ≥$40,000 | 5.9 | 9.1 | 7.4 | 11.2 | 13.1 | 4.2 |
| Insurance type | | | | | | |
| National only | 69.8% | 74.1% | 79.6% | 45.5% | 95.4% | 99.6% |
| Private only | 5.4 | 0.4 | 0.2 | 0.2 | 2.9 | 0.0 |
| Mean number of comorbid conditions[b] | 3.7 (2) | 3.9 (2.1) | 4.1 (2.1) | 3.1 (1.9) | 3.4 (2.1) | 2.7 (1.9) |
| Mean number of prescribed medications | 8.7 (3.6) | 9.9 (4.1) | 12.6 (4.8) | 7.7 (3.5) | 9.7 (3.5) | 6.4 (3.6) |

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## Example 2

- Percentage of minorities, compared across the 12 countries (only 6 countries shown)

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## Example 2

- Distribution of income categories

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## Example 2

- Distribution of income categories



## Example 2

- ANOVA as well (previously lecture section infiltration!)

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| | A/NZ (n = 561) | BEL (n = 468) | CAN (n = 503 | FRA (n = 481) | GER (n = 524) | ITA (n = 540) |
|---|---|---|---|---|---|---|
| Mean age (years) | 59.9 (14.7) | 66.2 (13.4) | 62.1 (14.7) | 64.1 (14.5) | 61.7 (14.1) | 64 (13.7) |
| Minority[a] | 21.5% | 5.3% | 18.7% | 7.1% | 0.4% | 0.4% |
| Income ($US) | | | | | | |
| <$20,000 | 85.0% | 73.4% | 71.8% | 67.0% | 59.7% | 78.3% |
| $20,000–$39,000 | 9.1 | 17.5 | 20.8 | 21.8 | 27.1 | 17.4 |
| ≥$40,000 | 5.9 | 9.1 | 7.4 | 11.2 | 13.1 | 4.2 |
| Insurance type | | | | | | |
| National only | 69.8% | 74.1% | 79.6% | 45.5% | 95.4% | 99.6% |
| Private only | 5.4 | 0.4 | 0.2 | 0.2 | 2.9 | 0.0 |
| Mean number of comorbid conditions[b] | 3.7 (2) | 3.9 (2.1) | 4.1 (2.1) | 3.1 (1.9) | 3.4 (2.1) | 2.7 (1.9) |
| Mean number of prescribed medications | 8.7 (3.6) | 9.9 (4.1) | 12.6 (4.8) | 7.7 (3.5) | 9.7 (3.5) | 6.4 (3.6) |



## Example 3: Academic Physician Salaries[3]

- From abstract

**Results** The mean salary within our cohort was $167 669 (95% CI, $158 417-$176 922) for women and $200 433 (95% CI, $194 249-$206 617) for men. Male gender was associated with higher salary (+$13 399; $P = .001$) even after adjustment in the final model for specialty, academic rank, leadership positions, publications, and research time. Peters-Belson analysis (use of coefficients derived from regression model for men applied to women) indicated that the expected mean salary for women, if they retained their other measured characteristics but their gender was male, would be $12 194 higher than observed.

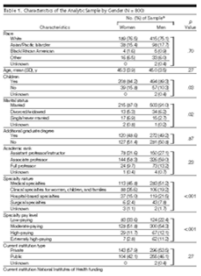
**Conclusion** Gender differences in salary exist in this select, homogeneous cohort of mid-career academic physicians, even after adjustment for differences in specialty, institutional characteristics, academic productivity, academic rank, work hours, and other factors.

*JAMA. 2012;307(22):2410-2417* www.jama.com

[3] Jagsi R, et al. Gender Differences in the Salaries of Physician Researchers. *Journal of the American Medical Association* (2012); 307(22); 2410-2417.

## Example 3: Academic Physician Salaries[3]

- Table: characteristics of physicians by sex



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## Example 3: Academic Physician Salaries[3]

- Table: characteristics of physicians by sex

Table 1. Characteristics of the Analytic Sample by Gender (N = 800)

| Characteristics | No. (%) of Sample[a] Women | Men | P Value |
|---|---|---|---|
| Race | | | |
| White | 189 (76.5) | 415 (75.1) | |
| Asian/Pacific Islander | 39 (15.4) | 98 (17.7) | |
| Black/African American | 4 (1.6) | 5 (0.9) | .70 |
| Other | 16 (6.5) | 33 (6.0) | |
| Unknown | 0 | 2 (0.4) | |
| Age, mean (SD), y | 45.3 (3.9) | 45.0 (3.6) | .27 |
| Children | | | |
| Yes | 208 (84.2) | 494 (89.3) | |
| No | 39 (15.8) | 57 (10.3) | .03 |
| Unknown | 0 | 2 (0.4) | |
| Marital status | | | |
| Married | 215 (87.0) | 503 (91.0) | |
| Divorced/widowed | 13 (5.3) | 34 (6.2) | .02 |
| Single/never married | 17 (6.9) | 15 (2.7) | |
| Unknown | 2 (0.8) | 1 (0.2) | |

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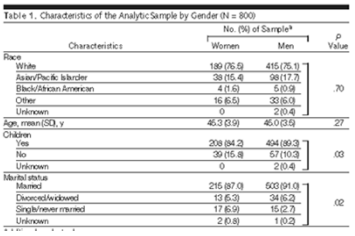
## Example 3: Academic Physician Salaries[3]

- Table: characteristics of physicians by sex



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## Summary

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Section C: (Hypothesis Testing) Comparing Survival Curves Between More Than Two Populations: Log-rank Tests

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## Learning Objectives

- In this lecture set you will learn interpret a p-value for a hypothesis test comparing survival curves (and hence incidence rates) between more than two populations
- The method for getting the p-value is an extension of the log rank test shown in lecture 10, and is also called a log rank test

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## Example 1[1]

- Maternal Vitamin Supplementation and Infant Mortality

$$\hat{IRR}_{VitA} = \frac{\hat{IR}_{VitA}}{\hat{IR}_{placebo}} = \frac{0.00041 \quad \text{deaths/day}}{0.00039 \quad \text{deaths/day}} \approx 1.05$$

$$\hat{IRR}_{BC} = \frac{\hat{IR}_{BC}}{\hat{IR}_{placebo}} = \frac{0.00039 \quad \text{deaths/day}}{0.00039 \quad \text{deaths/day}} \approx 1.00$$

1 Katz J, West K et al. Maternal low-dose vitamin A or ß-carotene supplementation has no effect on fetal loss and early infant mortality: a randomized cluster trial in Nepal. *American Journal of Clinical Nutrition* (2000) Vol. 71, No. 6, 1570-1576.

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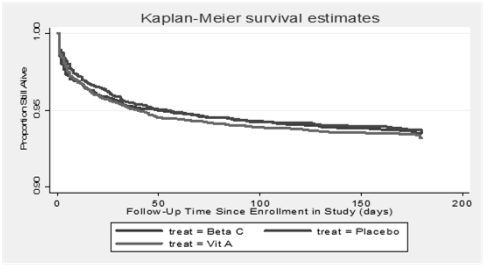
## Example 1

- Maternal Vitamin Supplementation and Infant Mortality

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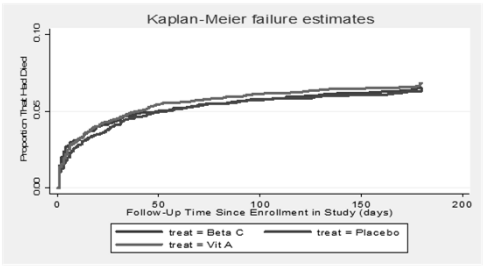
## Example 1

- Maternal Vitamin Supplementation and Infant Mortality

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## Example 1

- Log rank test
- Interpretation?

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## Examples 2

- Return to Work Following Injury: The Role of Economic, Social, and Job-Related Factors[2]

  "The main dependent variable in the analysis is the time (in days) from injury to the first time the study patient returned to work. Kaplan-Meier estimates of the cumulative proportion of patients returning to work were computed. These estimates take into account how long patients were followed as well as when they returned to work. A log-rank test was used to test the association between the cumulative probability of RTW and each of the risk factors considered one at a time"

2 MacKenzie E, et al Return to Work Following Injury:The Role of Economic, Social, and Job-Related Factors *America Journal of Public Health* 88; 11 (1998)

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## Example 2

- Kaplan Meier estimates of $1 - \hat{S}(t)$

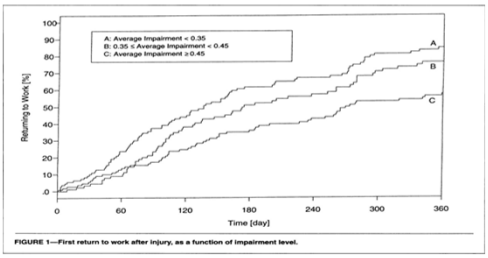


FIGURE 1—First return to work after injury, as a function of impairment level.

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## Example 3

- Post partum ART therapy for children born to HIV positive women[3]


BACKGROUND

The safety and efficacy of adding antiretroviral drugs to standard zidovudine prophylaxis in infants of mothers with human immunodeficiency virus (HIV) infection who did not receive antenatal antiretroviral therapy (ART) because of late identification are unclear. We evaluated three ART regimens in such infants.

METHODS

Within 48 hours after their birth, we randomly assigned formula-fed infants born to women with a peripartum diagnosis of HIV type 1 (HIV-1) infection to one of three regimens: zidovudine for 6 weeks (zidovudine-alone group), zidovudine for 6 weeks plus three doses of nevirapine during the first 8 days of life (two-drug group), or zidovudine for 6 weeks plus nelfinavir and lamivudine for 2 weeks (three-drug group). The primary outcome was HIV-1 infection at 3 months in infants uninfected at birth.

RESULTS


3 Nielson-Saines K, et al. Three Postpartum Antiretroviral Regimens to Prevent Intrapartum HIV Infection. *New England Journal of Medicine* (2012). 366 (25).

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## Example 3

- Post partum ART therapy for children born to HIV positive women

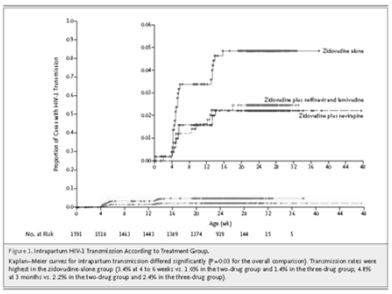


Figure 1. Intrapartum HIV-1 Transmission According to Treatment Group.
Kaplan–Meier curves for intrapartum transmission differed significantly (P = 0.03 for the overall comparison). Transmission rates were highest in the zidovudine-alone group (3.4% at 4 to 6 weeks vs. 1.6% in the two-drug group and 1.4% in the three-drug group; 4.8% at 3 months vs. 2.2% in the two-drug group and 2.4% in the three-drug group).

**"Kaplan–Meier curves for intrapartum transmission differed significantly (P = 0.03 for the overall comparison). Transmission rates were highest in the zidovudine-alone group (3.4% at 4 to 6 weeks vs. 1.6% in the two-drug group and 1.4% in the three-drug group; 4.8% at 3 months vs. 2.2% in the two-drug group and 2.4% in the three-drug group)."**

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## Example 3

- Post partum ART therapy for children born to HIV positive women


CONCLUSIONS

In neonates whose mothers did not receive ART during pregnancy, prophylaxis with a two- or three-drug ART regimen is superior to zidovudine alone for the prevention of intrapartum HIV transmission; the two-drug regimen has less toxicity than the three-drug regimen. (Funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development [NICHD] and others; ClinicalTrials.gov number, NCT00099359.)


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## Summary

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