Relationship of Income to Outcome and Treatment in CF Patients

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for the NNECFC with support from the Cystic Fibrosis Foundation

The Northern New England Cystic Fibrosis Consortium

The NNECFC is a regional, voluntary consortium of more than 80 clinicians and researchers from the CF care centers in Maine, New Hampshire and Vermont.

The mission of the group is to improve CF care and patient outcomes.

Goals

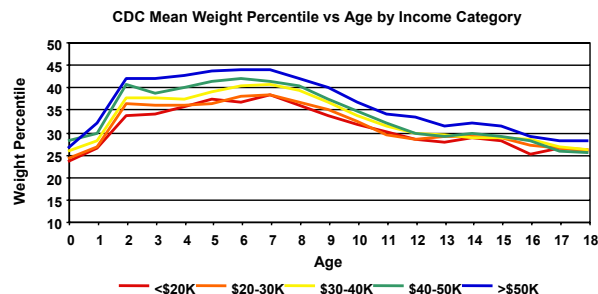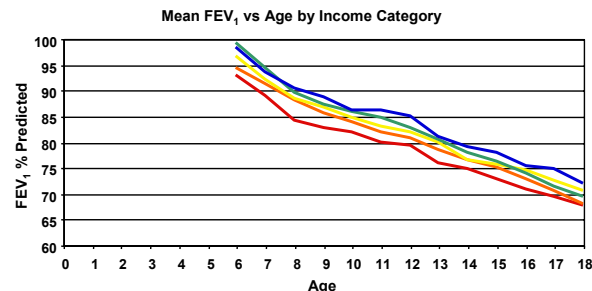To examine the association between income and:

- Age-related changes in pulmonary function and body weight;
- Use of nutritional and pulmonary therapies in guideline-eligible patients.

Methods

- Dataset included 23,817 patients from the CFF Registry diagnosed before 18 years of age with at least one record since 1991.
- Median household income assessed at the zip code level by linking to the 1990 US Census of the Population by zip code of residence.
- Median household income adjusted for state-level differences in cost of living using the 1998 Consumer Price Index.
- Rates of selected pulmonary and nutritional interventions from the CFF 2000 Patient Registry.
- Treatment eligibility was determined using US CFF Clinical Practice Guidelines and data available in CFF Registry.

Results

- At age 6 years the absolute difference in mean FEV_1 from lowest to highest income category was 5.5% of predicted (p-trend <0.001).
- Patients in the higher income categories had better FEV_1 than those in the lower income categories at every age, persisting through age 18.

Mean FEV_1 vs Age by Income Category

Legend: <$20K | $20-30K | $30-40K | $40-50K | >$50K

CDC Mean Weight Percentile vs Age by Income Category

Legend: <$20K | $20-30K | $30-40K | $40-50K | >$50K

- At 4, patients in the lowest income category had a mean CDC weight percentile 7.3 percentage points lower than patients in the highest income category (p-trend <0.001).
- Patients in the higher income categories had higher weight percentiles than those in the lower income categories at every age, persisting through age 18.
- Rates of prescribed supplemental feeding in patients at risk for and in nutritional failure decreased significantly from lowest to highest income, with the poorest patients receiving the most intervention.
- There was no significant trend between income categories in prescribed pulmonary therapies.

Oral or Enteral Feeding in Patients At Risk of Nutritional Failure (n=3039) p-trend <0.001
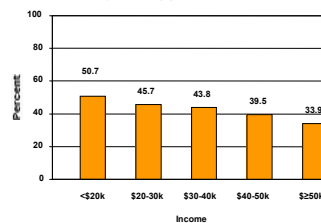

**Enteral or Parenteral Feeding in Patients in Nutritional Failure (n=4797) p-trend <0.001**
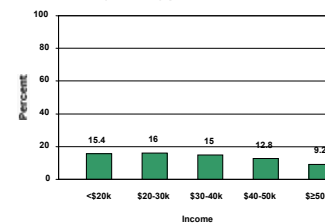
Definitions of At Risk of and in Nutritional Failure in Patients with CF as measured in the Patient Registry, with additions for patients >20 years.

Age group	At Risk	Nutritional Failure
0 to 2 years of age	Weight percentile 10th to 25th	Height percentile <5th, or weight percentile <10th or IBW<90%
2 to 20 years of age	BMI percentile 10th to 25th	BMI percentile <10th or IBW<90%
Adults	BMI 19 to 20	BMI<19 or IBW<90%

Use of Dnase in Eligible Patients (N=13537) p-trend=0.685
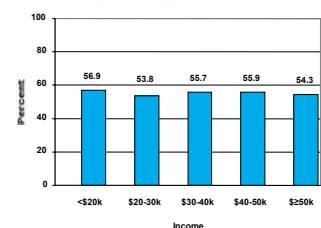
Use of TOBI in Eligible Patients (n=4413) p-trend=0.293
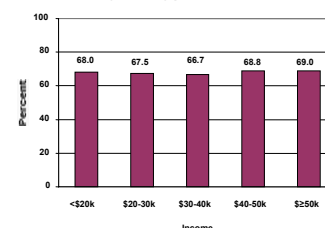
Definition of Eligibility for Pulmonary Treatments:
Dnase use: FEV_1 <90% and/or at least one acute exacerbation in the last year
TOBI use: ≥6 yrs old; FEV_1 25% to 75% predicted; PA+

Definitions adapted from the Clinical Practice Guidelines for Cystic Fibrosis, Cystic Fibrosis Foundation, Consensus Conferences, Concepts in CF Care.

Conclusions

- Patients living in low-income areas had poorer nutritional status and pulmonary function than patients living in high-income areas.
- Substantial differences in nutritional status and pulmonary function appear at an early age, persisting into adulthood.
- Rates of prescribed nutritional treatments were higher in lower income areas.
- Rates of prescribed pulmonary treatments were similar in low- and high-income areas.
- Further understanding will require more complete and direct measurement of socioeconomic status, treatment adherence, and local environmental conditions, especially in the early years of life.