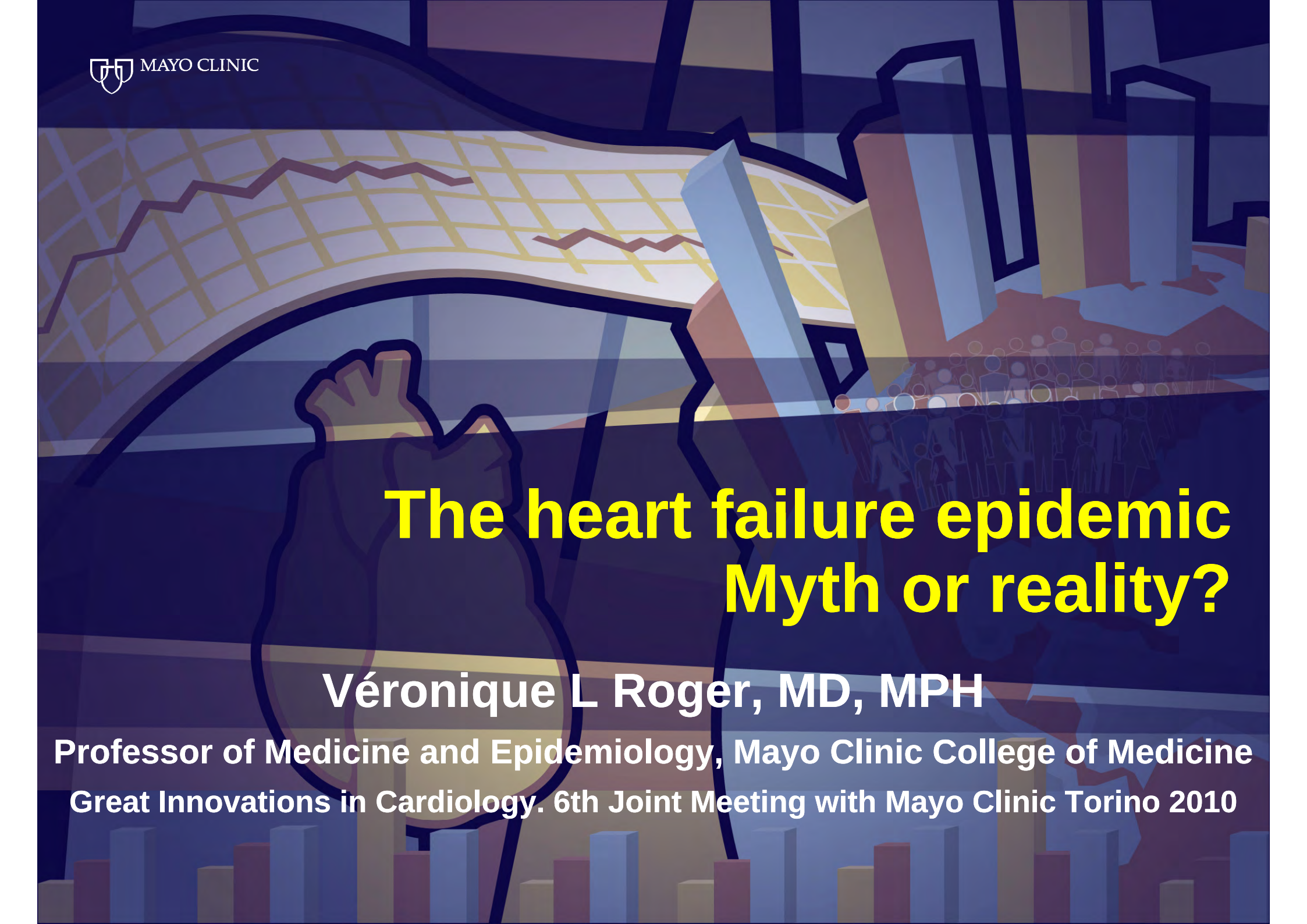




The heart failure epidemic Myth or reality?

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Disclosures



RO1 HL 59205

RO1 HL 72435

K24 HL 68765

R01 AR 30582



American Heart
Association



Learn and Live.

American Heart Association

Established Investigator award

Objectives

- What is HF?
- What epidemic?
- Hospitalizations
- Implications

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ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult

Heart failure is a **complex clinical syndrome** that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to **fill** with or **eject** blood

Syndrome is poorly described

- Gaps of knowledge on key aspects of HF including characteristics **according to EF** and **diastolic function**
- Studies inconsistently assessed EF and diastolic function, seldom with standardized techniques
- Need for **community** studies to capture “real life” experience



**Home of Mayo Clinic Rochester and Olmsted Medical Center
Geographically isolated from other providers of medical care
Linkage of all medical, surgical and tissue diagnoses**

Assessing LV function

Doppler Echocardiography

Systolic function



EF $\geq 50\%$ preserved

EF $< 50\%$ reduced

Diastolic function

Normal
Diastolic
Function



Mild
Diastolic
Dysfunction

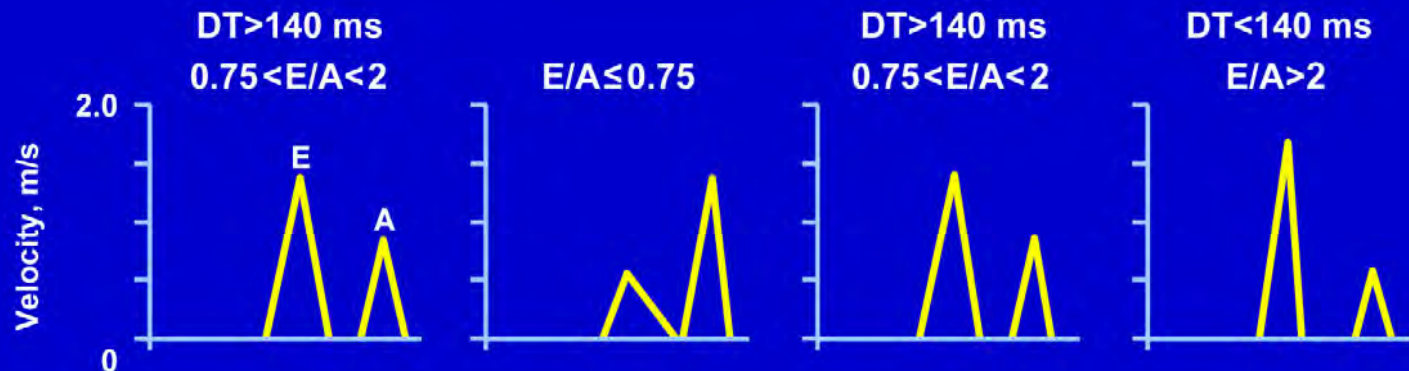


Moderate
Diastolic
Dysfunction

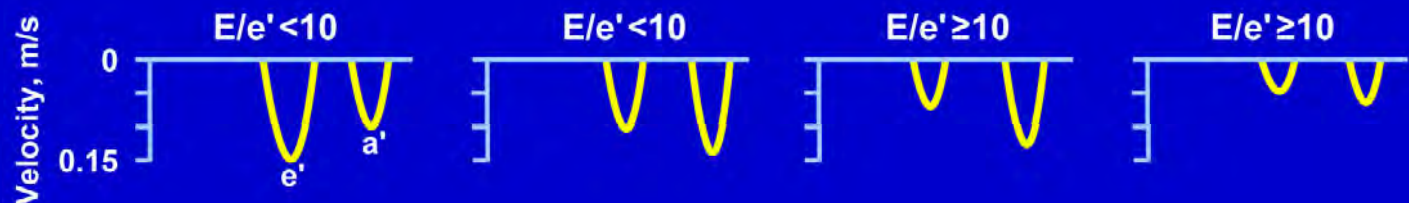


Severe
Diastolic
Dysfunction

Mitral inflow



Doppler tissue imaging of mitral annular motion



Systolic and Diastolic Function

556 patients with HF in the community

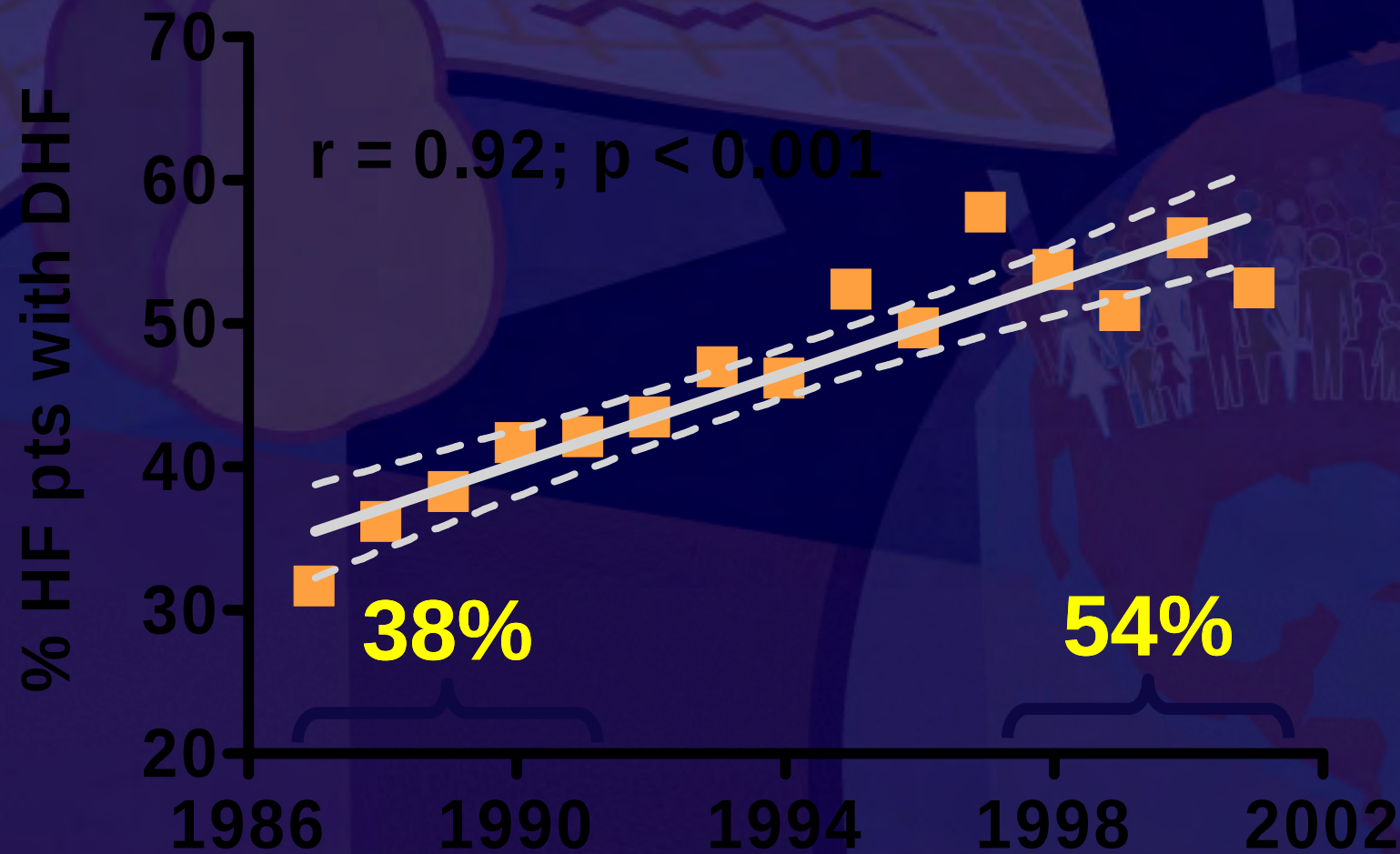
$EF \geq 50\%$ 55%

$EF < 50\%$ 45%

Isolated DD ($EF \geq 50\%$ and DD) 44%

Prevalence of Diastolic HF

HF with EF $\geq$ 50%



HF in the community

Bursi et al, JAMA 2006

	Overall N= 556	EF≥50% N=308	EF<50% N=248
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Age (yrs, mean±SD)	76±13	77±13	73±14 *
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Men, %	50	43	58*
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Comorbidity

Prior MI,%	43	36	50*
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Smoking,%	62	58	67*
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COPD,%	35	38	30
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Conditions ≥3,%	69	70	68
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Emergence of New Epidemics of Cardiovascular Disease

SHATTUCK LECTURE
MILLENNIUM

At the end of every century it is customary to reflect on the events of the past hundred years and to look toward the future, and in this lecture I should like to do this for cardiovascular disease. This is also an especially opportune time to comment on progress in cardiovascular disease, because both the National Heart, Lung, and Blood Institute and the American Heart Association are celebrating their golden anniversaries within the next 18 months. These two organizations have had the most profound influence on the development of research on cardiovascular disease during the 20th century.

A bewildering array of new techniques regarding the medical literature, the result, information has come quite far, and to the public, and to the public, that have occurred. To this end, about cardiovascular disease, having developed four phases of development.

PHASE
CARDIO

As the 20th century, the fourth most common cause of death in the United States, after heart disease, but cancer (Fig. 1) first place, great influence on common cause of the first.

From Parson
Harvard Medical
drew reprint
800 Boylston
Presented at
Massachusetts Medical Society
©1997, Massachusetts Medical Society.

Deaths due to cardiovascular disease increased substantially in all age groups, in both sexes, and in all races. Indeed, by mid-century cardiovascular disease accounted for more than half of all deaths, not only in the United States (Fig. 2) but also in the remainder of the industrialized world. By then the connection between streptococcal infection and rheumatic heart disease was clear, as was the infection of the aorta by *Treponema pallidum* and the subsequent development of luetic heart disease. However, the major causes of death and disability from cardiovascular disease — sudden death and acute myocardial infarction — were still mysterious. Often these ap-

pearances in patients given placebo. Similar considerations apply to the majority of other advances in phase 2, which must be considered to be only partial victories.

Emergence of New Epidemics of Cardiovascular Disease

Two new epidemics of cardiovascular disease are emerging: heart failure and atrial fibrillation. Hospital admissions for heart failure have climbed steadily, so that this condition has become the single most frequent cause of hospitalization in persons 65 years of age or older; it is now responsible for more than 875,000 admissions each year in the United States. Despite the development of a number of effective new therapies for heart failure, the incidence of this

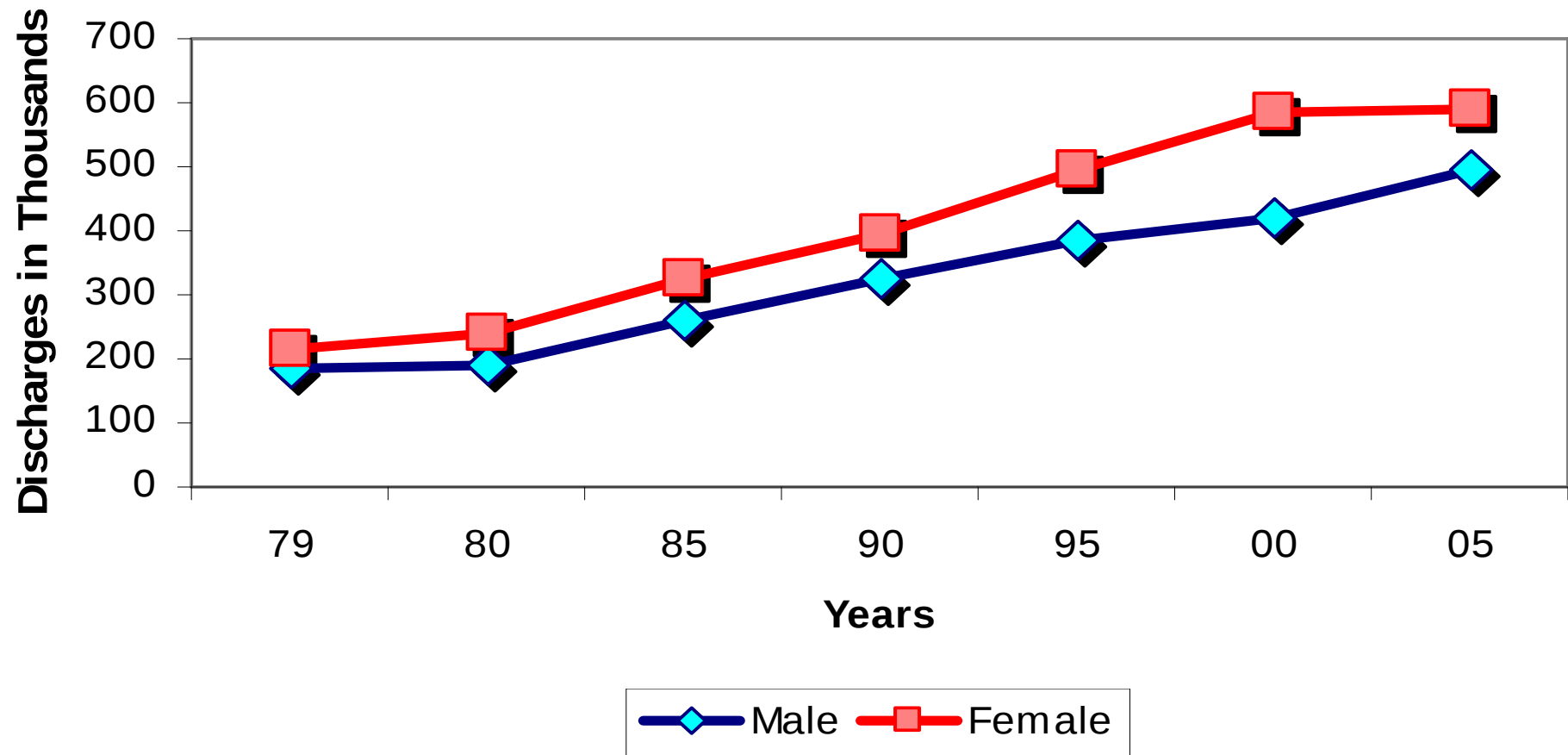
condition has increased. Since the 20th century, the focus of attention in health and disease, physicians used their physical senses and recently discovered tools such as electrocardiography, the sphygmomanometer, and roentgenography.

At the beginning of this century, the focus of attention began to shift from the intact subject to the isolated heart or heart-lung preparation. With these preparations, the biochemical milieu and hemodynamic load can be controlled, and the responses to various stimuli can be studied with far greater precision than is possible in the intact organism. This initiated what may be termed the reductionist approach to cardiovascular science, in which

Two new epidemics of cardiovascular disease are emerging: Heart failure and atrial fibrillation. Hospital admissions for heart failure have climbed steadily, so that this condition has become the single most frequent cause of hospitalization in persons 65 years of age and older. Braunwald E, NEJM, 1997

Hospital discharges for heart failure

United States: 1979-2005- Source: NHDS, NCHS and NHLBI



AHA Heart Disease and Stroke Statistics 2009 update

Epidemic: Merriam-Webster

- “An outbreak or product of sudden rapid spread, growth...a natural population suddenly and greatly enlarged.”
- Can be due to **increased incidence** and/or **increased survival**.
- Investigation: what is the **respective responsibility** of each of these factors in the genesis of the HF epidemic?

The Framingham Heart Study

Levy et al, NEJM 2002

TABLE 1. TEMPORAL TRENDS IN THE AGE-ADJUSTED INCIDENCE OF HEART FAILURE.*

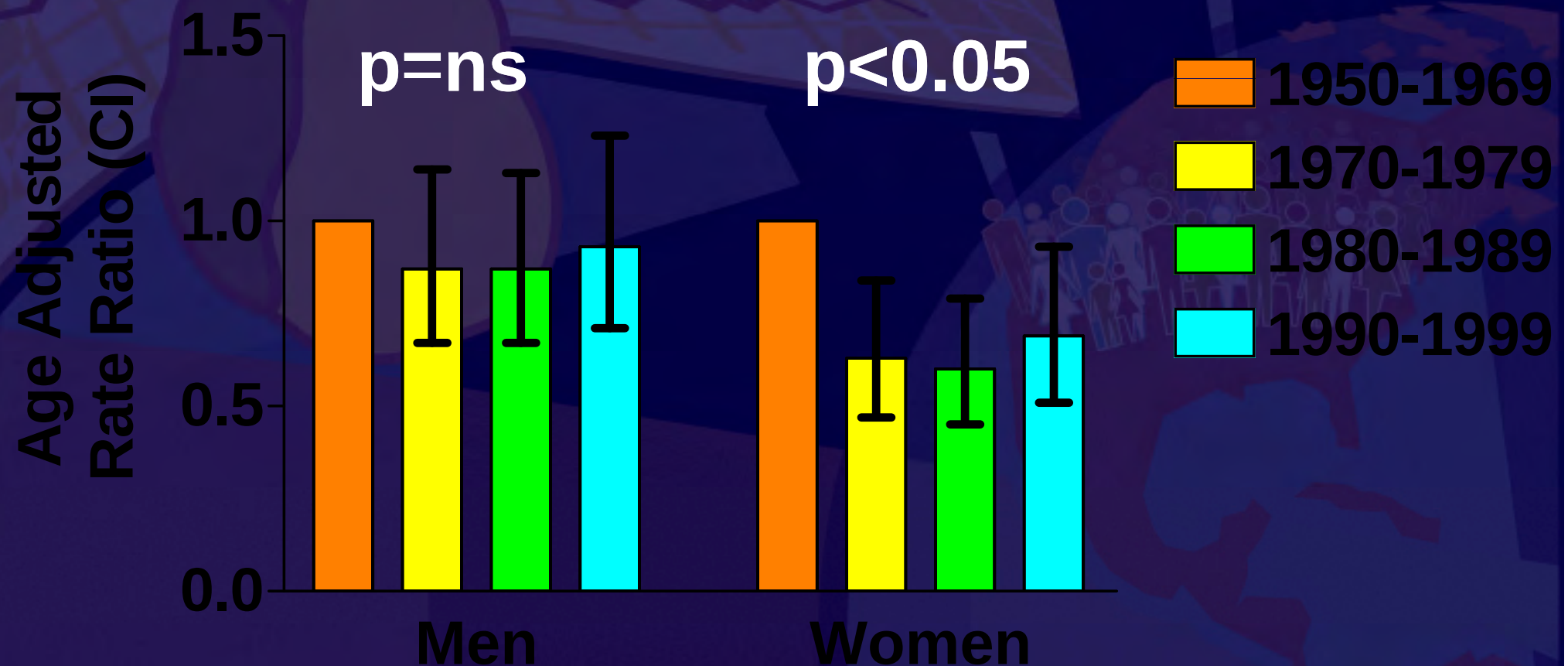
PERIOD	MEN		WOMEN	
	INCIDENCE OF HEART FAILURE	RATE RATIO	INCIDENCE OF HEART FAILURE	RATE RATIO
	rate/100,000 person-yr		rate/100,000 person-yr	
1950–1969†	627 (475–779)	1.00	420 (336–504)	1.00
1970–1979	563 (437–689)	0.87 (0.67–1.14)	311 (249–373)	0.63 (0.47–0.84)
1980–1989	536 (448–623)	0.87 (0.67–1.13)	298 (247–350)	0.60 (0.45–0.79)
1990–1999	564 (463–665)	0.93 (0.71–1.23)	327 (266–388)	0.69 (0.51–0.93)

*All values were adjusted for age (<55, 55 to 64, 65 to 74, 75 to 84, and ≥85 years). Values in parentheses are 95 percent confidence intervals.

†This period served as the reference period.

Incidence of HF in Framingham

Levy et al, NEJM 2002



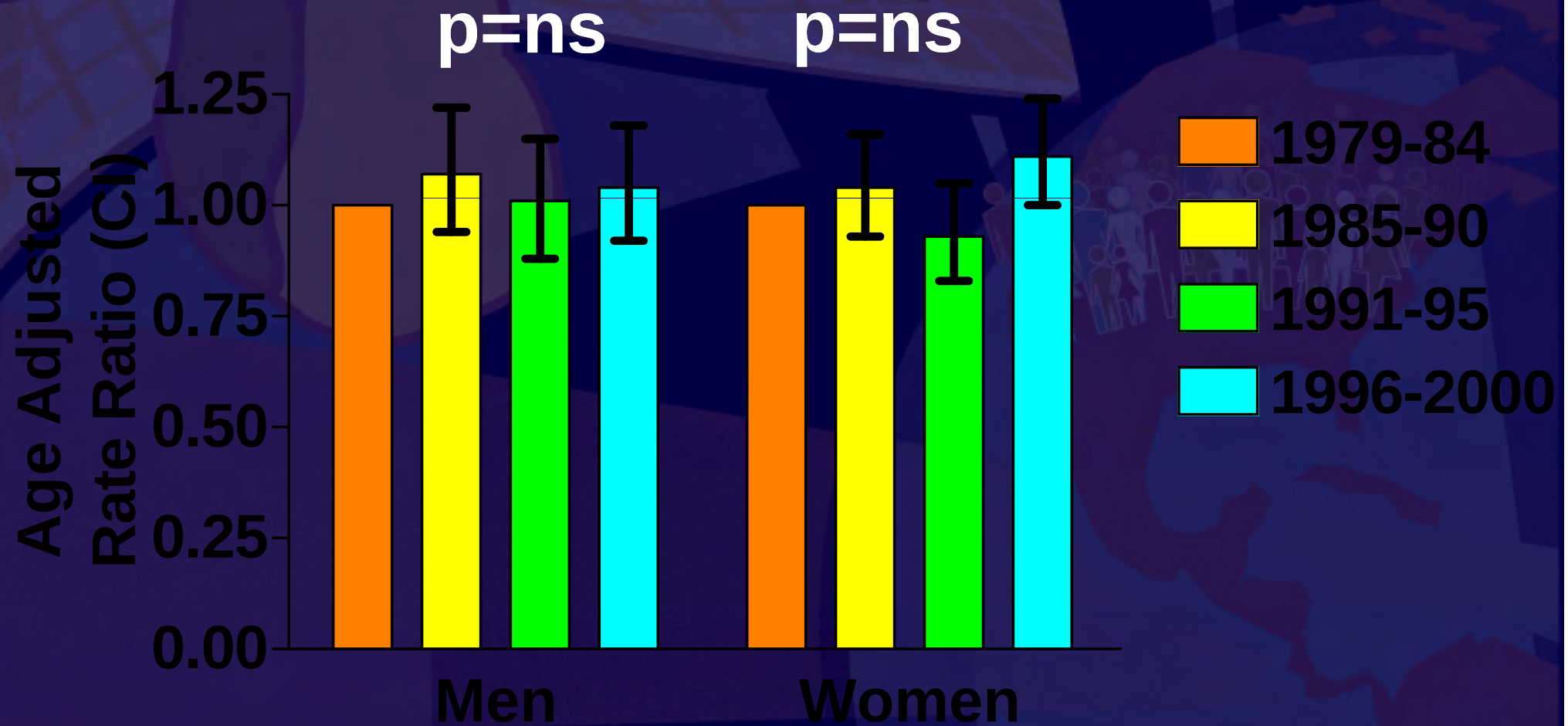
Incidence of Heart Failure in Olmsted County

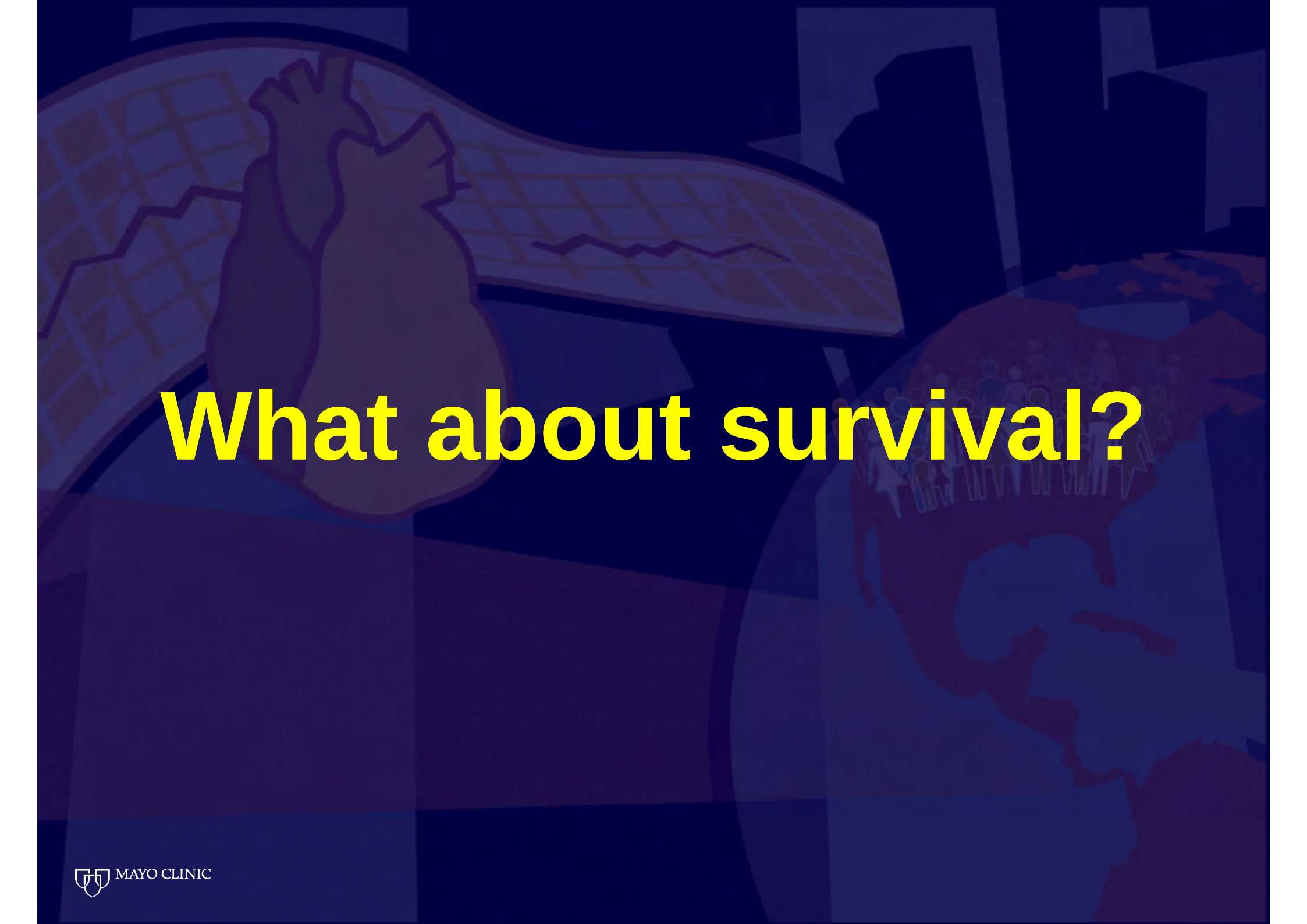
JAMA 2004

	Men		Women	
	Incidence/ 100,000 (95% CI)	RR (95% CI)	Incidence/ 100,000 (95% CI)	RR (95% CI)
1979-1984	360 (323-396)	1	284 (260-307)	1
1985-1990	390 (354-425)	1.07 (0.94-1.22)	292 (270-315)	1.04 (0.93-1.16)
1991-1995	375 (340-409)	1.01 (0.88-1.15)	260 (238-282)	0.93 (0.83-1.05)
1996-2000	383 (351-415)	1.04 (0.92-1.18)	315 (292-338)	1.11 (1.00-1.24)

Incidence of Heart Failure in Olmsted County

JAMA 2004

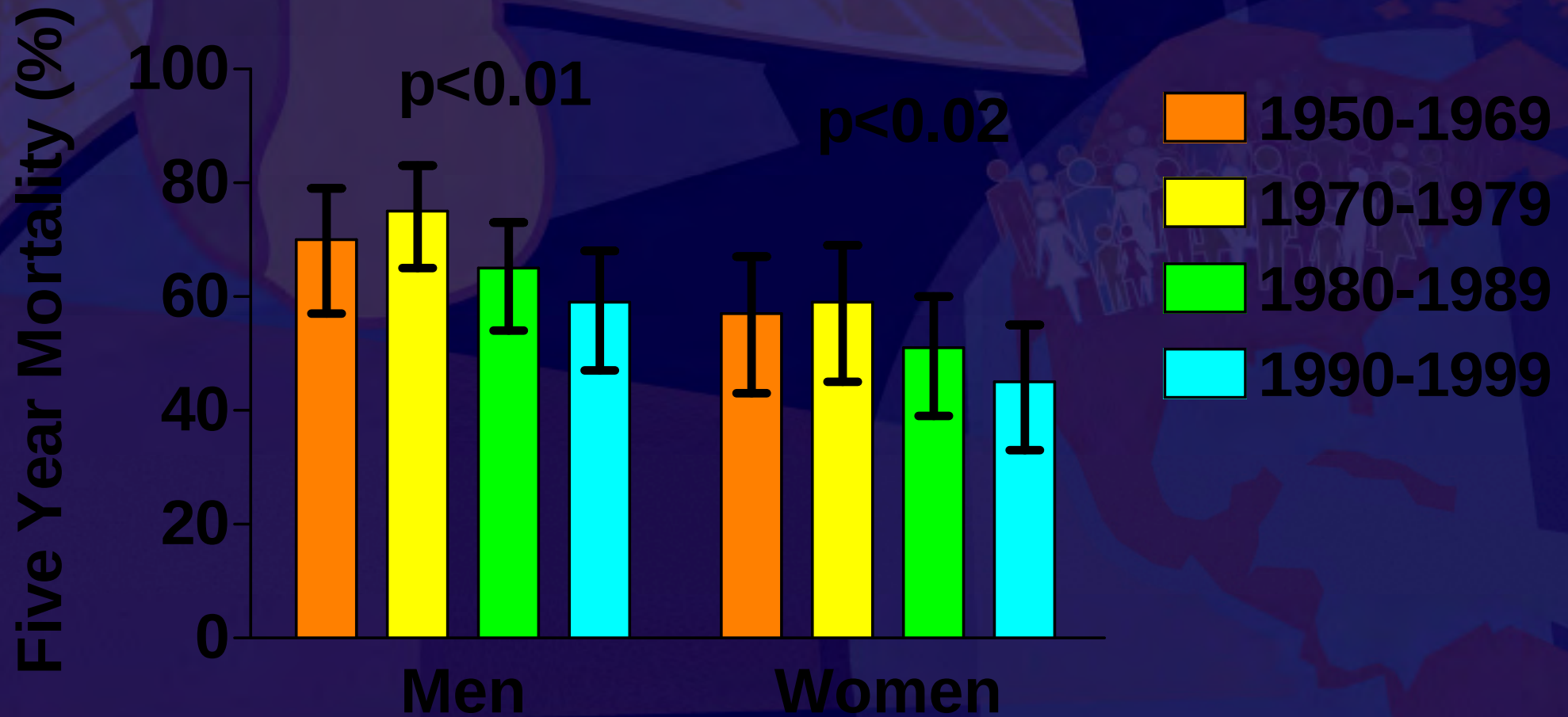


The background is a dark blue abstract composition. On the left, a stylized heart is overlaid on a grid pattern. To the right, a city skyline is visible. In the bottom right corner, a globe is shown with a group of small human figures standing on it. A jagged line, resembling a heartbeat or a data trend, runs across the upper portion of the image.

What about survival?

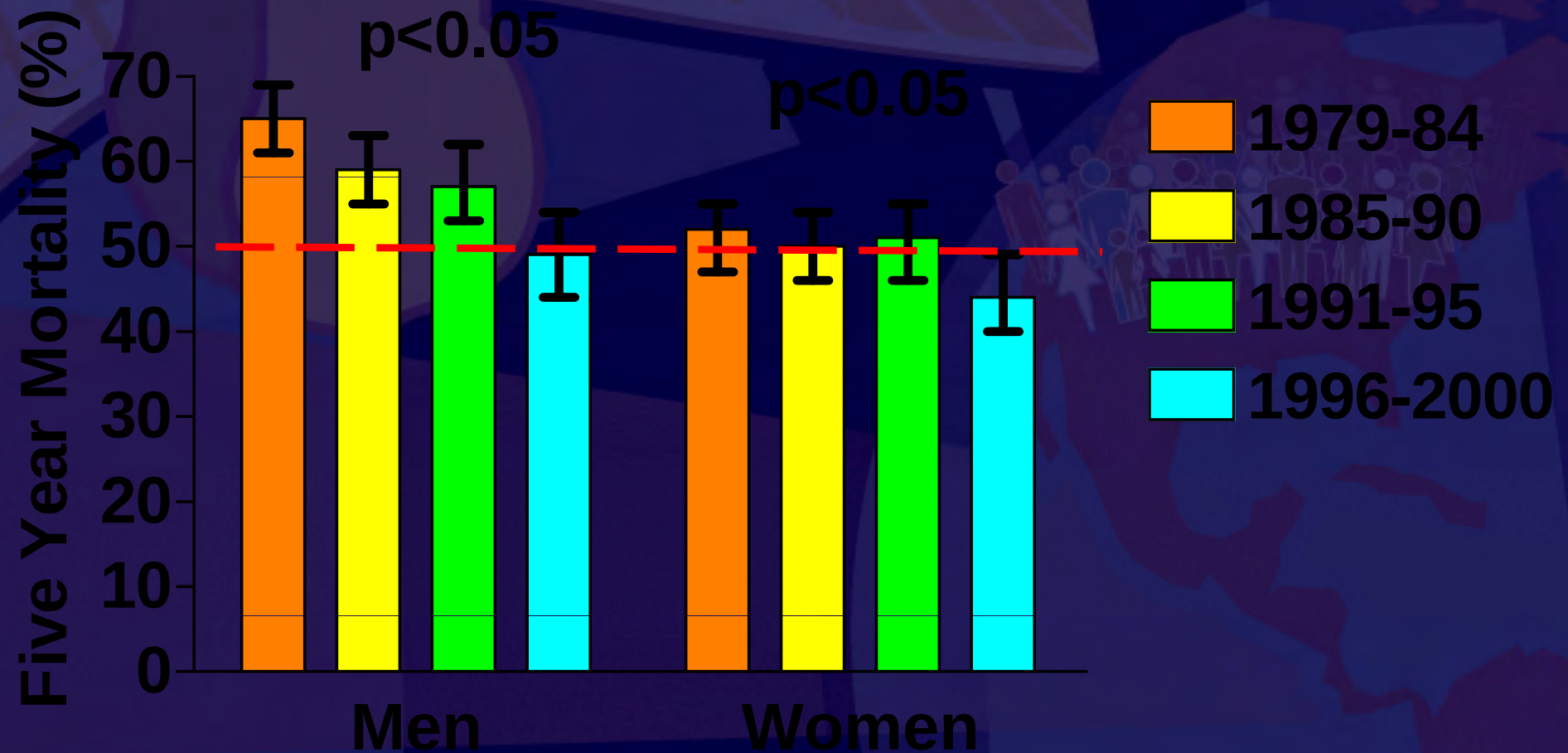
Mortality of HF in Framingham

Levy et al, NEJM 2002



Mortality of HF in Olmsted County

JAMA 2004



HF epidemic

Results of the Investigation

- Incidence mostly stable (among Caucasians)
- Survival improved
- Prevalence increased



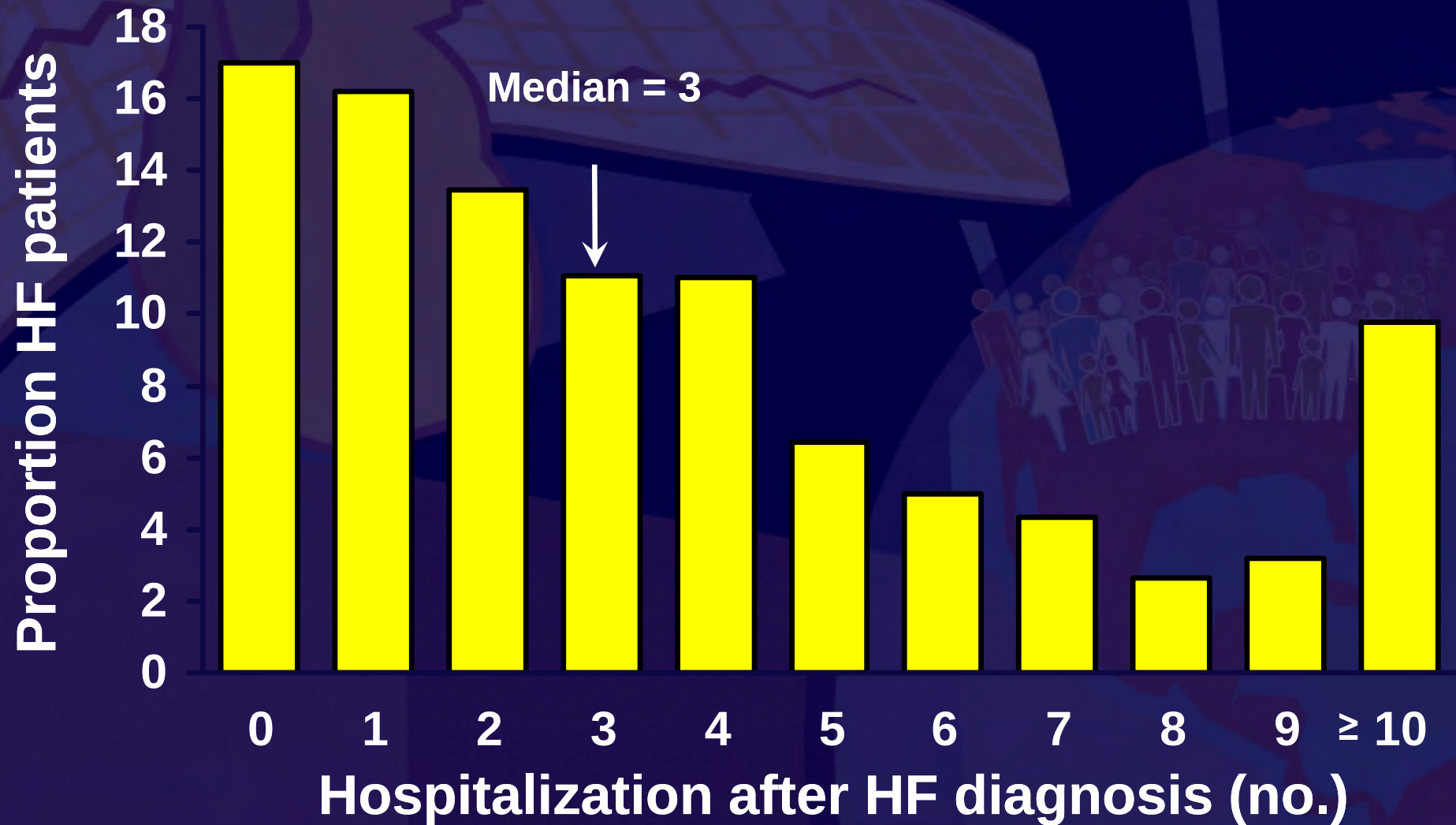
Objectives

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To understand the health care experience of patients with HF over a **lifetime**, we need **community** studies with **complete capture** of all health care events

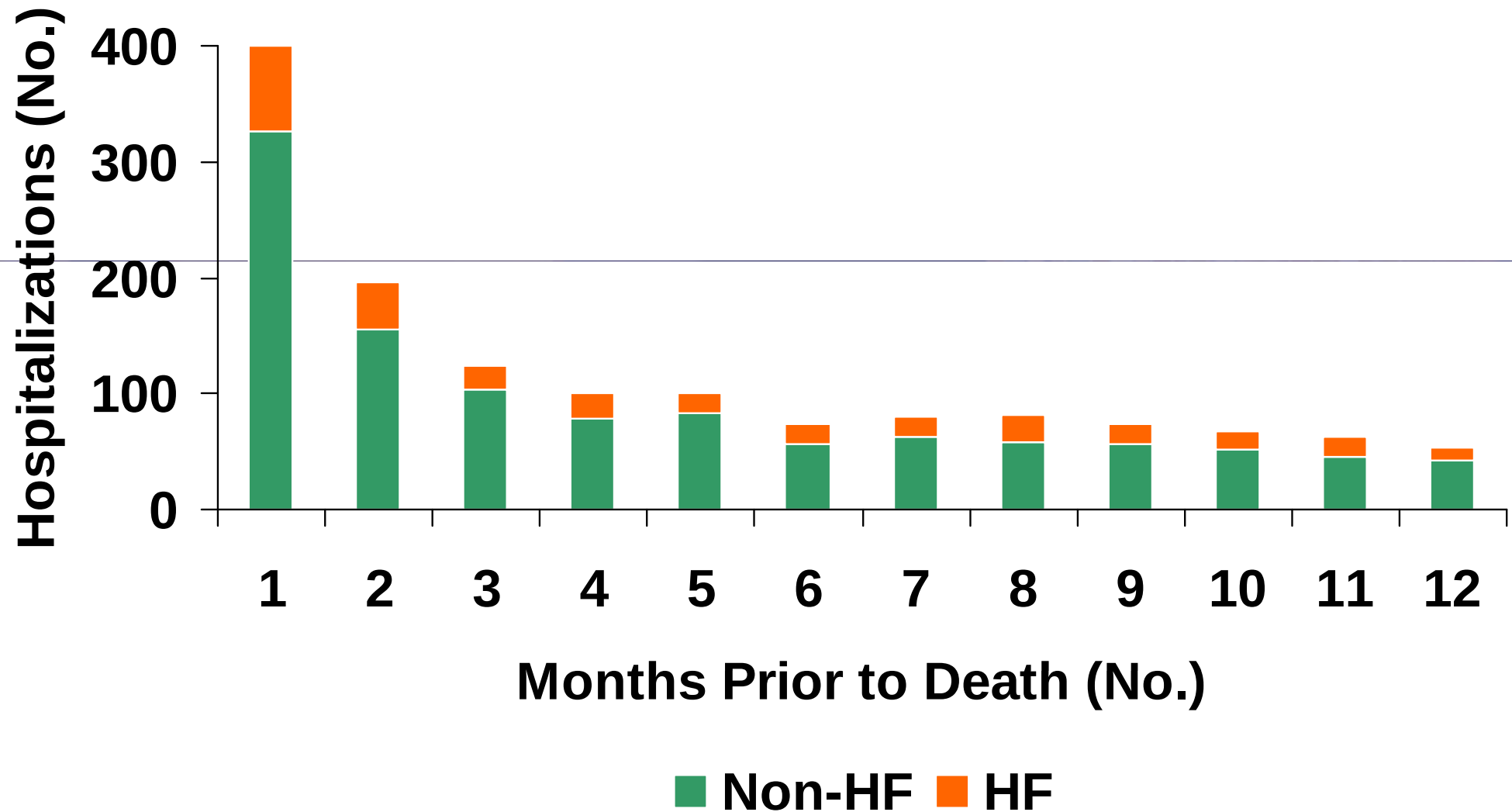
Hospitalizations After HF Diagnosis

1,077 Olmsted County Residents



Hospitalizations In Year Prior to Death

1077 Olmsted County residents



The background is a dark blue gradient with several abstract, semi-transparent elements. On the left, there is a stylized line drawing of a hand with fingers spread. In the upper right, there is a silhouette of a city skyline with several tall buildings. In the lower right, there is a faint outline of the map of the United States. A grid-like pattern is visible behind the hand.

Who gets hospitalized and re-hospitalized?

Hospitalization in Heart Failure

1,077 Olmsted County Residents

Age (years)

60 to <80

≥80

Male

EF ≥50%

Hypertension

Diabetes mellitus

Current smoker

Prior MI

COPD

Peripheral vascular disease

Cerebrovascular disease

BMI (kg/m²)

<20

20 to <25

25 to <30

Anemia

Creatinine clearance (mL/min)

<30

30 to <60

Year of diagnosis

1992-1996

1997-2002

2002-2006

LESS

MORE

1.34 (1.07, 1.66)

1.21 (0.97, 1.50)

1.13 (1.00, 1.28)

1.10 (0.97, 1.25)

1.19 (1.04, 1.37)

1.58 (1.36, 1.84)

0.91 (0.76, 1.08)

1.05 (0.91, 1.21)

1.47 (1.27, 1.71)

1.26 (1.09, 1.45)

1.19 (1.03, 1.37)

1.03 (0.80, 1.33)

0.94 (0.81, 1.11)

0.97 (0.84, 1.13)

1.26 (1.11, 1.43)

1.67 (1.30, 2.13)

1.11 (0.97, 1.26)

1.05 (0.89, 1.24)

1.05 (0.88, 1.26)

1.00 (0.83, 1.19)

0.5

1

2.0

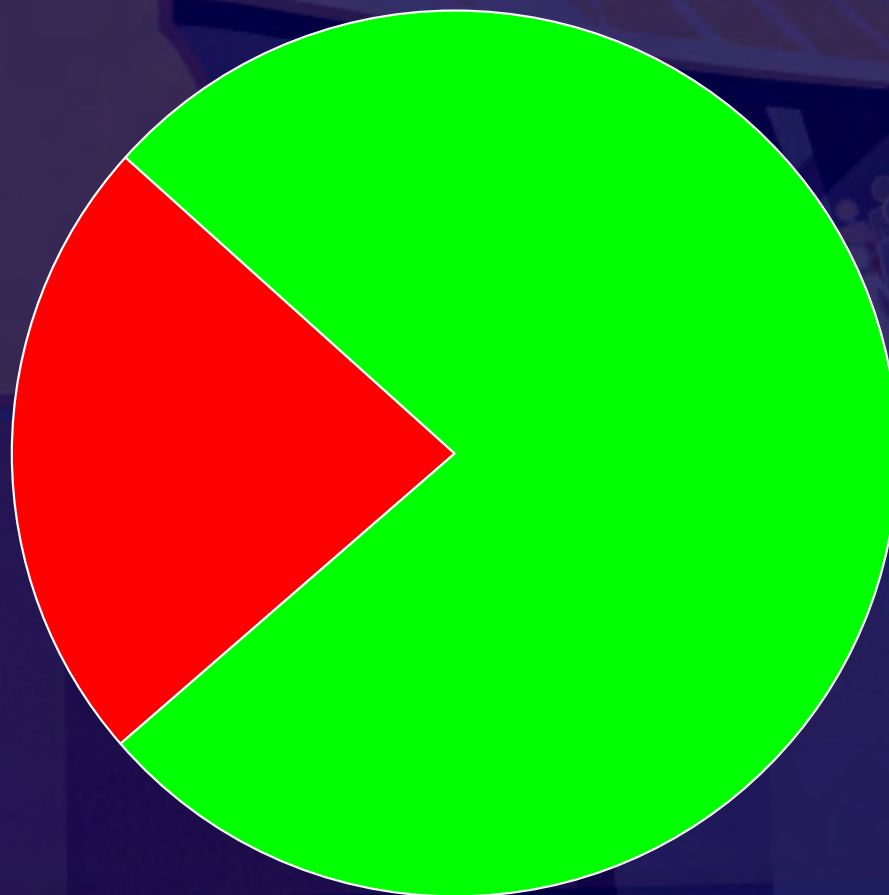
Hazard ratio (95% CI)

The background is a dark blue gradient with several faint, stylized white and light blue graphics. On the left, there is a large heart shape with a jagged, irregular outline. To the right of the heart, there is a stylized city skyline with several tall buildings. Below the skyline, there is a group of small, stylized human figures. The overall theme suggests health, urban life, and community.

What does it cost over a lifetime?

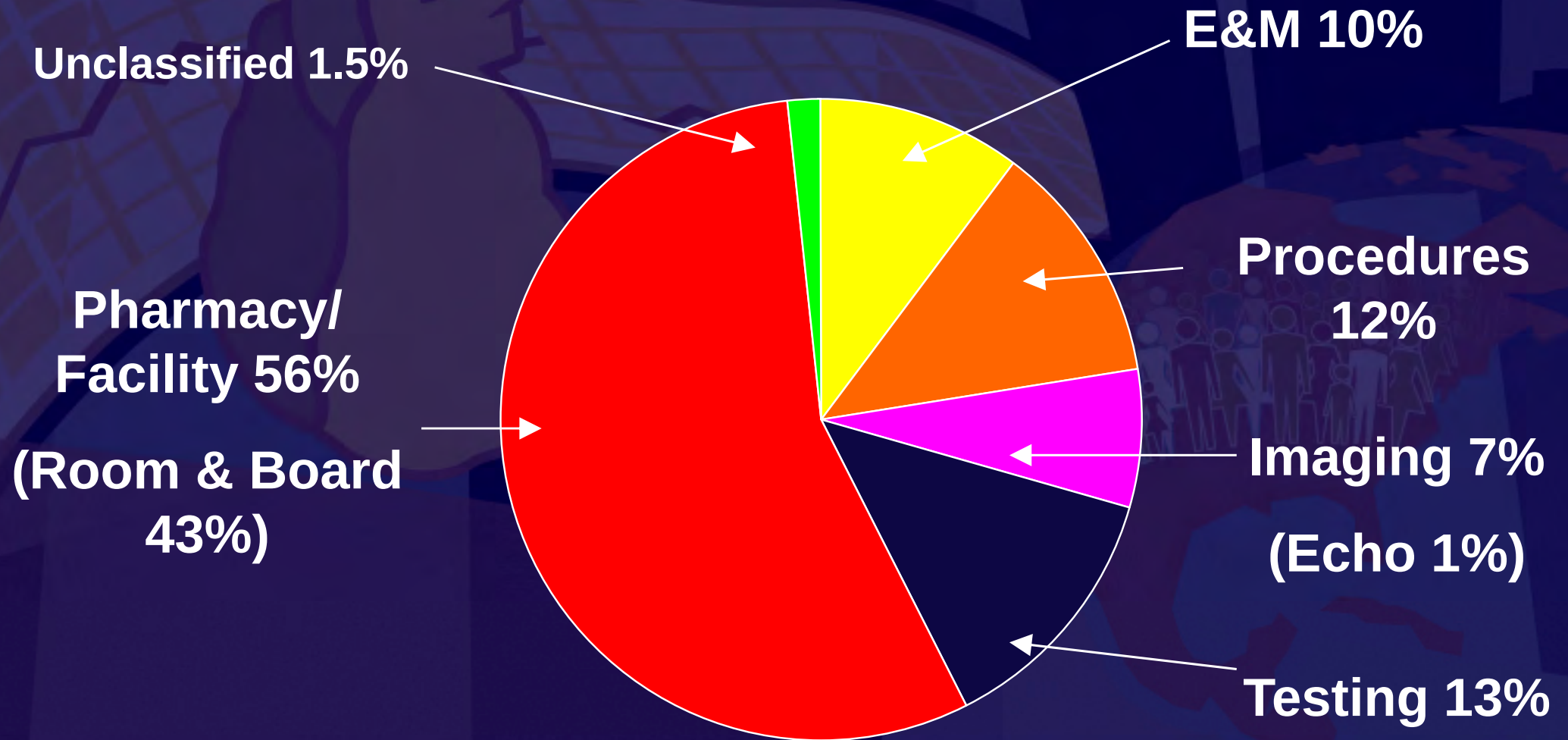
Lifetime Total Costs \$101 million for 1054 patients

Outpatient 23%
Mean \$22,032



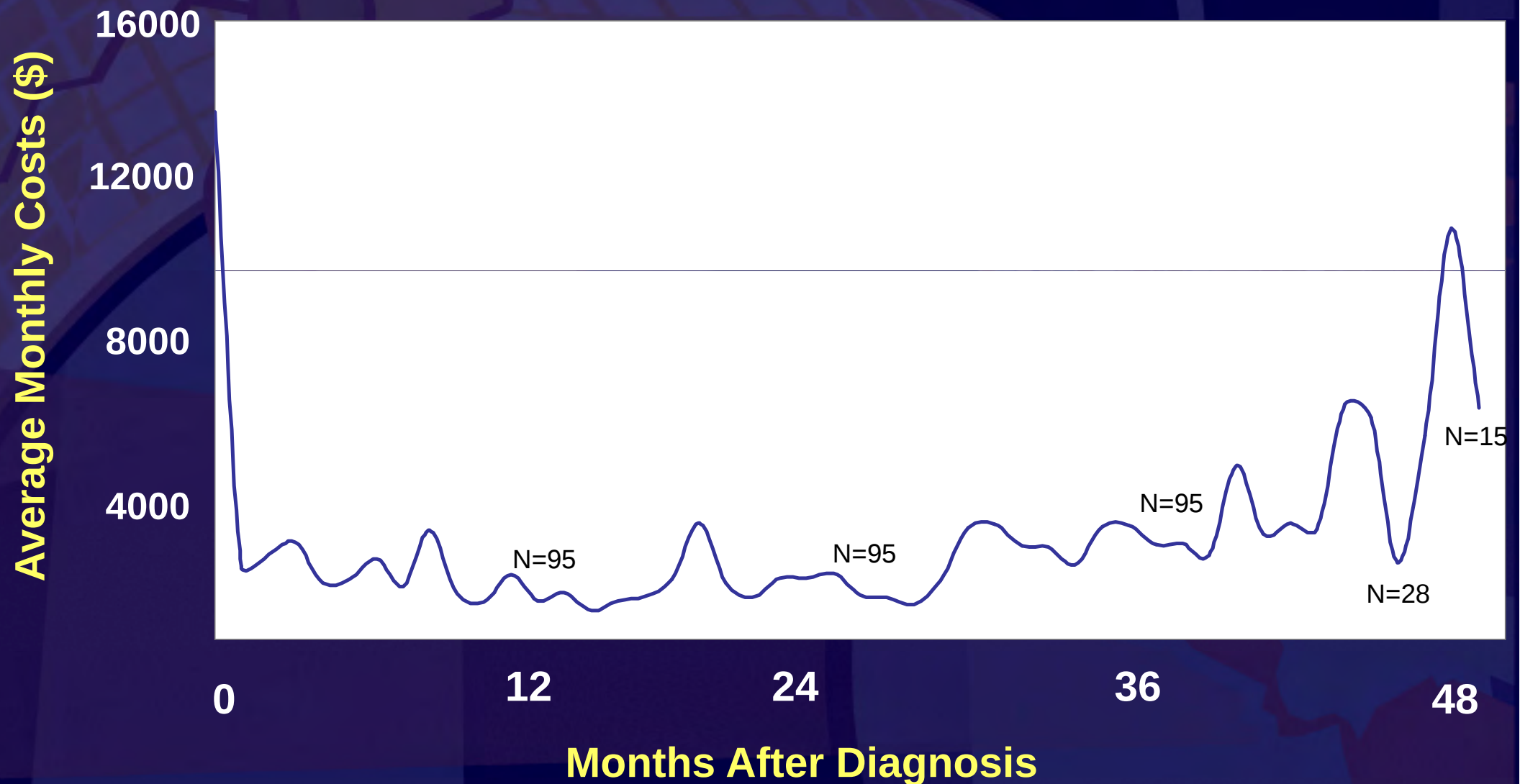
Inpatient 77%
Mean \$73,762

Lifetime Inpatient Costs (77% Total)



Dunlay et al, in press, Circ CVOQ

Lifetime Costs for Patients Living 3-4 years after HF Diagnosis (n=95)



****Similar pattern for those living 12-36 or 48-72 months**

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What did we learn about hospitalizations in HF in the community?

- **Hospitalizations** common after HF diagnosis
- Most due to non-CV causes
- Risk factors: COPD, diabetes, kidney disease, anemia, male sex
- Hospitalizations account for 77% of **lifetime costs** of HF
- **Costs** higher at initial dx and EoL

Hospital readmissions

- **Health Care Reform:** “... hospitals will receive bundled payments that cover not just the hospitalization, but care for certain post-acute providers ... and hospitals with high rates of readmission will be paid less if patients are re-admitted to...within the same 30-day period” (white house.gov)
- As most hospitalizations are due to **non CV** causes, interventions must go beyond the heart and focus...on the **patient!!!**
- **End of life care** must be addressed

