

# LLIN durability

## Construction and application of a «proportionate Hole Index»

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6<sup>th</sup> VCWG Meeting, Geneva 7-9 Feb. 2011



# Outline

- Suggestion of an improved Hole Index calculation
- Application of a preliminary cut-off for "good" and "torn" nets
- Examples how this approach produces comparable data across products and sites
- Example how this can contribute to an overall assessment of "useful life" of LLIN

# How to measure net integrity

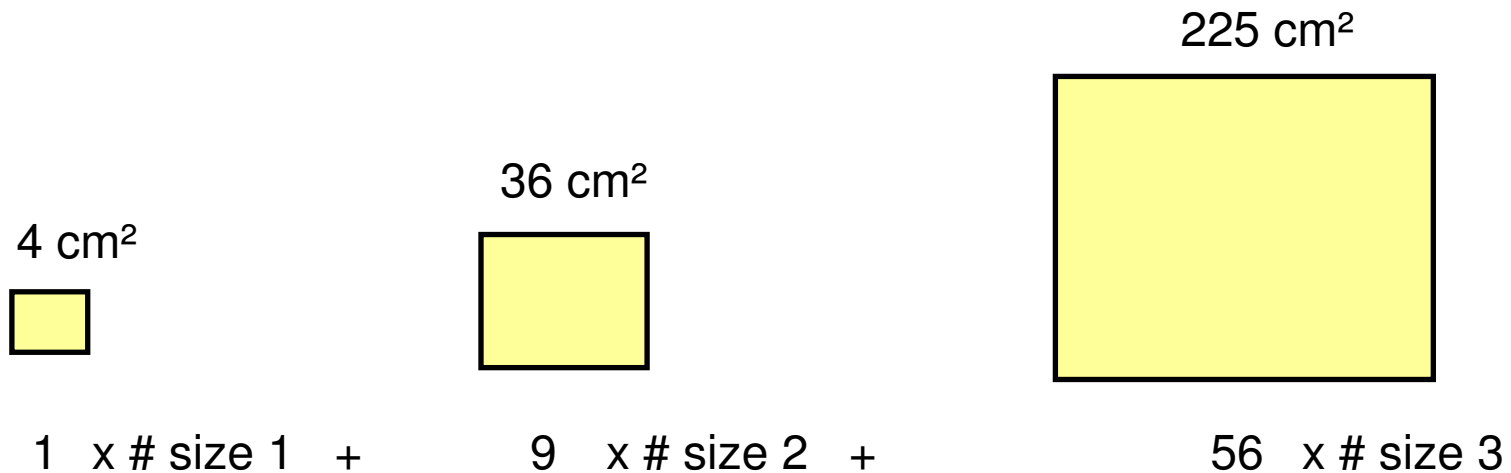
- Cross-sectional surveys
  - Works initially
  - But if nets are discarded at a certain state of destruction a steady state will be reached
- Longitudinal study
  - Preferable approach
  - But more time consuming
  - Capture attrition **and** condition of surviving nets

# How to assess net condition

- Classifying and counting holes
  - Ideally done in lab on frame
  - But not feasible in large field surveys as part of comprehensive questionnaires
  - Need something more robust
- Currently recommended classes
  - Size 1: 0.5-2cm (size 1)
  - Size 2: 2-10 cm (size 2)
  - Size 3: >10cm (size 3)

# How to get composite hole index

- Need one overall measure of integrity
- Weighted summary of holes of different sizes
- One option: proportionate Hole Index
  - Approximate measure of total hole surface
  - Standardized approach



# How to analyze hole index data

- Need to categorize nets
  - Serviceable
  - Torn
  - More torn
  - Very (too) torn
- Very little data to decide on cut-offs

# How to analyze hole index data

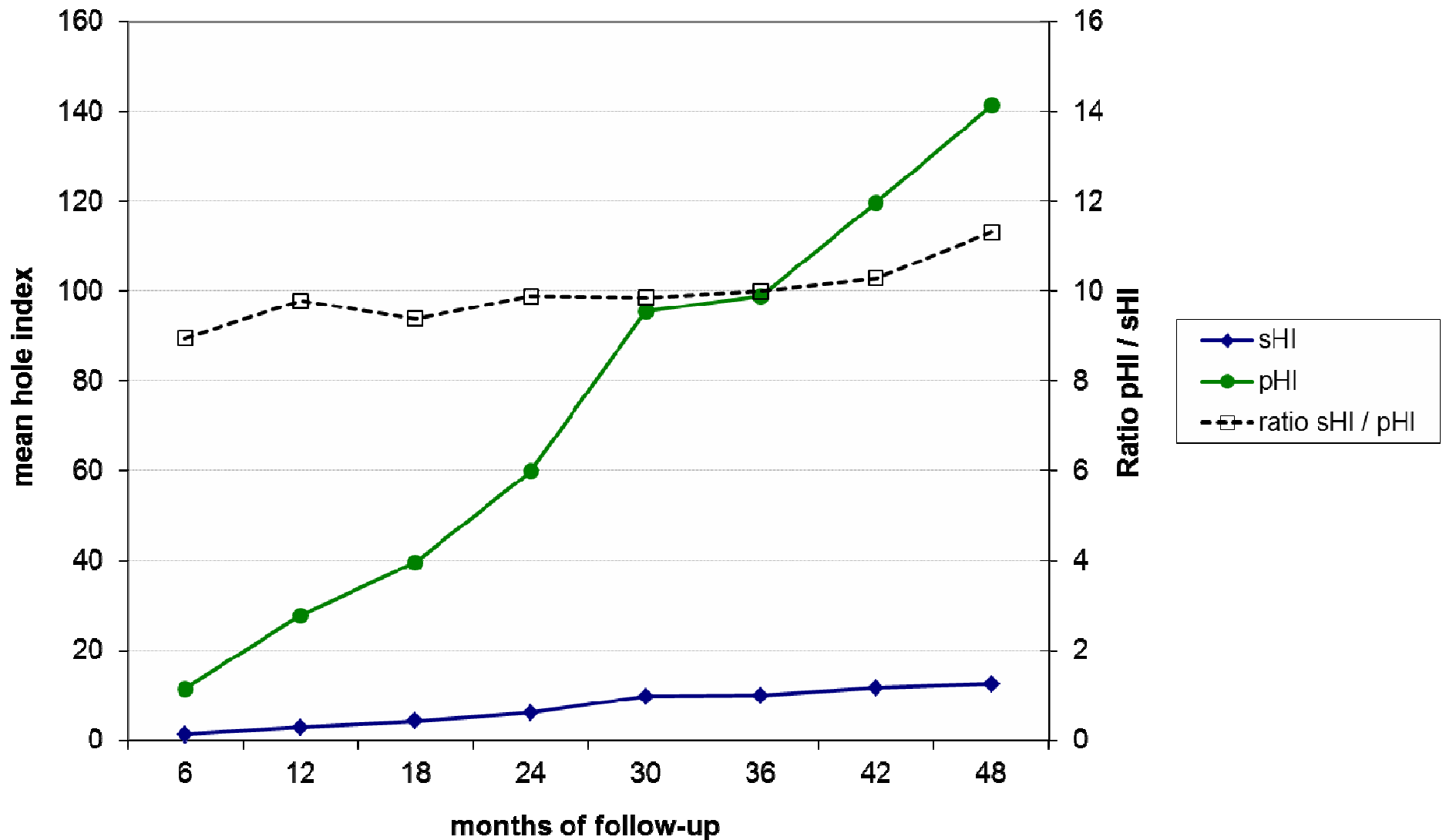
- But one option could be:
  - Servicable= <25pHI or < 100cm<sup>2</sup> holes
  - Max 2 size 2, none size 3
  - Very torn= > 300pHI or > 0.1m<sup>2</sup> holes
  - More than 4 size 3

Port GR, Boreham PFL: The effect of bed nets on feeding by *Anopheles gambiae* Giles (Diptera: Culicidae). Bull Ent Res 1982, 72: 483-8

Carnevale P et al.: Insecticide impregnation can restore the efficiency of torn bed nets and reduce man-vector contact in malaria endemic areas. Trans Roy Soc Trop Med Hyg 1992, 86: 362-4

Vatabdoost et al. Comparative study on the efficacy of lambda-cyhalothrin and bifenthrin on torn nets against the malaria vector *Anopheles stephensi* as assessed by tunnel test method. J Vect Borne Dis 2006, 43: 133-5

# Comparing «simple» and «proportionate» Hole Index



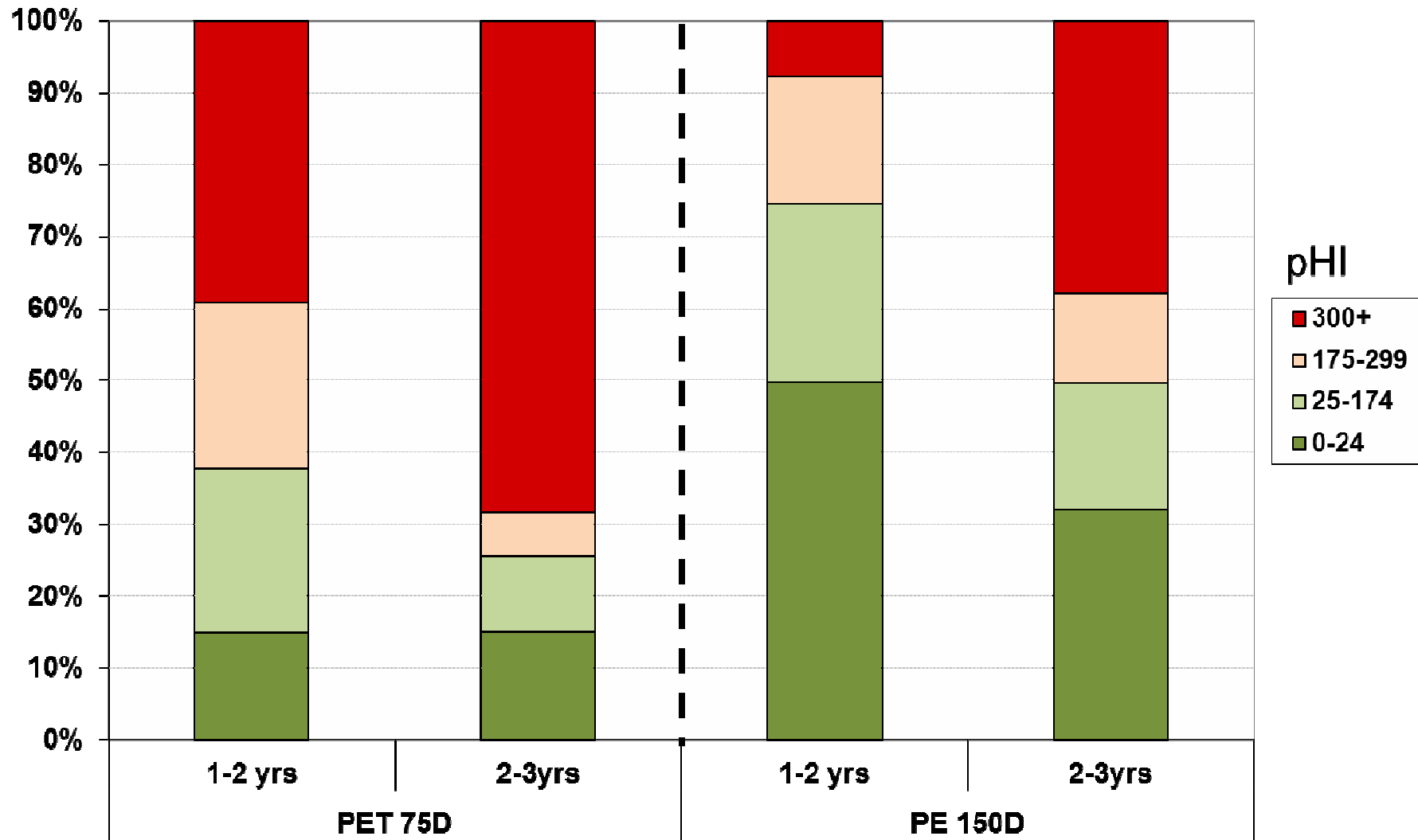


# How to analyze hole index data

- **Advantage**
- Can be back-translated to approximate hole surface area
- Is reasonably robust against errors in counts
- Allows easy and standardized comparisons
- Since it is based on the original hole counts can be recalculated if better approach determined

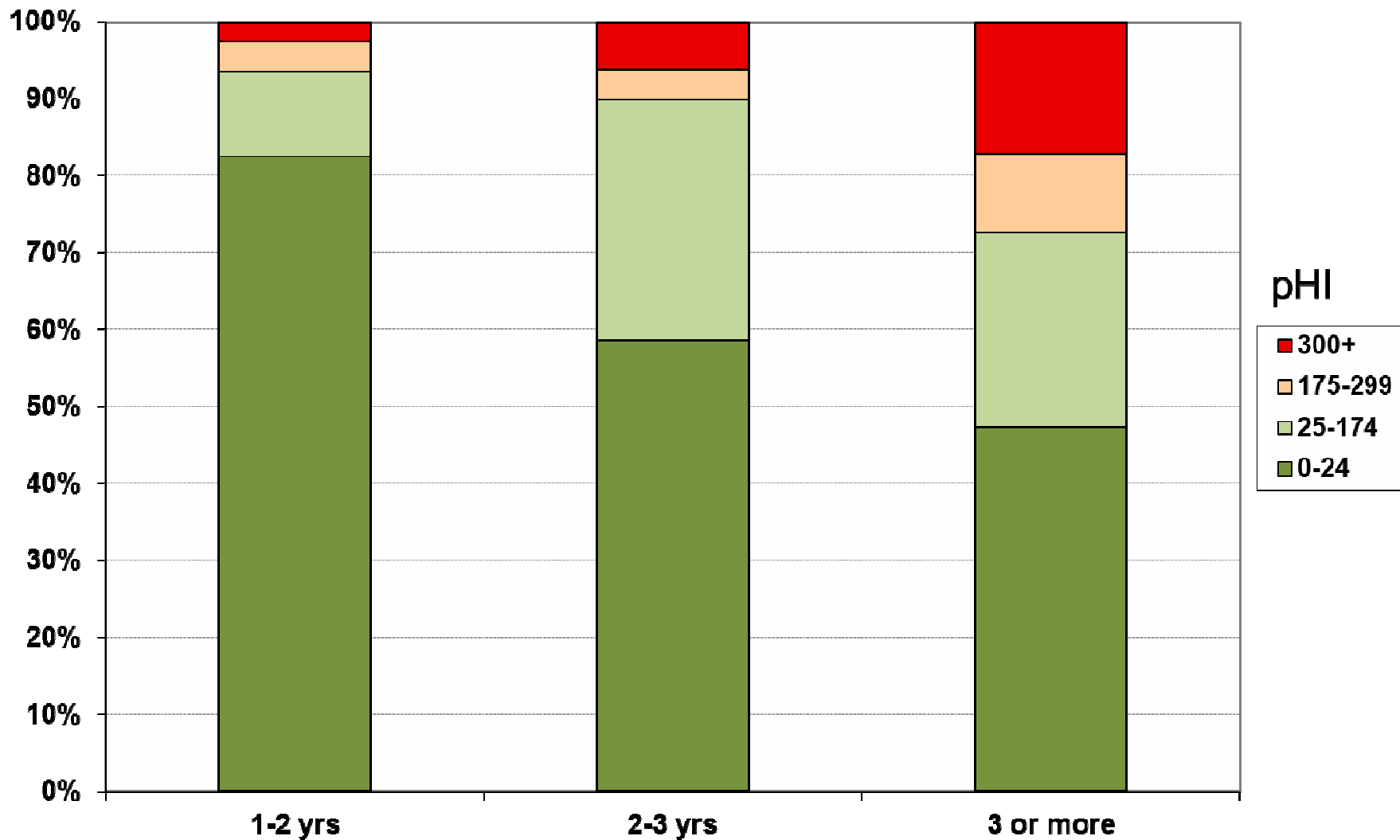
# Example

Eastern Chad, Refugee and local communities, only nets used for sleeping



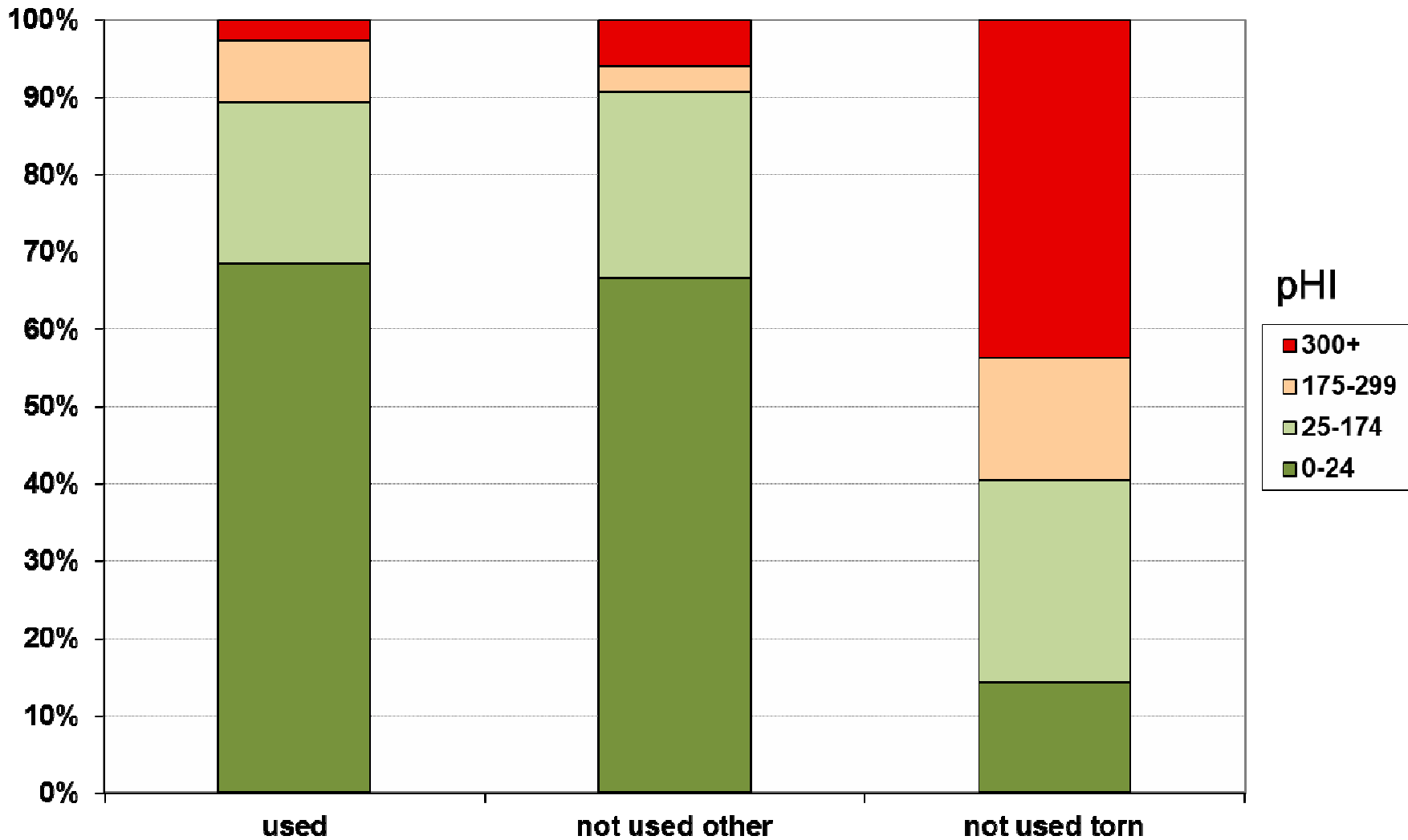
# Example

Ethiopia, SNNPR, PET 75D (95%)



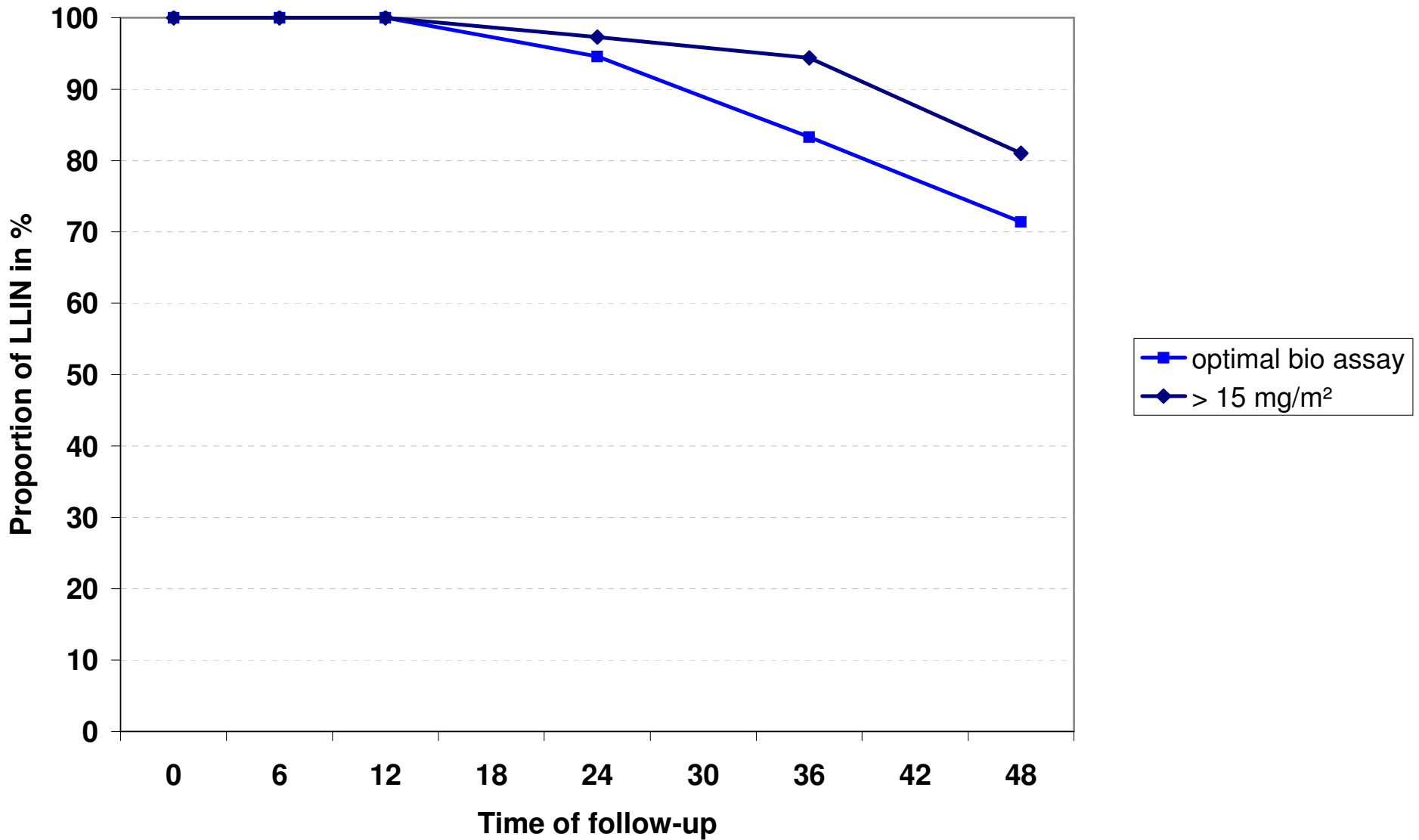
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Ethiopia, SNNPR, PET 75D (95%)



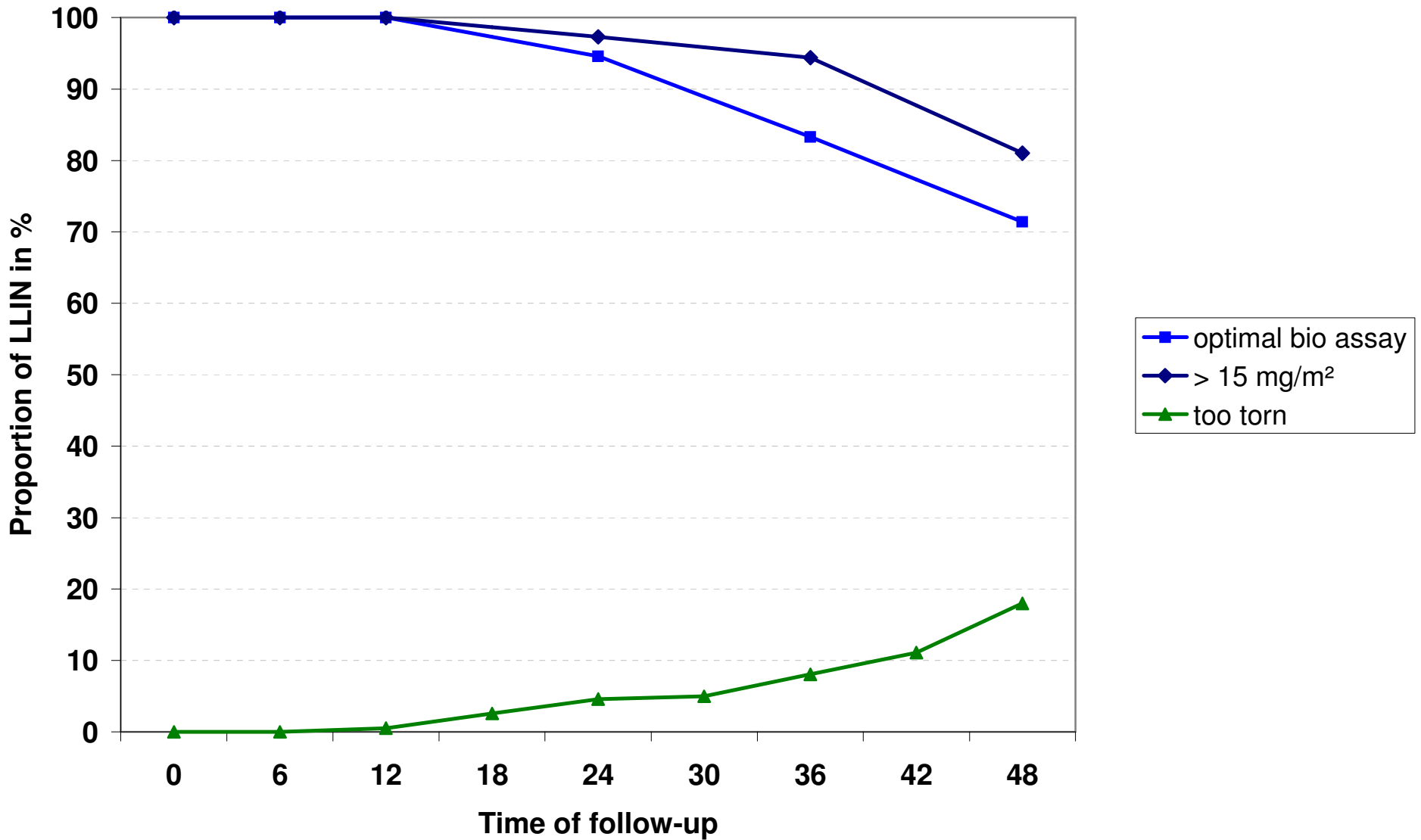
# Example

Polyester LLIN, 75 Denier, Field use West Uganda



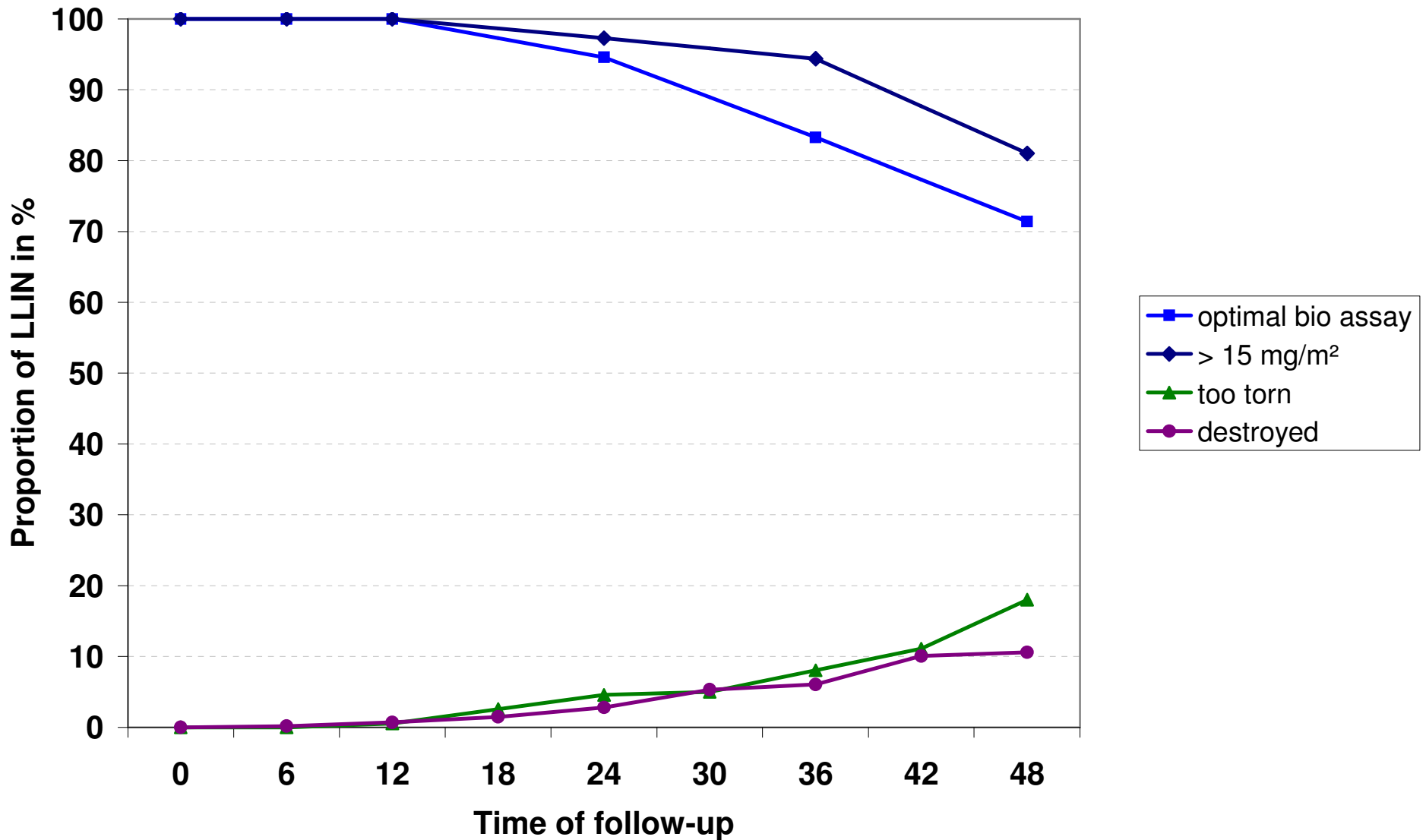
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Polyester LLIN, 75 Denier, Field use West Uganda



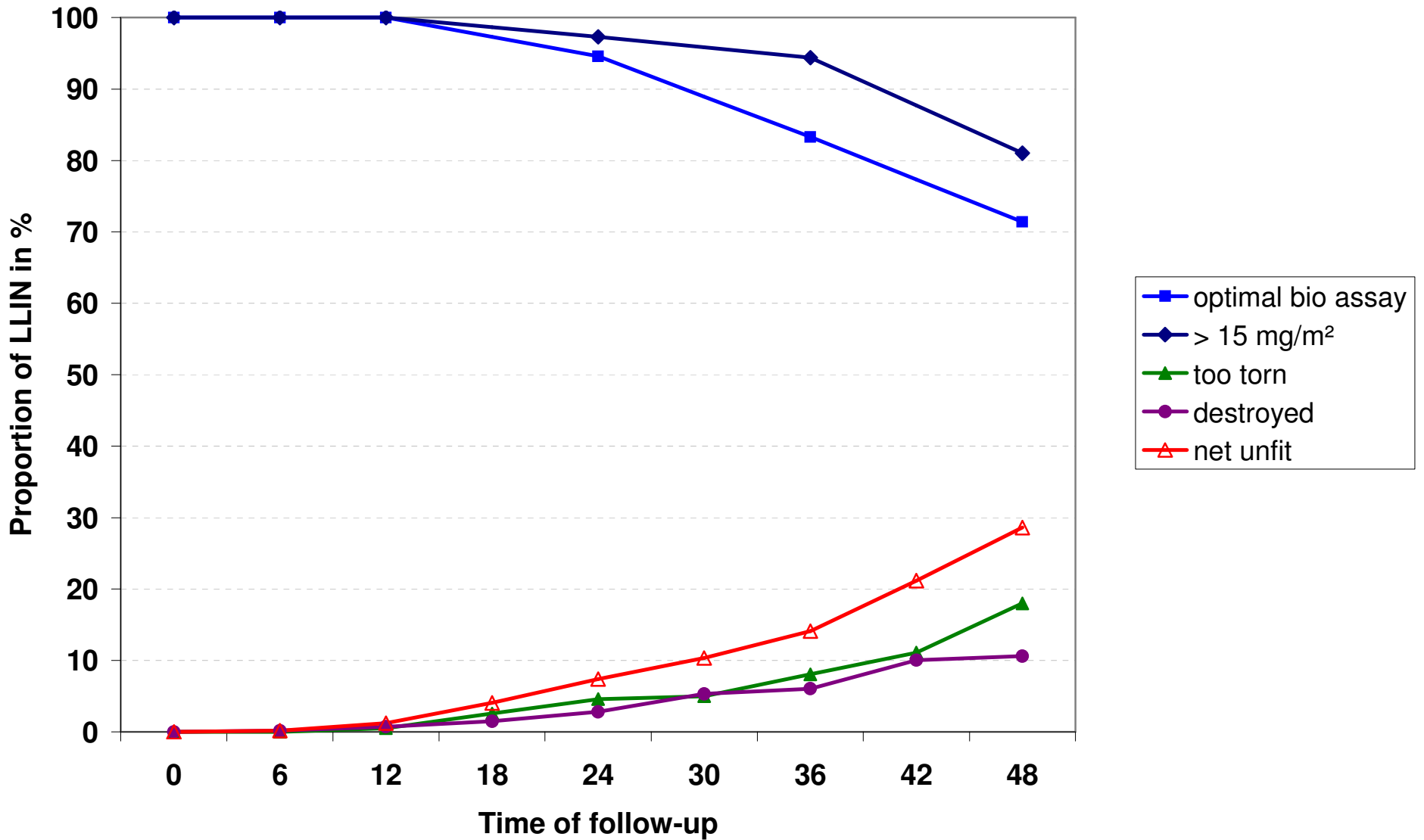
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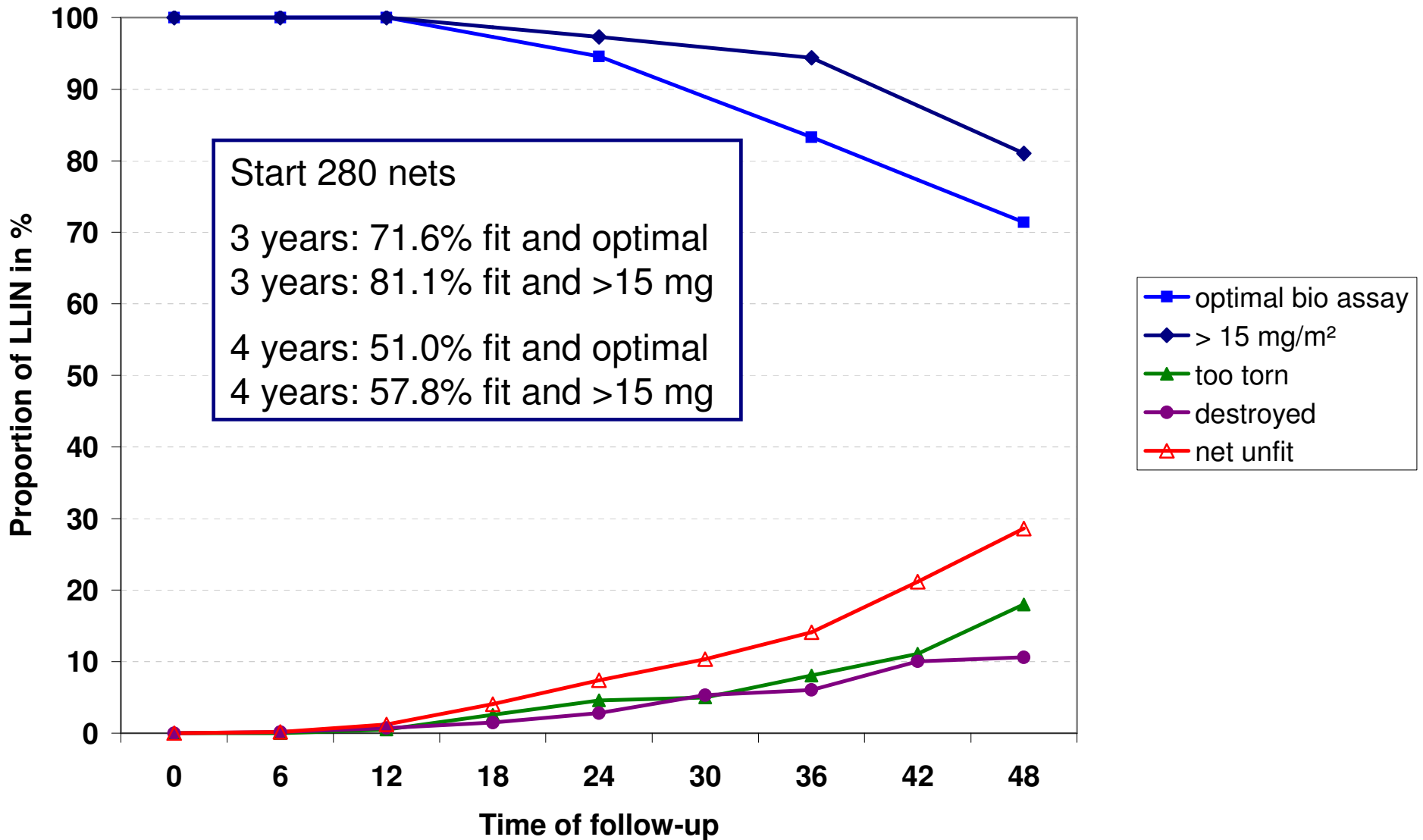
Polyester LLIN, 75 Denier, Field use West Uganda





# Example

Polyester LLIN, 75 Denier, Field use West Uganda



# Conclusion

- The PHI may not be the ultimate solution
- But data needs to be collected
- This is a starting point that can provide us the data we need to move forward