

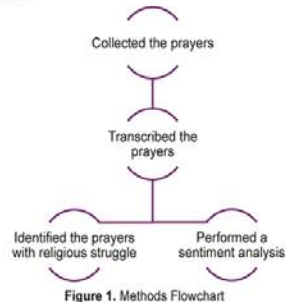
## Introduction

- Religious struggle is “having conflicted spiritual beliefs as a result of high religious needs and low religious resources” (1). People experiencing religious struggle tend to have a poorer quality of life, increased depression and disability (2).
- The goal of the ULTRE study is to identify families who are undergoing religious struggle in hospitals using their written prayers. These prayers are mainly written in Spanish and English.
- Previous studies have made an effort to understand differences in emotions between Spanish and English speakers. Ramirez-Esparza et al. (3) compared the statements produced by Spanish and English-speaking depression patients. Spanish-speaking patients were more emotive and used more religious terms.
- Effectively detecting religious struggle requires understanding inherent differences in how sentiment is expressed in Spanish and English.

## Aims

- As part of the ULTRE study, the goal of this project is to perform a sentiment analysis on Spanish and English prayers to better understand the emotions found in them.
  - Hypothesis 1:** The percentage of negative and positive emotions in Spanish and English prayers will be the same.
  - Hypothesis 2:** The frequency of prayers indicating (non-) religious struggle will be the same for Spanish and English prayers.

## Methods



- Collected the prayers from the open prayer books in the chapels and labeled them by language.
- Transcribed the prayers into a Word document and de-identified them.
- Identified the prayers with religious struggle, the struggle in each prayer was annotated based on 16 criteria developed by 8 board-certified pediatric chaplains.
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- In total, 890 prayers were analyzed with the R sentiment package and the LIWC tool: 528 in English and 362 in Spanish (see table 1).

	Spanish	English
Number of prayers	362	528
Number of prayers per year	30.2	88.1
Average number of words per prayer	23.6	36.6

Table 1. The distribution of Spanish and English Prayers

- Spanish prayers indicate struggle far less frequently. All of the Spanish prayers were annotated as “None” since they did not present any type of struggle. In contrast, 80 English prayers (out of 528) had religious struggle.

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Religious Struggle	0	80
NOT Religious Struggle	362	448

Table 2. Amount of prayers with religious struggle present in both languages.

## Results (Sentiment Analysis)

- 18 LIWC categories were chosen based on their association with sentiment analysis.
- Categories like Inclusive and Humans had a higher mean frequency in Spanish. Mean frequencies for the Religious Terms were relatively close with the Spanish being 0.40% higher.

Category	Examples
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Religious Processes	Mark, with, time, with
Religious Processes	With, and
Capital Processes	With, with, with
Anger	With, with, with
Stimulus	With, with, with
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Religious Terms	With, with, with
With	With, with, with
Family	With, with, with
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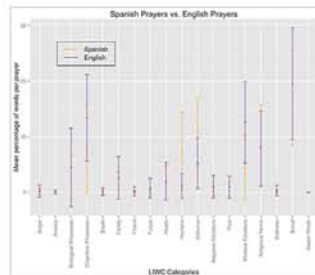


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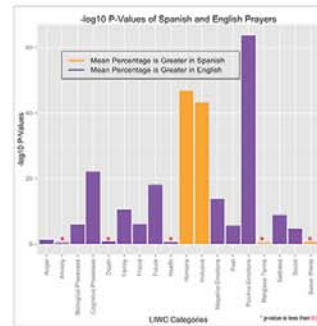


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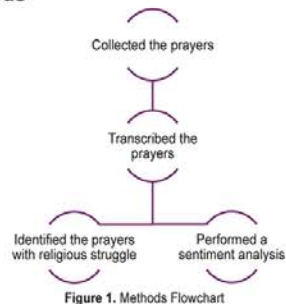
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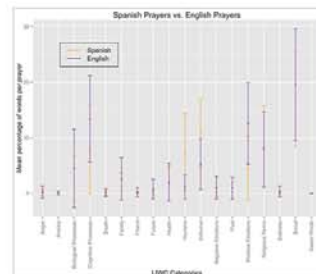


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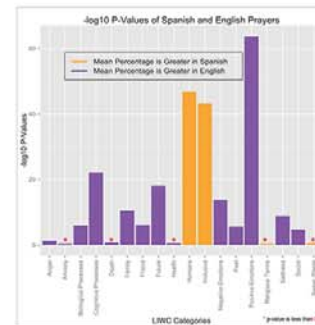


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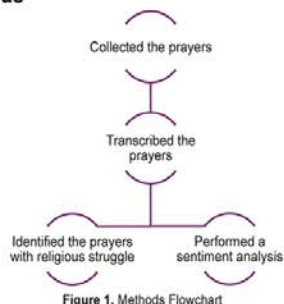
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Wish	Very, could, get
Family	Member, husband, wife
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Food Drink	With, can, feel
Locations	Where, where

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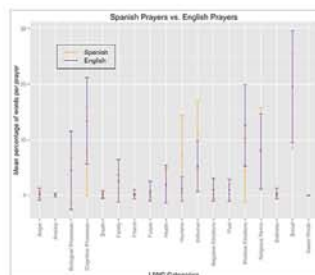


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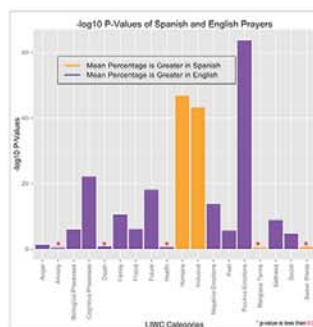


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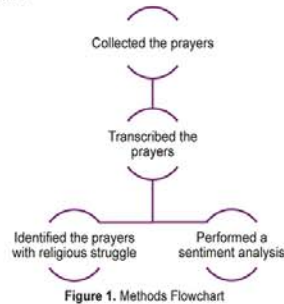
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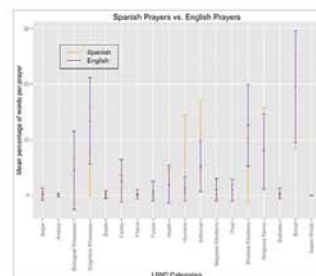


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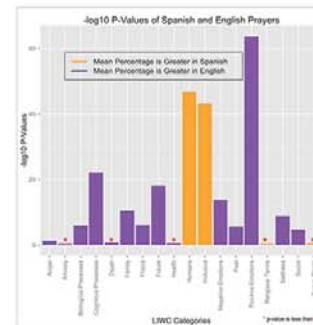


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- Grosseohme, D., Fitchett, G. (2013). Testing the Validity of a Protocol to Screen for Spiritual Struggle among Parents of children with Cystic Fibrosis. *Research in the Social Scientific Study of Religion*, 24, 281-302.
- Ramirez-Esparza, N., Chung, C., Kacewicz, E., Pennebaker, J. (2001). The Psychology of Word Use in Depression Forums in English and in Spanish: Testing Two Text Analytic Approaches. *Association for the Advancement of Artificial Intelligence*, 102-108.
- Pennebaker, J., Graybeal, A. (2001). Patterns of Natural Language Use: Disclosure, Personality, and Social Integration. *American Psychological Society*, 10: Number 3, 90-93.

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