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The impact of childhood epilepsy diagnoses on adult religiosity

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Abstract

For some patients, epileptic seizures are accompanied by surreal physical sensations and religious visions. In some cases, these seizures lead individuals to dramatically change their worldview and religious beliefs. Using data from the National Longitudinal Study of Adolescent to Adult Health, we build econometric models to assess how a childhood epilepsy diagnosis affects one's religiosity as an adult. While we find no evidence that epilepsy diagnoses increase religious faith, we show that people with epilepsy are 17.7 percentage points more likely to attend religious services at least once per month.

1. Introduction

For most, epileptic seizures are grueling affairs in which the afflicted may lose consciousness or sustain injuries. However, some experience ecstatic seizures, in which the patient reports "immense joy" that is "above physical sensations" (Gschwind & Picard, 2016). During such seizures, patients note heightened awareness of self and difficulty assessing the passage of time. These episodes are sometimes associated with religious visions. After a seizure, one patient stated that he "knew what it was like to be in heaven" (Subirana, 1953). Others report visions of Jesus (Morgan 1990) or a halo around God (Naito and Matsui, 1988). Ecstatic seizures may cause the afflicted to adopt new spiritual beliefs. For example, Dewhurt and Beard (1970) reported that one previously irreligious patient believed he was "God's chosen instrument" after a seizure (p. 499). Although such cases are atypical—only 1.3% of epilepsy patients report hyper-religious experiences during seizures (Ogata & Miyawa, 1998)—the potential impacts are profound. Ecstatic seizures "might have influenced religious beliefs over time, and therewith had an impact on the history of human culture" (Gschwind & Picard, 2016, p. 17).

Ecstatic seizures serve as only one potential mechanism through which epilepsy could alter religiosity. Prior research indicates that epilepsy patients face higher unemployment and underemployment rates (Smeets et al. 2007) and increased anxiety (Tellez-Zenteno et al. 2007). These challenges could drive the afflicted to religion or perhaps illicit cynicism regarding the existence of higher beings. To assess the relationship between epilepsy and religiosity, we construct economic models using data from the National Longitudinal Study of Adolescent to Adult Health (Add Health). We find that individuals with epilepsy are 17.7 percentage points more likely to attend religious services at least once per month. However, they do not exhibit higher levels of religious faith. Thus, it appears that epilepsy impacts a person's religious life, but the mechanisms are unclear.

2. Materials and Methods

To assess the relationship between epilepsy and religiosity, we employ data from National Add Health (AddHealth), in which individuals were interviewed multiple times throughout their lives. We primarily use data from Wave V, when respondents were 33 to 43 years old.[1] We first consider how epilepsy (and other factors) impacts a person's religiosity as measured by their self-reported religious faith. Survey participants were asked "How Important (if at all) is your religious faith to you?" for which, respondents were given four options. Our dependent variable, *Faith*, equals one if the respondent answers "somewhat important", "very important", or "more important than anything else" and zero if "not important".[2] We estimate the following probit model:

$$Faith_i = \beta_0 + \beta_1 Epilepsy_i + \beta_2 ParentsAttService_i + \pi I_i + R_i + C_i + \varepsilon_i.$$
Eq. 1

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[1] See Harris et al. (2018) and Harris (2019) for data.
[2] In an alternate specification, we estimated an ordered probit model with a quaternary dependent variable that ranged from 1 ("not important") to 4 ("more important than anything else"). The findings from this specification did not meaningfully differ from our probit output.

Using a question from Wave V of the National Add Health dataset, we employ the key control variable, *Epilepsy*, which equals one if a respondent self-reported that they were diagnosed with epilepsy before age 16. To account for upbringing, we include a dummy variable indicating if a respondent's parent(s) report attending religious services at least once per month when the respondent was a child (*ParentAttend*).[3] The vector, I_i, accounts for two individual characteristics—sex at birth, and birth year.[4] Finally, we include fixed effects for race (R_i) and country region (C_i).

Next, we consider whether epilepsy diagnoses affect adult attendance of religious services. Within Wave V, individuals were asked, "How often have you attended church, synagogue, temple, mosque, or religious services in the past 12 months?" Responses ranged from "never" to "more than once per week". We create the variable, *AttendDummy*, which equals one if respondents attend religious services least once per month. We estimate the probit model:

$AttendDummy_i = \beta_0 + \beta_1 Epilepsy_i + \beta_2 ParentsAttendService_i + \beta_3 FaithSomewhatImp_i + \beta_4 FaithVeryImp_i + \beta_5 FaithMostImpt_i + \pi I_i + R_i + C_i + \varepsilon_i.$
Eq. 2

In addition to the controls in equation (1), we also account for self-reported religious faith to determine if religious service attendance is impacted by epilepsy for individuals of comparable religious faith. As a robustness check, we also estimate an ordered probit model utilizing the same religious attendance survey question with the dependent variable, *Attend*, which ranges from 1 ("never") to 6 ("more than once per week").

Summary statistics are provided in Table 1. About 1.3% of respondents report an epilepsy diagnosis, which mirrors the national average of 1.2% (CDC 2023). About 77.2% report religious faith as being at least "somewhat important" and 32.2% attend a religious service at least monthly. Roughly 58.8% of respondents were raised by parents that attended religious services at least monthly. Educational attainment is based on highest degree attained—for example, 24.9% received a bachelor's degree but did not attain post-graduate degrees. About 13.8% report household income exceeding $100,000. While 4,196 individuals were interviewed for AddHealth, many did not complete their surveys. After removing incompletes, 3,219 observations remain.

3. Results

Table 2 displays regression results. Our first model indicates that religious faith is unaffected by a childhood epilepsy diagnosis. However, we find significance for many controls. Females and older respondents report higher levels of religious faith, all else equal. Having a high income is associated with less importance placed on religious faith. Using marginal effects,

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[3] Respondents' parents were directly surveyed during Wave 1 of AddHealth, when their children were in grades 7 through 12. The survey question specifically asked if parents attended religious services at least once per month within the last year.

[4] AddHealth surveys for a given wave occur across multiple years. Data provide the year of birth, but not respondent's ages. Forthcoming regressions use *BirthYear* as a continuous variable. We also estimate models using dummy variables for each year of birth. Model outputs were not sensitive to this change.

we can determine the magnitude of such correlations. For example, being born female correlates with a 8.9 percentage-point increase in the likelihood of a respondent reporting that their religious faith was at least somewhat important. Relative to the omitted case of low income (<$25,000/annually), a person with an income exceeding $100,000 is 6.8 percentage points less likely to report that their religious faith is important. Likewise, a college graduate (graduate degree) is 12.6 percentage points (12.5) less likely to state that religious faith is at least somewhat important, relative to an otherwise similar person with no high school degree.

Next, we use the dependent variable *AttendDummy*, to determine the correlates of religious service attendance. In this specification, we find significant positive effects for *Epilepsy*. With a marginal effect of 0.177 for *Epilepsy*, our model shows that being diagnosed with epilepsy is associated with a 17.7 percentage point increase in the probability of attending religious services monthly or more, relative to an otherwise similar person that was not diagnosed with epilepsy as a child.[5] For comparison, this effect is more than twice as large as being raised by a parent that attended church at least monthly when the respondent was a child. An ordered probit model, provided in the final column of Table 2, closely mirrors our probit model findings, confirming a strong connection between epilepsy diagnoses and the attendance of religious services.

Collectively, our results indicate that epilepsy patients exhibit levels of religious faith that mirror their peers. However, individuals with epilepsy are far more likely to attend religious services. This is one of a few interesting discrepancies implied by our models. We show that females place higher importance on faith but are no more likely than males to attend religious services, controlling for faith. We also find inconsistencies for our educational attainment variables. Relative to a person with no high school degree, a person that graduates college (but does not attend graduate school) is 18.7 percentage points more likely to attend church each month but is 12.6 percentage points less likely to view faith as at least somewhat important. A similar effect, albeit with marginal statistical significance, is identified for high income respondents.

4. Discussion

Researchers (e.g. Gschwind & Picard [2016] and Ogata & Miyawa [1998]) have long-established a link between ecstatic seizures and increased religiosity. While we make no claim of causality nor can we specifically address the importance of *ecstatic* seizures, our results indicate a large, positive association between being diagnosed with epilepsy as a child and attending religious services as an adult. However, we report no statistically significant correlation between epilepsy diagnoses and a person's self-reported religious faith. Thus, it appears that there is a meaningful, yet complicated relationship between epilepsy and religious behavior.

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[5] In alternate specifications, we exclude the self-reported controls for religiosity (e.g. *FaithSomewhatImportant*). In these specifications, the coefficient for *Epilepsy* is smaller (0.138 for the probit model, 0.328 for ordered probit model) and marginally significant (p-value = 0.096 for the probit model; p-value=0.053 for ordered probit model).

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Table 1. Summary Statistics

Variable *(obs=3,219)*	Mean	Std. Dev.	Min	Max
Dep. Variables				
Faith	0.772	0.420	0	1
AttendDummy	0.322	0.467	0	1
Attend	2.433	1.597	0	6
Ind. Variables				
Epilepsy	0.013	0.112	0	1
BirthYear	1979.731	1.758	1976	1983
Female	0.571	0.495	0	1
ParentAttend	0.588	0.492	0	1
FaithNotImp	0.228	0.420	0	1
FaithSomewhatImp	0.272	0.445	0	1
FaithVeryImp	0.357	0.479	0	1
FaithMostImp	0.142	0.349	0	1
NoDegree	0.041	0.199	0	1
HSDegree	0.536	0.499	0	1
CollegeDegree	0.249	0.433	0	1
PostGradDegree	0.174	0.379	0	1
MidLowInc ($25k to $50k/yr)	0.285	0.452	0	1
MidHighInc ($50k to $100k/yr)	0.301	0.459	0	1
HighInc (>$100k/yr)	0.138	0.345	0	1
White	0.709	0.454	0	1
Black	0.199	0.399	0	1
Hispanic	0.091	0.287	0	1
Asian	0.034	0.181	0	1
PacificIslander	0.010	0.099	0	1
NativeAmerican	0.031	0.173	0	1
OtherRace	0.005	0.068	0	1
Northeast	0.200	0.400	0	1
Midwest	0.239	0.426	0	1
South	0.139	0.346	0	1
West	0.422	0.494	0	1

Table 2. Model Outputs

Model *Dep. Variable*	Probit *Faith*	Marg. Eff *Faith*	Probit *AttendDummy*	Marg. Eff *AttendDummy*	Ord. Probit *Attend*
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Marg. Eff (T-stat)	Coef. (T-stat)
Epilepsy	0.177 (0.74)	0.046 (0.81)	0.509** (2.04)	0.177* (1.85)	0.412** (2.36)
BirthYear	-0.038** (2.57)	-0.011** (2.57)	-0.024 (1.53)	-0.007 (1.53)	-0.023** (2.05)
Female	0.314*** (5.79)	0.089*** (5.73)	0.012 (0.20)	0.004 (0.20)	0.065 (1.53)
ParentAttend	0.532*** (9.93)	0.153*** (9.73)	0.284*** (4.70)	0.084*** (4.81)	0.271*** (6.23)
FaithSomewhatImp	-	-	1.121*** (8.09)	0.380*** (8.34)	0.871*** (13.35)
FaithVeryImp	-	-	2.277*** (16.88)	0.702*** (24.63)	1.838*** (27.57)
FaithMostImp	-	-	3.006*** (20.47)	0.847*** (50.89)	2.725*** (33.30)
HSDegree	-0.182 (1.26)	-0.050 (1.27)	0.172 (1.19)	0.051 (1.20)	0.147 (1.38)
CollegeDegree	-0.420*** (2.77)	-0.126** (2.59)	0.570*** (3.68)	0.187*** (3.45)	0.486*** (4.27)
PostGradDegree	-0.406** (2.57)	-0.125** (2.36)	0.636*** (3.93)	0.216*** (3.62)	0.540*** (4.55)
MidLowInc	-0.064 (0.22)	-0.018 (0.38)	0.026 (0.35)	0.008 (0.35)	0.023 (0.43)
MidHighInc	-0.106 (1.12)	-0.030 (1.42)	-0.008 (0.11)	-0.003 (0.11)	-0.007 (0.12)
HighInc	-0.30** (2.49)	-0.068** (2.35)	0.126 (1.23)	0.039 (1.19)	0.143* (1.95)
Includes Fixed Effects for Race and Region	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.113	-	0.327	-	0.189

***Significant at 99% level; **Significant at 95% level; *Significant at 90% level