

SUPPLEMENTARY DATA

**Online-Only Supplemental Material**  
**Hearing Impairment and Type 1 Diabetes in the DCCT/EDIC Cohort**

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This document presents supplemental materials cited in the text of the main manuscript

SUPPLEMENTARY DATA

**Supplementary Table S1.** Association of Speech-frequency and High-frequency PTA in Participants with Type 1 Diabetes and Spousal Controls

Hearing Impairment	Paired Participant with Type 1 Diabetes and Spousal Controls (n=283 pairs)		Participants with Type 1 Diabetes (n=1150) vs. Spousal Controls (n=283)	
	Unadjusted	Adjusted	Unadjusted	Adjusted
<b>Worse ear</b>				
Speech-frequency	-0.81 ± 1.02	-1.23 ± 0.97	-0.15 ± 0.92	-0.01 ± 0.86
High-frequency	0.62 ± 1.63	-0.49 ± 1.44	0.95 ± 1.34	1.11 ± 1.17
<b>Better ear</b>				
Speech-frequency	0.60 ± 0.69	0.32 ± 0.65	0.90 ± 0.56	1.07 ± 0.53
High-frequency	2.03 ± 1.36	1.14 ± 1.22	1.52 ± 1.05	1.71 ± 0.94
<b>Average (left/right)</b>				
Speech-frequency	-0.11 ± 0.80	-0.45 ± 0.75	0.37 ± 0.68	0.53 ± 0.63
High-frequency	1.33 ± 1.45	0.32 ± 1.28	1.23 ± 1.16	1.42 ± 1.01
<b>Overall Hearing (Speech- + High-)*</b>	0.61 ± 1.08	-0.07 ± 0.96	0.82 ± 0.88	0.96 ± 0.78

Data are beta estimates ± SE from unadjusted and age and gender adjusted linear regression models.

\* Overall test for any hearing loss (speech- and high-frequency). Models were adjusted for type of hearing loss (speech-frequency worse ear, speech-frequency better ear, high-frequency worse ear, high-frequency better ear).

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**Supplementary Table S2.** Odds of Speech-frequency and High-frequency Hearing Impairment per 10% increase in HbA1c in Participants with Type 1 Diabetes

Unadjusted Models						Adjusted Models				
Hearing Impairment	At DCCT Entry	Mean DCCT	Mean EDIC	Current	Time-weighted Mean DCCT/EDIC	At DCCT Entry	Mean DCCT	Mean EDIC	Current	Time-weighted Mean DCCT/EDIC
Odds Ratios (95% CI)										
<b>Both ears</b>										
Speech-frequency	0.93 (0.83, 1.04)	0.94 (0.84, 1.06)	1.12 (0.96, 1.30)	1.02 (0.90, 1.16)	1.08 (0.92, 1.27)	0.95 (0.84, 1.07)	1.01 (0.90, 1.14)	1.18 (1.00, 1.39)	1.09 (0.95, 1.26)	1.17 (0.98, 1.39)
High-frequency	0.99 (0.92, 1.05)	0.94 (0.88, 1.01)	1.09 (0.99, 1.20)	1.00 (0.93, 1.09)	1.05 (0.95, 1.16)	1.04 (0.96, 1.12)	1.02 (0.94, 1.11)	1.14 (1.03, 1.27)	1.07 (0.98, 1.18)	1.14 (1.02, 1.27)
<b>Either ear</b>										
Speech-frequency	1.01 (0.93, 1.10)	1.02 (0.94, 1.12)	1.24 (1.10, 1.39)	1.11 (1.01, 1.23)	1.22 (1.08, 1.38)	1.04 (0.96, 1.14)	1.10 (1.01, 1.21)	1.30 (1.14, 1.47)	1.18 (1.07, 1.31)	1.32 (1.15, 1.50)
High-frequency	1.02 (0.96, 1.09)	0.99 (0.92, 1.06)	1.12 (1.02, 1.23)	1.05 (0.97, 1.13)	1.10 (1.00, 1.21)	1.09 (1.01, 1.17)	1.08 (1.00, 1.17)	1.17 (1.06, 1.29)	1.12 (1.03, 1.22)	1.19 (1.07, 1.33)

Data are odds ratios and 95% confidence intervals from unadjusted and age and gender adjusted logistic regression models. Odds ratios are presented per 10% increase in HbA1c.

SUPPLEMENTARY DATA

**Supplemental Table S3.** Prevalence of Speech-frequency and High-frequency Hearing Impairment in Participants with Type 1 Diabetes and Time-weighted HbA1c <7% (53 mmol/mol) and Spousal Controls

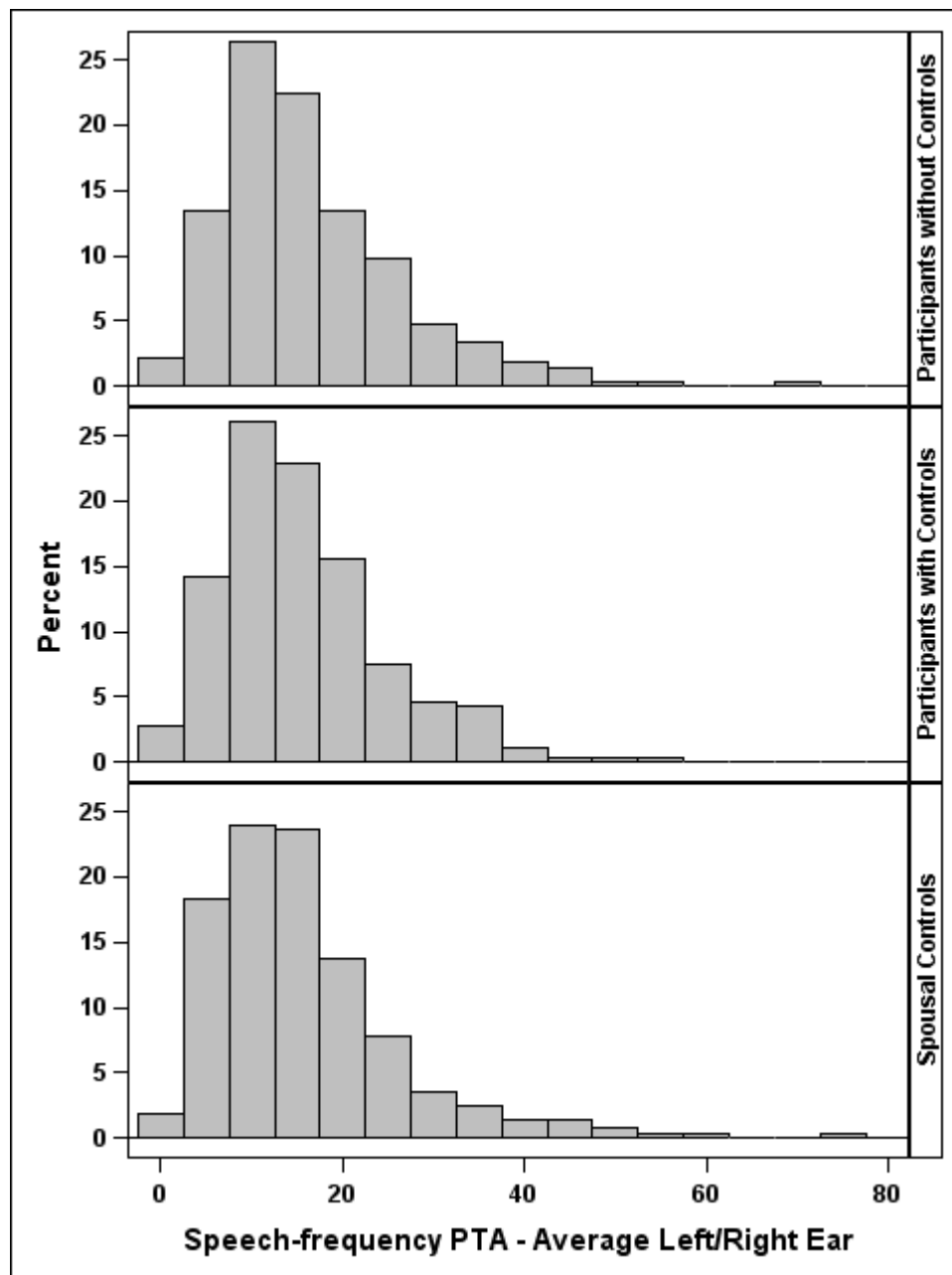
Hearing Impairment	Participants with Type 1 Diabetes and HbA1c <7% (n=159)	Spousal Controls (n=283)	Unadjusted Models	Participants with Type 1 Diabetes and HbA1c <7% (n=159)	Spousal Controls (n=283)	Adjusted Models
	Crude Prevalence No. (%)		Odds Ratios (95% CI)	Adjusted Estimated Prevalence (%)		Odds Ratios (95% CI)
<b>Both ears</b>						
Speech-frequency	15 (9)	22 (8)	1.3 (0.7, 2.5)	8	6	1.3 (0.6, 2.5)
High-frequency	47 (30)	93 (33)	0.9 (0.6, 1.4)	26	30	0.8 (0.5, 1.3)
<b>Either ear</b>						
Speech-frequency	20 (13)	53 (19)	0.6 (0.4, 1.1)	10	16	0.6 (0.3, 1.0)
High-frequency	73 (46)	135 (48)	0.9 (0.6, 1.4)	44	48	0.9 (0.6, 1.3)

Data are prevalence estimates No. (%) and odds ratios (participants with type 1 diabetes vs. spousal controls) and 95% confidence intervals from unadjusted and age and gender adjusted logistic regression models.

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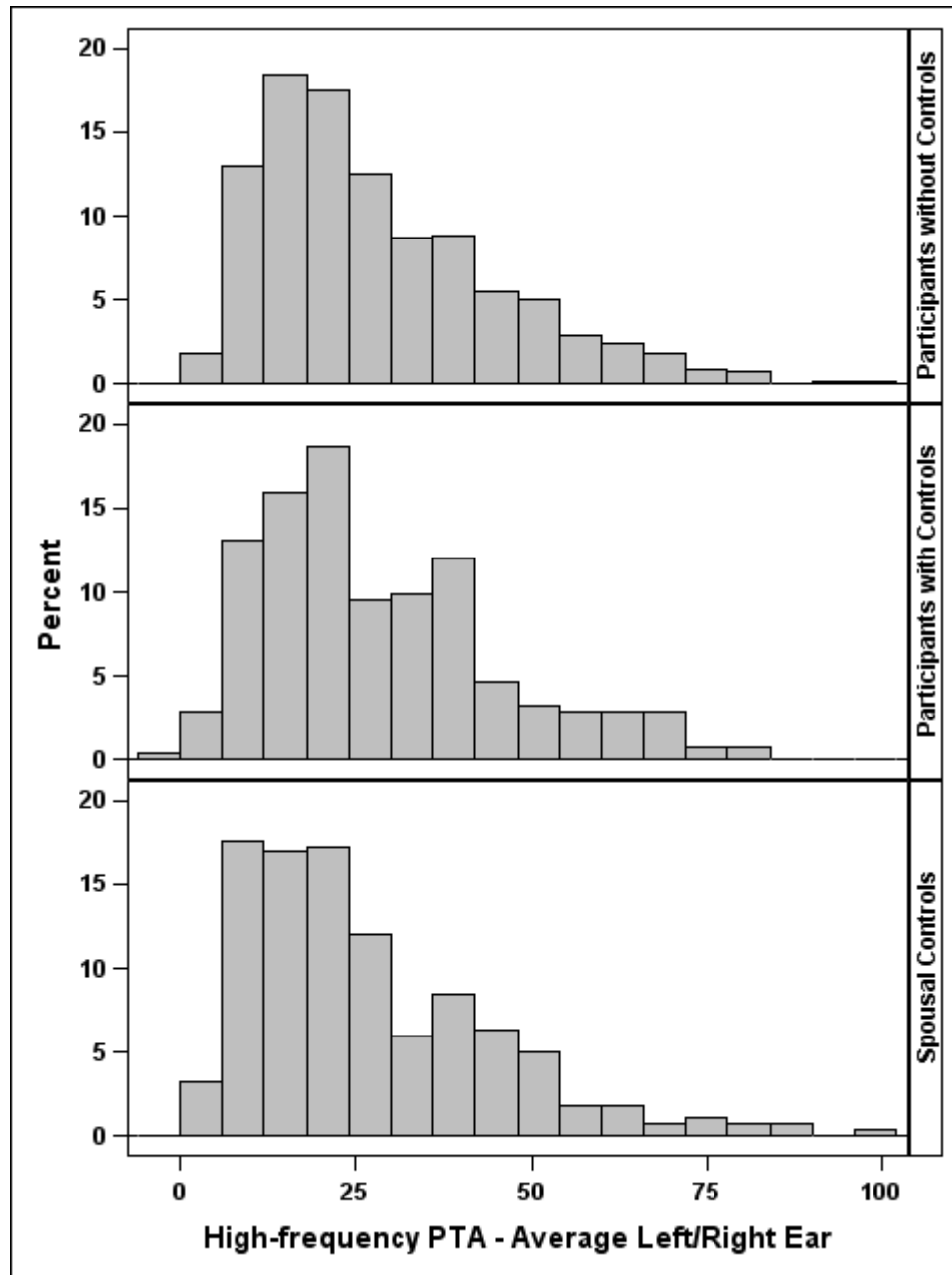
**Supplementary Figure S1.** Distribution of (A) speech-frequency and (B) high-frequency PTA in participants with type 1 diabetes and spousal controls.

(A)



SUPPLEMENTARY DATA

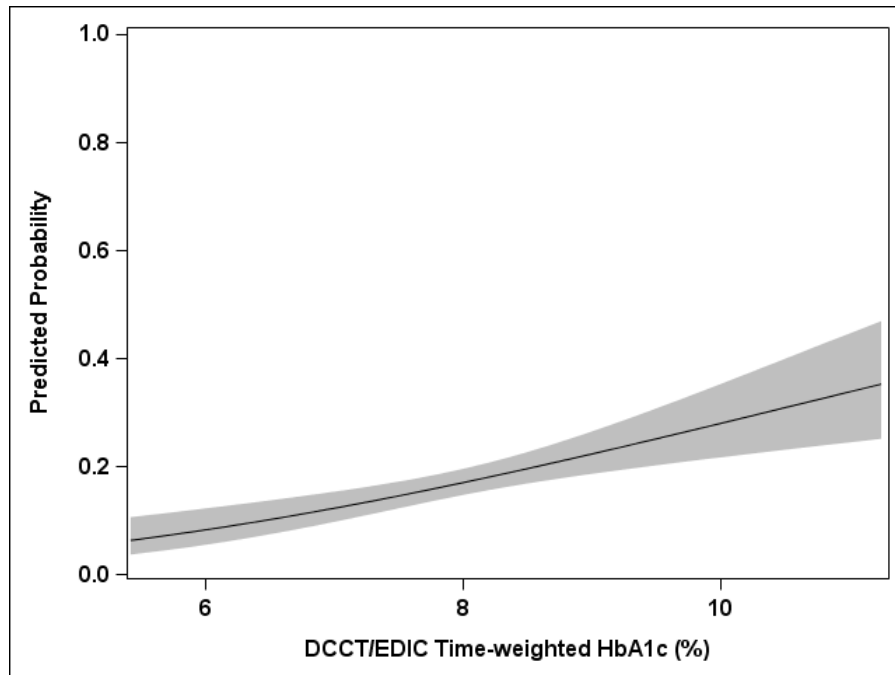
(B)



## SUPPLEMENTARY DATA

**Supplementary Figure S2.** Probability of (A) speech-frequency and (B) high-frequency hearing impairment in either ear as a function of time-weighted mean DCCT/EDIC HbA1c in participants with type 1 diabetes. The dark line represents the predicted probability of hearing impairment at a given level of HbA1c; the shaded area is the 95% confidence interval for the predicted probability.

### (A) Speech-frequency



### (B) High-frequency

