

Supplementary file

Table S1. Weighted characteristics of research subjects by adult smoking status in NHANES from 2005 to 2018 (n=4217) (2005-2012 and 2015-2018)

| | Non-smoking | smoking | p |
|--|-----------------------------|-----------------------------|---------|
| Gender | | | <0.0001 |
| Female | (1261) 54.67 (52.30 ,57.03) | (780) 45.67 (42.69 ,48.68) | |
| Male | (1033) 45.33 (42.97 ,47.70) | (1143) 54.33 (51.32 ,57.31) | |
| Age (years) | | | <0.0001 |
| Young (20-39) | (1049) 46.51 (42.32 ,50.76) | (600) 32.68 (29.29 ,36.26) | |
| Middle-aged (40-59) | (755) 36.98 (33.31 ,40.82) | (646) 40.40 (36.47 ,44.46) | |
| Older (\geq 60) | (490) 16.50 (14.13 ,19.19) | (677) 26.92 (23.91 ,30.16) | |
| Race | | | <0.0001 |
| Mexican american | (311) 8.49 (5.84 ,12.18) | (230) 6.74 (4.94 ,9.14) | |
| Other hispanic | (251) 6.29 (4.51 ,8.72) | (171) 4.70 (3.08 ,7.09) | |
| Non-hispanic white | (857) 67.72 (62.17 ,72.80) | (957) 75.34 (70.59 ,79.54) | |
| Non-hispanic black | (525) 10.36 (7.82 ,13.62) | (374) 7.71 (5.81 ,10.15) | |
| Other races | (350) 7.14 (5.67 ,8.95) | (191) 5.52 (4.26 ,7.11) | |
| Educational level | | | <0.0001 |
| Less than high school | (329) 8.71 (6.79 ,11.11) | (442) 15.67 (12.78 ,19.07) | |
| High school or GED | (383) 14.07 (11.85 ,16.63) | (467) 23.59 (20.51 ,26.98) | |
| Above high school | (1582) 77.22 (73.06 ,80.91) | (1014) 60.74 (55.83 ,65.45) | |
| Marital status | | | 0.1338 |
| Married/living with partner | (1417) 66.38 (62.33 ,70.20) | (1144) 63.13 (59.59 ,66.52) | |
| Never married/divorced/ separated/widowed | (877) 33.62 (29.80 ,37.67) | (779) 36.87 (33.48 ,40.41) | |
| Alcohol | | | <0.0001 |
| No | (2114) 93.05 (91.04 ,94.64) | (1435) 74.69 (71.87 ,77.32) | |
| Yes | (180) 6.95 (5.36 ,8.96) | (488) 25.31 (22.68 ,28.13) | |
| PIR | | | <0.0001 |
| >3,5 | (883) 50.37 (45.05 ,55.69) | (535) 39.89 (34.59 ,45.43) | |
| 1.3-3.5 | (846) 33.42 (29.70 ,37.35) | (776) 37.66 (33.73 ,41.77) | |
| 1.3 | (565) 16.21 (13.32 ,19.58) | (612) 22.45 (19.57 ,25.62) | |
| Tinnitus | | | 0.0010 |
| No | (1989) 85.39 (82.72 ,87.71) | (1544) 80.20 (77.44 ,82.70) | |
| Yes | (305) 14.61 (12.29 ,17.28) | (379) 19.80 (17.30 ,22.56) | |
| Noise exposure | | | <0.0001 |
| No | (1152) 43.13 (39.66 ,46.67) | (620) 29.14 (26.02 ,32.47) | |
| Yes | (1142) 56.87 (53.33 ,60.34) | (1303) 70.86 (67.53 ,73.98) | |
| BMI (kg/m ²) | | | 0.1148 |
| <25 | (697) 30.51 (26.55 ,34.79) | (521) 28.18 (24.89 ,31.72) | |
| 25-30 | (753) 34.46 (31.17 ,37.90) | (651) 31.78 (28.72 ,35.02) | |
| >30 | (844) 35.03 (31.61 ,38.61) | (751) 40.04 (36.64 ,43.53) | |

| | | | | | |
|-----------------------|-----|-----------------------------|-----------------------------|--|---------|
| Hypertension | | | | | 0.0001 |
| | No | (1542) 69.73 (66.92 ,72.41) | (1144) 63.00 (60.57 ,65.37) | | |
| | Yes | (752) 30.27 (27.59 ,33.08) | (779) 37.00 (34.63 ,39.43) | | |
| Abnormal blood lipids | | | | | <0.0001 |
| | No | (1050) 44.44 (41.84 ,47.06) | (748) 36.54 (33.78 ,39.40) | | |
| | Yes | (1244) 55.56 (52.94 ,58.16) | (1175) 63.46 (60.60 ,66.22) | | |
| Diabetes | | | | | 0.0107 |
| | No | (2082) 93.23 (91.50 ,94.63) | (1655) 90.21 (88.41 ,91.75) | | |
| | Yes | (212) 6.77 (5.37 ,8.50) | (268) 9.79 (8.25 ,11.59) | | |
| Moderate activity | | | | | 0.0002 |
| | No | (1433) 58.42 (55.58 ,61.20) | (1115) 53.09 (49.83 ,56.32) | | |
| | Yes | (861) 41.58 (38.80 ,44.42) | (808) 46.91 (43.68 ,50.17) | | |
| LFHL | | | | | <0.0001 |
| | No | (2048) 91.49 (89.72 ,92.98) | (1553) 84.38 (81.91 ,86.56) | | |
| | Yes | (246) 8.51 (7.02 ,10.28) | (370) 15.62 (13.44 ,18.09) | | |
| SFHL | | | | | <0.0001 |
| | No | (1955) 87.02 (84.72 ,89.02) | (1380) 76.78 (74.08 ,79.28) | | |
| | Yes | (339) 12.98 (10.98 ,15.28) | (543) 23.22 (20.72 ,25.92) | | |
| HFHL | | | | | <0.0001 |
| | No | (1426) 63.05 (58.70 ,67.19) | (822) 46.52 (42.47 ,50.63) | | |
| | Yes | (868) 36.95 (32.81 ,41.30) | (1101) 53.48 (49.37 ,57.53) | | |
| LFHL(continuous) | | (2294) 11.10 (10.41 ,11.78) | (1923) 14.56 (13.75 ,15.38) | | <0.0001 |
| SFHL(continuous) | | (2294) 13.10 (12.26 ,13.94) | (1923) 17.66 (16.71 ,18.62) | | <0.0001 |
| HFHL(continuous) | | (2294) 25.34 (23.60 ,27.08) | (1923) 33.55 (31.84 ,35.25) | | <0.0001 |

P values from χ^2 test or Wilcoxon rank-sum test (categorical categories) and Student's t-tests (continuous covariates). *P < 0.05, **P < 0.01, ***P < 0.001. Data in the table: For continuous variables: (N-observe, N-represent) survey-weighted mean (95% CI) , P-value was by survey-weighted linear regression (svyglm); For categorical variables: (N-observe, N-represent) survey-weighted percentage (95% CI) , P-value was by survey-weighted Chi-square test (svytable).

Table S2. Baseline characteristics of study participants in NHANES according to hearing loss (2005-2012 and 2015-2018)

| Characteristics | Non-LF HL (N = 36 01) | LFHL (N = 616) | P-value | Non-S FHL (N = 33 35) | SFHL (N = 882) | P-value | Non-HF HL (N = 2248) | HFHL (N = 19 69) | P |
|------------------------|--------------------------------|----------------------------|---------|--------------------------------|----------------------------|---------|-----------------------------|-----------------------------|---------|
| Gender | | | 0.5517 | | | <0.0001 | | | <0.0001 |
| Female | 50.79 (49.25 , 52.34) | 49.15 (43.41 ,54.92) | | 52.88 (51.09 ,54.67) | 39.94 (35.32 ,44.74) | | 55.10 (52.89 , 57.29) | 44.98 (42.39 , 47.59) | |
| Male | 49.21 (47.66 , 50.75) | 50.85 (45.08 ,56.59) | | 47.12 (45.33 ,48.91) | 60.06 (55.26 ,64.68) | | 44.90 (42.71 , 47.11) | 55.02 (52.41 , 57.61) | |
| Age (years) | | | <0.0001 | | | <0.0001 | | | <0.0001 |
| Young (20-39) | 44.78 (40.95 , 48.68) | 6.17 (4.08 , 9.22) | | 47.81 (44.03 ,51.61) | 4.92 (3.44 , 7.00) | | 63.47 (59.57 , 67.19) | 11.22 (9.40 , 13.34) | |
| Middle-aged (40-59) | 40.06 (36.70 , 43.53) | 26.98 (20.42 ,34.73) | | 39.39 (36.03 ,42.85) | 34.52 (29.38 ,40.04) | | 32.89 (29.17 , 36.83) | 45.59 (41.52 , 49.72) | |
| Older (≥ 60) | 15.15 (13.49 , 16.98) | 66.85 (59.27 ,73.65) | | 12.81 (11.23 ,14.57) | 60.56 (55.24 ,65.64) | | 3.65 (2.50 , 4.79) | 43.19 (39.30 , 47.17) | |
| Race | | | <0.0001 | | | <0.0001 | | | <0.0001 |
| Mexican american | 8.14 (5.82 , 11.28) | 4.35 (2.81 , 6.67) | | 8.41 (5.99 , 11.68) | 4.37 (2.95 , 6.43) | | 9.40 (6.54 , 12.34) | 5.57 (3.91 , 7.89) | |
| Other hispanic | 5.85 (4.16 , 7.54) | 3.50 (1.86 , 6.49) | | 5.99 (4.26 , 8.36) | 3.62 (2.12 , 6.12) | | 6.77 (4.77 , 8.77) | 4.07 (2.74 , 5.40) | |
| Non-hispanic white | 69.90 (64.65 , 74.67) | 80.69 (75.85 ,84.75) | | 69.00 (63.54 ,73.98) | 81.28 (76.76 ,85.09) | | 65.55 (59.80 , 70.89) | 78.18 (73.91 , 81.92) | |
| Non-hispanic black | 9.50 (7.16 , 11.84) | 6.65 (4.85 , 9.06) | | 9.95 (7.49 , 12.41) | 5.46 (4.09 , 7.25) | | 10.93 (8.18 , 13.46) | 6.95 (5.28 , 8.62) | |
| Other races | 6.62 (5.28 , 7.96) | 4.81 (3.20 , 6.42) | | 6.65 (5.29 , 8.01) | 5.27 (3.39 , 7.15) | | 7.35 (5.75 , 8.95) | 5.22 (4.07 , 6.37) | |

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|--|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|
| | .26) | 7.18) | 8.33) | 8.09) | .35) | .68) |
| Educational level | | | <0.0001 | | <0.0001 | <0.0001 |
| Less than high school | 10.72 (8.72 , 3.10) | 20.42 (16.34 ,25.20) | 10.17 (8.27 , 12.45) | 19.74 (15.76 ,24.44) | 8.43 (6.36 , 1.09) | 16.14 (13.44 , 19.26) |
| High school or GED | 17.88 (15.79 , 20.19) | 22.08 (17.81 ,27.04) | 17.31 (15.16 ,19.71) | 23.35 (18.90 ,28.48) | 15.33 (12.76 , 18.32) | 22.18 (19.37 , 25.27) |
| Above high school | 71.40 (67.46 , 75.03) | 57.50 (50.58 ,64.14) | 72.52 (68.65 ,76.07) | 56.90 (49.85 ,63.69) | 76.24 (71.49 , 80.41) | 61.68 (56.96 , 66.18) |
| Marital status | | | 0.9250 | | 0.3506 | 0.0238 |
| Married/living with partner | 64.94 (61.62 , 68.12) | 64.66 (59.02 ,69.92) | 64.43 (60.92 ,67.79) | 67.12 (62.02 ,71.85) | 62.01 (58.06 , 65.80) | 68.53 (63.90 , 72.83) |
| Never married/divorced/separated/widowed | 35.06 (31.88 , 38.38) | 35.34 (30.08 ,40.98) | 35.57 (32.21 ,39.08) | 32.88 (28.15 ,37.98) | 37.99 (34.20 , 41.94) | 31.47 (27.17 , 36.10) |
| Alcohol | | | 0.0753 | | 0.0140 | 0.0002 |
| No | 85.24 (83.24 , 87.04) | 81.03 (74.49 ,86.20) | 85.60 (83.63 ,87.36) | 80.77 (75.41 ,85.20) | 87.47 (84.62 , 89.85) | 81.34 (78.65 , 83.76) |
| Yes | 14.76 (12.96 , 16.76) | 18.97 (13.80 ,25.51) | 14.40 (12.64 ,16.37) | 19.23 (14.80 ,24.59) | 12.53 (10.15 , 15.38) | 18.66 (16.24 , 21.35) |
| Smoking | | | <0.0001 | | <0.0001 | <0.0001 |
| No | 56.77 (54.25 , 59.24) | 39.75 (34.29 ,45.47) | 57.85 (55.39 ,60.26) | 40.37 (35.88 ,45.02) | 62.13 (59.08 , 65.09) | 45.56 (42.73 , 48.41) |
| Yes | 43.23 (40.76 , 45.75) | 60.25 (54.53 ,65.71) | 42.15 (39.74 ,44.61) | 59.63 (54.98 ,64.12) | 37.87 (34.91 , 40.92) | 54.44 (51.59 , 57.27) |
| PIR | | | 0.0683 | | 0.1926 | 0.4745 |
| >3,5 | 46.26 (41.54 , 51.05) | 40.90 (33.29 ,48.98) | 46.42 (41.66 ,51.25) | 41.93 (34.96 ,49.23) | 44.25 (39.19 , 49.44) | 47.35 (41.24 , 53.54) |

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|-----------------------|---------|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|
| | 1.3-3.5 | 34.50 (31.23 , 37.92) | 41.63 (35.27 ,48.28) | 34.34 (30.97 ,37.87) | 40.02 (34.04 ,46.32) | 35.75 (32.10 , 39.57) | 34.83 (30.74 , 39.14) |
| | 1.3 | 19.24 (16.61 , 22.17) | 17.46 (13.96 ,21.63) | 19.24 (16.38 ,22.46) | 18.05 (14.39 ,22.39) | 20.00 (16.56 , 23.95) | 17.82 (14.66 , 21.49) |
| Tinnitus | | | | <0.0001 | | <0.0001 | <0.0001 |
| | No | 85.25 (82.90 , 87.32) | 66.49 (60.68 ,71.83) | 86.93 (84.80 ,88.80) | 64.88 (60.59 ,68.95) | 91.11 (89.40 , 92.56) | 72.96 (69.55 , 76.12) |
| | Yes | 14.75 (12.68 , 17.10) | 33.51 (28.17 ,39.32) | 13.07 (11.20 ,15.20) | 35.12 (31.05 ,39.41) | 8.89 (7.44 ,1 0.60) | 27.04 (23.88 , 30.45) |
| Noise exposure | | | | 0.3538 | | 0.0003 | 0.0012 |
| | No | 37.10 (34.02 , 40.28) | 34.60 (29.75 ,39.78) | 38.40 (35.37 ,41.52) | 29.34 (24.83 ,34.30) | 39.19 (35.89 , 42.59) | 33.81 (30.58 , 37.21) |
| | Yes | 62.90 (59.72 , 65.98) | 65.40 (60.22 ,70.25) | 61.60 (58.48 ,64.63) | 70.66 (65.70 ,75.17) | 60.81 (57.41 , 64.11) | 66.19 (62.79 , 69.42) |
| BMI (kg/m2) | | | | 0.0116 | | 0.0007 | <0.0001 |
| | <25 | 30.41 (27.26 , 33.75) | 22.33 (18.00 ,27.36) | 31.10 (27.83 ,34.56) | 21.80 (18.35 ,25.69) | 34.47 (30.81 , 38.32) | 23.19 (20.47 , 26.16) |
| | 25-30 | 32.97 (30.67 , 35.35) | 35.37 (29.51 ,41.70) | 33.04 (30.54 ,35.64) | 34.22 (29.15 ,39.68) | 31.40 (28.88 , 34.04) | 35.56 (32.23 , 39.03) |
| | >30 | 36.63 (33.87 , 39.47) | 42.30 (37.38 ,47.37) | 35.86 (33.03 ,38.80) | 43.98 (38.83 ,49.27) | 34.13 (30.63 , 37.82) | 41.25 (38.37 , 44.18) |
| Hypertension | | | | <0.0001 | | <0.0001 | <0.0001 |
| | No | 68.20 (65.89 , 70.42) | 55.30 (51.20 ,59.33) | 69.52 (67.07 ,71.85) | 53.47 (49.22 ,57.66) | 74.50 (71.84 , 76.98) | 56.92 (54.15 , 59.65) |
| | Yes | 31.80 (29.58 , 34.11) | 44.70 (40.67 ,48.80) | 30.48 (28.15 ,32.93) | 46.53 (42.34 ,50.78) | 25.50 (23.02 , 28.16) | 43.08 (40.35 , 45.85) |
| Abnormal blood lipids | | | | 0.2667 | | <0.0001 | <0.0001 |
| | No | 41.20 (39.15 , | 38.34 (33.56 | 42.64 (40.56 | 32.57 (28.71 | 48.99 (46.28 , | 30.71 (28.73 , |

| | | | | | | | | | |
|-------------------|-----|----------|---------|---------|---------|---------|---------|----------|----------|
| | | 43.28) | ,43.36) | | ,44.75) | ,36.69) | | 51.71) | 32.75) |
| | Yes | 58.80 | 61.66 | | 57.36 | 67.43 | | 51.01 | 69.29 |
| | | (56.72 , | (56.64 | | (55.25 | (63.31 | | (48.29 , | (67.25 , |
| | | 60.85) | ,66.44) | | ,59.44) | ,71.29) | | 53.72) | 71.27) |
| Diabetes | | | | <0.0001 | | | <0.0001 | | <0.0001 |
| | No | 93.01 | 83.25 | | 93.83 | 82.68 | | 96.06 | 86.61 |
| | | (91.71 , | (78.60 | | (92.46 | (78.11 | | (94.68 , | (84.29 , |
| | | 94.12) | ,87.06) | | ,94.96) | ,86.46) | | 97.10) | 88.64) |
| | Yes | 6.99 | 16.75 | | 6.17 | 17.32 | | 3.94 | 13.39 |
| | | (5.88 ,8 | (12.94 | | (5.04 , | (13.54 | | (2.90 ,5 | (11.36 , |
| | | .29) | ,21.40) | | 7.54) | ,21.89) | | .32) | 15.71) |
| Moderate activity | | | | 0.1119 | | | 0.2017 | | 0.4418 |
| | No | 55.49 | 59.85 | | 55.39 | 58.86 | | 55.34 | 56.84 |
| | | (52.67 , | (54.46 | | (52.44 | (53.77 | | (51.93 , | (53.48 , |
| | | 58.29) | ,65.02) | | ,58.31) | ,63.77) | | 58.69) | 60.14) |
| | Yes | 44.51 | 40.15 | | 44.61 | 41.14 | | 44.66 | 43.16 |
| | | (41.71 , | (34.98 | | (41.69 | (36.23 | | (41.31 , | (39.86 , |
| | | 47.33) | ,45.54) | | ,47.56) | ,46.23) | | 48.07) | 46.52) |

For categorical variables: survey-weighted percentage (95%CI), P was by survey-weighted Chi-square test (svytable)