Supplementary Appendix to the Manuscript Entitled

**Changes in the Prevalence of Symptoms of Depression, Loneliness, and Insomnia in US
Older Adults with Type 2 Diabetes During the COVID-19 Pandemic: The Look AHEAD
Study**

Supplementary Appendix: Look AHEAD Extension Study Group

Clinical Sites

The Johns Hopkins University: Jeanne M. Clark, MD, MPH¹; Lee Swartz²; Dawn Jiggetts²; Jeanne Charleston, RN³; Lawrence Cheskin, MD³; Nisa M. Maruthur, MD, MHS³; Scott J. Pilla, MD, MHS³; Danielle Diggins; Mia Johnson

Pennington Biomedical Research Center: George A. Bray, MD¹; Frank L. Greenway, MD¹; Donna H. Ryan, MD³; Catherine Champagne, PhD, RD³; Valerie Myers, PhD³; Jeffrey Keller, PhD³; Tiffany Stewart, PhD³; Jennifer Arceneaux, RN²; Karen Boley, RD, LDN²; Greta Fry, LPN; Lisa Jones; Kim Landry; Melissa Lingle; Marisa Smith².

The University of Alabama at Birmingham: Cora E. Lewis, MD, MSPH¹; Sheikilya Thomas, PhD, MPH²; Stephen Glasser, MD³; Gareth Dutton, PhD³; Amy Dobelstein; Sara Hannum; Anne Hubbell, MS; DeLavallade Lee; Phyllis Millhouse, L. Christie Oden; Cathy Roche, PhD, RN, BSN; Jackie Grant; Janet Turman

Harvard Center

Massachusetts General Hospital: David M. Nathan, MD¹; Valerie Goldman, MS, RDN²; Linda Delahanty, MS, RDN³; Mary Larkin, MS, RN; Kristen Dalton, BS; Roshni Singh, BS; Melanie Ruazol, BS

Joslin Diabetes Center: Medha N Munshi, MD¹; Sharon D. Jackson, CCRC, MS, RD, CDE²; Roeland J.W. Middelbeek MD³; A. Enrique Caballero, MD, Anthony Rodriguez

Beth Israel Deaconess Medical Center: George Blackburn, MD, PhD^{1*}; Christos Mantzoros, MD, DSc³; Ann McNamara, RN

University of Colorado Anschutz Medical Campus: Holly Wyatt, MD¹; James O. Hill, PhD¹; Jeanne Anne Breen, MS²; Marsha Miller, MS, RD²; Debbie Bochert; Suzette Bossart; Paulette Cohrs, RN, BSN; Susan Green; April Hamilton, BS, CCRC; Eugene Leshchinskiy; Loretta Rome, TRS.

Baylor College of Medicine: John P. Foreyt, PhD¹; Molly Gee, MEd, RD²; Henry Pownall, PhD³; Ashok Balasubramanyam, MBBS³; Chu-Huang Chen, MD, PhD³; Peter Jones, MD³; Michele Burrington, RD, RN; Allyson Clark Gardner, MS, RD; Sharon Griggs; Michelle Hamilton; Veronica Holley; Sarah Lee; Sarah Lane Liscum, RN, MPH; Susan Cantu-Lumbreras; Julieta Palencia, RN; Jennifer Schmidt; Jayne Thomas, RD; Carolyn White; Charlyne Wright, RN; Monica Alvarez, PCT

The University of Tennessee Health Science Center

University of Tennessee East: Karen C. Johnson, MD, MPH¹; Beate Griffin, RN, BS²; Mace Coday, PhD³; Donna Valenski, Lisa Jones; Karen Johnson, RN

University of Tennessee Downtown: Karen C. Johnson, MD, MPH¹; Beate Griffin, RN, BS²; Helmut Steinburg, MD³

University of Minnesota: Robert W. Jeffery, PhD¹; Tricia Skarphol, MA²; John P. Bantle, MD³; J. Bruce Redmon, MD³; Kerrin Brelje, MPH, RD; Carolyn Campbell; Mary Ann Forseth, BA; Soni Uccellini, BS; Mary Susan Voeller, BA

Columbia University Medical Center: Blandine Laferrère, MD, PhD¹; Xavier Pi-Sunyer, MD¹; Jennifer Patricio, MS²; Jose Luchsinger, MD¹; Priya Palta, PhD, MHS³; Jennifer Patricio, MS²; Sarah Lyon, Kim Kelly

University of Pennsylvania: Thomas A. Wadden, PhD¹; Barbara J. Maschak-Carey, MSN, CDE²; Robert I. Berkowitz, MD³; Ariana Chao, PhD, CRNP³; Renee Davenport; Katherine Gruber, CRNP; Sharon Leonard, RD; Olivia Walsh, BA

University of Pittsburgh: John M. Jakicic, PhD¹; Jacqueline Wesche-Thobaben, RN, BSN, CDE²; Lin Ewing, PhD, RN³; Andrea Hergenroeder, PhD, PT, CCS³; Mary Korytkowski, MD³; Susan Copelli, BS, CTR; Rebecca Danchenko, BS; Diane Ives, MPH; Juliet Mancino, MS, RD, CDE, LDN; Lisa Martich, BS, RD, LDN; Meghan McGuire, MS; Tracey Y. Murray, BS; Linda Semler, MS, RD, LDN; Kathy Williams, RN, MHA

The Miriam Hospital/Brown Medical School: Rena R. Wing, PhD¹; Caitlin Egan, MS²; Elissa Jelalian, PhD³; Jeanne McCaffery, PhD³; Kathryn Demos McDermott, PhD³; Jessica Unick, PhD³; Kirsten Annis, BA; Jose DaCruz; Ariana Rafanelli, BA

The University of Texas Health Science Center at San Antonio: Helen P. Hazuda, PhD¹; Juan Carlos Isaac, CCRC, BSN²; Prepedigna Hernandez, RN

VA Puget Sound Health Care System/University of Washington: Steven E. Kahn, MB, ChB¹; Edward J. Boyko, MD, MPH³; Elaine Tsai, MD³; Lorena Wright, MD³; Karen Atkinson, RN, BSN²; Ivy Morgan-Taggart; Jolanta Socha, BS; Heidi Urquhart, RN

Southwestern American Indian Center, Phoenix, Arizona and Shiprock, New Mexico:

William C. Knowler, MD, DrPH¹; Paula Bolin, RN, MC²; Harelda Anderson, LMSW², Sara Michaels, MD³; Ruby Johnson; Patricia Poorthunder; Janelia Smiley

University of Southern California: Anne L. Peters, MD¹; Siran Ghazarian, MD²; Elizabeth Beale, MD³; Edgar Ramirez; Gabriela Rodriguez, MA; Valerie Ruelas MSW, LCSW; Sara Serafin-Dokhan; Martha Walker, RD; Marina Perez

Coordinating Center

Wake Forest University: Mark A. Espeland, PhD¹; Lynne E. Wagenknecht, DrPH¹; Judy L. Bahnson, BA, CCRP³; David Reboussin, PhD³; Mike E. Miller, PhD³; Peter Brubaker, PhD³; Nicholas Pajewski, PhD³; Michael Bancks, PhD³; Jingzhong Ding, PhD³; Gagan Deep, PhD³; Kathleen Hayden, PhD³; Stephen R. Rapp, PhD³; Felicia Simpson, PhD³; Haiying Chen, PhD, MM³; Bonnie C. Sachs, PhD³; Denise Houston, PhD³; Shyh-Huei Chen, PhD³; Andrea Anderson, MS; Jerry M. Barnes, MA; Mary Barr; Tara D. Beckner; Delilah R. Cook; Carrie C. Williams, MA, CCRP; Joni Evans, MS; Katie Garcia, MS; Sarah A. Gaussoin, MS; Carol Kittel, MS; Lea Harvin, BS; Marjorie Howard, MS; Joni Evans, MS; James Lovato, MS; Rebecca H. Neiberg, MS; June Pierce, AB; Debbie Steinberg, BS; Christopher Webb; Jennifer Walker, MS; Michael P. Walkup, MS; Carolyn Watkins

Central Resources Centers

Central Laboratory, Northwest Lipid Metabolism and Diabetes Research Laboratories Santica

M. Marcovina, PhD, ScD¹; Jessica Hurting²; John J. Albers, PhD³, Vinod Gaur, PhD⁴

DXA Reading Center, University of California at San Francisco Michael Nevitt, PhD¹; Ann Schwartz, PhD²; John Shepherd, PhD³; Michaela Rahorst; Lisa Palermo, MS, MA; Susan Ewing, MS; Cynthia Hayashi; Jason Maeda, MPH

¹ Principal Investigator

² Program Coordinator

³ Co-Investigator

*Deceased

All other Look AHEAD staffs are listed alphabetically by site.

Table S1. Characteristics of Look AHEAD Responders to the COVID-19 Survey vs. Non-Responders

	Responders	Non-Responders	p-value
	No. (%)	No. (%)	
Characteristics			
N	2829	487	
Sex (% female)	1788 (63.2%)	325 (66.7%)	0.13
Race/ethnicity			0.77
American Indian/ Native American /			
Alaskan Native	165 (5.8%)	32 (6.6%)	
Asian/Pacific Islander	31 (1.1%)	6 (1.2%)	
Black	462 (16.3%)	85 (17.4%)	
Hispanic	398 (14.1%)	58 (11.9%)	
Other/Mixed	58 (2.0%)	12 (2.5%)	
White	1715 (60.6%)	294 (60.4%)	
Education			0.09
< 13 y	553 (20.0%)	113 (23.8%)	
13 to < 16 y	1023 (36.9%)	178 (37.6%)	
≥ 16 y	1193 (43.1%)	183 (38.6%)	
Treatment (% in ILI)	1458 (51.5%)	245 (50.3%)	0.62
Age at baseline, mean (SD), y	57.8 (6.2)	59.8 (6.8)	< 0.001
Multimorbidity, mean (SD)	2.5 (0.9)	2.6 (0.9)	0.01
Depressive symptoms at LAE1, mean (SD)	2.6 (3.2)	3.5 (3.7)	< 0.001
Depressive symptoms at LAE2, mean (SD)	2.6 (3.3)	3.4 (4.1)	0.002
Loneliness at LAE1, mean (SD)	3.8 (1.3)	4.1 (1.6)	< 0.001
Insomnia at LAE1, mean (SD)	7.0 (4.4)	7.0 (4.7)	> 0.99

Insomnia at LAE2, mean (SD)

7.1 (4.4)

7.0 (4.7)

0.73

Table S2. Number of participants from the Look AHEAD cohort who completed each questionnaire

	Before COVID-19		During COVID-19
	Visit 1	Visit 2	Visit 3
N	2652	2679	2829
Depressive symptoms	2533	2488	2829
Loneliness	2616	N/A	2829
Insomnia	2637	2671	2829
Anxiety	N/A	N/A	2829
Perceived COVID-19 threat	N/A	N/A	2814

Table S3. Prevalence and change in moderate or greater symptoms of depression (PHQ-8 $\geq$ 10) by subgroup

	Visit 1	Visit 2	Visit 3 (during COVID)	P-Value for Change in Prevalence	
	Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)		
				Visit 1 to Visit 2	Visit 2 to Visit 3
Age					
≤75	4.4%	4.8%	9.3%	0.65	< 0.001
	(3.3% - 5.6%)	(3.7% - 6.0%)	(7.7% - 10.9%)		
>75	4.7%	4.4%	7.6%	0.73	< 0.001
	(3.5% - 6.0%)	(3.2% - 5.6%)	(6.1% - 9.2%)		
Race/ethnicity					
Non-Hispanic, White	4.6%	3.9%	8.2%	0.38	< 0.001
	(3.5% - 5.7%)	(2.9% - 4.9%)	(6.8% - 9.7%)		
Underrepresented ^a	4.6 %	5.7%	8.9%	0.27	0.002
	(3.3% - 6.0%)	(4.2% - 7.1%)	(7.1% - 10.6%)		
Multimorbidity					
≤ 2	4.1%	4.3%	8.4%	0.83	< 0.001
	(3.1% - 5.2%)	(3.3% - 5.4%)	(6.9% - 9.8%)		
> 2	5.3%	5.1%	8.7%	0.90	< 0.001
	(3.8% - 6.8%)	(3.6% - 6.6%)	(6.9% - 10.6%)		
Body mass index^b					
<30	4.2%	3.5%	6.7%	0.40	< 0.001
	(3.0% - 5.5%)	(2.4% - 4.7%)	(5.2% - 8.3%)		
≥30	4.8%	5.4%	9.9%	0.48	< 0.001
	(3.7% - 6.0%)	(4.2% - 6.7%)	(8.3% - 11.5%)		
Sex					

Male	3.6%	3.9%	6.6%	0.89	0.001
	(2.4% - 4.9%)	(2.6% - 5.1%)	(4.9% - 8.2%)		
Female	5.2%	5.1%	9.6%	> 0.99	< 0.001
	(4.0% - 6.3%)	(4.0% - 6.2%)	(8.1% - 11.1%)		
Treatment group					
ILI	3.9%	4.7%	8.1%	0.36	< 0.001
	(2.8% - 5.0%)	(3.5% - 5.8%)	(6.6% - 9.7%)		
DSE	5.3%	4.6%	8.9%	0.42	< 0.001
	(4.0% - 6.6%)	(3.4% - 5.8%)	(7.2% - 10.5%)		

Note. DSE=diabetes support and education. ILI=intensive lifestyle intervention. ^aUnderrepresented populations include participants who identified as American Indian/Native American/Alaskan Native, Asian/Pacific Islander, Hispanic, Black, or Other/Mixed. ^bBMI using self-reported weight from Visit 3.

Table S4. Multivariable odds ratios or parameter estimates for psychosocial outcomes during COVID (Visit 3) by demographic and clinical factors

Variable	Milder or Greater		Moderate or Greater		Loneliness		Insomnia		Anxiety		COVID-19 Threat	
	Depressive Symptoms		Depressive Symptoms									
	OR	p-value	OR	p-value	OR	p-value	OR	p-value	OR	p-value	Parameter	p-value
	(95% CI)		(95% CI)		(95% CI)		(95% CI)		(95% CI)		Estimate	
Age	1.00	0.72	0.99	0.37	0.99	0.44	0.98	0.02	0.94	< 0.001	-0.08	< 0.001
	(0.98 – 1.01)		(0.96 – 1.02)		(0.97 – 1.01)		(0.96 – 1.00)		(0.91 – 0.97)		(-0.12 – -0.04)	
Sex		0.004		0.03		< 0.001		0.70		0.002		< 0.001
Male	1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Female	1.37		1.49		2.16		1.04		1.90		1.03	
	(1.11 – 1.70)		(1.05 – 2.12)		(1.72 – 2.71)		(0.85 – 1.27)		(1.26 – 2.87)		(0.58 – 1.49)	
Race/ethnicity		< 0.001		0.14		< 0.001		0.01		0.01		< 0.001
White, non-Hispanic	1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Black	0.90		0.86		0.74		0.67		0.55		1.71	
	(0.68 – 1.19)		(0.55 – 1.34)		(0.55 – 0.98)		(0.51 – 0.88)		(0.31 – 0.97)		(1.11 – 2.31)	
American Indian / Native Alaskan	0.19		0.51		0.38		0.50		0.18		3.21	
	(0.11 – 0.33)		(0.23 – 1.14)		(0.23 – 0.65)		(0.32 – 0.80)		(0.04 – 0.74)		(2.23 – 4.18)	
Asian/Pacific Islander	1.12		2.61		2.50		1.13		0.56		4.10	
	(0.44 – 2.81)		(0.85 – 8.02)		(1.12 – 5.60)		(0.47 – 2.69)		(0.07 – 4.18)		(2.03 – 6.17)	
Hispanic	0.69		0.98		0.60		0.91		1.45		2.37	
	(0.51 – 0.93)		(0.63 – 1.53)		(0.44 – 0.81)		(0.69 – 1.19)		(0.94 – 2.25)		(1.73 – 3.00)	
Other/Mixed	1.75		1.81		2.03		1.20		1.37		2.07	

	(0.94 – 3.27)		(0.76 – 4.30)		(1.10 – 3.76)		(0.64 – 2.22)		(0.48 – 3.89)		(0.58 – 3.57)	
MMI	1.09	0.16	1.05	0.64	1.08	0.21	0.94	0.26	1.16	0.14	0.25	0.05
	(0.97 – 1.22)		(0.87 – 1.26)		(0.96 – 1.21)		(0.84 – 1.05)		(0.95 – 1.43)		(-0.001 – 0.50)	
BMI ^b		0.06		0.06		0.08		0.99		0.53		0.42
< 30	1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
≥ 30	1.22		1.38		1.21		1.00		0.89		0.18	
	(0.99 – 1.50)		(0.99 – 1.93)		(0.98 – 1.49)		(0.83 – 1.21)		(0.62 – 1.27)		(-0.26 – 0.62)	
Treatment		0.32		0.78		0.96		0.84		0.97		0.72
Arm												
DSE	1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
ILI	0.90		0.96		1.00		0.98		1.01		0.08	
	(0.74 – 1.10)		(0.70 – 1.31)		(0.82 – 1.23)		(0.81 – 1.18)		(0.71 – 1.42)		(-0.35 – 0.50)	
Previous Score		< 0.001		< 0.001		< 0.001		< 0.001				
None	1 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]					
Visit 1 Only	4.22 (3.09 –		5.67		7.99		2.85					
	5.76)		(3.27 – 9.83)		(6.14 – 10.39)		(2.17 – 3.75)					
Visit 2 Only	4.77		11.12				3.34					
	(3.49 – 6.53)		(6.71 – 18.41)				(2.56 – 4.36)					
Visit 1 + Visit 2	15.13 (10.84 –		22.34 (10.64 –				8.87 (7.03 –					
	21.13)		46.88)				11.20)					

Note. Odds ratios and parameter estimates are from multivariable models adjusted for demographic and clinical variables listed in table. MMI=multimorbidity index score. DSE=diabetes support and education. ILI=intensive lifestyle intervention. Complete case analysis was used for multivariable logistic regressions, which resulted in 2315 participants for depressive symptoms, 2780 for anxiety, 2573 for loneliness, 2505 for insomnia, and 2766 for perceived COVID-19 threat. Mild or greater depressive symptoms were defined as a PHQ-8 score ≥5, moderate or greater depressive symptoms as a PHQ-8 score ≥10, anxiety as a GAD-7 score ≥10, loneliness as a 3-item UCLA Brief Loneliness Scale score ≥6, and insomnia as a Women’s Health Initiative Insomnia Rating Scale score ≥9.

^aUnderrepresented populations include participants who identified as American Indian/Native American/Alaskan Native, Asian/Pacific Islander, Hispanic, Black, or Other/Mixed. ^bBMI using self-reported weight from Visit 3.

Figure S1.