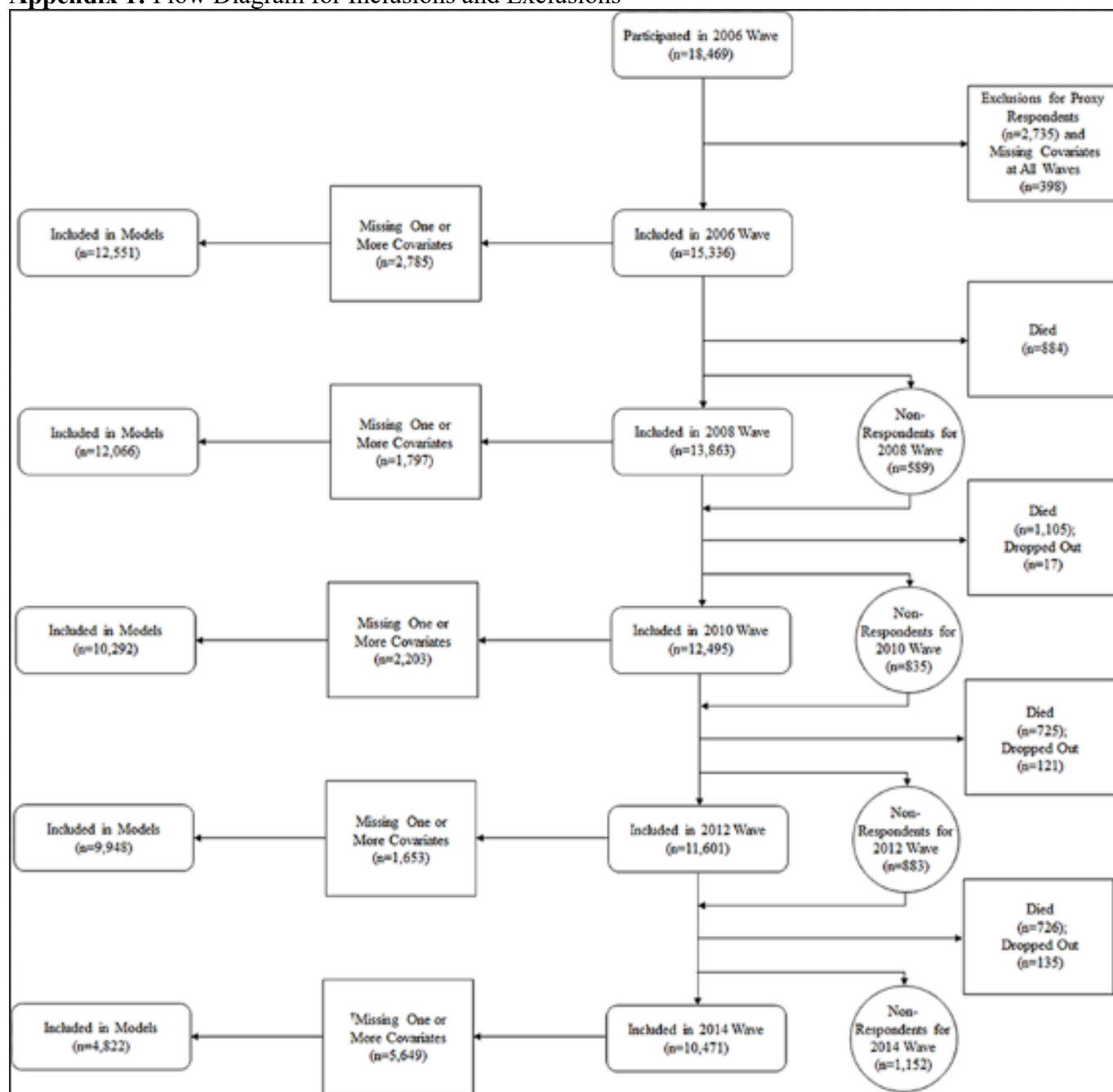


Appendix 1: Flow Diagram for Inclusions and Exclusions



Appendix 2. Means and 95% Confidence Intervals for the Descriptive Characteristics of the Participants.

	2006 Wave	2008 Wave	2010 Wave	2012 Wave	2014 Wave
Handgrip Strength (kg)	31.6 (31.4, 31.8)	31.7 (31.5, 31.9)	31.4 (31.1, 31.7)	31.6 (31.3, 31.8)	28.7 (28.4, 29.0)
Age (years)	66.9 (66.7, 67.1)	68.3 (68.2, 68.5)	69.8 (69.7, 70.0)	71.2 (71.0, 71.3)	72.5 (72.3, 72.6)
Female (%)	60.0 (59.2, 60.8)	60.5 (59.6, 61.3)	60.9 (60.0, 61.7)	61.3 (60.5, 62.2)	62.1 (61.2, 63.1)
White (%)	81.4 (80.3, 82.0)	81.5 (80.9, 82.2)	81.2 (80.6, 81.9)	81.4 (80.7, 82.1)	81.0 (80.2, 81.7)
Black (%)	13.7 (13.1, 14.2)	13.5 (12.9, 14.1)	13.7 (13.1, 14.3)	13.4 (12.8, 14.0)	13.7 (13.0, 14.3)
Hispanic (%)	8.7 (8.2, 9.1)	8.8 (8.3, 9.2)	8.7 (8.2, 9.2)	9.0 (8.5, 9.5)	9.0 (8.5, 9.6)
Body Mass Index (kg/m ²)	28.0 (27.9, 28.1)	28.2 (28.1, 28.3)	28.2 (28.1, 28.3)	28.2 (28.1, 28.3)	28.2 (28.1, 28.3)
Cognitive Impairment (%)	10.1 (9.6, 10.6)	9.3 (8.8, 9.7)	6.4 (6.0, 6.8)	6.7 (6.3, 7.2)	9.9 (9.3, 10.5)
Number of Morbid Conditions	1.9 (1.9, 1.9)	2.1 (2.0, 2.1)	2.2 (2.2, 2.3)	2.4 (2.3, 2.4)	2.5 (2.5, 2.5)
Depression Score	1.5 (1.4, 1.5)	1.4 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)
Current Smoker (%)	14.2 (14.0, 14.5)	13.0 (12.8, 13.3)	11.8 (11.5, 12.0)	10.9 (10.7, 11.2)	9.5 (9.3, 9.8)
Previous Smoker (%)	57.2 (56.6, 58.1)	56.7 (56.0, 57.6)	56.2 (55.5, 57.2)	55.6 (54.7, 56.6)	54.8 (53.8, 55.7)
Self-Rated Health (%)					
Excellent	11.6 (11.1, 12.2)	9.3 (9.1, 9.5)	9.3 (9.1, 9.5)	8.6 (8.4, 8.8)	7.2 (7.0, 7.4)
Very Good	30.0 (29.4, 30.8)	30.0 (29.8, 30.4)	32.3 (31.9, 32.6)	31.5 (31.2, 31.9)	30.2 (29.8, 30.5)
Good	30.9 (30.7, 31.3)	32.6 (32.3, 32.9)	32.6 (32.3, 33.0)	32.8 (32.5, 33.2)	34.6 (34.2, 35.0)
Fair	19.8 (19.6, 20.1)	19.9 (19.7, 20.2)	19.2 (18.9, 19.5)	19.6 (19.3, 19.9)	20.9 (20.6, 21.3)
Poor	7.3 (7.1, 7.4)	7.9 (7.7, 8.1)	6.4 (6.2, 6.6)	7.2 (7.0, 7.4)	6.8 (6.6, 7.0)
Reading a Map IADL Impairment (%)	20.2 (19.6, 20.8)	20.2 (19.5, 20.9)	18.5 (17.9, 19.2)	18.9 (18.3, 19.7)	19.9 (19.2, 20.7)
Taking Medications IADL Impairment (%)	2.4 (2.2, 2.7)	2.4 (2.2, 2.7)	2.5 (2.3, 2.9)	2.8 (2.5, 3.1)	3.0 (2.7, 3.3)
Using a Phone IADL Impairment (%)	2.6 (2.4, 2.9)	2.8 (2.5, 3.1)	3.5 (3.2, 3.8)	3.4 (3.1, 3.8)	4.3 (3.9, 4.7)
Grocery Shopping IADL Impairment (%)	10.4 (9.9, 10.9)	9.6 (9.1, 10.1)	9.9 (9.3, 10.4)	10.4 (9.9, 11.0)	11.2 (10.6, 11.8)
Managing Money IADL Impairment (%)	7.3 (6.9, 7.7)	7.0 (6.5, 7.4)	8.0 (7.5, 8.4)	8.0 (7.5, 8.5)	9.3 (8.8, 9.9)
Preparing Hot Meals IADL Impairment (%)	8.2 (7.8, 8.7)	8.1 (7.7, 8.6)	8.0 (7.5, 8.5)	8.7 (8.2, 9.3)	8.9 (8.3, 9.4)

Note: IADL=instrumental activities of daily living; kg=kilogram; kg/m²=kilograms per meters-squared.

Appendix 3. Number of Missing Observations for Each Wave.

	2006 Wave	2008 Wave	2010 Wave	2012 Wave	2014 Wave
Handgrip Strength [†]	2,620	1,670	2,099	1,545	5,600 [‡]
Age	0	0	0	0	0
Sex	0	0	0	0	0
Race and Ethnicity	2	0	0	0	0
Body Mass Index	191	125	123	99	96
Cognitive Impairment	0	0	0	0	0
Number of Morbid Conditions	0	2	1	0	0
Depression Score	7	1	268	4	0
Current Smoker	41	33	23	12	7
Previous Smoker	39	32	22	11	4
Self-Rated Health	20	10	5	14	7
IADL-Reading a Map	14	7	18	32	30
IADL-Taking Medications	219	159	147	140	132
IADL-Using a Phone	8	5	3	11	12
IADL-Grocery Shopping	7	6	5	16	14
IADL-Managing Money	9	5	8	14	15
IADL-Preparing Hot Meals	7	5	7	16	13

[†]Measures alternated for participants at each wave.

[‡]Handgrip strength data for the 2016 wave were not available.

Note: IADL=instrumental activities of daily living.

Appendix 4. The Crude Time-Varying Associations Between Decreased Handgrip Strength and Individual IADL Impairments.

	Using a Map		Preparing Hot Meals		Taking Medications		Managing Money		Using a Telephone		Shopping for Groceries	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Handgrip Strength (5-kg Decrease)	1.19	1.17, 1.21	1.20	1.17, 1.23	1.33	1.26, 1.41	1.18	1.15, 1.21	1.21	1.16, 1.26	1.27	1.17, 1.38
Age	1.03	1.03, 1.04	1.05	1.04, 1.05	1.00	0.99, 1.01	1.03	1.02, 1.03	1.06	1.05, 1.07	1.03	1.01, 1.04
White (Ref: Not White)	0.62	0.55, 0.70	0.83	0.67, 1.03	0.61	0.44, 0.85	0.76	0.63, 0.91	0.55	0.43, 0.71	0.70	0.41, 1.20
Black (Ref: Not Black)	2.17	1.88, 2.50	1.23	0.96, 1.57	1.34	0.91, 1.99	1.14	0.92, 1.42	1.05	0.77, 1.43	1.34	0.71, 2.50
Hispanic (Ref: Not Hispanic)	2.74	2.49, 3.02	1.11	0.93, 1.32	1.78	1.35, 2.35	1.60	1.39, 1.85	2.33	1.91, 2.85	1.31	0.83, 2.06
Male (Ref: Female)	0.48	0.45, 0.52	2.69	2.40, 3.01	2.52	2.03, 3.14	2.06	1.85, 2.30	2.72	2.30, 3.20	1.59	1.15, 2.20

Note: CI=95% confidence interval; IADL=instrumental activities of daily living; kg=kilogram; OR=odds ratio; Ref=reference.

Appendix 5. The Partially-Adjusted Time-Varying Associations Between Decreased Handgrip Strength and Individual IADL Impairments.

	Using a Map		Preparing Hot Meals		Taking Medications		Managing Money		Using a Telephone		Shopping for Groceries	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Handgrip Strength (5-kg Decrease)	1.12	1.10, 1.14	1.08	1.06, 1.10	1.11	1.07, 1.16	1.07	1.05, 1.10	1.08	1.04, 1.11	1.11	1.08, 1.13
Age	1.04	1.03, 1.04	1.06	1.05, 1.06	1.00	0.99, 1.01	1.03	1.03, 1.03	1.06	1.06, 1.07	1.04	1.04, 1.05
Male (Ref: Female)	0.40	0.37, 0.42	2.19	1.99, 2.42	1.72	1.46, 2.04	1.74	1.57, 1.92	2.22	1.92, 2.58	1.13	1.02, 1.24
White (Ref: Not White)	0.70	0.61, 0.79	1.01	0.83, 1.23	0.76	0.58, 0.99	0.91	0.76, 1.09	0.65	0.51, 0.83	0.90	0.76, 1.07
Black (Ref: Not Black)	2.05	1.78, 2.37	1.10	0.88, 1.38	1.20	0.88, 1.63	1.08	0.87, 1.35	0.93	0.70, 1.25	1.14	0.93, 1.39
Hispanic (Ref: Not Hispanic)	2.20	2.00, 2.43	0.83	0.71, 0.98	1.41	1.13, 1.75	1.31	1.13, 1.51	1.74	1.44, 2.11	0.92	0.79, 1.06
Body Mass Index	0.98	0.98, 0.99	1.01	1.00, 1.02	0.97	0.96, 0.98	0.99	0.98, 0.99	0.98	0.97, 0.99	1.03	1.02, 1.04
Morbidity [‡]	1.05	1.03, 1.07	1.16	1.12, 1.19	1.30	1.24, 1.36	1.17	1.13, 1.20	1.11	1.07, 1.16	1.22	1.19, 1.26
Depression Score	1.16	1.14, 1.18	1.14	1.12, 1.16	1.19	1.16, 1.23	1.17	1.15, 1.19	1.21	1.18, 1.24	1.17	1.15, 1.19
Current Smoker (Ref: Non-Smoker)	1.27	1.16, 1.38	1.11	0.98, 1.26	0.90	0.73, 1.10	1.14	1.01, 1.28	1.25	1.04, 1.50	1.40	1.25, 1.56
Previous Smoker (Ref: Non-Smoker)	0.96	0.90, 1.02	0.92	0.84, 1.00	0.79	0.69, 0.91	0.93	0.86, 1.02	0.93	0.82, 1.06	0.95	0.87, 1.03
Self-Rated Health Status (Ref: Excellent)												
Very Good	1.25	1.10, 1.41	1.02	0.84, 1.24	0.80	0.55, 1.16	0.88	0.73, 1.05	1.00	0.72, 1.38	1.01	0.80, 1.28
Good	1.77	1.57, 2.00	1.36	1.12, 1.65	1.19	0.83, 1.70	1.15	0.96, 1.37	1.40	1.02, 1.92	1.76	1.41, 2.19
Fair	2.67	2.35, 3.05	2.40	1.97, 2.03	2.47	1.72, 3.54	1.68	1.40, 2.02	2.40	1.75, 3.29	3.90	3.12, 4.88
Poor	3.46	2.97, 4.03	5.25	4.24, 6.49	4.12	2.82, 6.02	2.52	2.05, 3.09	4.29	3.06, 6.01	8.77	6.94, 11.09

[‡]For Every 1 Condition.

Note: CI=95% confidence interval; IADL=instrumental activities of daily living; kg=kilogram; OR=odds ratio; Ref=reference.

Appendix 6. The Fully-Adjusted Time-Varying Associations Between Decreased Handgrip Strength and Individual IADL Impairments.

	Using a Map		Preparing Hot Meals		Taking Medications		Managing Money		Using a Telephone		Shopping for Groceries	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Handgrip Strength (5-kg Decrease)	1.11	1.09, 1.13	1.07	1.05, 1.09	1.09	1.05, 1.14	1.06	1.04, 1.08	1.05	1.02, 1.09	1.10	1.07, 1.12
Cognitive Impairment (Ref: No Impairment)	2.47	2.27, 2.70	2.23	1.98, 2.50	3.24	2.76, 3.79	3.12	2.80, 3.48	3.95	3.40, 4.58	1.87	1.67, 2.09
Age	1.04	1.04, 1.04	1.06	1.06, 1.07	1.01	1.00, 1.02	1.04	1.03, 1.04	1.07	1.07, 1.08	1.05	1.04, 1.05
Male (Ref: Female)	0.37	0.35, 0.40	2.11	1.92, 2.33	1.60	1.35, 1.89	1.63	1.48, 1.81	2.08	1.80, 2.41	1.09	0.99, 1.20
White (Ref: Not White)	0.76	0.67, 0.86	1.09	0.89, 1.32	0.87	0.67, 1.13	1.03	0.85, 1.23	0.74	0.85, 0.94	0.96	0.81, 1.14
Black (Ref: Not Black)	1.98	1.72, 2.29	1.03	0.82, 1.29	1.06	0.78, 1.45	0.97	0.78, 1.21	0.78	0.58, 1.06	1.08	0.89, 1.32
Hispanic (Ref: Not Hispanic)	2.05	1.86, 2.27	0.78	0.66, 0.91	1.24	1.00, 1.55	1.17	1.01, 1.36	1.54	1.27, 1.87	0.87	0.75, 1.00
Body Mass Index	0.98	0.98, 0.99	1.01	1.01, 1.02	0.97	0.96, 0.98	0.99	0.98, 1.00	0.98	0.97, 0.99	1.03	1.03, 1.04
Morbidity [‡]	1.04	1.02, 1.07	1.15	1.12, 1.18	1.29	1.23, 1.35	1.16	1.13, 1.20	1.18	1.06, 1.16	1.22	1.19, 1.25
Depression Score	1.15	1.13, 1.17	1.13	1.11, 1.15	1.18	1.14, 1.21	1.16	1.14, 1.18	1.19	1.16, 1.22	1.17	1.15, 1.19
Current Smoker (Ref: Non-Smoker)	1.21	1.11, 1.32	1.07	0.94, 1.21	0.84	0.72, 0.95	1.07	0.94, 1.21	1.15	0.96, 1.39	1.36	1.21, 1.52
Previous Smoker (Ref: Non-Smoker)	0.98	0.92, 1.04	0.93	0.86, 1.01	0.83	0.72, 0.95	0.96	0.88, 1.05	0.97	0.85, 1.10	0.96	0.89, 1.04
Self-Rated Health Status (Ref: Excellent)												
Very Good	1.25	1.11, 1.42	1.02	0.84, 1.25	0.80	0.55, 1.16	0.88	0.73, 1.05	1.01	0.73, 1.40	1.02	0.81, 1.28
Good	1.77	1.56, 2.00	1.37	1.13, 1.66	1.18	0.82, 1.68	1.14	0.96, 1.36	1.42	1.04, 1.94	1.76	1.42, 2.20
Fair	2.61	2.29, 2.97	2.38	1.95, 2.90	2.34	1.64, 3.35	1.62	1.35, 1.95	2.36	1.72, 3.24	3.86	3.10, 4.82
Poor	3.23	2.78, 3.77	5.03	4.07, 6.23	3.70	2.54, 5.40	2.32	1.89, 2.85	3.99	2.85, 5.59	8.47	6.71, 10.69

[‡]For Every 1 Condition.

Note: CI=95% confidence interval; IADL=instrumental activities of daily living; kg=kilogram; OR=odds ratio; Ref=reference.

Appendix 7. The Fully-Adjusted Time-Varying Associations Between Decreased Handgrip Strength and Individual IADL Impairments For Males and Females.

	Using a Map		Preparing Hot Meals		Taking Medications		Managing Money		Using a Telephone		Shopping for Groceries	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
<i>Males</i>												
Handgrip Strength (5-kg Decrease)	1.19	1.15, 1.23	1.05	1.02, 1.09	1.18	1.12, 1.25	1.11	1.08, 1.15	1.10	1.05, 1.15	1.13	1.09, 1.17
<i>Females</i>												
Handgrip Strength (5-kg Decrease)	1.08	1.06, 1.10	1.11	1.07, 1.15	1.03	0.99, 1.08	1.04	1.01, 1.07	1.03	0.99, 1.08	1.09	1.06, 1.12

Note: The models were controlled for race and ethnicity, age, body mass index, morbidity, depression score, current smoking status, smoking history, self-rated health, and cognitive impairments. CI=95% confidence interval; IADL=instrumental activities of daily living; kg=kilogram; OR=odds ratio; Ref=reference.

Appendix 8. The Fully-Adjusted Time-Varying Associations Between Decreased Handgrip Strength and Individual IADL Impairments for Middle-Aged and Older Adults.

	Using a Map		Preparing Hot Meals		Taking Medications		Managing Money		Using a Telephone		Shopping for Groceries	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
<i>Aged 50-64 Years</i>												
Handgrip Strength (5-kg Decrease)	1.15	1.11, 1.19	1.10	1.05, 1.16	1.20	1.11, 1.29	1.12	1.06, 1.17	1.11	1.02, 1.20	1.15	1.10, 1.20
<i>Aged ≥65 Years</i>												
Handgrip Strength (5-kg Decrease)	1.09	1.07, 1.11	1.04	1.02, 1.07	1.02	0.98, 1.06	1.04	1.01, 1.06	1.03	1.00, 1.07	1.06	1.04, 1.09

Note: The models were controlled for race and ethnicity, sex, age, body mass index, morbidity, depression score, current smoking status, smoking history, self-rated health, and cognitive impairments. CI=95% confidence interval; IADL=instrumental activities of daily living; kg=kilogram; OR=odds ratio; Ref=reference.