

## **Adequacy of health literacy and its effect on diabetes self-management: a meta-analysis**

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## Supporting information

**Table S1: Characteristics of the included studies**

Study	n	Design	Age (years)	Years with DM	% Females	% Married	% Educated	% Un-employed	% Low-income	% HbA1c	Health literacy Tool
<b>Al Sayah 2015</b>	1948	CS-MC	65±11	13.2±10.9	45		86	58			BHLS
<b>Bains 2011</b>	125	CS-MB			72.5	70	56	57		7.6±0.2	REALM-R
<b>Barber 2009</b>	309	CS-HC	53.7±19		57.4	68.9	95.8		3.7		TOFHLA
<b>Bohanny 2013</b>	150	CS-HC/FB	52.7±10.5	7.8±5.8	53						S-TOFHLA
<b>Chahardah-Cherik 2017</b>	175	CS-HC	47.7±12		52	70					HELIA
<b>Choi 2012</b>	145	CS-HC	49.2±12.3		50		84		10.7		NVS scale
<b>de Castro 2014</b>	150	CS-HC	86% >45				50	41			S-TOFHLA
<b>Elliott 2013</b>	184	CS-HC			60		20				DSME
<b>Hussein 2018</b>	359	CS-HC			52	80	68	21	35		S-TOFHLA
<b>Ishikawa 2008</b>	138	CS-HC	65±9.9	11.5±9.4	47		69		15.2	7.3±1.4	FCCHL
<b>Ishikawa 2011</b>	143	CS-HC	65±9.1	11.1±9.6	61		76			7.3±1.4	CHL
<b>Kassahun 2016</b>	309	CS-HC			38		28	25			
<b>Kim 2004</b>	92	PROSP	60.3	8.1	64				46	7.1±0.19	S-TOFHLA
<b>Kim 2018</b>	203	CS-HC	61.3±11		46		42		50		eHEALS
<b>Lai 2013</b>	63	CS-HC	57.7±10.1	20.2±13.3	40		59		49	7.5±4.6	FCCHL
<b>Lee 2016</b>	295	CS-HC	58.2±11.8	9.9±7.2	43		63		67		DHL
<b>Mancuso 2010</b>	102	CS-HC	52±9.1		61	16	59	11	80	8.2±2	TOFHLA
<b>Mbaezue 2010</b>	189	CS-HC	51.2±10	8.5±8.1	59	14	68	82	78		S-TOFHLA
<b>Morris 2006</b>	1002	PROSP	66	6.8±5.1	54	63	76		59	6.9±0.4	S-TOFHLA
<b>Nguyen 2013</b>	537	CS-HC	70±7	14±12	50		51			7±1.4	S-TOFHLA
<b>Osborn 2010</b>	130	CS-HC	62.7±11.8		73	41	66	78	20		REALM-R
<b>Osborn 2011</b>	383	CS-HC	54.4±13	11.3±9.5	50		56		44	7.6±1.7	REALM-R
<b>Powell 2007</b>	55	CS-HC	55±13	7±5.6	79					8.3±3.2	REALM-R
<b>Reisi 2016</b>	187	CS-HC	57.4±11.1	8.4±6.8	68	81					FCCHL
<b>Rothman 2004</b>	111	CS-HC	58	11.1	60		38			10.7	REALM-R

<b>Rothman 2005</b>	217	CS-HC	55.1±11.8	8.4±8.9	56		60		47	10.8±2.3	SKILLD
<b>Schillinger 2002</b>	408	CS-HC	58.1±11.4	9.5±8	58		54		93	8.5	S-TOFHLA
<b>Souza 2014</b>	129	CS-HC	75.9±6.2	10±7.2	70	33				7.2±1.4	SAHLPA-18
<b>Tang 2008</b>	149	CS-HC			46	83	15	55		7.3±0.94	S-TOFHLA
<b>van Der Heide 2014</b>	1714	CS-MC			50		55				Chew's BSQ
<b>Wang 2016</b>	395	PROSP	58.3±11.6	9.87±7.25	45					7.28±1.2	FCCHL
<b>Williams 1998</b>	114	CS-HC	53.6±9.7		71.2		35				S-TOFHLA
<b>Young 2018</b>	96	CS-HC	56.1±10.3	10.6±8.5	52		88		54	8.3±2.3	SKILLD

Abbreviations: **BHLS**, Brief Health Literacy Screen; **Chew's BSQ**, Chew's Brief Screening Questions; **CHL**, Communicative health literacy; **CS-FB**, cross-sectional field-based; **CS-HC**, cross-sectional at healthcare center; **CS-MB**, cross-sectional-mail-based; **DHL**, Diabetes Health literacy scale; **DSME**, Diabetes Self-Management and Education; **eHEALS**, eHealth Literacy Scale; **FCCHL**, Functional, Communicative and Critical Health Literacy scale; **HELIA**, Health Literacy for Iranian Adults; **NVS**, Newest Vital Sign scale; **PROSP**, prospective; **REALM-R**, Rapid Estimate of Adult Literacy in Medicine - revised; **SAHLPA-18**, Short Assessment of Health Literacy for Portuguese-speaking Adults; **SKILLD**, Spoken Knowledge in Low Literacy in Diabetes; **TOFHLA**, Test of Functional Health Literacy in Adults; **S-TOFHLA**, short-TOFHLA.

**Table S2: Quality assessment with Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies**

Study	Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Bains 2011</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Barber 2009</b>		Yes	Yes	No	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Bohanny 2013</b>		No	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Chahardah-Cherik 2017</b>		Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Choi 2012</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>de Castro 2014</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Elliott 2013</b>		Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Hussein 2018</b>		Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Ishikawa 2008</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Ishikawa 2011</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Kassahun 2016</b>		No	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Kim 2004</b>		Yes	Yes	Yes	Yes	No	Yes	NA	No	Yes	No	Yes	No	NA	NA
<b>Kim 2018</b>		Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Lai 2013</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Lee 2016</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Mancuso 2010</b>		Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Mbaezue 2010</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Morris 2006</b>		Yes	Yes	Yes	Yes	No	Yes	NA	No	Yes	No	Yes	No	NA	NA
<b>Nguyen 2013</b>		No	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Osborn 2010</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Osborn 2011</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Powell 2007</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Reisi 2016</b>		Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA

<b>Rothman 2004</b>	Yes	Yes	Yes	Yes	No	Yes	NA	No	Yes	No	Yes	No	NA	NA
<b>Rothman 2005</b>	Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Sayah 2015</b>	Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Schillinger 2002</b>	No	Yes	No	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Souza 129</b>	Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Tang 2008</b>	Yes	Yes	NR	Yes	Yes	No	NA	No	Yes	No	Yes	No	NA	NA
<b>van Der Heide 2014</b>	Yes	Yes	No	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Wang 2016</b>	Yes	Yes	Yes	Yes	Yes	No	NA	No	Yes	Yes	Yes	No	NA	NA
<b>Williams 1998</b>	Yes	Yes	Yes	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA
<b>Young 2018</b>	Yes	Yes	NR	Yes	No	No	NA	No	Yes	No	Yes	No	NA	NA

#### Criteria

1. Was the research question or objective in this paper clearly stated?
2. Was the study population clearly specified and defined?
3. Was the participation rate of eligible persons at least 50%?
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
5. Was a sample size justification, power description, or variance and effect estimates provided?
6. For the analyses in this paper, were the exposure (health literacy) measured prior to the outcome(s) being measured?
7. Was timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
8. For exposure (health literacy) that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
9. Was the exposure (health literacy) measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
10. Was the exposure (health literacy) assessed more than once over time?
11. Were outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?
12. Were the outcome assessors blinded to the exposure status of participants?
13. Was loss to follow-up after baseline 20% or less?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

**Legends:** Yes, No, CD, cannot determine; NA, not applicable; NR, not reported

Begg's funnel plot with pseudo 95% confidence limits

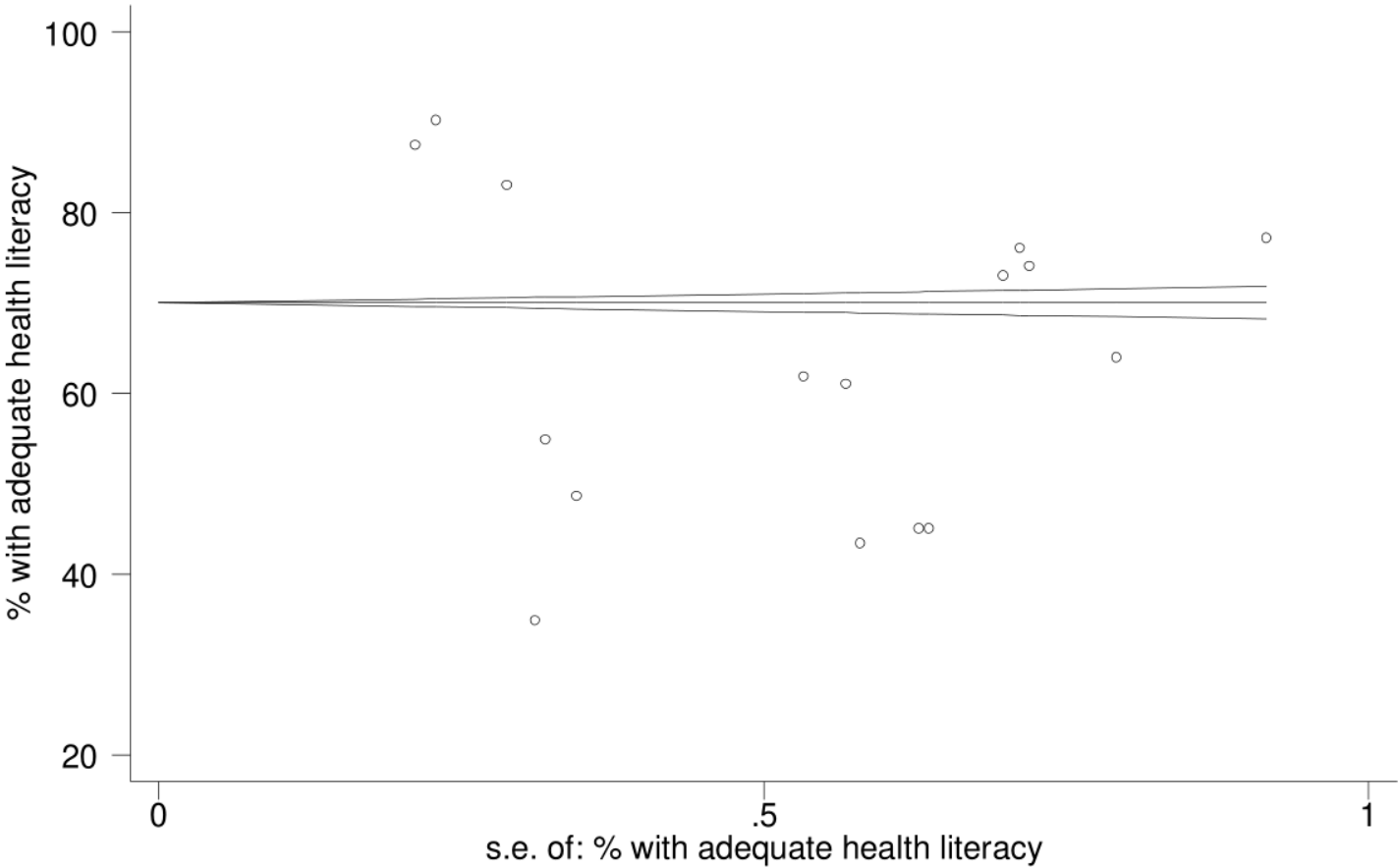


Figure S1: A funnel plot showing the outcomes of Begg's test of publication bias.

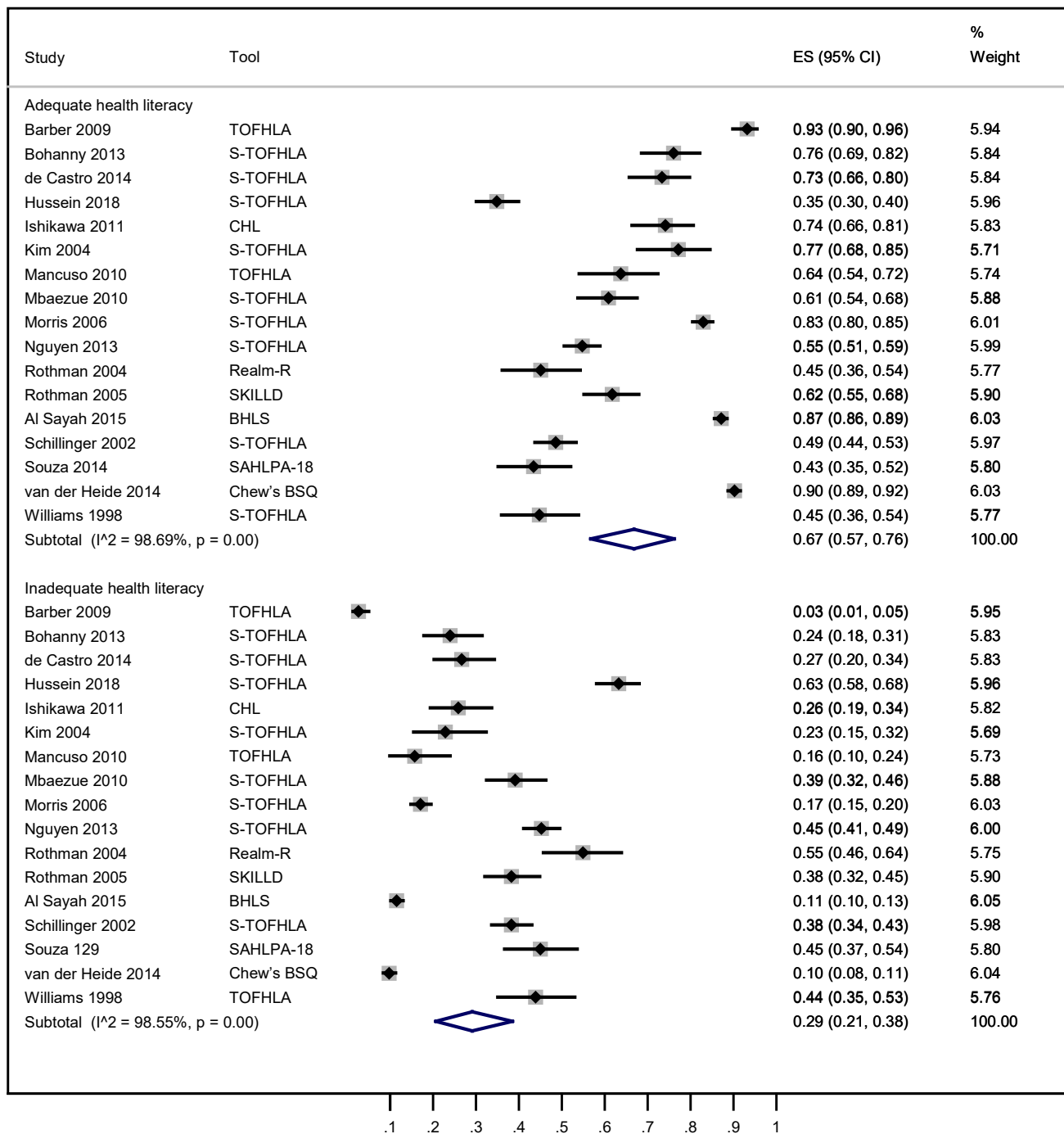


Figure S2: A forest graph showing the meta-analysis of proportions differentiating the proportions of patients with adequate and inadequate health literacy. Abbreviations: **BHLS**, Brief Health Literacy Screen; **Chew's BSQ**, Chew's Brief Screening Questions; **CHL**, Communicative health literacy; **DHL**, Diabetes Health literacy scale; **DSME**, Diabetes Self-Management and Education; **eHEALS**, eHealth Literacy Scale; **FCCHL**, Functional, Communicative and Critical Health Literacy scale; **HELIA**, Health Literacy for Iranian Adults; **NVS**, Newest Vital Sign scale; **REALM**, Rapid Estimate of Adult Literacy in Medicine; **SAHLPA-18**, 18-item Short Assessment of Health Literacy for Portuguese-speaking Adults; **SKILLD**, Spoken Knowledge in Low Literacy in Diabetes; **TOFHLA**, Test of Functional Health Literacy in Adults; **S-TOFHLA**, short-TOFHLA.

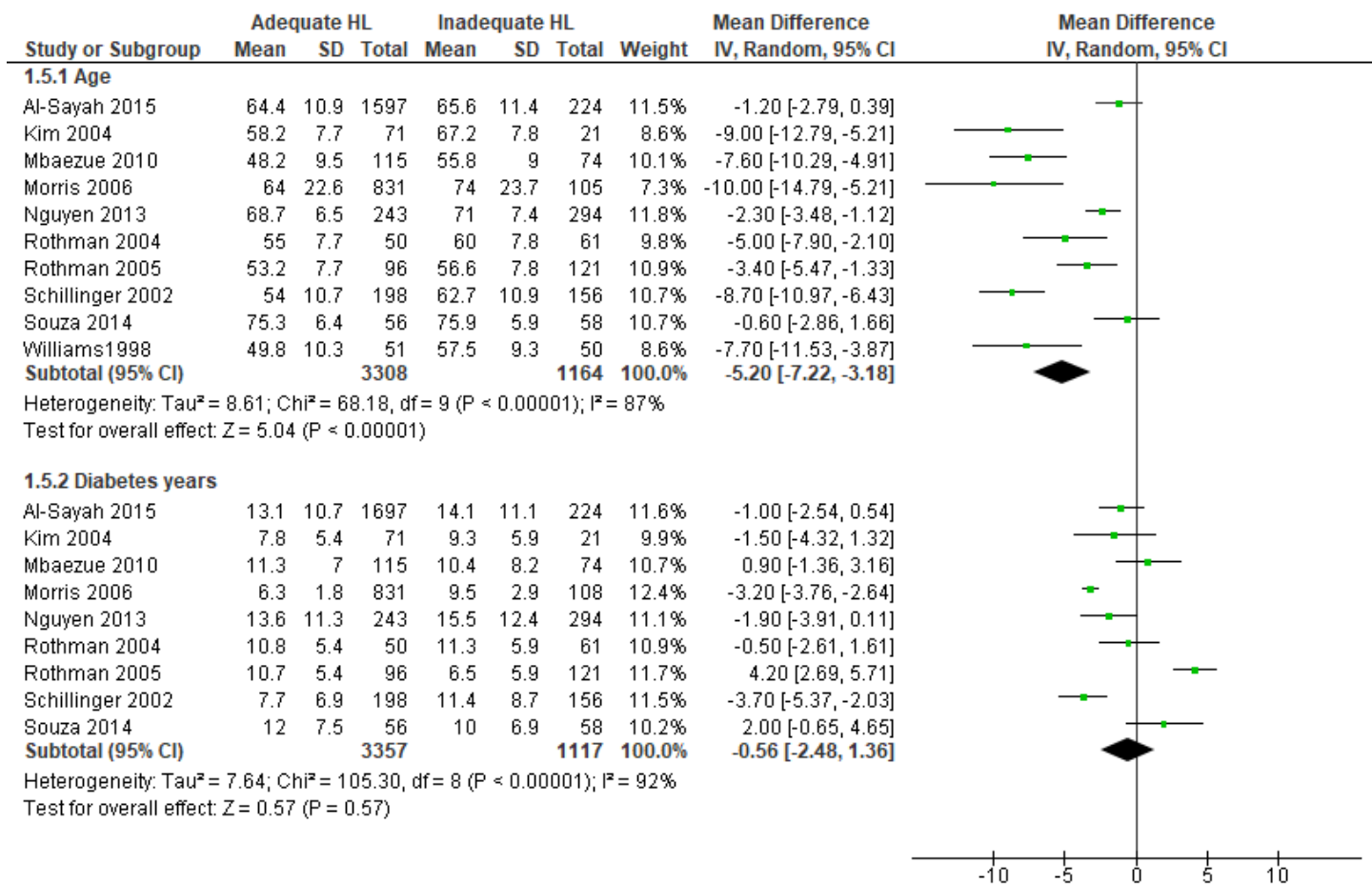


Figure S3: A forest graph showing the outcomes of the meta-analysis of odds ratio between adequate and inadequate health literacy in age and the length of diabetes. Abbreviations: **BHLS**, Brief Health Literacy Screen; **Chew's BSQ**, Chew's Brief Screening Questions; **CHL**, Communicative health literacy; **DHL**, Diabetes Health literacy scale; **DSME**, Diabetes Self-Management and Education; **eHEALS**, eHealth Literacy Scale; **FCCHL**, Functional, Communicative and Critical Health Literacy scale; **HELIA**, Health Literacy for Iranian Adults; **NVS**, Newest Vital Sign scale; **REALM**, Rapid Estimate of Adult Literacy in Medicine; **SKILLD**, Spoken Knowledge in Low Literacy in Diabetes; **TOFHLA**, Test of Functional Health Literacy in Adults; **S-TOFHLA**, short-TOFHLA.



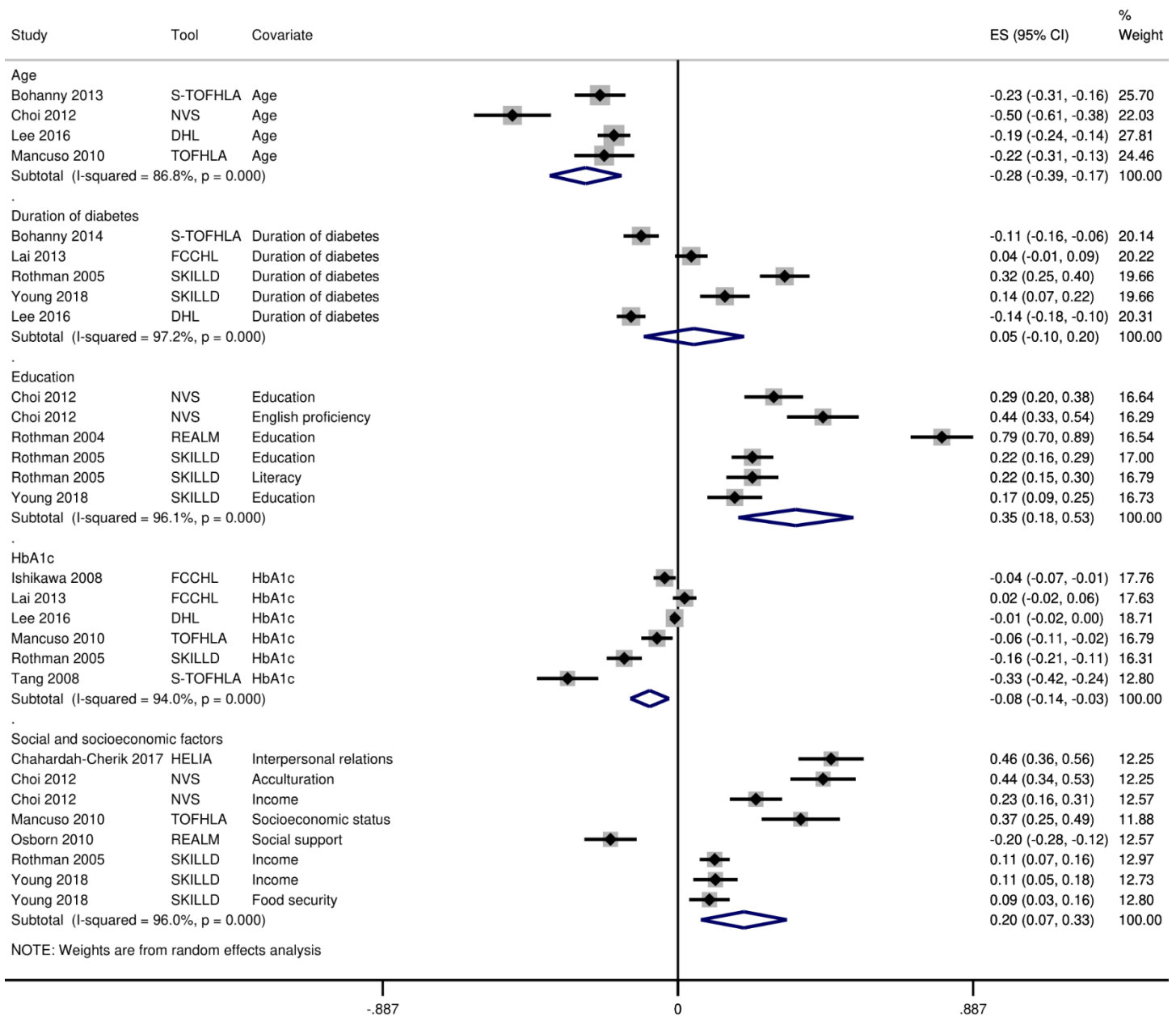


Figure S4: A forest graph showing the pooled z-scores corresponding to the correlation coefficients between health literacy and patient age, formal education of high school or above, HbA1c levels, and socioeconomic status. Abbreviations: BHLs, Brief Health Literacy Screen; Chew's BSQ, Chew's Brief Screening Questions; CHL, Communicative health literacy; DHL, Diabetes Health literacy scale; DSME, Diabetes Self-Management and Education; eHEALS, eHealth Literacy Scale; FCCHL, Functional, Communicative and Critical Health Literacy scale; HELIA, Health Literacy for Iranian Adults; NVS, Newest Vital Sign scale; REALM, Rapid Estimate of Adult Literacy in Medicine; SKILLD, Spoken Knowledge in Low Literacy in Diabetes; TOFHLA, Test of Functional Health Literacy in Adults