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Supplemental Material

Long-term Fine Particulate Matter Exposure and Nonaccidental and Cause-specific Mortality in a Large National Cohort of Chinese Men

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Supplementary materials:

Table S1: Hazard ratio (95%CI) per 10ug/m^3 increase of $PM_{2.5}$[a] for models with and without hypertension

Cause of death	Main model[b]	Main model + hypertension
Non accidental	1.09 (1.08-1.09)	1.08 (1.08, 1.09)
Cardiovascular	1.09 (1.08-1.10)	1.08 (1.07, 1.10)
IHD	1.09 (1.06-1.12)	1.09 (1.06, 1.12)
Stroke	1.14 (1.13-1.16)	1.14 (1.12, 1.15)
COPD	1.12 (1.10-1.13)	1.12 (1.10-1.13)
Lung cancer	1.12 (1.07-1.14)	1.12 (1.07-1.14)

[a]$PM_{2.5}$ levels were based on mean exposures during 2000–2005 at each participant's baseline cohort site.

[b]Adjusted for age, individual-level covariates including marital status, educational level, smoking status, years of smoking, cigarettes per day, passive smoking, occupational exposure, alcohol drinking, units of alcohol per week, BMI, consumption of fresh fruit and vegetables, and indoor air pollution, and area-level covariates including urban/rural, region and mean years of education. This model corresponds to "model 2" in Table 3 in the manuscript.

Table S2: Hazard ratios (95%CI) of mortality associated with 10ug/m^3 increase in $PM_{2.5}$ levels[a] by incremental adjustment for risk factors, -2LL and percent change in the –2LL relative to the age-adjusted basic model

Cause of death	Age-adjusted basic model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Non-accidental									
HR (95%CI)	1.03(1.02-1.03)	1.04(1.03-1.04)	1.03(1.02-1.03)	1.05(1.05-1.06)	1.03(1.03-1.04)	1.07(1.07-1.08)	1.03(1.03-1.04)	1.05(1.05-1.06)	1.09(1.08-1.09)
-2LL(% change)	813238(0)	761946(-6.3)	712884(-12.3)	601543(-26.0)	761916(-6.3)	554665(-31.8)	712864(-12.3)	601542(-26.0)	554590(-31.8)
Cardiovascular									
HR (95%CI)	1.07(1.06-1.07)	1.06(1.05-1.07)	1.06(1.05-1.07)	1.08(1.07-1.09)	1.04(1.03-1.05)	1.09(1.08-1.10)	1.04(1.03-1.05)	1.07(1.06-1.09)	1.09(1.08-1.10)
-2LL(% change)	287716(0)	285040(-0.9)	266691(-7.3)	224310(-22.0)	284962(-1.0)	206935(-28.1)	266587(-7.3)	224310(-22.0)	206934(-28.1)
IHD									
HR (95%CI)	1.14(1.12-1.15)	1.11(1.09-1.13)	1.09(1.07-1.11)	1.14(1.11-1.16)	1.05(1.03-1.07)	1.11(1.08-1.13)	1.05(1.03-1.07)	1.09(1.07-1.12)	1.09(1.06-1.12)
-2LL(% change)	56530(0)	55849(-1.2)	51416(-9.0)	43491(-23.1)	55662(-1.5)	39457(-30.2)	51266(-9.3)	43451(-23.1)	39451(-30.2)
Stroke									
HR (95%CI)	1.08(1.07-1.09)	1.07(1.06-1.08)	1.07(1.06-1.08)	1.09(1.08-1.11)	1.06(1.05-1.07)	1.13(1.11-1.14)	1.06(1.04-1.07)	1.11(1.10-1.13)	1.14(1.13-1.16)
-2LL(% change)	173814(0)	171875(-1.1)	161299(-7.2)	134790(-22.5)	171853(-1.1)	124435(-28.4)	161252(-7.2)	134761(-22.5)	124408(-28.4)
COPD									
HR (95%CI)	0.98(0.97-0.98)	1.00(0.99-1.01)	1.00(0.99-1.01)	1.01(1.00-1.02)	1.05(1.04-1.06)	1.05(1.04-1.07)	1.07(1.06-1.08)	1.06(1.05-1.08)	1.12(1.10-1.13)
-2LL(% change)	180580(0)	177215(-1.9)	167847(-7.1)	139296(-22.9)	176712(-2.1)	130292(-27.8)	166999(-7.5)	139005(-23.0)	129895(-28.1)
Lung cancer									
HR (95%CI)	1.03(1.01-1.05)	1.04(1.02-1.07)	1.01(0.99-1.03)	1.12(1.10-1.15)	0.98(0.96-1.00)	1.13(1.10-1.16)	0.98(0.96-1.00)	1.11(1.10-1.14)	1.10(1.07-1.14)
-2LL(% change)	40049(0)	39625(-1.1)	36395(-9.1)	30944(-22.7)	39419(-1.6)	27968(-30.2)	36336(-9.3)	30868(-22.9)	27957(-30.2)

[a]$PM_{2.5}$ levels were based on mean exposures during 2000–2005 at each participant's baseline cohort site.

Model 1: age-adjusted basic model + individual-level covariates including marital status, educational level, smoking status, years of smoking, cigarettes per day, passive smoking, occupational exposure, alcohol drinking, units of alcohol per week, BMI, consumption of fresh fruit and vegetables, and indoor air pollution. Model 1 corresponds to "model 1" in Table 3 in the manuscript.

Model 2: model 1 + urban/rural

Model 3: model 1 + region

Model 4: model 1 + area-level mean years of education

Model 5: model 1 + urban/rural + region

Model 6: model 1 + urban/rural + area-level mean years of education

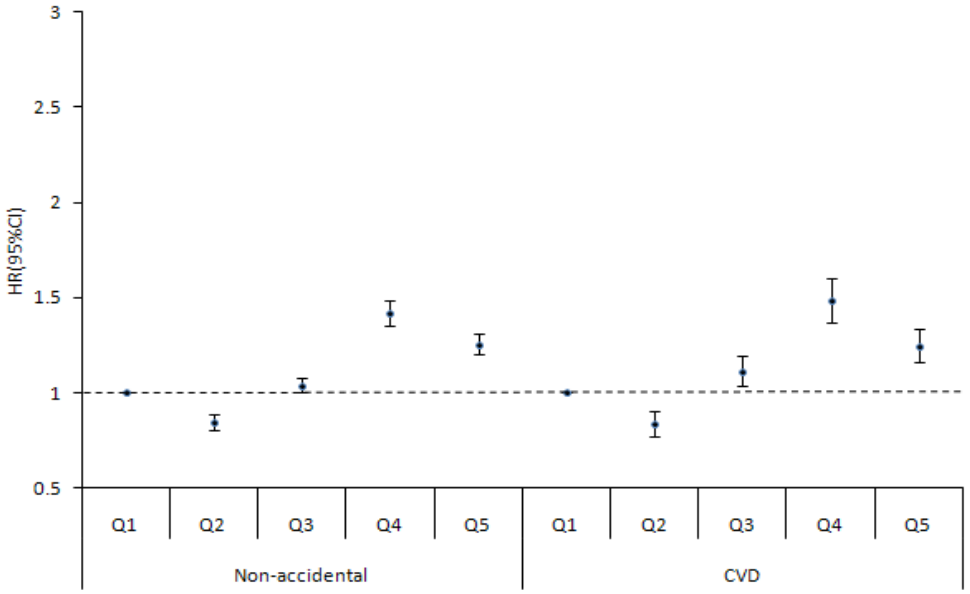
Model 7: model 1 + region + area-level mean years of education

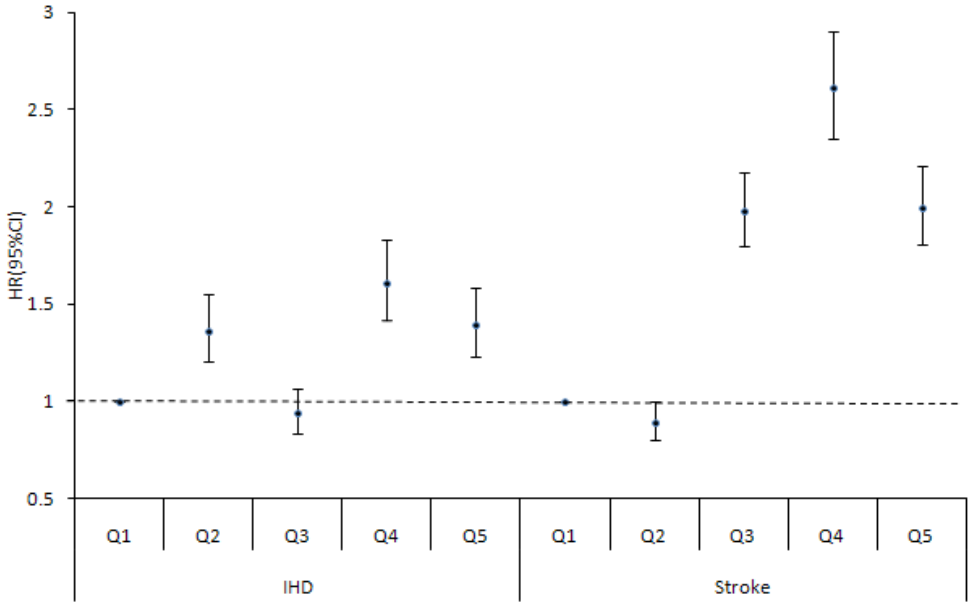
Model 8: model 1 + region + urban/rural + area-level mean years of education. Model 8 corresponds to “model 2” in Table 3 in the manuscript.

Table S3: Characteristics of cohort participants according to region and urban/rural

	No. of participants	Mean $PM_{2.5}$ (range)	Non-accidental		CVD		COPD		Lung cancer	
			No. of deaths	Mortality rate*	No. of deaths	Mortality rate*	No. of deaths	Mortality rate*	No. of deaths	Mortality rate*
Northeast	19413	22.7(16.5-33.2)	5065	2543	2103	1074	640	351	430	202
Urban	4424	27.1(18.7-33.2)	1297	2539	589	1159	155	310	102	197
Rural	14989	20.8(16.5-25.1)	3768	2567	1514	1048	485	372	328	205
North	16577	45.5(20.7-56.5)	4579	2837	2104	1295	783	530	270	155
Urban	6523	39.8(30.1-52.1)	1468	2052	669	948	139	202	171	220
Rural	10054	48.0(20.7-56.5)	3111	3517	1435	1592	644	828	99	101
Northwest	21363	44.8(25.9-55.0)	6466	3181	2630	1318	1652	858	223	100
Urban	4930	33.0(25.9-43.9)	1513	3216	415	894	507	1100	56	111
Rural	16433	48.7(39.1-55.0)	4953	3168	2215	1436	1145	785	167	97
Southwest	39267	39.5(15.5-71.1)	11811	2770	3488	818	4190	996	466	102
Urban	4527	38.8(24.3-63.8)	2078	4121	624	1241	378	728	157	324
Rural	34740	39.6(15.5-71.1)	9733	2584	2864	763	3812	1031	309	75
South-central	78103	46.2(28.3-69.6)	18340	2240	7315	898	3680	474	834	94
Urban	10805	43.1(34.5-60.1)	2083	2063	863	867	272	302	157	132
Rural	67298	46.4(28.3-69.6)	16257	2275	6452	907	3408	500	677	89
East	15070	43.8(27.3-75.1)	3761	2186	1219	712	1044	629	300	164
Urban	7054	62.6(46.1-75.1)	1490	1636	578	637	186	208	151	155
Rural	8016	27.3(27.3-27.3)	2271	2795	641	788	858	1132	149	163

*age-adjusted mortality rate (per 100,000 person years)


3
2.5
2
1.5
1
0.5
HR(95%CI)
Q1
Q2
Q3
Q4
Q5
Q1
Q2
Q3
Q4
Q5
Non-accidental
CVD


3
2.5
2
1.5
1
0.5
HR(95%CI)
Q1
Q2
Q3
Q4
Q5
Q1
Q2
Q3
Q4
Q5
IHD
Stroke

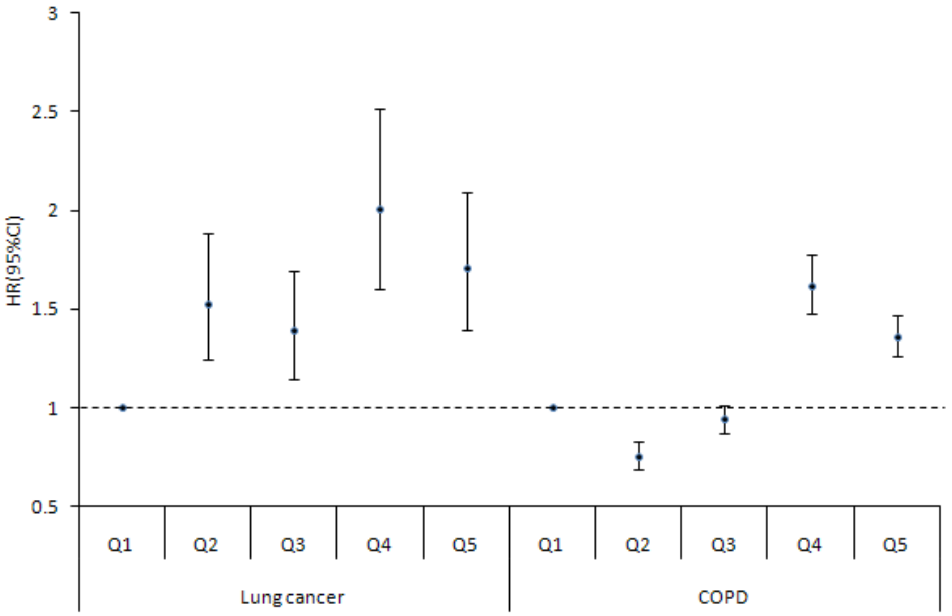
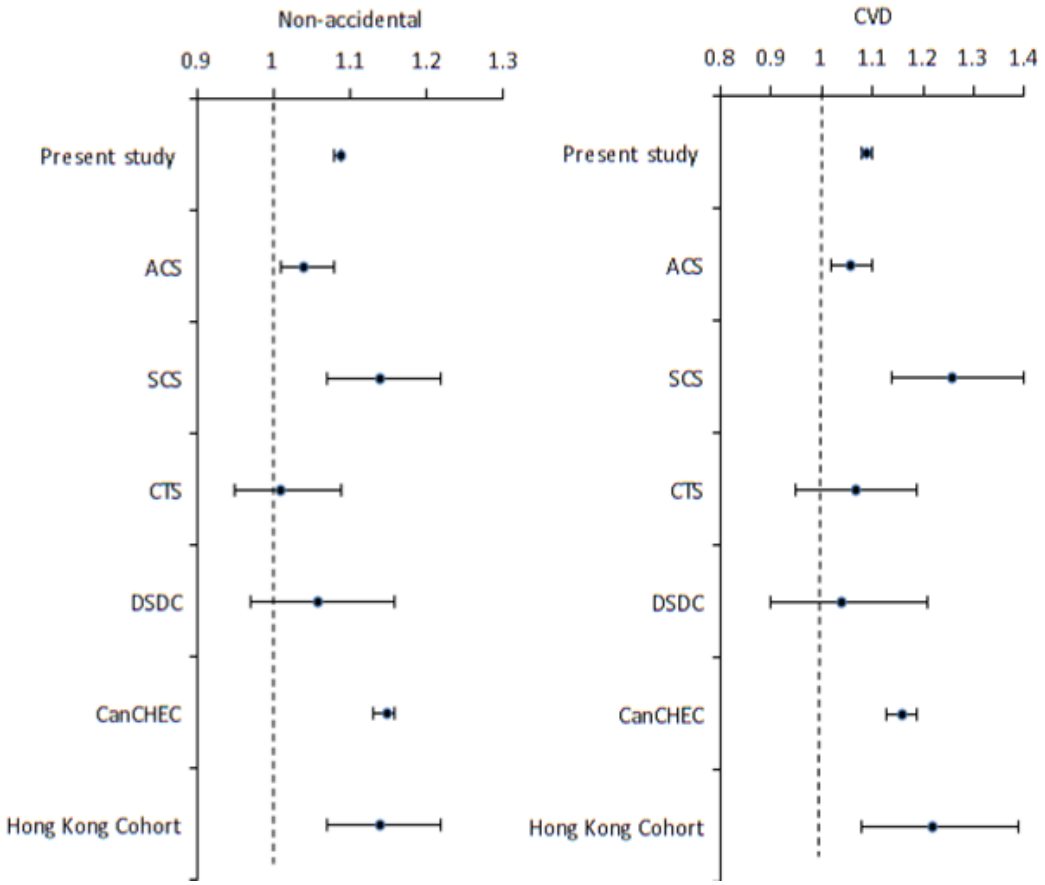
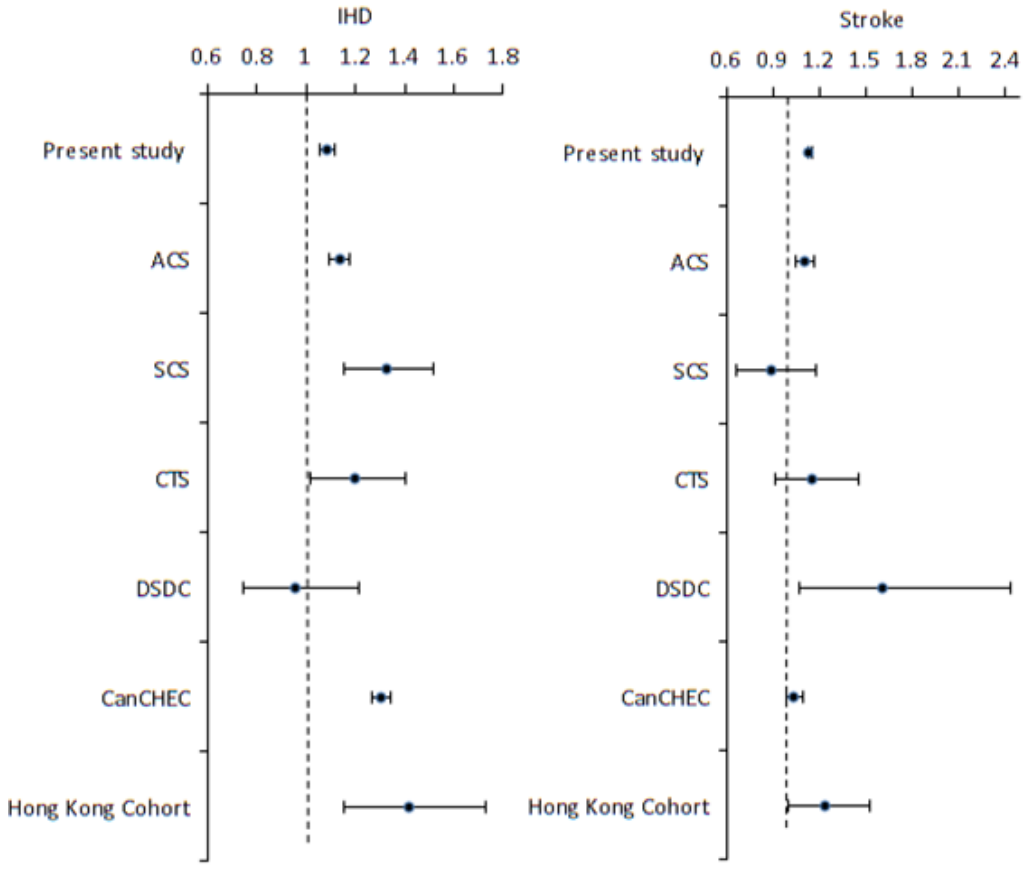


Figure S1: HRs(95%CI) of non-accidental causes, CVD, IHD, stroke, lung cancer and COPD mortality associated with increased quintiles (Q) of $PM_{2.5,}$ adjusted for age, individual-level covariates including marital status, educational level, smoking status, years of smoking, cigarettes per day, passive smoking, occupational exposure, alcohol drinking, units of alcohol per week, BMI, consumption of fresh fruit and vegetables, and indoor air pollution, and area-level covariates including urban/rural, region and mean years of education.

$PM_{2.5}$ cutpoints were based on average exposures during 2000–2005 for each cohort site at baseline. Q1: 18.6 (4.2-27.0), Q2: 29.5 (27.3-34.5), Q3: 41.1 (35.6-48.4), Q4: 57.0 (52.1-60.1), Q5: 69.5 (60.4-83.8).


Non-accidental
0.9
1
1.1
1.2
1.3
Present study
ACS
SCS
CTS
DSDC
CanCHEC
Hong Kong Cohort
CVD
0.8
0.9
1
1.1
1.2
1.3
1.4
Present study
ACS
SCS
CTS
DSDC
CanCHEC
Hong Kong Cohort


IHD
0.6 0.8 1 1.2 1.4 1.6 1.8
Present study
ACS
SCS
CTS
DSDC
CanCHEC
Hong Kong Cohort
Stroke
0.6 0.9 1.2 1.5 1.8 2.1 2.4
Present study
ACS
SCS
CTS
DSDC
CanCHEC
Hong Kong Cohort

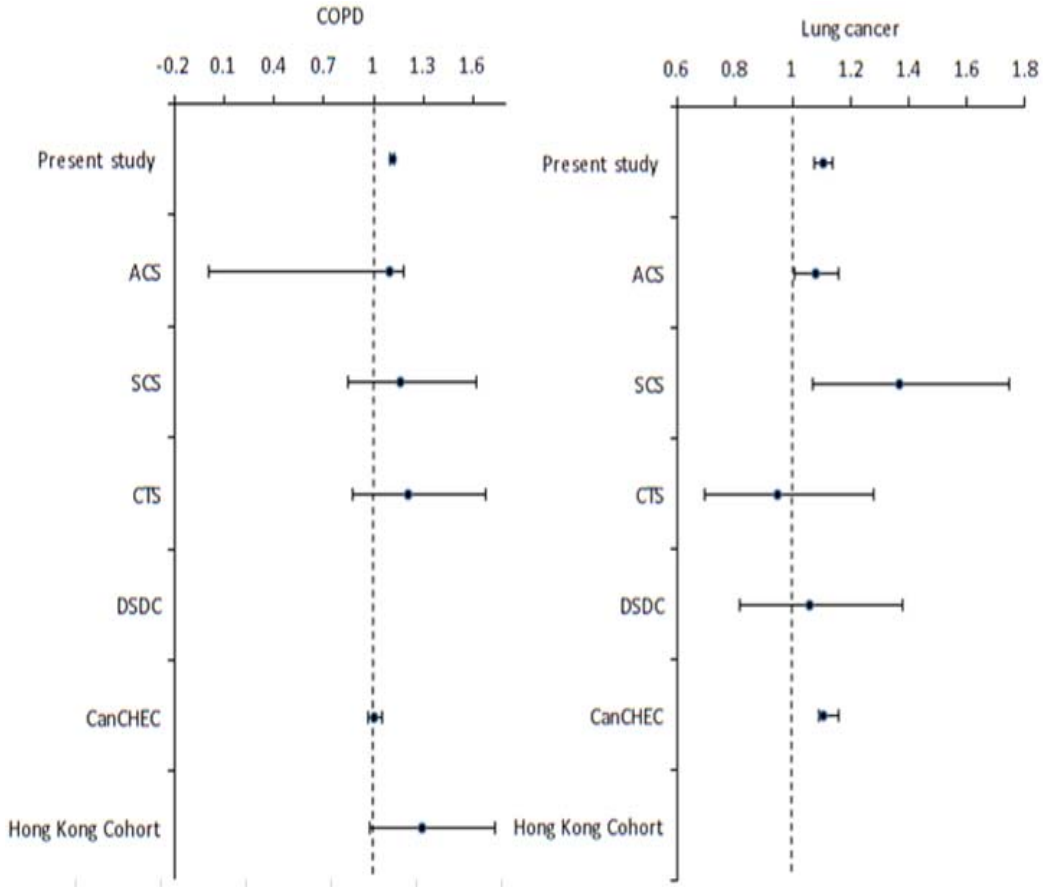


Figure S2. Comparison of hazard ratios associated with 10ug/m^3 increase of $PM_{2.5}$ between our study and major cohort studies.

ACS: American Cancer Society Cancer Prevention Study II (Krewski et al, 2009);

SCS: Six City Study (Lepeule et al, 2012);

CTS: California Teachers Study (Lispett et al, 2011);

DSDC: Dutch Study of Diet and Cancer (Beelen et al, 2008);

CanCHEC: Canadian Census Health and Environment Cohort (Crouse et al, 2012);

Hong Kong cohort (Wong et al, 2015).

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