



KPMG LLP
Two Financial Center
60 South Street
Boston, MA 02111

Report of Independent Registered Public Accounting Firm

The Board of Directors of Massachusetts Mutual Life Insurance Company and Contract Owners of Panorama Separate Account:

Opinion on the Financial Statements and Financial Highlights

We have audited the accompanying statements of assets and liabilities of Panorama Separate Account (comprised of the sub-accounts listed in Appendix A to the opinion) (collectively, “the Separate Account”) as of December 31, 2020, the related statements of operations and changes in net assets for each of the years (as described in Appendix A) in the two-year period then ended, and the related notes (collectively, the “financial statements”) and the financial highlights for each of the years in the five-year period then ended. In our opinion, the financial statements and financial highlights present fairly, in all material respects, the financial position of the Separate Account as of December 31, 2020, the results of its operations and the changes in its net assets for each of the years in the two-year period then ended, and the financial highlights for each of the years in the five-year period then ended, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements and financial highlights are the responsibility of the Separate Account’s management. Our responsibility is to express an opinion on these financial statements and financial highlights based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Separate Account in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements and financial highlights are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements and financial highlights, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements and financial highlights. Such procedures also included confirmation of securities owned as of December 31, 2020, by correspondence with the underlying mutual funds or their transfer agent. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements and financial highlights. We believe that our audits provide a reasonable basis for our opinion.

KPMG LLP

We have served as the Separate Account’s auditor since 2004.

Boston, Massachusetts
March 10, 2021

Appendix A

Panorama Separate Account is comprised of the following sub-accounts and the activities of each sub-account have been included within the accompanying statements of assets and liabilities as of December 31, 2020 and the related statements of operations and changes in net assets for each of the years in the two-year period then ended.

Sub-Accounts

Invesco Oppenheimer V.I. Capital Appreciation Sub-Account *
Invesco Oppenheimer V.I. Conservative Balanced Sub-Account *
Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account *
Invesco Oppenheimer V.I. Global Sub-Account *
Invesco Oppenheimer V.I. Government Money Sub-Account *
Invesco Oppenheimer V.I. Main Street Sub-Account *
Invesco Oppenheimer V.I. Total Return Bond Sub-Account *
MML Equity Index Sub-Account
MML High Yield Sub-Account
MML Managed Bond Sub-Account
MML Short-Duration Bond Sub-Account
MML Small Cap Equity Sub-Account

* See Note 2 to the financial statements for information regarding the merger of this Sub-Account.

Panorama Separate Account

STATEMENTS OF ASSETS AND LIABILITIES December 31, 2020

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MMI Equity Index Sub-Account
ASSETS								
Investments								
Number of shares	42,209	2,447,202	21,511	81,019	2,643,678	1,317,890	410,496	96,339
Identified cost	\$ 2,294,054	\$ 32,974,492	\$ 1,591,114	\$ 2,968,375	\$ 2,643,678	\$ 34,607,151	\$ 3,120,037	\$ 2,445,101
Value	\$ 2,968,970	\$ 43,878,326	\$ 2,300,182	\$ 4,222,730	\$ 2,643,678	\$ 39,418,088	\$ 3,460,477	\$ 2,800,568
Dividends receivable	-	-	-	-	2	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	787	-	-	-	372	-	301	-
Total assets	2,969,757	43,878,326	2,300,182	4,222,730	2,644,052	39,418,088	3,460,778	2,800,568
LIABILITIES								
Ammutant mortality fluctuation reserve								
Payable to Massachusetts Mutual Life Insurance Company	2,179	39,982	-	429	2,025	49,127	3,075	602
	-	1,651	-	7	-	72	-	17
Total liabilities	2,179	41,633	-	436	2,025	49,199	3,075	619
NET ASSETS	\$ 2,967,578	\$ 43,836,693	\$ 2,300,182	\$ 4,222,294	\$ 2,642,027	\$ 39,368,889	\$ 3,457,703	\$ 2,799,949
Net Assets:								
Accumulation units - value	\$ 2,894,930	\$ 42,503,955	\$ 2,300,182	\$ 4,207,981	\$ 2,574,517	\$ 37,731,339	\$ 3,355,189	\$ 2,779,882
Contracts in payout (annuitization) period	72,648	1,332,738	-	14,313	67,510	1,637,550	102,514	20,067
Net assets	\$ 2,967,578	\$ 43,836,693	\$ 2,300,182	\$ 4,222,294	\$ 2,642,027	\$ 39,368,889	\$ 3,457,703	\$ 2,799,949
Outstanding units								
Contract owners	923,677	3,203,892	786,497	984,025	822,188	1,050,971	439,676	837,786
UNIT VALUE								
Panorama	\$ 3.21	\$ 13.68	\$ 2.92	\$ 4.29	\$ 3.21	\$ 37.46	\$ 7.86	\$ 3.34

See Notes to Financial Statements.

Panorama Separate Account

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2020

ASSETS	MML High Yield Sub-Account	MML Managed Bond Sub-Account	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
Investments				
Number of shares	68,423	57,245	16,561	164,465
Identified cost	\$ 679,700	\$ 717,116	\$ 161,844	\$ 1,530,248
Value	\$ 686,963	\$ 774,424	\$ 162,463	\$ 1,827,271
Dividends receivable	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance	-	-	-	5
Total assets	686,963	774,424	162,463	1,827,276
LIABILITIES				
Annuitant mortality fluctuation reserve	-	-	-	729
Payable to Massachusetts Mutual Life Insurance Company	-	-	11	-
Total liabilities	-	-	11	729
NET ASSETS	\$ 686,963	\$ 774,424	\$ 162,452	\$ 1,826,547
Net Assets:				
Accumulation units - value	\$ 686,963	\$ 774,424	\$ 162,452	\$ 1,802,249
Contracts in payout (annuitization) period	-	-	-	24,298
Net assets	\$ 686,963	\$ 774,424	\$ 162,452	\$ 1,826,547
Outstanding units				
Contract owners	359,755	50,175	139,781	412,785
UNIT VALUE				
Panorama	\$ 1.91	\$ 15.43	\$ 1.16	\$ 4.42

See Notes to Financial Statements.

Panorama Separate Account

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS For The Year Ended December 31, 2020

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MML Equity Index Sub-Account
Investment Income								
Dividends	\$ -	\$ 864,017	\$ 754	\$ 24,347	\$ 6,559	\$ 532,946	\$ 106,412	\$ 40,502
Expenses								
Mortality and expense risk fees	18,426	306,149	14,252	25,490	20,483	262,359	25,950	17,572
Net investment income (loss)	(18,426)	557,868	(13,498)	(1,143)	(13,924)	270,587	80,462	22,930
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	106,894	1,137,091	105,373	98,619	-	1,067,976	(93,238)	66,749
Realized gain distribution	377,981	960,071	157,224	126,855	-	3,509,756	-	586,559
Realized gain (loss)	484,875	2,097,162	262,597	225,474	-	4,577,732	(93,238)	653,308
Change in net unrealized appreciation/ depreciation of investments	338,622	2,925,807	440,779	643,234	-	(309,556)	317,853	(247,964)
Net gain (loss) on investments	823,497	5,022,969	703,376	868,708	-	4,268,176	224,615	405,344
Net increase (decrease) in net assets resulting from operations	805,071	5,580,837	689,878	867,565	(13,924)	4,538,763	305,077	428,274
Capital transactions:								
Transfer of net premiums	12,368	37,191	2,654	4,686	33,341	39,439	-	2,871
Transfers due to death benefits	-	(670,574)	-	-	(4,074)	(393,231)	(4,186)	-
Transfers due to annuity benefit payments	(3,167)	(122,564)	-	(773)	(6,180)	(135,594)	(8,195)	(1,253)
Transfers due to withdrawal of funds	(227,017)	(3,176,650)	(214,677)	(259,252)	(298,531)	(3,324,907)	(425,899)	(80,357)
Transfers due to net charge (credit) to annuitant mortality fluctuation	98	(2,273)	-	6	1,948	20,407	(1,148)	35
Transfers between Sub-Accounts	(7,399)	81,113	(18,052)	(7,565)	(13,167)	(100,237)	-	40,102
Net increase (decrease) in net assets resulting from capital transactions	(225,117)	(3,853,757)	(230,075)	(262,898)	(286,663)	(3,894,123)	(439,428)	(38,602)
Total increase (decrease)	579,954	1,727,080	459,803	604,667	(300,587)	644,640	(134,351)	389,672
NET ASSETS, at beginning of the year	2,387,624	42,109,613	1,840,379	3,617,627	2,942,614	38,724,249	3,592,054	2,410,277
NET ASSETS, at end of the year	2,967,578	43,836,693	2,300,182	4,222,294	2,642,027	39,368,889	3,457,703	2,799,949

See Notes to Financial Statements.

Panorama Separate Account

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued) For The Year Ended December 31, 2020

	MML High Yield Sub-Account	MML Managed Bond Sub-Account	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
Investment Income				
Dividends	153 \$	723 \$	-	8,975
Expenses				
Mortality and expense risk fees	4,669	5,504	1,157	12,045
Net investment income (loss)	(4,516)	(4,781)	(1,157)	(3,070)
Net realized and unrealized gain (loss) on investments				
Realized gain (loss) on sale of fund shares	(4,343)	(739)	(74)	(15,229)
Realized gain distribution	-	-	-	16,105
Realized gain (loss)	(4,343)	(739)	(74)	876
Change in net unrealized appreciation/ depreciation of investments	39,130	54,517	2,166	312,816
Net gain (loss) on investments	34,787	53,778	2,092	313,692
Net increase (decrease) in net assets resulting from operations	30,271	48,997	935	310,622
Capital transactions:				
Transfer of net premiums	3,050	3,528	-	5,368
Transfers due to death benefits	-	-	-	-
Transfers due to annuity benefit payments	-	-	-	(1,269)
Transfers due to withdrawal of funds	(16,561)	(32,963)	(1,282)	(347,896)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	-	-	(102)
Transfers between Sub-Accounts	1,903	18,548	-	4,754
Net increase (decrease) in net assets resulting from capital transactions	(11,608)	(10,887)	(1,282)	(339,145)
Total increase (decrease)	18,663	38,110	(347)	(28,523)
NET ASSETS, at beginning of the year	668,300	736,314	162,799	1,855,070
NET ASSETS, at end of the year	686,963 \$	774,424 \$	162,452 \$	1,826,547

See Notes to Financial Statements.

Panorama Separate Account

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS For The Year Ended December 31, 2019

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MML Equity Index Sub-Account
Investment Income								
Dividends	\$ 1,411	\$ 948,751	\$ -	\$ 32,336	\$ 52,049	\$ 400,597	\$ 123,661	\$ 62,107
Expenses								
Mortality and expense risk fees	16,579	308,452	12,185	26,087	22,381	274,660	27,173	16,561
Net investment income (loss)	(15,168)	640,299	(12,185)	6,249	29,668	125,937	96,488	45,546
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	111,103	1,219,804	19,550	335,646	-	1,983,242	(255,975)	133,500
Realized gain distribution	222,185	672,015	213,188	510,766	-	6,030,536	-	201,293
Realized gain (loss)	333,288	1,891,819	232,738	846,412	-	8,013,778	(255,975)	334,793
Change in net unrealized appreciation/ depreciation of investments	342,948	3,946,230	285,518	83,844	-	1,855,610	472,028	201,568
Net gain (loss) on investments	676,236	5,838,049	518,256	930,256	-	9,869,388	216,053	536,361
Net increase (decrease) in net assets resulting from operations	661,068	6,478,348	506,071	936,505	29,668	9,995,325	312,541	581,907
Capital transactions:								
Transfer of net premiums	125,497	208,262	91,849	35,065	22,427	150,201	-	3,508
Transfers due to death benefits	(100,558)	(1,260,714)	-	(49,809)	(73,025)	(447,342)	(83,343)	-
Transfers due to annuity benefit payments	(1,674)	(113,215)	-	(188)	(18,508)	(126,711)	(7,602)	(469)
Transfers due to withdrawal of funds	(186,374)	(3,971,575)	(26,373)	(375,038)	(451,133)	(4,142,659)	(529,557)	(179,685)
Transfers due to net charge (credit) to annuitant mortality fluctuation	(166)	21,909	-	(570)	3,524	13,141	4,802	52
Transfers between Sub-Accounts	(23,286)	164,002	(7,702)	(79,681)	282,630	(231,910)	(25,867)	(10,826)
Net increase (decrease) in net assets resulting from capital transactions	(186,561)	(4,951,331)	57,774	(470,221)	(234,085)	(4,785,280)	(641,567)	(187,420)
Total increase (decrease)	474,507	1,527,017	563,845	466,284	(204,417)	5,210,045	(329,026)	394,487
NET ASSETS, at beginning of the year	1,913,117	40,582,596	1,276,534	3,151,343	3,147,031	33,514,204	3,921,080	2,015,790
NET ASSETS, at end of the year	2,387,624	42,109,613	1,840,379	3,617,627	2,942,614	38,724,249	3,592,054	2,410,277

See Notes to Financial Statements.

Panorama Separate Account

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued) For The Year Ended December 31, 2019

	MML High Yield Sub-Account	MML Managed Bond Sub-Account	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
Investment Income				
Dividends	38,388 \$	25,012 \$	4,911 \$	8,360
Expenses				
Mortality and expense risk fees	4,649	5,281	1,216	12,726
Net investment income (loss)	33,739	19,731	3,695	(4,366)
Net realized and unrealized gain (loss) on investments				
Realized gain (loss) on sale of fund shares	(3,664)	(2,325)	(225)	27,383
Realized gain distribution	-	-	-	150,133
Realized gain (loss)	(3,664)	(2,325)	(225)	177,516
Change in net unrealized appreciation/ depreciation of investments	33,812	43,046	2,241	202,864
Net gain (loss) on investments	30,148	40,721	2,016	380,380
Net increase (decrease) in net assets resulting from operations	63,887	60,452	5,711	376,014
Capital transactions:				
Transfer of net premiums	61,000	3,634	-	121,580
Transfers due to death benefits	-	-	-	-
Transfers due to annuity benefit payments	-	-	-	(112)
Transfers due to withdrawal of funds	(1,310)	(16,631)	(1,243)	(109,825)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	-	-	(341)
Transfers between Sub-Accounts	(15,670)	(10,832)	(24,042)	(16,818)
Net increase (decrease) in net assets resulting from capital transactions	44,020	(23,829)	(25,285)	(5,516)
Total increase (decrease)	107,907	36,623	(19,574)	370,498
NET ASSETS, at beginning of the year	560,393	699,691	182,373	1,484,572
NET ASSETS, at end of the year	668,300 \$	736,314 \$	162,799 \$	1,855,070

See Notes to Financial Statements.

Panorama Separate Account

Notes to Financial Statements

1. ORGANIZATION

Panorama Separate Account (the “Separate Account”) is a separate investment account of Massachusetts Mutual Life Insurance Company (“MassMutual”) established on June 23, 1981. The Separate Account is registered as a unit investment trust under the Investment Company Act of 1940 (“the 1940 Act”).

The assets and liabilities of the Separate Account are clearly identified and distinguished from MassMutual’s other assets and liabilities. The Separate Account assets are not chargeable with liabilities arising from any other MassMutual business.

Notes To Financial Statements (Continued)

2. INVESTMENT OF THE SEPARATE ACCOUNT'S ASSETS

As of December 31, 2020, the Separate Account consists of twelve sub-accounts which invest in the following mutual funds:

Sub-Accounts	The sub-account listed in the first column invests in the fund in this column
Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Capital Appreciation Fund ^{1,2}
Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Fund ^{1,2}
Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Fund ^{1,2}
Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Global Fund ^{1,2}
Invesco Oppenheimer V.I. Government Money Sub-Account	Invesco Oppenheimer V.I. Government Money Fund ^{1,2}
Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Main Street Fund® ^{1,2}
Invesco Oppenheimer V.I. Total Return Bond Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Fund ^{1,2}
MML Equity Index Sub-Account	MML Equity Index Fund ³
MML High Yield Sub-Account	MML High Yield Fund ³
MML Managed Bond Sub-Account	MML Managed Bond Fund ³
MML Short-Duration Bond Sub-Account	MML Short-Duration Bond Fund ³
MML Small Cap Equity Sub-Account	MML Small Cap Equity Fund ³

¹ Effective after the close of the New York Stock Exchange on May 24, 2019, Invesco Ltd. completed its acquisition of OppenheimerFunds, Inc. The Acquiring Funds/Sub-Accounts assume the accounting and performance history of the corresponding Merging Funds/Sub-Accounts. In connection with that transaction, the following Funds/Sub-Accounts merged:

MERGING FUND/SUB-ACCOUNT	ACQUIRING FUND/SUB-ACCOUNT
Fund: Oppenheimer Capital Appreciation Fund/VA Sub-Account: Oppenheimer Capital Appreciation Sub-Account	Fund: Invesco Oppenheimer V.I. Capital Appreciation Fund Sub-Account: Invesco Oppenheimer V.I. Capital Appreciation Sub-Account
Fund: Oppenheimer Conservative Balanced Fund/VA Sub-Account: Oppenheimer Conservative Balanced Sub-Account	Fund: Invesco Oppenheimer V.I. Conservative Balanced Fund Sub-Account: Invesco Oppenheimer V.I. Conservative Balanced Sub-Account
Fund: Oppenheimer Discovery Mid Cap Growth Fund/VA Sub-Account: Oppenheimer Discovery Mid Cap Growth Sub-Account	Fund: Invesco Oppenheimer V.I. Discovery Mid Cap Growth Fund Sub-Account: Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account
Fund: Oppenheimer Global Fund/VA Sub-Account: Oppenheimer Global Sub-Account	Fund: Invesco Oppenheimer V.I. Global Fund Sub-Account: Invesco Oppenheimer V.I. Global Sub-Account
Fund: Oppenheimer Government Money Fund/VA Sub-Account: Oppenheimer Government Money Sub-Account	Fund: Invesco Oppenheimer V.I. Government Money Fund Sub-Account: Invesco Oppenheimer V.I. Government Money Sub-Account
Fund: Oppenheimer Main Street Fund®/VA Sub-Account: Oppenheimer Main Street Sub-Account	Fund: Invesco Oppenheimer V.I. Main Street Fund® Sub-Account: Invesco Oppenheimer V.I. Main Street Sub-Account
Fund: Oppenheimer Total Return Bond Fund/VA Sub-Account: Oppenheimer Total Return Bond Sub-Account	Fund: Invesco Oppenheimer V.I. Total Return Bond Fund Sub-Account: Invesco Oppenheimer V.I. Total Return Bond Sub-Account

²Invesco Advisers, Inc. is the investment adviser to this Fund.

³MML Investment Advisers, LLC is the investment adviser to this Fund.

Notes To Financial Statements (Continued)

3. SIGNIFICANT ACCOUNTING POLICIES

The following is a summary of significant accounting policies followed by the Separate Account in preparation of the financial statements in conformity with generally accepted accounting principles. Separate Account Panorama Separate Account follows the accounting and reporting guidance in FASB Accounting Standards Codification 946.

A. Investment Valuation

Investments in the investment sub-accounts are valued at the closing net asset value of each of the respective underlying funds, which value their investment securities at fair value.

B. Accounting for Investments

Investment transactions are accounted for on a trade-date basis and identified cost is the basis followed in determining the cost of investments sold for financial statement purposes. Dividend income and gains from realized gain distributions are recorded on the ex-distribution date, and they are generally reinvested in the underlying investment sub-accounts.

C. Federal Income Taxes

MassMutual is taxed under federal law as a life insurance company under the provisions of the 1986 Internal Revenue Code, as amended. Under existing federal law, no taxes are payable on net investment income and net realized capital gains attributable to contracts which depend on the Separate Account's investment performance. Accordingly, no provision for federal income tax has been made. MassMutual may, however, make such a charge in the future if an unanticipated change of current law results in a company tax liability attributable to the Separate Account.

D. Contract Charges

See Note 8B for charges associated with the contracts.

E. Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

F. Annuitant Mortality Fluctuation

The Separate Account maintains a reserve as required by regulatory authorities to provide for mortality losses incurred. The reserve is adjusted quarterly for mortality losses and gains and its proportionate share of changes in value. Transfers to or from MassMutual are then made quarterly to adjust the Separate Account. Net transfers from MassMutual to the Separate Account totaled \$18,971 for the year ended December 31, 2020. Net transfers from the Separate Account to MassMutual totaled \$42,350 for the year ended December 31, 2019. The reserve is subject to a maximum of 3% of the Separate Account's annuity reserves. Any mortality losses in excess of this reserve will be borne by MassMutual. The reserve is not available to owners of the contracts except to the extent necessary to cover mortality losses under the contracts.

Notes To Financial Statements (Continued)

G. Annuity Reserves

Annuity reserves are developed by using accepted actuarial methods and are computed using the 83 IAM or Annuity 2000, depending on the year of issue.

4. FAIR VALUE OF FINANCIAL INSTRUMENTS

The Separate Account defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. In determining fair value, the Separate Account generally uses the market approach as the valuation technique due to the nature of the mutual fund investments offered in the Separate Account. This technique maximizes the use of observable inputs and minimizes the use of unobservable inputs. Investments in mutual funds are valued at the mutual fund's closing net asset value per share on the day of valuation.

Valuation Inputs: Various inputs are used to determine the value of the Separate Account's investments. These inputs are summarized in the three broad levels listed below:

- **Level 1** – quoted prices in active markets for identical securities
- **Level 2** – observable inputs other than Level 1 quoted prices (including, but not limited to, quoted prices for similar securities, interest rates, prepayment speeds and credit risk)
- **Level 3** – unobservable inputs

The investments of the Separate Account are measured at fair value. All the investments are categorized as Level 1 as of December 31, 2020. There have been no transfers between levels for the year ended December 31, 2020.

5. RELATED PARTY TRANSACTIONS

A. Sales Agreements

Pursuant to separate underwriting agreements with MassMutual, on its own behalf and on behalf of the Separate Account, MML Investors Services, LLC ("MMLIS") serves as principal underwriter of the contracts sold by its registered representatives, and MML Strategic Distributors, LLC ("MSD") serves as principal underwriter of the contracts sold by registered representatives of other broker-dealers who have entered into distribution agreements with MSD.

Both MMLIS and MSD are registered with the Securities and Exchange Commission (the "SEC") as broker-dealers under the Securities Exchange Act of 1934 and are members of the Financial Industry Regulatory Authority ("FINRA"). Commissions for sales of contracts by MMLIS registered representatives are paid on behalf of MMLIS to its registered representatives. Commissions for sales of contracts by registered representatives of other broker-dealers are paid on behalf of MSD to those broker-dealers. MMLIS and MSD also receive compensation for their actions as principal underwriters of the contracts.

The contracts are no longer offered for sale to the public. Contract owners may continue, however, to make purchase payments under existing contracts.

B. Receivable from/Payable to MassMutual

Certain fees such as cost of insurance fees and mortality and expense risk fees are charges paid between the general investment account (the "General Account") and the Separate Account. The General Account is not registered as an investment company under the 1940 Act.

Notes To Financial Statements (Continued)

6. PURCHASES AND SALES OF INVESTMENTS

The cost of purchases and proceeds from sales of investments for the year ended December 31, 2020 were as follows:

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account
Cost of purchases.....\$	423,617	\$ 2,155,444	\$ 163,725	\$ 155,796	\$ 246,879
Proceeds from sales	(288,370)	(4,482,091)	(250,073)	(292,547)	(547,507)

	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MML Equity Index Sub-Account	MML High Yield Sub-Account	MML Managed Bond Sub-Account
Cost of purchases.....\$	4,156,210	\$ 131,367	\$ 689,716	\$ 5,154	\$ 27,150
Proceeds from sales	(4,265,993)	(489,906)	(118,398)	(21,279)	(42,818)

	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
Cost of purchases.....\$	-	\$ 50,746
Proceeds from sales	(2,432)	(376,129)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS

The changes in outstanding units for the two years ended December 31, 2020 were as follows:

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account
2020					
Units purchased	16,636	26,069	1,394	1,624	16,047
Units withdrawn	(97,687)	(338,475)	(86,644)	(84,052)	(100,861)
Units transferred					
between Sub-Accounts	(2,958)	7,110	(7,137)	(1,840)	(4,093)
Net increase (decrease)	<u>(84,010)</u>	<u>(305,296)</u>	<u>(92,386)</u>	<u>(84,269)</u>	<u>(88,906)</u>

	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MML Equity Index Sub-Account	MML High Yield Sub-Account	MML Managed Bond Sub-Account
2020 (continued)					
Units purchased	4,321	3,440	5,289	1,865	246
Units withdrawn	(119,525)	(61,225)	(33,786)	(9,263)	(2,195)
Units transferred					
between Sub-Accounts	(3,153)	-	21,063	1,038	1,240
Net increase (decrease)	<u>(118,357)</u>	<u>(57,785)</u>	<u>(7,433)</u>	<u>(6,361)</u>	<u>(709)</u>

Notes To Financial Statements (Continued)

	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
2020 (continued)		
Units purchased	-	5,540
Units withdrawn	(1,147)	(97,014)
Units transferred		
between Sub-Accounts	-	1,946
Net increase (decrease)	<u>(1,147)</u>	<u>(89,529)</u>

	Invesco Oppenheimer V.I. Capital Appreciation Sub-Account	Invesco Oppenheimer V.I. Conservative Balanced Sub-Account	Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account	Invesco Oppenheimer V.I. Global Sub-Account	Invesco Oppenheimer V.I. Government Money Sub-Account
2019					
Units purchased	67,053	23,486	52,186	15,522	8,081
Units withdrawn	(139,477)	(473,841)	(13,496)	(139,504)	(168,817)
Units transferred					
between Sub-Accounts	(11,564)	14,188	(3,207)	(25,216)	88,021
Net increase (decrease)	<u>(83,988)</u>	<u>(436,167)</u>	<u>35,484</u>	<u>(149,197)</u>	<u>(72,716)</u>

	Invesco Oppenheimer V.I. Main Street Sub-Account	Invesco Oppenheimer V.I. Total Return Bond Sub-Account	MML Equity Index Sub-Account	MML High Yield Sub-Account	MML Managed Bond Sub-Account
2019 (continued)					
Units purchased	8,993	1,878	1,372	35,312	262
Units withdrawn	(158,813)	(91,081)	(69,911)	(734)	(1,165)
Units transferred					
between Sub-Accounts	(7,795)	(3,769)	(4,535)	(9,374)	(792)
Net increase (decrease)	<u>(157,615)</u>	<u>(92,972)</u>	<u>(73,074)</u>	<u>25,204</u>	<u>(1,695)</u>

	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account
2019 (continued)		
Units purchased	-	37,266
Units withdrawn	(1,087)	(34,458)
Units transferred		
between Sub-Accounts	(21,247)	(5,176)
Net increase (decrease)	<u>(22,334)</u>	<u>(2,368)</u>

Notes To Financial Statements (Continued)

8 FINANCIAL HIGHLIGHTS

A. A summary of units outstanding, unit values, net assets, investment income ratios, expense ratios (excluding expenses of the underlying funds) and total return ratios for each of the five years in the period ended December 31, 2020 follows:

	At December 31,			For the Years Ended December 31,		
	Units	Unit Value	Net Assets	Investment Income Ratio ¹	Expense Ratio ²	Total Return ³
Invesco Oppenheimer V.I. Capital Appreciation Sub-Account⁴						
2020	923,677	\$ 3.21	\$ 2,967,578	- %	0.73 %	35.59 %
2019	1,007,687	2.37	2,387,624	0.06	0.73	35.20
2018	1,091,674	1.75	1,913,117	0.32	0.73	(6.42)
2017	1,106,867	1.87	2,072,779	0.22	0.73	25.91
2016	1,462,864	1.49	2,175,660	0.41	0.73	(2.91)
Invesco Oppenheimer V.I. Conservative Balanced Sub-Account⁴						
2020	3,203,892	13.68	43,836,693	2.06	0.73	14.02
2019	3,509,188	12.00	42,109,613	2.25	0.73	16.66
2018	3,945,356	10.29	40,582,596	1.98	0.73	(6.01)
2017	4,388,178	10.94	48,025,958	1.98	0.73	8.46
2016	4,958,690	10.09	50,037,053	2.38	0.73	4.50
Invesco Oppenheimer V.I. Discovery Mid Cap Growth Sub-Account⁴						
2020	786,497	2.92	2,300,182	0.04	0.73	39.67
2019	878,884	2.09	1,840,379	-	0.73	38.35
2018	843,400	1.51	1,276,534	-	0.73	(6.77)
2017	848,298	1.62	1,377,173	0.03	0.73	27.86
2016	926,945	1.27	1,176,982	-	0.73	1.59
Invesco Oppenheimer V.I. Global Sub-Account⁴						
2020	984,025	4.29	4,222,294	0.70	0.73	26.71
2019	1,068,294	3.39	3,617,627	0.90	0.73	30.83
2018	1,217,491	2.59	3,151,343	0.98	0.73	(13.82)
2017	1,281,030	3.00	3,847,318	0.92	0.73	35.67
2016	1,387,829	2.21	3,072,125	1.06	0.73	(0.64)
Invesco Oppenheimer V.I. Government Money Sub-Account⁴						
2020	822,188	3.21	2,642,027	0.23	0.73	(0.51)
2019	911,095	3.23	2,942,614	1.70	0.73	0.97
2018	983,811	3.20	3,147,031	1.33	0.73	0.61
2017	1,136,500	3.18	3,613,270	0.37	0.73	(0.34)
2016	1,526,003	3.19	4,868,102	0.01	0.73	(0.72)
Invesco Oppenheimer V.I. Main Street Sub-Account⁴						
2020	1,050,971	37.46	39,368,889	1.48	0.73	13.11
2019	1,169,328	33.12	38,724,249	1.06	0.73	31.12
2018	1,326,942	25.26	33,514,204	1.16	0.73	(8.56)
2017	1,433,586	27.62	39,597,098	1.25	0.73	16.06
2016	1,610,159	23.80	38,319,523	1.12	0.73	10.81
Invesco Oppenheimer V.I. Total Return Bond Sub-Account⁴						
2020	439,676	7.86	3,457,703	2.99	0.73	8.91
2019	497,461	7.22	3,592,054	3.32	0.73	8.73
2018	590,433	6.64	3,921,080	3.38	0.73	(1.75)
2017	639,981	6.76	4,325,660	2.38	0.73	3.83
2016	714,727	6.51	4,652,819	3.67	0.73	2.52
MML Equity Index Sub-Account						
2020	837,786	3.34	2,799,949	1.68	0.73	17.20
2019	845,219	2.85	2,410,277	2.74	0.73	29.91
2018	918,293	2.20	2,015,790	1.54	0.73	(5.50)
2017	969,438	2.32	2,251,928	0.94	0.73	20.46
2016	878,856	1.93	1,694,731	1.67	0.73	10.67

Notes To Financial Statements (Continued)

8 FINANCIAL HIGHLIGHTS (Continued)

	At December 31,			For the Years Ended December 31,		
	Units	Unit Value	Net Assets	Investment Income Ratio ¹	Expense Ratio ²	Total Return ³
MML High Yield Sub-Account						
2020	359,755	1.91	686,963	0.02	0.73	4.61
2019	366,116	1.83	668,300	6.02	0.73	11.05
2018	340,912	1.64	560,393	5.98	0.73	(4.25)
2017	399,196	1.72	685,323	7.14	0.73	7.10
2016	330,466	1.60	529,713	7.02	0.73	15.41
MML Managed Bond Sub-Account						
2020	50,175	15.43	774,424	0.10	0.73	6.66
2019	50,883	14.47	736,314	3.46	0.73	8.74
2018	52,578	13.31	699,691	3.20	0.73	(1.41)
2017	60,307	13.50	814,033	3.13	0.73	3.68
2016	43,692	13.02	568,855	2.59	0.73	1.75
MML Short-Duration Bond Sub-Account						
2020	139,781	1.16	162,452	-	0.73	0.61
2019	140,928	1.16	162,799	2.95	0.73	3.41
2018	163,262	1.12	182,373	2.26	0.73	0.55
2017	381,595	1.11	423,925	2.58	0.73	1.55
2016	326,480	1.09	357,151	2.02	0.73	1.80
MML Small Cap Equity Sub-Account						
2020	412,785	4.42	1,826,547	0.54	0.73	19.82
2019	502,314	3.69	1,855,070	0.48	0.73	25.55
2018	504,682	2.94	1,484,572	0.49	0.73	(10.84)
2017	512,500	3.30	1,690,917	0.83	0.73	13.54
2016	530,655	2.91	1,542,026	1.05	0.73	17.36

¹The investment income ratios represent the dividends, excluding distributions of capital gains, received by the sub-account from the underlying mutual fund, net of management fees assessed by the fund manager, divided by the average net assets. These ratios exclude those expenses, such as mortality and expense charges, that are assessed against contract owners accounts either through reductions in the unit values or the redemption of units. The recognition of investment income by the sub-account is affected by the timing of the declaration of dividends by the underlying fund in which the sub-account invests.

²The expense ratios represent the annualized contract expenses of the Separate Account, consisting primarily of mortality and expense charges, for each period indicated. The ratios include only those expenses that result in a direct reduction of unit values. Charges made directly to contract owners accounts through the redemption of units and expenses of the underlying fund have been excluded.

³The total returns are for the periods indicated, including changes in the value of the underlying fund, and the expenses assessed through the reduction of unit values. These ratios do not include any expenses assessed through the redemption of units. Investment options with a date notation indicate the effective date of that investment option in the variable account. The total return is calculated for each period indicated or from the effective date through the end of the reporting period.

⁴Effective after the close of the New York Stock Exchange on May 24, 2019, Invesco Ltd. completed its acquisition of OppenheimerFunds, Inc. See Note 2 to the financial statements for information regarding the merger of this Sub-Account.

Notes To Financial Statements (Continued)

FINANCIAL HIGHLIGHTS (Continued)

- B. The Separate Account assesses charges associated with the contract. These charges are either assessed as a direct reduction in unit values or through a redemption of units for all contracts contained within the Separate Account.

<p>Mortality and Expense Risk Charge</p> <p>This charge is assessed through reduction of unit values.</p>	<p>This charge is equal, on an annual basis, to 0.73% of the daily value of the assets invested in each fund.</p>
<p>Annual Maintenance Charge - for deferred contracts.</p> <p>This charge is assessed through the redemption of units.</p>	<p>\$40 per contract, annually</p>
<p>Policy Fee - for immediate contracts.</p> <p>This charge is assessed through a reduction in the number of units purchased.</p>	<p>\$70 per contract</p>
<p>Contingent Deferred Sales Charge - for deferred contracts.</p> <p>This charge is assessed through the redemption of units.</p>	<p>0% - 5%</p>
<p>Sales Charge - for immediate contracts.</p> <p>This charge is assessed through a reduction in the number of units purchased.</p>	<p>3% of the purchase payment up to \$10,000; 2% of the next \$90,000 and 1% of any purchase payment over \$100,000</p>

Notes To Financial Statements (Continued)

9. *SUBSEQUENT EVENTS*

The Separate Account's management has reviewed events occurring through March 10, 2021, the date the financial statements were issued, and no subsequent events occurred requiring accrual or disclosure.

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