

Performance Update

As of August 31, 2021

Panorama®

variable annuity

- Not a bank or credit union deposit or obligation
- Not insured by any federal government agency
- Not FDIC or NCUA-insured
- Not guaranteed by any bank or credit union
- May go down in value

Panorama®

A deferred variable annuity is a long-term investment designed to help you accumulate assets for retirement. It also offers a broad array of investment choices and asset classes, fixed accounts, death benefit choices and multiple methods to turn those assets into a stream of guaranteed income at some point in the future. (Guarantees are based on the claims-paying ability of the issuing company and do not apply to the investment performance or the safety of amounts held in the variable investment choices.) Variable annuities are not appropriate for everyone. There are fees and charges associated with owning an annuity. **Variable annuities are subject to market risk, including the potential loss of principal.** Also, withdrawals of earnings will be subject to income tax and may be subject to a 10 percent federal income tax penalty if taken prior to age 59 ½.

Panorama first became available (in most states) on January 21, 1982, but many of the underlying funds were established before this date. For these funds, the total returns are computed using hypothetical variable annuity unit values which are based on the underlying fund's performance less separate account expenses for the periods shown, including periods before the product was available. For periods of one year or less, the total return is not annualized and is the percentage change in an Accumulation Unit. For periods greater than one year, the average annual total return for the time periods is shown.

Past performance is no indication of future results. This update contains the most recent month-end performance. Since performance changes daily, the current performance may be lower or higher than the performance reflected in this update. The investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. For the most recent month-end performance information, visit our website at www.massmutual.com or call the MassMutual Customer Service Center at (800) 272-2216, Monday – Friday, 8 a.m. to 8 p.m. Eastern Time.

Investing involves risk, including the loss of principal. Each investment choice underlying the variable annuity contract has broad risks that apply to all investment choices, such as market risk, as well as specific risks inherent in particular types of investment choices that may subject your variable annuity contract to greater risk and volatility than the general market.

This material must be preceded or accompanied by the [current prospectuses \(or summary prospectuses, if available\) for the Panorama underlying investment funds](#). The funds' prospectuses contain more information about the funds' charges, expenses, risks and investment objectives. Please read the prospectuses carefully before investing or sending money. If you wish to receive additional prospectuses, request them from your registered representative or call the MassMutual Customer Service Center at (800) 272-2216, press 2, 8:00 a.m. to 8:00 p.m. (ET). Please note that Panorama is closed to new business. Existing contract owners, however, may continue to make purchase payments under existing contracts.

Market Indices as of August 31, 2021

	YTD	1 Year	3 Years	5 Years	10 Years
S&P 500 Index	21.58%	31.17%	18.07%	18.02%	16.34%
Morgan Stanley Capital International World Index	17.94%	29.76%	14.96%	14.83%	12.14%
Russell 2000 Total Return Index	15.83%	47.08%	10.75%	14.38%	13.62%
Bloomberg U.S. Aggregate Bond Index	-0.69%	-0.08%	5.43%	3.11%	3.18%

Market indices have been provided for informational purposes only; they are unmanaged and reflect no fees or expenses. Individuals cannot invest directly in an index.

The Standard & Poor's 500 Index is an unmanaged measure of common stock total return performance in the U.S.

The Morgan Stanley Capital International World Index is an unmanaged measure of total return performance in the global securities market.

The Russell 2000 Total Return Index is a broad based, unmanaged index comprised of 2000 of the smallest U.S. domiciled company common stocks (on the basis of capitalization) that are traded in the United States on the New York Stock Exchange, the American Stock Exchange, and NASDAQ.

The Bloomberg U.S. Aggregate Bond Index is an unmanaged index of U.S. corporate bond issues, U.S. Government Securities and mortgage-backed securities.

Total Returns
For the Period Ending: August 31, 2021

 Total Returns reflect total annualized separate account expenses of 0.73% and all fund level expenses. **These returns do not reflect contingent deferred sales charges**

Asset Category	Separate Account Sub-account	Fund Inception Date	Endnotes	Cumulative YTD	Average Annual				
					1 Year	3 Years	5 Years	10 Years	Since Inception
Money Market	Invesco V.I. Government Money <i>7-day yield: -1.01%</i>	4/3/1985	1, **	-0.48%	-0.72%	0.10%	0.00%	-0.36%	2.47%
Fixed Income	Invesco V.I. Core Bond	4/3/1985	3, **	-0.84%	0.19%	5.51%	3.04%	3.77%	4.42%
	MML High Yield	5/3/2010		5.73%	12.42%	5.12%	5.48%	6.49%	6.39%
	MML Managed Bond	8/15/2008	2	0.98%	3.42%	5.33%	3.03%	2.71%	6.28%
	MML Short-Duration Bond	5/3/2010		1.61%	3.69%	1.90%	1.50%	1.21%	1.48%
Balanced	Invesco V.I. Conservative Balanced	2/9/1987	**	9.17%	13.28%	10.53%	7.98%	7.57%	8.13%
Large Cap Blend	Invesco V.I. Main Street	7/5/1995	**	20.61%	27.84%	15.57%	14.51%	14.15%	15.67%
	MML Equity Index	5/1/1997		20.66%	29.88%	16.74%	16.68%	15.02%	8.14%
Large Cap Growth	Invesco V.I. Capital Appreciation	4/3/1985	**	20.38%	29.51%	22.51%	20.88%	15.87%	10.53%
Small/Mid Cap Blend	MML Small Cap Equity	6/1/1998		18.47%	46.25%	11.24%	14.48%	14.11%	7.14%
Small/Mid Cap Growth	Invesco V.I. Discovery Mid Cap Growth	8/15/1986	**	18.11%	38.16%	22.71%	21.29%	16.78%	10.13%
International/Global	Invesco V.I. Global	11/12/1990	**	17.62%	34.43%	17.07%	18.13%	13.24%	10.20%

Standardized Total Returns - With Full Surrender
For the Period Ending: June 30, 2021

These standardized returns assume a single \$1,000 purchase payment made at the beginning of the periods shown most recent calendar quarter. They assume that the contract is redeemed and reflect total separate account expenses of 0.73% level charges) of \$40.00 allocated proportionately for each Sub-account

 Contract Year: 1 2 3 4 5 6 7 8 9 10 11+
 5% 5% 5% 5% 5% 4% 4% 4% 4% 4% 0%

These returns do not reflect premium taxes

Asset Category	Separate Account Sub-account	Date Added to Separate Account	Endnotes	Cumulative YTD	Average Annual				
					1 Year	3 Years	5 Years	10 Years	Since Date Added to Separate Account
Money Market	Invesco V.I. Government Money <i>7-day yield: -1.01%</i>	1/31/1987	1, **	-5.66%	-6.00%	-1.85%	-1.35%	-1.11%	2.08%
Fixed Income	Invesco V.I. Core Bond	4/30/1985	3, **	-6.78%	-4.71%	3.45%	1.74%	3.21%	4.25%
	MML High Yield	5/3/2010		-0.29%	12.02%	3.41%	4.82%	5.42%	5.79%
	MML Managed Bond	5/1/2009	2	-5.28%	-0.80%	3.15%	1.60%	2.11%	2.91%
	MML Short-Duration Bond	5/3/2010		-3.83%	0.12%	-0.04%	0.17%	0.57%	0.76%
Balanced	Invesco V.I. Conservative Balanced	4/30/2012	**	1.15%	11.15%	8.43%	6.42%	—	6.40%
Large Cap Blend	Invesco V.I. Main Street	4/30/2012	**	9.66%	31.90%	14.10%	12.69%	—	11.89%
	MML Equity Index	1/16/2001		8.57%	32.13%	15.05%	14.86%	12.85%	6.25%
Large Cap Growth	Invesco V.I. Capital Appreciation	1/16/2001	**	6.61%	33.00%	20.41%	18.90%	13.55%	5.91%
Small/Mid Cap Blend	MML Small Cap Equity	1/16/2001		11.26%	50.14%	11.24%	13.94%	11.84%	7.93%
Small/Mid Cap Growth	Invesco V.I. Discovery Mid Cap Growth	1/16/2001	**	3.12%	32.20%	20.47%	18.78%	13.83%	5.16%
International/Global	Invesco V.I. Global	1/16/2001	**	5.44%	36.65%	13.84%	17.11%	10.54%	7.47%

Endnotes

- 1 **An investment in the Fund is neither insured nor guaranteed by the Federal Deposit Insurance Corporation or by any other government agency. Although the Fund seeks to preserve the value of your investment at \$1.00 per share, it is possible to lose money by investing in the Fund.**

The yield quotation more closely reflects the current earnings of the Fund than the total return quotation. It is an annualized rate based on results over the last seven days of the period, and is net of all recurring contract fees and charges.

Although the Oppenheimer Government Money Fund/VA commenced operations on April 3, 1985, the information necessary to calculate the returns is available only for the year 1987 and subsequent periods.
 - 2 The fund established a new class of shares, which is available with this contract, after it began its initial investment operations. The performance for the period prior to offering the new class shows the historical returns for the original class of shares, which were not subject to a 12b-1 fee. The performance shown from the inception date of the class available with this contract includes the fees and expenses of that share class, including a 12b-1 fee. A 12b-1 fee reduces a fund's performance.
 - 3 Unavailable in contracts issued on or after May 1, 2009. For contracts issued prior to May 1, 2009, you may not allocate any new money to this fund via purchase payments or transfers.
- ** Formerly known as Invesco Oppenheimer V.I. Government Money Fund.
** Formerly known as Invesco Oppenheimer V.I. Core Bond Fund.
** Formerly known as Invesco Oppenheimer V.I. Conservative Balanced Fund.
** Formerly known as Invesco Oppenheimer V.I. Main Street Fund.
** Formerly known as Invesco Oppenheimer V.I. Capital Appreciation Fund.
** Formerly known as Invesco Oppenheimer V.I. Discovery Mid Cap Growth Fund.
** Formerly known as Invesco Oppenheimer V.I. Global Fund.

Panorama® (Contract Form #: P81-106A) variable annuity was issued by Massachusetts Mutual Life Insurance Company, 1295 State Street, Springfield, MA 01111-0001. We no longer offer this contract for sale to the public. Contract owners may continue, however, to make purchase payments to their contracts.

Principal Underwriters:

MML Investors Services, LLC
MML Strategic Distributors, LLC

Subsidiaries of Massachusetts Mutual Life Insurance Company, 1295 State Street, Springfield, MA 01111-0001

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