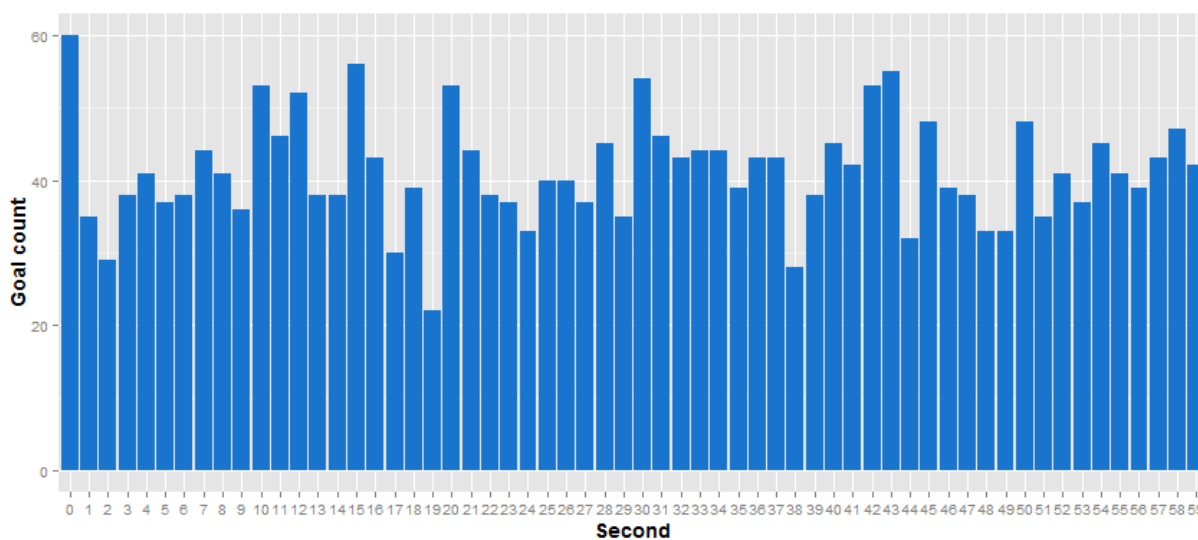


What follows is a statistical exploration of the times goals are scored in Hill-Murray hockey games. This is about broad trends over the long-term; there is so much variation in individual games that one could not use this to predict single game outcomes.

I've chosen to use games back to the 2004 season, when period length increased from 15 to 17 minutes. Through the middle of the 2015 season, that gives us 342 games, and 2476 total goals by both teams in regulation. I'm ignoring overtime for the most part; there aren't a lot of overtime games – not many goals to analyze anyway – but I'll show what's there at the end.

For each goal, the time in minutes and seconds since the start of the period is recorded. The distribution of seconds should be fairly uniform, so let's check that. (This is irrespective of whatever minute the goal occurred – for this exercise, 59 seconds means the goal could have been scored at 0:59, 1:59, 2:59, etc)

Total goals by second of scoring time, all games



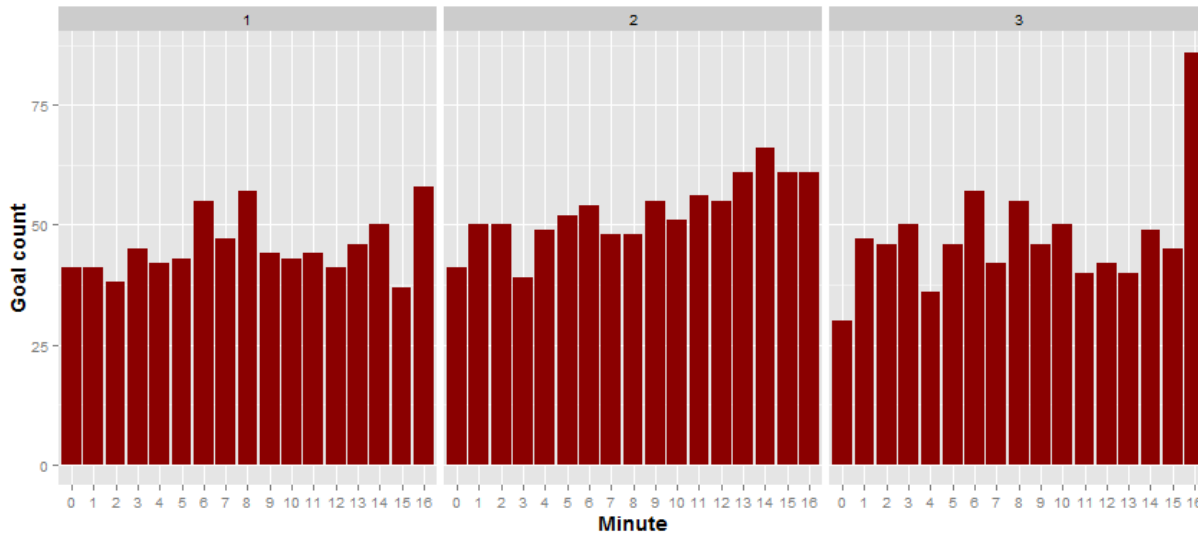
Hmm, it's a bit puzzling that the highest value occurs at 0 seconds, and there are some spikes at other round numbers, like 10, 15, 20, 30.

What I think could be happening is that when the game is on running time, the scorer rounds the time and so we see an excess of goals at x:00, x:10, etc.

And 19 seconds seems to be a goal scoring void for some reason.

Now on to the more interesting stuff. Here are goals plotted by period and minute – i.e. the 0 minute is 0:00 to 0:59. You could call it the first minute, but that’s the convention I’m using.

Total goals by period and minute of scoring time, all games



The mean is 7.2 goals per game. In a 51 minute game, that equates to about one goal every 7 minutes. Multiplied by 342 games, we get an average of 49 total goals per distinct minute in this sample.

There were 772 goals (31%) in the first period, 897 (36%) in the second, and 807 (33%) in the third. The highest scoring minute was the final minute of the third, which should be a tip-off that it’s inflated by empty net goals. There were 38 empty net goals, 33 in the last minute, so without those, scoring at the end of the third is pretty much in line with the rest of the period. In fact, if we take out the empty net goals, the third period is almost identical to the first in total scoring. The lowest scoring minute is the first minute of the third period with only 30 goals, almost 40% lower than average.

Notice the increased scoring in the second period, and most of it is in the second half.

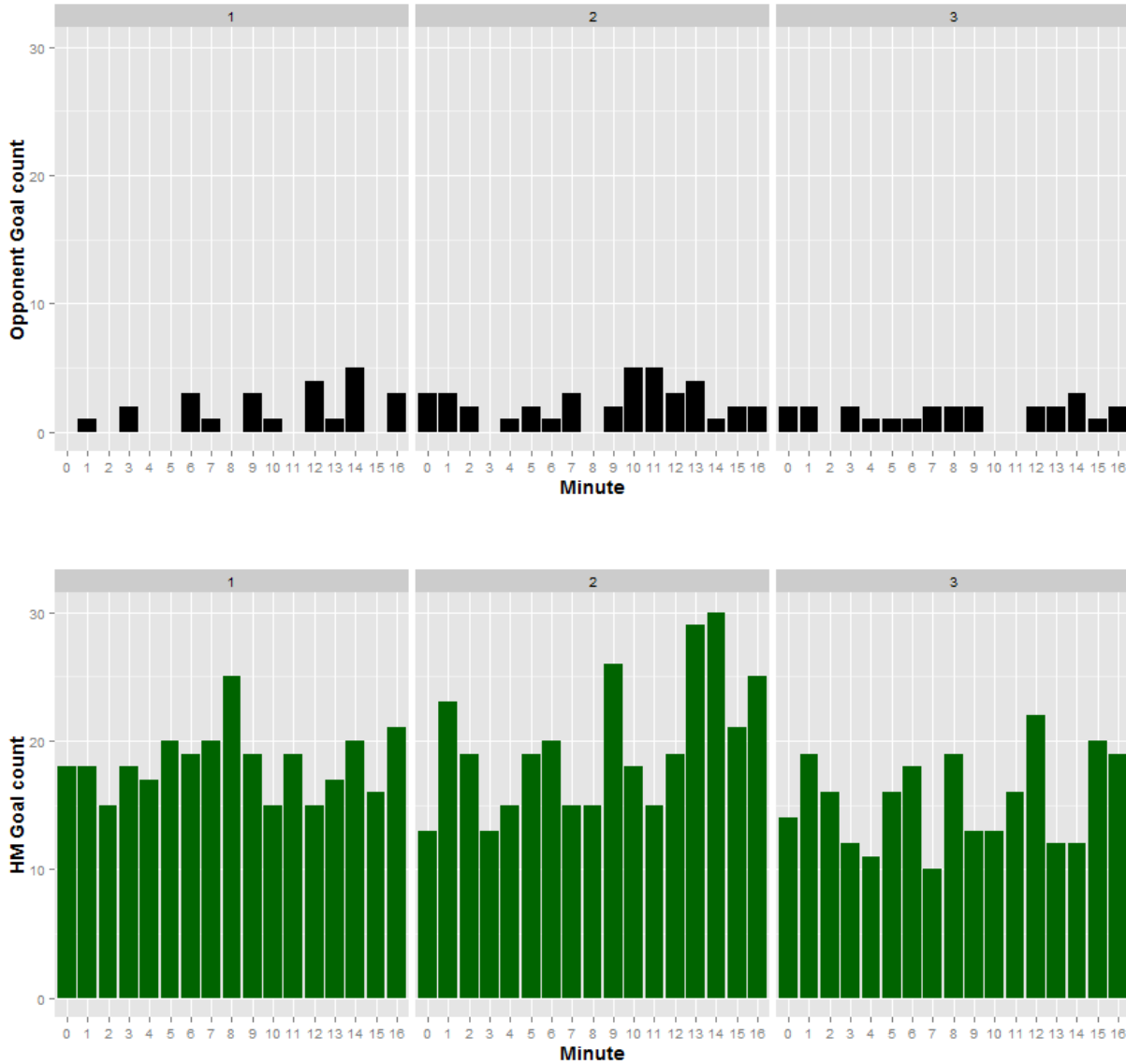
Period	Goal count First 8 minutes	Goal count Last 8 minutes
1	352	363
2	383	466
3	354	360

(excluding the “middle” minute and empty net goals)

Second period scoring is 8% higher in the first half compared to the first and third, which could be a chance difference. But it’s 28% higher in the second half.

When comparing goals by which team scored, Hill-Murray or opponents, I divided the games into to groups according to whether Hill-Murray scored 7 or more goals. This roughly differentiates the “blowout” games from the “competitive” ones. There were 95 blowout games (28% of the total) and goals per game were higher, not surprisingly: 10.5 versus 6.0 in the 247 competitive games.

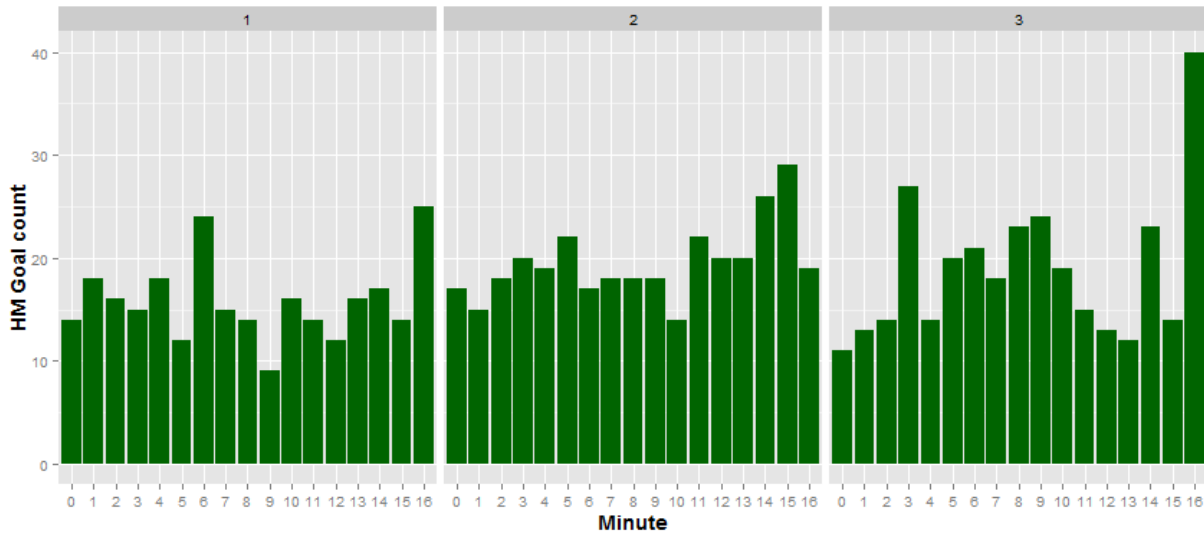
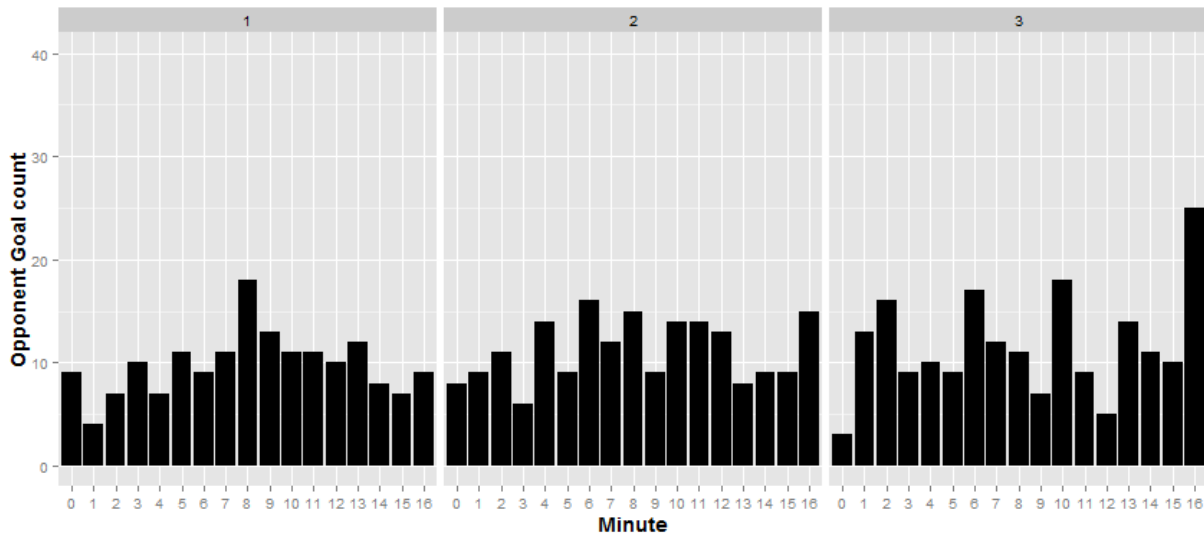
Total goals by period and minute of scoring time (HM vs. Opp), blowout games



	Goals per blowout game			
	1	2	3	Total
Opponents	0.25	0.41	0.26	0.93
Hill-Murray	3.28	3.53	2.76	9.57

Again, we see increased scoring late in the second period and a moderate dropoff in the third by HM.

Total goals by period and minute of scoring time (HM vs. Opp), competitive games



	Goals per competitive game			
	1	2	3	Total
Opponents	0.68	0.77	0.81	2.26
Hill-Murray	1.09	1.34	1.30	3.73

When we take out empty net goals, Hill-Murray does appear to have a second period boost on the order of 20% relative to the rest of the game, regardless of strength of opponent, and the difference is concentrated in the latter half of the second period. But I don't want to make too big a deal of it, since the main theme is that goal scoring is fairly uniform throughout the game.

Period	Opponent goal count		Hill-Murray goal count	
	First 8 minutes	Last 8 minutes	First 8 minutes	Last 8 minutes
1	68	81	132	123
2	85	91	146	168
3	89	87	138	135

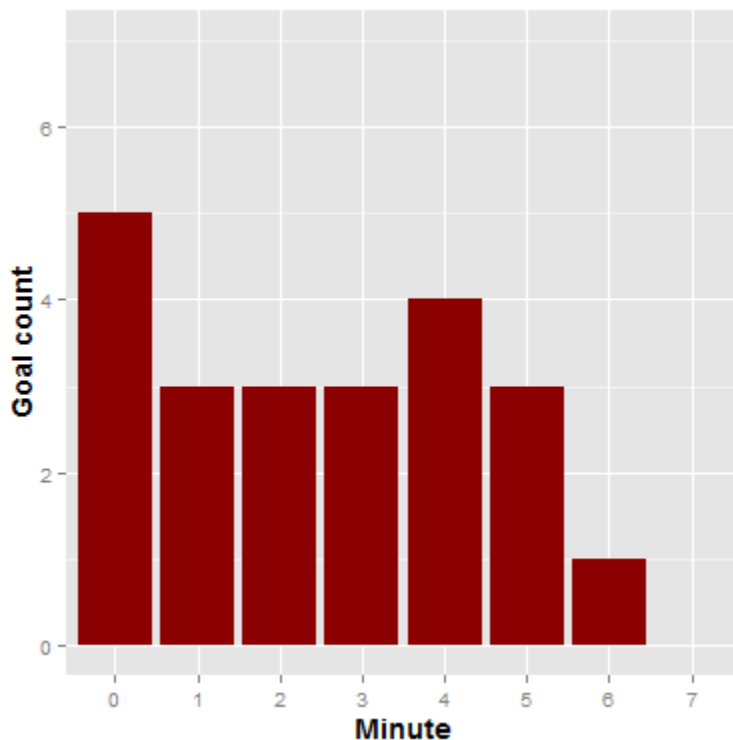
(excluding the "middle" minute and empty net goals)

About 20% of all goals are scored on the power play. I'm not showing them because their distribution roughly follows total goals. However, there are about 25% fewer power play goals scored in the first period than the other two. I'm guessing that is mostly because there are no carryover penalties at the start of the game. Maybe there are fewer penalties called over the whole period, but I don't have that data.

(I did a back-of-the-envelope estimation of what power plays do to the goal scoring rate, and concluded that it approximately doubles the scoring for the team with the advantage - maybe a little more, like 2.5x, while driving the other team's rate close to zero. That results in a net increase in combined goals and obviously a drastic shift in the likelihood of which team scores.)

Finally, here are the first overtime goals. There were 22 goals in 35 games (8 ties and 5 playoff games decided in multiple overtimes). We should expect a decreasing trend in the number of goals in each minute, since a game won't reach a later minute if a goal is scored beforehand.

Total goals by minute of first overtime



There are 14 goals in the first four minutes versus 8 in the last four, check. The goal scoring rate is about 10% higher in overtime than regulation in competitive games, more similar than different.